

### Lightning strike protection for hybrid-carbon fiber wind turbine blades

#### Lightning strike protection (LSP)

PPG's MICROGRID<sup>®</sup> engineered materials are thin, open-area products applied to a layer on the top of the structural carbon fiber spar/web or other systems that utilize carbon such as de-icing solutions with carbon heating mats incorporated on the leading edge.

PPG's LSP engineered materials can achieve critical conductivity, sometimes in conjunction with the carbon components, to dissipate 20-25 years' worth of lightning strikes. PPG's expanded copper and aluminum micro-meshes are essential at extending the life of hybrid-carbon fiber composite blades.

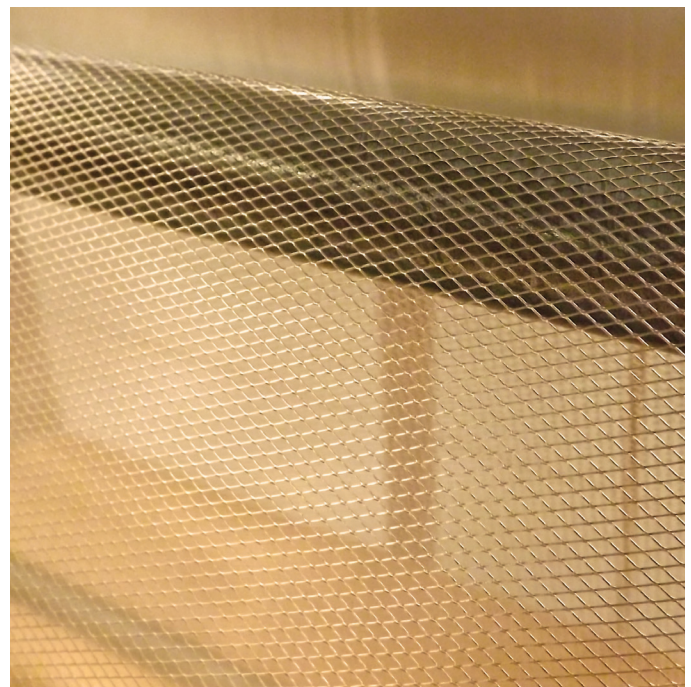
#### Applications of carbon being used in recently designed wind turbine blades:

1. Low wind conditions such as wind class IEC IIIA and the need to generate the maximum amount of rated power is driving the use of lighter and longer blades
  - Carbon has a substantially greater strength to weight ratio than other conventional materials
  - 20% or more reduction in weight with the introduction of a carbon fiber spar/web
2. Heating mats being utilized in the de-icing system on the leading edges
3. Lighter and longer blades for the new recently developed direct drive technology turbines to reduce maintenance costs over the life of the turbine

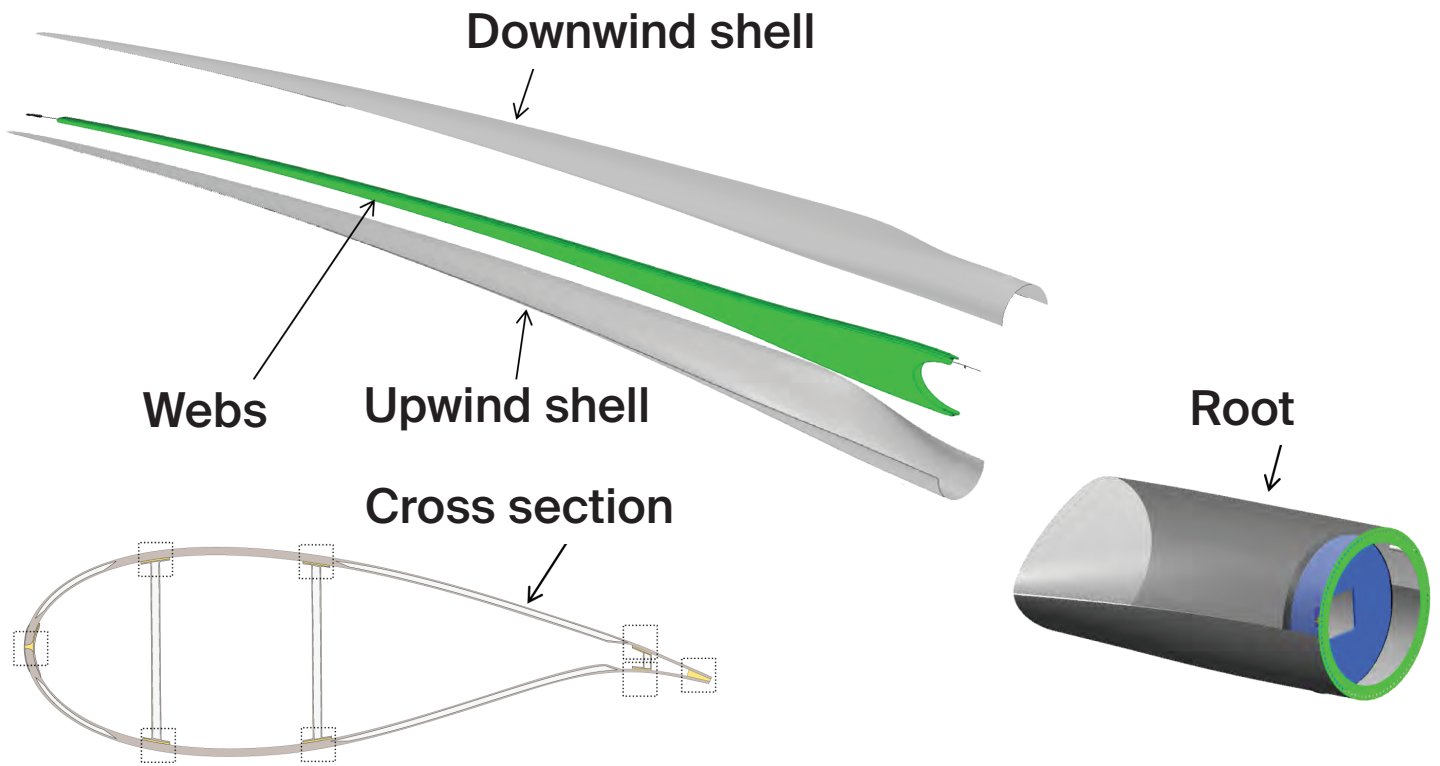
PPG's LSP engineered material is used in conjunction with the other parts of the entire lightning strike protection system for a wind turbine blade. The micro-mesh provides connections between receptor(s) and anchor blocks/root through which high voltage currents are passed to ground connections.

#### MicroGrid advantages:

1. Proven technology for lightning strike protection
2. Highly conductive patterns matched to specific requirements
3. Open area design for easy dry or wet layup without delaminating
4. For onshore and offshore wind turbine blades



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**The main building blocks of a wind turbine blade**

## Common wind power lightning strike protection configurations

Product Code	3CU7-100FA	4CU14-125	8AL17-125FA	10CU10-125FA
<b>Weight - LBS/SF (±10%) -GMS/SM (±10%)</b>	0.040 195.3	0.086 420	0.065 317	0.167 815
<b>Original expanded thickness (±.001 inch / ±.025 mm)</b>	0.003 inch 0.076 mm	0.004 inch 0.102 mm	0.008 inch 0.203 mm	0.010 inch 0.254 mm
<b>Long way of the diamond LWD (±5%)</b>	0.100 inch 2.54 mm	0.125 inch 3.175 mm	0.125 inch 3.175 mm	0.125 inch 3.175 mm
<b>Open area (±5%)</b>	70%	53%	42%	64%

**MicroGrid is a registered trademark of Dexmet Corporation**

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Issue Date: 05/22  
Supersedes: 8/19  
Lit : 4811