

COOLING TOWER SOLUTIONS



The manufacturing facility extending over an area of 550,000 Sq. Ft. With Monthly production capacity of 500 Tons of composites using pultrusion manufacturing process makes EPP Asia's most integrated composite plant.

EPP Manufacturing has assembly lines handling various types of profiles that meet CTI STD-137 standard and BS EN 13706 (E-17 & E-23) Standards. All the pultruded profiles manufactured by EPP, uses Tri-axial surface mats to improve Strength, Fire retardancy and UV Properties.

For specific custom requirements Epoxy or Vinylester resin base structural profiles can be offered.

EPP's tool store has more than 100+ structural profiles in the form of Square tube, Round Pipe, I-Beam, Flats and Deck Channels etc.

EPP's in house testing facility is fully equipped to cater to most of the tests as per CTI /ASTM/ BIS / IEC standards. All the equipments are NABL approved and/or calibrated. With ISO 9001: 2015 certificate ,we assure to maintain the quality standards as committed.



KEY FEATURES

ry good Strength to weight ratio.



Ve
This makes it lighter than steel, aluminium, wood & Concrete.



With the density between 1.7-2.0 , this are 60-70% lighter than Steel.



Excellent Chemical resistance towards most of the acids and alkalis.



Polymers used in the composite possesses excellent electrical resistance



Inherent capabilities of GRP provide a great resistance to electric Charge.



Over the standard sizes, profiles and shapes can be designed to minimize the assembly cost.



With special FR Grade resins, profiles have a fire retardant property and low flammability.



Additional Polyurethane paints can offer greater UV Stability.



Self Pigmented profiles and chemical and mechanical properties ensures the Lowest life cycle cost.



With inherent low density makes it very easy to handle during installation, even of height.



Composites don't absorb water or react with water which makes them the friendliest material to water.



Profiles have great thermal properties and work without losing its bonds cross linking polymers.

These salient features enable its applicability in the cooling towers manufacturers worldwide where these GRP structural profiles have replaced old age of wood & steel. The conventional products like wood, Steel & RCC are providing a very poor life and a very high maintenance cost during a cooling tower's life cycle. RCC structures are time consuming method where as the steel profiles require periodic refurbishing. Wood is a valuable asset towards nature hence the use of wood has also slowly phased out.



ADDITIONAL PRODUCTS



EPP offers custom solutions of GFRP Gratings and Profiles for Cooling Tower applications.

- Stairs & Handrails
- Walkways
- Platforms
- Safety Ladders
- FRP Cladding Sheet
- FRP Fan Stack



HEADER PIPES

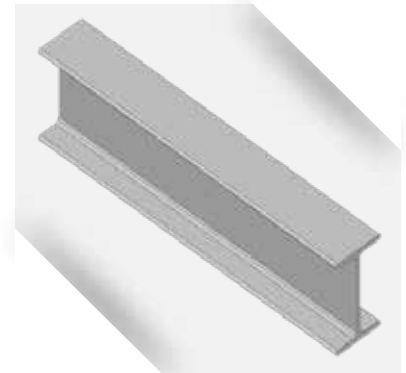
Header Pipes as per
CTI STD - 154.



SECTION LIST

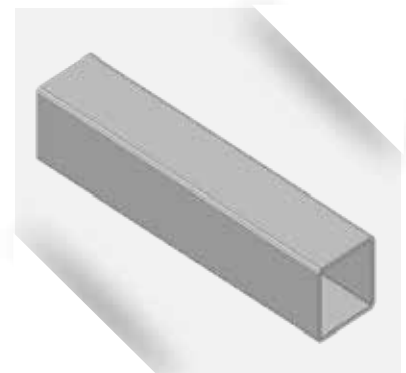
I BEAM

DIMENSIONS (In Inches)	DIMENSIONS (In MM)
3"15/16 x 1"31/32 x 15/64"	100 x 50 x 6
3"15/16 x 3"15/16 x 15/64"	100 x 75 x 6
4" X 2" X 1/4"	101.6 x 50.8 x 6.35
5"29/32 x 2"61/64 x 15/64"	150 x 75 x 6
5"29/32 x 5"29/32 x 15/64"	150 x 150 x 6
6" X 3" X 1/4"	152.4 x 76.2 x 6.35
7"7/8 x 3"15/16 x 25/64"	200 x 100 x 10
11"13/16 x 5"29/32 x 15/32"	300 x 150 x 12



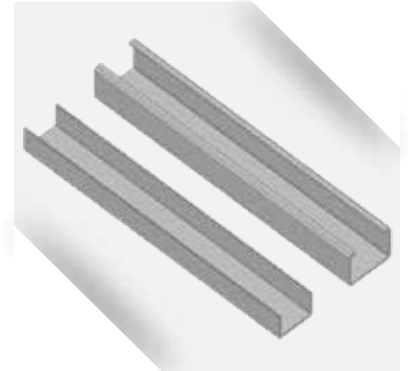
SQUARE BOX

DIMENSIONS (In Inches)	DIMENSIONS (In MM)
1" 1/2 x 1" 1/2 x 1/4"	38.1 x 38.1 x 6.35
1" 3/4 x 1" 3/4 x 1/8"	44.45 x 44.45 x 3.175
1" 3/4 x 1" 3/4 x 1/4"	44.45 x 44.45 x 6.35
2" x 2" x 1/8"	50.8 x 50.8 x 3.175
2" X 2" X 1/4"	50.8 x 50.8 x 6.35
2" 1/2 x 2" 1/2 x 1/4"	63.5 x 63.5 x 6.35
2"61/64 x 2"61/64 x 13/64"	75 x 75 x 5
2"61/64 x 2"61/64 x 15/64"	75 x 75 x 6
2"61/64 x 2"61/64 x 5/16"	75 x 75 x 8
3" x 3" x 1/4"	76.2 x 76.2 x 6.35
3" 1/2 x 3" 1/2 x 1/8"	88.9 x 88.9 x 3.175
3" 1/2 x 3" 1/2 x 5	88.9 x 88.9 x 5
3" 1/2 x 3" 1/2 x 1/4"	88.9 x 88.9 x 6.35
3" 1/2 x 3" 1/2 x 8	88.9 x 88.9 x 8
3"15/16 x 3"15/16 x 15/64"	100 x 100 x 6
3"15/16 x 3"15/16 x 5/16"	100 x 100 x 8
3"15/16 x 3" 15/16 x 25/64"	100 x 100 x 10
4" x 4" x 1/4 "	101.6 x 101.6 x 6.35



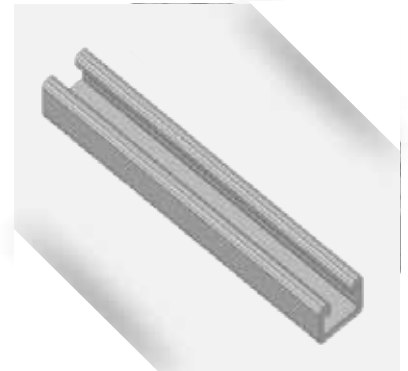
C - CHANNEL

DIMENSIONS (In Inches)	DIMENSIONS (In MM)
3" x 7/8" x 1/4"	76.2 x 22.225 x 6.35
4" x 1" 1/16 x 1/8"	101.6 x 26.987 x 3.175
4" x 1" 1/8 x 1/4"	101.6 x 28.575 x 6.35
4" x 1" 1/8 x 3/8"	101.6 x 28.575 x 9.525
6" x 1" 5/8 x 1/4"	152.4 x 41.275 x 6.35
6" x 1" 11/16 x 3/8"	152.4 x 42.8625 x 9.525
8" x 2" 3/16 x 3/8"	203.2 x 55.5625 x 9.525



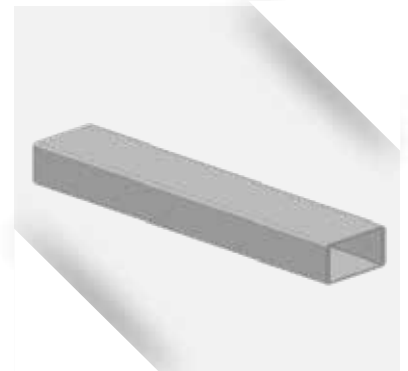
RAIL CHANNEL

DIMENSIONS (In Inches)	DIMENSIONS (In MM)
4" x 1" 15/16 x 1/4"	101.6 x 49.02 x 6.35



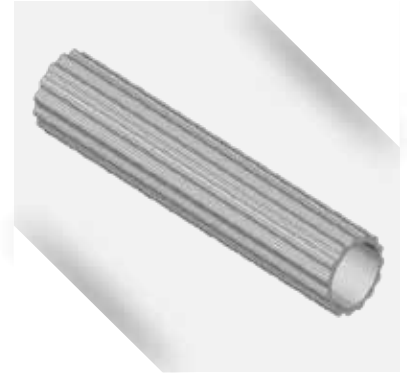
RECTANGULAR BOX

DIMENSIONS (In Inches)	DIMENSIONS (In MM)
1"31/32 x 63/64" x 1/8"	50 x 25 x 3
1"31/32 x 63/64" x 13/64"	50 x 25 x 5
2" X 1" X 1/8"	50.8 x 25.4 x 3.175
2"61/64 x 1"49/64 x 1/8"	75 x 45 x 3
2"61/64 x 1"49/64 x 15/64"	75 x 45 x 6
3" x 2" x 1/8"	76.2 x 50.8 x 3.175



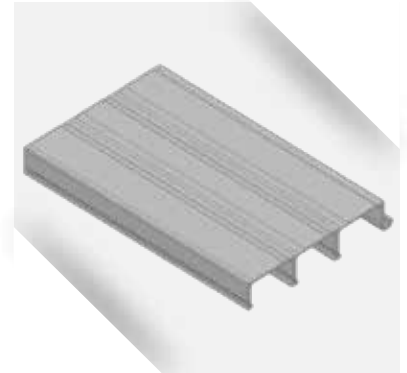
FLUTED TUBE

DIMENSIONS (In Inches)	DIMENSIONS (In MM)
Ø1"17/64 x 5/32"	Ø32 x 4 mm



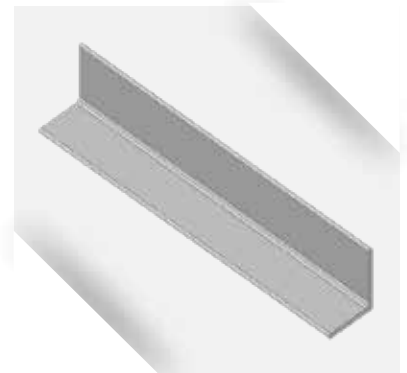
DECK PANNEL

DIMENSIONS (In Inches)	DIMENSIONS (In MM)
11"13/16 x 1"31/32 x 5/32"	300 x 50 x 4
19"11/16 x 1"37/64 x 5/32"	500 x 40 x 4
23"15/16 x 1"1/2 x 1/8"	608 x 38 x 3.3



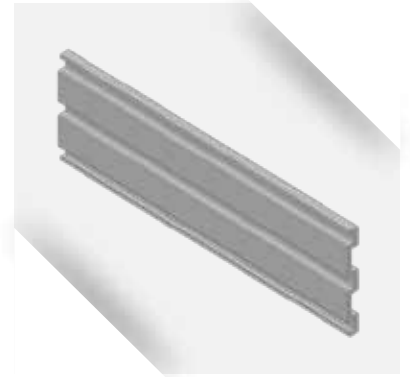
ANGLE

DIMENSIONS (In Inches)	DIMENSIONS (In MM)
1" 1/2 x 1"1/2 x 1/4"	38.1 x 38.1 x 6.35
2" x 2" x 1/4"	50.8 x 50.8 x 6.35
3" x 3" x 1/4"	76.2 x 76.2 x 6.35
3" 1/2 x 3" 1/2 x 1/4"	88.9 x 88.9 x 6.35
4" x 4" x 1/4"	101.6 x 101.6 x 3.175
4" x 4" x 1/4"	101.6 x 101.6 x 6.35



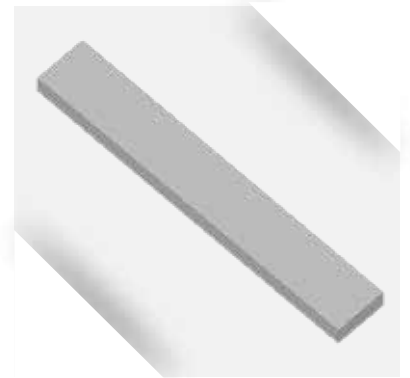
KICK PLATE

DIMENSIONS (In Inches)	DIMENSIONS (In MM)
4" x 1/2" X 1/8"	101.6 x 12.7 x 3.175
5"29/32 x 33/64" x 1/8"	150 x 13 x 3



FLAT

DIMENSIONS (In Inches)	DIMENSIONS (In MM)
63/64" x 15/64"	25 x 6
63/64" x 19/32"	25 x 15
1"3/16 x 13/64	30 x 3
1"3/8 x 13/64"	35 x 5
1"37/64 x 5/32"	40 x 4
1"31/32 x 15/64"	50 x 6
1"31/32 x 5/16"	50 x 8
2"23/64 x 15/32"	60 x 12
2"3/4 x 15/64"	70 x 6
2"3/4 x 5/16"	70 x 8
2"3/4 x 25/64"	70 x 10
2"61/64 x 5/32"	75 x 4
2"61/4 x 15/64"	75 x 6
2"61/4 x 5/16"	75 x 8
2"61/4 x 15/32"	75 x 12
3"5/32 x 5/32"	80 x 4
4"23/32 x 5/16"	120 x 8
3"15/16 x 15/64"	100 x 6
4"59/64 x 15/64"	125 x 6
5"29/32 x 5/16"	150 x 8
6"21/32 x 5/32"	169 x 4
9"29/64 x 5/32"	240 x 4
12"19/32 x 1"8	320 x 3
13"25/32 x 1"8	350 x 3
15"3/4 x 15/64"	400 x 6
31"1/2 x 1"8	800 x 3
36"1/32 x 19/32"	915 x 15
39"3/8 x 15/32"	1000 x 12



CHEMICAL RESISTANCE GUIDE

STRUCTURAL SHAPES

STANDARD POLYESTER (ISO or PN) RESIN SYSTEM

The STANDARD POLYESTER RESIN SYSTEM refers to a NON FLAME RETARDANT isophthalic polyester resin system. This resin system is manufactured in olive green and incorporates ultraviolet inhibitors. Polyester resins exhibit good corrosion resistance, good electrical properties, low thermal conductivity and excellent mechanical properties.

FLAME RETARDANT POLYESTER (ISOFR or PF) RESIN SYSTEM

This resin system exhibits the same characteristics as the Standard Polyester resin system PLUS a flame spread rating of 25 or less when tested in accordance with ASTM E-84. The FLAME RETARDANT resin system is manufactured in gray and yellow.



FLAME RETARDANT VINYL ESTER (VEFR or VF) RESIN SYSTEM

This resin system is manufactured from vinyl ester resin which exhibits higher strength, improved strength and stiffness retention at elevated temperatures, and improved corrosion resistance. This system also meets a maximum flame spread rating of 25 and is produced in beige and yellow.

ELEVATED TEMPERATURE EFFECTS

The approximate retention of mechanical properties at elevated temperatures are:

	TEMPERATURE	ISO (PN) / ISOFR (PF)	VEFR(VF)
Ultimate Stress	37° C	90%	85%
	51° C	80%	70%
	65° C	80%	50%
	79° C	75%	Not Recommended
	93° C	50%	Not Recommended
Modulus of Elasticity	37° C	100%	100%
	51° C	95%	90%
	65° C	90%	85%
	79° C	88%	Not Recommended
	93° C	85%	Not Recommended



The data in this chemical resistance guide is based on field service performance, laboratory testing and extrapolated values from our resin manufacturers' recommendation. Data shown is intended as a guide only. It is recommended that for a specific application, testing be done in the actual chemical environment.

The following conditions will effect the suitability of a specific resin laminate:

Periodic changes in temperature.

Exposure to intermittent splashes and spills.

Combinations of chemicals.

Exposure to frequent splashes and spills.

Changes in chemical concentrations.

Load bearing or non-load bearing requirements.

Temperature spikes.

Frequency of maintenance wash down.

Exposure to vapors only.



CHEMICAL ENVIRONMENT	MAXIMUM RECOMMENDED SERVICE TEMPERATURES, °C		CHEMICAL ENVIRONMENT	MAXIMUM RECOMMENDED SERVICE TEMPERATURES, °C	
	VEFR	ISO / ISOFR		VEFR	ISO / ISOFR
Acetic Acid, to 10%	76	26	Butyl Acetate	NR	NR
Acetic Acid, to 50%	81	NR	Butyl Alcohol	26	NR
Acetic Acid, Glacial	NR	NR	Calcium Carbonate	76	49
Acetone	NR	NR	Calcium Hydroxide	60	49
Aluminum Chloride	76	49	Calcium Hypochlorite	49	NR
Aluminum Hydroxide	60	49	Calcium Nitrate	76	49
Aluminum Nitrate	60	49	Calcium Sulfate	76	49
Aluminum Sulfate	76	49	Carbon Disulfide	NR	NR
Ammonium Chloride	76	49	Carbon Monoxide Gas	76	60
Ammonium Hydroxide, 5%	60	NR	Carbon Dioxide Gas	76	60
Ammonium Nitrate, to 50%	76	49	Carbon Tetrachloride	20	NR
Ammonium Nitrate, Saturated	76	NR	Liquid or Vapor	43	NR
Ammonium Persulfate, to 25%	60	32	Chlorine, Dry Gas	76	NR
Ammonium Phosphate	76	49	Chlorine, Wet Gas	76	NR
Ammonium Sulfate	76	49	Chlorine Water	60	NR
Amyl Alcohol	26	NR	Chloroform	NR	NR
Barium Carbonate	76	49	Chromic Acid, to 5%	43	NR
Barium Chloride	76	49	Chromous Sulfate	60	49
Barium Sulfate	76	49	Citric Acid	76	49
Benzene	NR	NR	Copper Chloride	76	76
Benzene Sulfonic Acid 50%	43	NR	Copper Cyanide	76	76
Benzoic Acid	76	49	Copper Nitrate	76	76
Benzyl Alcohol	NR	NR	Crude Oil, Sour	76	76
Borax	76	49	Cyclohexane, Liquid and Vapor	76	NR
Brine (Sodium Chloride Sol.)	76	49	Diesel Fuel	60	32
Bromine, Liquid or Vapor	NR	NR	Ethyl Acetate	NR	NR
Ethyl Alcohol	NR	NR	Phosphoric Acid, Vapor	76	49
Ethylene Glycol	76	49	Potassium Aluminum Sulfate	76	49
Fatty Acids	76	26	Potassium Bicarbonate	43	37
Ferric Chloride	76	43	Potassium Carbonate, to 10%	43	NR
Ferric Sulfate	76	43	Potassium Chloride	76	49
Formaldehyde	43	NR	Potassium Hydroxide	60	NR
Fuel Oil	60	26	Potassium Nitrate	76	49
Gasoline, Aviation and Ethyl	60	26	Potassium Sulfate	76	49

CHEMICAL ENVIRONMENT	MAXIMUM RECOMMENDED SERVICE TEMPERATURES, °C		CHEMICAL ENVIRONMENT	MAXIMUM RECOMMENDED SERVICE TEMPERATURES, °C	
	VEFR	ISO / ISOFR		VEFR	ISO / ISOFR
Glucose	76	37	Propylene Glycol	76	49
Glycerine	76	37	Sodium Acetate	76	49
Hexane	49	32	Sodium Benzoate	60	49
Hydraulic Fluid (Glycol Based)	60	NR	Sodium Bicarbonate	60	49
Hydraulic Fluid Skydraul	60	NR	Sodium Bisulfate	76	49
Hydrobromic Acid	43	NR	Sodium Bisulfite	76	49
Hydrochloric Acid, up to 15%	60	26	Sodium Borate	76	49
Hydrochloric Acid, Concentrated	43	NR	Sodium Bromide	76	49
Hydrogen Bromide, Dry Gas	60	26	Sodium Carbonate, to 10%	60	20
Hydrogen Bromine, Wet Gas	60	NR	Sodium Chloride	76	49
Hydrogen Chloride, Dry Gas	76	26	Sodium Cyanide	76	49
Hydrogen Chloride, Wet Gas	76	26	Sodium Dichromate	76	49
Hydrogen Flouride, Sol or Vapor	60	NR	Sodium Diphosphate	76	49
Hydrogen Peroxide, to 10%	43	NR	Sodium Hydroxide, 10%	60	NR
Hydrogen Sulfide, Dry Gas	60	26	Sodium Hypochlorite, to 5-1/4%	43	20
Hydrogen Sulfide, Wet Gas	60	26	Sodium Monophosphate	76	49
Isopropyl Alcohol	26	NR	Sodium Nitrate	76	49
JP-4	60	26	Sodium Nitrite	76	49
Kerosene	60	43	Sodium Sulfate	76	49
Lactic Acid	76	49	Sodium Tetraborate	60	49
Lead Acetate	76	49	Sodium Thiosulfate	60	49
Linseed Oil	76	37	Soy Oil	76	37
Lithium Chloride	76	49	Stearic Acid	76	49
Magnesium Carbonate	76	49	Styrene	NR	NR
Magnesium Chloride	76	49	Sulfamic Acid	76	49
Magnesium Hydroxide	76	37	Sulfated Detergents	NR	49
Magnesium Nitrate	76	49	Sulfite Liquor	71	37
Magnesium Sulfate	76	49	Sulfur Dioxide, gas-dry	76	49
Mercuric Chloride	76	49	Sulfur Dioxide, gas-wet	76	20
Mercury Metal	76	49	Sulfur Trioxide, gas-wet or dry	76	NR
Methyl Ethyl Ketone	NR	NR	Sulfuric Acid, to 25%	76	26
Mineral Oil	76	49	Tartaric Acid	76	49
Monochlorobenzene	NR	NR	Tetrachloroethylene	NR	NR
Naphtha	60	49	Toluene	NR	NR
Nickel Chloride	76	49	Trichloroethylene vapor	NR	NR
Nitric Acid, to 5%	43	37	Trisodium Phosphate	76	NR
Nitric Acid, Concentrated	NR	NR	Urea, 35%	43	NR
Nitric Acid, Vapor	60	37	Vinegar	76	65
Oleic Acid	76	49	Water, Distilled	81	65
Oxalic Acid	76	49	Water, Tap	81	49
Paper Mill Liquor	37	37	Zinc Chloride	76	49
Phenol Solution or Vapor	NR	NR	Zinc Nitrate	76	49
Phosphoric Acid	76	37	Zinc Sulfate	76	49
Phosphoric Acid, Salts thereof	76	49			

SOLUTION	MAXIMUM RECOMMENDED TEMPERATURE C°
H ₂ SO ₄ - 25 %	99
HCl - 20%	99
HNO ₃ - Gas	38
Acetic Acid - 25%	99
Phosphoric Acid - 100%	99
NaOH - 50%	82
Sodium Carbonate - 35%	82
NaCl - Saturated	82
Ethanol - 10%	49
Sodium Hypochlorate - 10%	49
All Alk (SO ₄) ₂	99
Perochloroethylene - 100%	27
n-Heptane - 100%	99
Kerosene - 100%	82
Toluene - 100%	27
H ₂ O ₂ - 30%	65
Distilled Water	82

NOTE:

Threads of threaded rods are cut into specially manufactured pultruded rods. Therefore, after installation of threaded rods and fiberglass nuts in a corrosive environment, the threads are to be sealed with a vinyl ester resin.



The values listed below are test results from coupon tests performed in accordance with the noted ASTM Test.

MECHANICAL PROPERTIES	ASTM	UNITS	VALUE
Tensile Stress, LW	D-638	MPa	206.8
Tensile Stress, CW	D-638	MPa	48.2
Tensile Modulus, LW	D-638	GPa	17.2
Tensile Modulus, CW	D-638	GPa	5.5
Compressive Stress, LW	D-695	MPa	206.8
Compressive Stress, CW	D-695	MPa	103.4
Compressive Modulus, LW	D-695	GPa	17.2
Compressive Modulus, CW	D-695	GPa	6.9
Flexural Stress, LW	D-790	MPa	206.8
Flexural Stress, CW	D-790	MPa	68.9
Flexural Modulus, LW	D-790	GPa	12.4
Flexural Modulus, CW	D-790	GPa	5.5
Modulus of Elasticity, E	Full Section	GPa	19.3
Shear Modulus	-----	GPa	3.1
Short Beam Shear	D-2344	MPa	31.0
Punch Shear	D-732	MPa	68.9
Bearing Stress, LW	D-953	MPa	206.8
Notched Izod Impact, LW	D-256	J/mm	1.33
Notched Izod Impact, CW	D-256	J/mm	0.21

MECHANICAL PROPERTIES	ASTM	UNITS	VALUE
Barcol Hardness	D-2583	-----	45
24 Hour Water Absorption	D-570	% max	0.45
Density	D-792	g/cc	1.72-1.94
Coefficient of Thermal Expansion, LW	D-696	10 ⁻⁶ cm/cm/°C	8

MECHANICAL PROPERTIES	ASTM	UNITS	VALUE
Arc Resistance, LW	D-495	seconds	120
Dielectric Strength, LW	D-149	KV/mm	1.37
Dielectric Strength, PF	D-149	KV/mm	7.9
Dielectric Constant, PF	D-150	@60hz	5

MECHANICAL PROPERTIES	ASTM	UNITS	VALUE
Tunnel Test	E-84	Flame Spread	25 max
Flammability	D-635	-----	Nonburning

LW = Lengthwise CW = Crosswise PF = Perpendicular to Laminate Face

Below are the test results for typical coupon properties of ISO, ISOFR and VEFR Flat Sheet. Properties are derived per the ASTM test method shown. Synthetic surfacing veil and ultraviolet inhibitors are standard.

MECHANICAL PROPERTIES	ASTM	UNITS	THICKNESS					
			ISO & ISOFR			VEFR		
			3.2 mm	4.8-6.4mm	9.5-25.4 mm	3.2 mm	4.8-6.4mm	9.5-25.4 mm
Tensile Stress, LW	D-638	MPa	165.5	165.5	165.5	165.5	165.5	165.5
Tensile Stress, CW	D-638	MPa	51.7	68.9	68.9	51.7	68.9	68.9
Tensile Modulus, LW	D-638	GPa	13.8	13.8	13.8	13.8	13.8	13.8
Tensile Modulus, CW	D-638	GPa	6.9	7.6	9.6	6.9	7.6	9.6
Compressive Stress, LW	D-695	MPa	165.5	165.5	165.5	165.5	165.5	165.5
Compressive Stress, CW	D-695	MPa	106.9	113.8	113.8	113.8	120.7	120.7
Compressive Modulus, LW	D-695	GPa	12.4	12.4	12.4	12.4	12.4	12.4
Compressive Modulus, CW	D-695	GPa	6.9	6.9	6.9	6.9	6.9	6.9
Flexural Stress, LW	D-790	MPa	241.3	241.3	206.8	241.3	241.3	206.8
Flexural Stress, CW	D-790	MPa	103.4	103.4	124.1	103.4	103.4	124.1
Flexural Modulus, LW	D-790	GPa	11.0	13.8	13.8	11.0	13.8	13.8
Flexural Modulus, CW	D-790	GPa	6.2	7.6	9.6	6.2	7.6	9.6
Perpendicular Sher Stress , LW	D-3846	MPa	41.3	41.3	41.3	41.3	41.3	41.3
Perpendicular Sher Stress , CW	D-3846	MPa	41.3	41.3	41.3	41.3	41.3	41.3
Bearing Stress,LW	D-953	MPa	220.6	220.6	220.6	220.6	220.6	220.6
Notched Izod Impact, LW	D-256	J/mm	0.99	1.1	1.1	0.99	1.1	1.1
Notched Izod Impact, CW	D-256	J/mm	0.27	0.27	0.27	0.27	0.27	0.27

PHYSICAL PROPERTIES	ASTM	UNITS	3.2 mm	4.8-6.4mm	9.5-25.4 mm	3.2 mm	4.8-6.4mm	9.5-25.4 mm
Barcol Hardness	D-2583	—	40	40	40	40	40	40
24 Hour Water Absorption	D-570	% MAX	0.6	0.6	0.6	0.6	0.6	0.6
Density	D-792	g/cc	1.72-1.94	1.72-1.94	1.72-1.94	1.72-1.94	1.72-1.94	1.72-1.94
Coefficient Thermal Expansion, LW	D-696	10 ⁻⁶ mm/mm/c	8	8	8	8	8	8

ELECTRICAL PROPERTIES	ASTM	UNITS	3.2 mm	4.8-6.4mm	9.5-25.4 mm	3.2 mm	4.8-6.4mm	9.5-25.4 mm
Arc Resistance, LW	D-495	seconds	120	120	120	120	120	120
Dielectric Strength,LW	D-149	kv./mm	1.37	1.37	1.37	1.37	1.37	1.37
Dielectric Strength,PF	D-149	kv./mm	7.9	7.9	7.9	7.9	7.9	7.9

FLAMMABILITY PROPERTIES FOR ISOFR & VEFR FLAT SHEET		
Tunnel Test	E-84	Flame Spread 25max.
Flammability	D-635	Nonburning
	94	vo
NBS Smoke Chamber	E-662	Smoke Density 600 -700

LW = Lengthwise

CW = Crosswise

PF =Perpendicular to Laminate Face