Mechanical properties – GPP pultruded profiles

Designing with pultruded profiles is similar to designing with conventional materials. The designer should however consider the following:

- High Strength – Pultruded profiles are stronger than steel on a weight per weight basis and can be used to form considerable weight bearing structures.
- Modulus Of Elasticity – Pultruded profiles have a lower modulus of elasticity than steel. Deflection can be a limiting design factor.
- Shear Modulus – Pultruded profiles have a lower shear modulus than conventional materials.
- Lightweight – Pultruded profiles weigh approximately 30% less than aluminium and 80% less than steel, resulting in structures which can easily be transported, handled and lifted into place.
- Temperature – Pultruded profiles become stronger in cold temperatures, but may suffer from slight degradation at high temperatures.

Characteristic Material Properties - Pultrusion (1:1 Mat/Roving Construction)			
Property	Symbol	Characteristic Value	
Tensile Strength (longitudinal)	$\sigma_{x,t,k}$	207	N/mm^2
Tensile Strength (transverse)	$\sigma_{y,t,k}$	48	N/mm^2
Tensile Modulus (longitudinal)	$E_{x,t,k}$	17.2	kN/mm^2
Tensile Modulus (transverse)	$E_{y,t,k}$	5.5	kN/mm^2
Compressive Strength (longitudinal)	$\sigma_{x,c,k}$	207	N/mm^2
Compressive Strength (transverse)	$\sigma_{y,c,k}$	103	N/mm^2
Compressive Modulus (longitudinal)	$E_{x,c,k}$	17.2	kN/mm^2
Compressive Modulus (transverse)	$E_{y,c,k}$	6.9	kN/mm^2
Shear Strength (in plane)	$\tau_{xy,k}$	31	N/mm^2
Shear Modulus (in plane)	$G_{xy,k}$	2.9	kN/mm^2
Flexural Strength (longitudinal)	$\sigma_{x,b,k}$	207	N/mm^2
Flexural Strength (transverse)	$\sigma_{y,b,k}$	69	N/mm^2
Flexural Modulus (longitudinal)	$E_{x,b,k}$	13.8	kN/mm^2
Flexural Modulus (transverse)	$E_{y,b,k}$	5.5	kN/mm^2
Poisson's Ratio (longitudinal)	ν_{xy}	0.33	
Poisson's Ratio (transverse)	ν_{yx}	0.11	

NOMENCLATURE

Iyy - Second moment of area (Y-Y axis)
iyy - Radius Of Gyration (Y-Y axis)
Izz - Second Moment Of Area (Z-Z axis)
izz - Radius Of Gyration (Z-Z axis)
Wyy - Section Modulus (Y-Y axis)
Wzz - Section Modulus (Z-Z axis)
J - Torsional Constant