



## HexWeb® HRH-10

Aramid Fiber/Phenolic Resin Honeycomb

### *Product Data*

#### **Description**

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HexWeb® HRH-10 is manufactured from NOMEX® aramid fiber sheets. A thermosetting adhesive is used to bond these sheets at the nodes, and, after expanding to the hexagonal or OX-Core® configuration, the block is dipped in phenolic resin. After curing the resin, slices are cut to the desired thickness. For special applications, such as air directionalizing, HexWeb® HRH-10 can be provided without the phenolic resin. Using this process, a wide range of cell sizes, paper thicknesses, and densities can be produced. The standard product line is shown under Mechanical Properties.

#### **Features**

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- High strength at low densities
- Small cell sizes at low densities
- Damage resistant under normal shop use
- Formable
- Fire-resistant (self-extinguishing)
- Water and fungus resistant
- Excellent dielectric properties
- Good bonding surfaces
- Good thermal and electrical insulator

#### **Applications**

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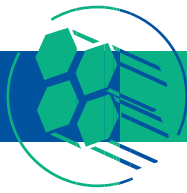
HexWeb® HRH-10 has been widely accepted throughout the aerospace industry and several commercial areas as a very tough, environmentally resistant core material in sandwich panels. It has been designed and used in flat and contoured shapes, with a wide variety of facing materials and adhesives, and it has extensive service in both structural and nonstructural parts. Most of the interior panels of commercial jets, such as the 737, 747, 777, 757, 767, A310, A320, etc., are made with this core material primarily because of its resilience, small cell size/low density combination, and its fire resistance. Exterior aircraft parts such as radomes, fairings, helicopter blades, flaps, etc., are designed with HexWeb® HRH-10 because of the features listed above. Surfboards and high-performance boats are but two additional applications where this core has been used because of its toughness and resistance to corrosive attack. The OX configuration is a hexagonal HexWeb® honeycomb that has been overexpanded in the W direction, providing a rectangular cell shape that facilitates curving or forming in the L direction.

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## Standard Dimensions

HexWeb® HRH-10 honeycomb is available in the following standard sizes.

Products	L	W	T maximum	T minimum	Sq. Ft. Per Panel
HRH-10 Materials	44 in. ± 2 in.	96 in. ± 6 in.	34 in.	0.200 in.	29.3
	48 in. ± 2 in.	96 in. ± 6 in.	34 in.	0.200 in.	32.0
	52 in. ± 2 in.	110 in. ± 6 in.	34 in.	0.200 in.	39.7
HRH-10/OX Materials	38 in. ± 2 in.	96 in. ± 6 in.	34 in.	0.200 in.	25.3

## Thickness Tolerance

Tolerances on cut thickness are as follows:

0.200 in. to 2.000 in. tolerance will be ± 0.006 in. (± 0.002 in. available on request)

2.001 in. to 4.000 in. tolerance will be ± 0.010 in.

4.001 in. and over tolerance will be ± T/100

Special thickness tolerances as well as other L, W, and T dimensions are available upon special request. For large volume requirements it may be possible to supply panels to your specific size at little or no additional charge. Tolerances on L and W for pieces cut to size will depend on the core type and panel dimensions. Tight tolerances are not always possible because of the flexible nature of this core type.

## Type Designation

HexWeb® HRH-10 honeycomb is designated as follows:

Material – Cell Size – Density

Example: HRH-10 – 1/8 – 3.0

Where:

**HRH-10** – designates honeycomb type

**1/8** – is the cell size in inches

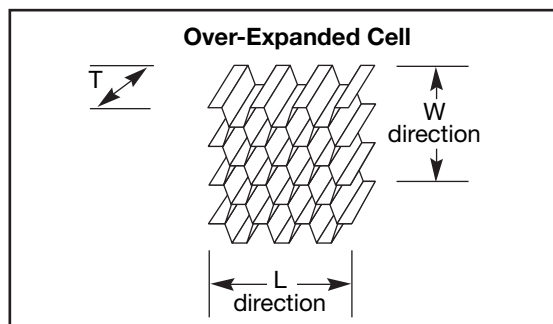
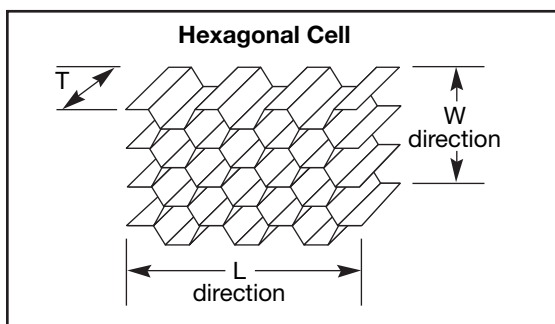
**3.0** – is the nominal density in pounds per cubic foot

## Dimensional Nomenclature

**T** = Thickness, or cell depth

**L** = Ribbon direction

**W** = Long direction, or direction perpendicular to the ribbon



### Availability

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HexWeb® HRH-10 will be supplied F.O.B. Casa Grande, Arizona. Lead times will vary with particular core types selected. Contact the nearest Hexcel Sales Office for delivery information.

### Special Configuration and Shapes

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Honeycomb cores can be custom designed with nonstandard mechanical property combinations to meet a variety of special applications. In addition to the hexagonal and overexpanded (OX) cell shapes, HexWeb® HRH-10 is available in Flex-Core®, a very flexible core material. (See Flex-Core Data Sheet.) HexWeb® HRH-10 can be provided machined or formed to your specific requirements, including flat pieces cut to size, simple tapers, edge chamfering, doubler reliefs, or machining to complex and compound curvatures. Hexcel has unique capabilities to machine parts to unusual contours and to shape honeycomb by a variety of heat-forming techniques. Contact the nearest Hexcel Sales Office for additional information.

### Specifications

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HexWeb® HRH-10 has been evaluated and approved for numerous corporate specifications and meets the requirements of SAE specifications AMS3711B and MIL-C-81986, Amendment 1. In addition, HexWeb® HRH-10 meets the following parameters and properties.

**Configuration** – The cell size of hexagonal core will give the nominal cell dimensions in inches across the flats (nodes) of the cell. Cell size determination will be made by measuring the length of 10 consecutive cells in 6 random locations and averaging the results. Double laps will be permitted as long as the core blankets are within density tolerance. Unbonded nodes will be permitted to the extent that no opening larger than three times the nominal cell size is created and the minimum mechanical properties are obtainable.

**Density** – The tolerance on honeycomb density when measured on a minimum of 100 cubic inches of core will be  $\pm 10\%$ .

**Flame Retardance** – HexWeb® HRH-10 will meet the “self extinguishing” classification of FAA Air Crash Worthiness Rules and Regulations Section 25.853.

**Water Migration** – HexWeb® HRH-10 does not exceed one cell water migration in 24 hours when tested per MIL-STD-401B.

**Mechanical Properties** – The table on the next page lists the HexWeb® HRH-10 product line and mechanical properties when tested per MIL-STD-401B using 0.500 inch core thickness. The typical values represent the mean average of a relatively large number of test values obtained from many blocks of HexWeb® honeycomb. The minimum properties represent recommended minimum average specification values. The preliminary values marked with a “p” are results from a limited amount of testing.

## Mechanical Properties of HexWeb® HRH-10 at Room Temperature

Hexcel Honeycomb Designation  Material – Cell – Density	Compressive					Plate Shear					
	Bare		Stabilized			L Direction			W Direction		
	Strength psi		Strength psi		Modulus ksi	Strength psi		Modulus ksi	Strength psi		Modulus ksi
<b>Hexagonal</b>	typ	min	typ	min	typ	typ	min	typ	typ	min	typ
HRH-10 – 1/16 – 3.4	195	160	205	170	20	155	125	6.0	85	65	2.9
HRH-10 – 1/8 – 1.8	105	85	115	95	8	90	75	3.8	50	40	1.5
HRH-10 – 1/8 – 3.0	300	235	325	270	20	175	155	6.0	100	85	3.5
HRH-10 – 1/8 – 4.0	520	400	575	470	28	255	225	8.6	140	115	4.7
HRH-10 – 1/8 – 5.0	700	560	770	620	37	325	275	10.2	175	150	5.4
HRH-10 – 1/8 – 6.0	1050	850	1125	925	60	385	330	13.0	200	170	6.5
HRH-10 – 1/8 – 8.0	1675	1370	1830	1450	78	480	400	16.0	260	210	9.5
HRH-10 – 1/8 – 9.0	2000	1525	2100	1600	90	515	425	17.5	300	250	11.0
HRH-10 – 3/16 – 1.5	90	75	100	85	6	75	60	3.0	40	32	1.6
HRH-10 – 3/16 – 1.8	120	95	130	105	8	90	75	3.8	50	40	1.9
HRH-10 – 3/16 – 2.0	120	100	140	105	11	110	90	4.3	60	45	2.1
HRH-10 – 3/16 – 3.0	300	235	325	270	20	175	140	6.5	100	85	3.4
HRH-10 – 3/16 – 4.0	500	430	540	470	28	245	215	7.8	140	110	4.7
HRH-10 – 3/16 – 6.0	935	780	1020	865	60	420	370	13.0	225	200	6.5
HRH-10 – 1/4 – 1.5	80	65	90	75	6	70	55	3.0	35	25	1.3
HRH-10 – 1/4 – 2.0	140	115	155	125	11	105	85	4.0	50	40	2.0
HRH-10 – 1/4 – 3.1	285	240	310	265	21	185	160	6.5	90	75	3.0
HRH-10 – 1/4 – 4.0	440	360	480	390	28	250	205	8.0	125	100	3.5
HRH-10 – 3/8 – 1.5	95	75	105	80	6	70	55	3.0	35	25	1.5
HRH-10 – 3/8 – 2.0	140	115	155	125	11	90	72	3.7	55	36	2.4
HRH-10 – 3/8 – 3.0	290	240	320	270	17	185	160	5.6	95	80	3.5
HRH-10 – 1/2 – 2.0	115	90	120	95	–	110	90	4.5	45	33	2.0
HRH-10 – 3/4 – 1.5	70p	50p	80p	55p	7p	70p	55p	3.4p	35p	25p	1.7p
<b>OX-Core</b>											
HRH-10/OX – 3/16 – 1.8	110	85	120	95	7	65	45	2.0	70	50	3.0
HRH-10/OX – 3/16 – 3.0	320	260	350	285	17	115	95	3.0	135	110	6.0
HRH-10/OX – 3/16 – 4.0	600	500	650	550	26	130	105	4.6	150	130	8.4
HRH-10/OX – 1/4 – 3.0	350	280	385	310	17	110	90	3.0	135	110	6.0

Test data obtained at 0.500 inch thickness.

p = Preliminary value obtained from limited testing.

## Additional Properties

The following properties of HexWeb® HRH-10 were obtained on representative production materials.

### Dielectric Constant

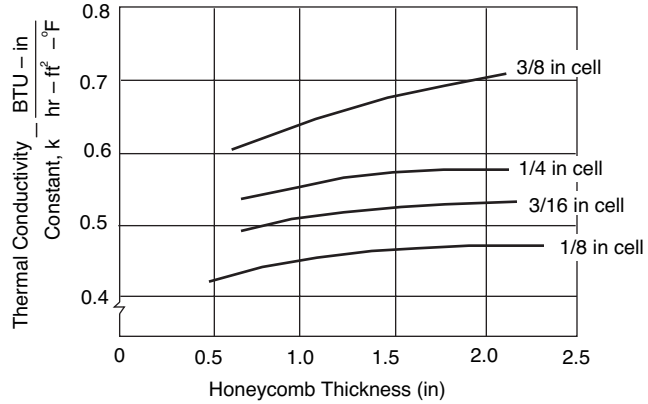
The dielectric constant of a few core types has been measured at a frequency of 9375 MHz. Polarization parallel to both the L and W direction was used.

Core Density	Polarization Parallel to L		Polarization Parallel to W	
	E Parallel L	E Parallel W	E Parallel L	E Parallel W
1.5	1.09	1.09	1.04	1.03
2.0	1.10	1.10	1.05	1.04
3.0	1.11	1.11	1.07	1.05
4.0	1.13	1.13	1.10	1.07
5.0	1.15	1.15	1.14	1.09
6.0	1.19	1.19	1.18	1.11



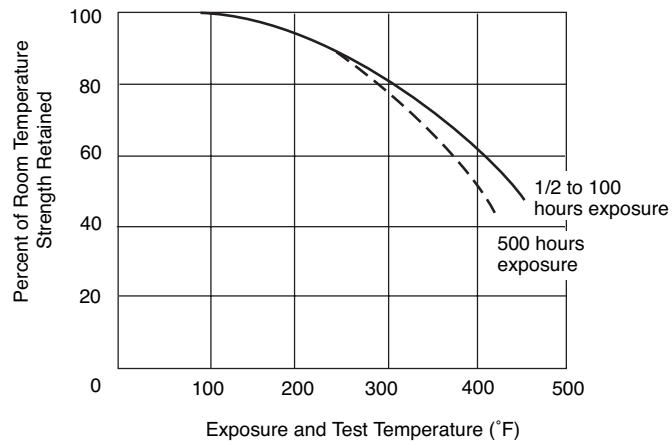
## Thermal Conductivity

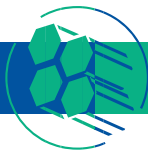
Several honeycomb cores have been tested for thermal conductivity. The figure to the right shows the results of this evaluation for HexWeb® HRH-10. The thermal conductivity constant varies with cell size and core thickness because the air convection affects inside the cells. Note the following values were obtained with the heat flow from top to bottom of the panel.



## Properties at Elevated Temperatures

HexWeb® HRH-10 has been tested for shear and compressive strength at elevated temperatures and time exposures up to 500 hours. Because the NOMEX® softens between 450°F to 500°F, the properties drop off rapidly at those temperatures; however, when returned to ambient conditions, most of its original strength is retained.





## **Important**

Hexcel Corporation believes, in good faith, that the technical data and other information provided herein is materially accurate as of the date this document is prepared. Hexcel reserves the right to modify such information at any time. The performance values in this data sheet are considered representative but do not and should not constitute specification minima. The only obligations of Hexcel, including warranties, if any, will be set forth in a contract signed by Hexcel or in Hexcel's then current standard Terms and Conditions of Sale as set forth on the back of Hexcel's Order Acknowledgement.

## **For more information**

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- RTM Materials
- Honeycomb Cores
- Continuous Fiber Reinforced Thermoplastics
- Carbon, Glass, Aramid and Hybrid Prepregs
- Structural Film Adhesives
- Honeycomb Sandwich Panels
- Special Process Honeycombs
- Reinforced Fabrics

For US quotes, orders and product information call toll-free 1-800-688-7734. For other worldwide sales office telephone numbers and a full address list please click here: <http://www.hexcel.com/contact/salesoffices>.