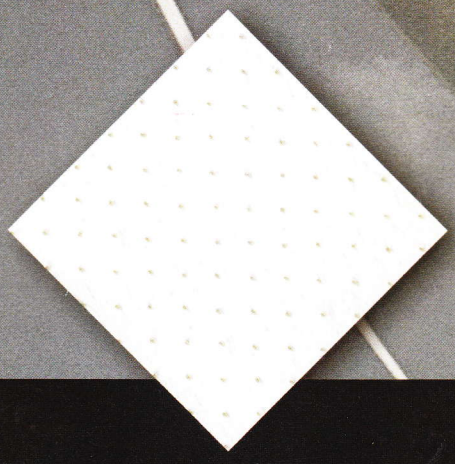
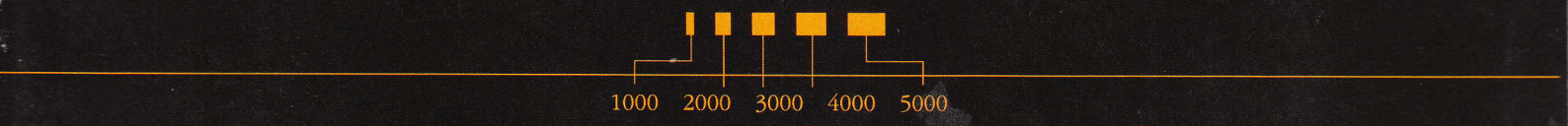
U-PICA MAT

Marubeni Corporation





U-PICA MAT has been developed jointly by Toyobo Inc., Toyo Cloth Co.,Ltd. and Japan U-PICA Co.,Ltd. as a laminate bulker/print control mat in order to provide remarkable workability, cost and weight advantages in FRP laminates. In fact U-PICA MAT's laminated density is only about half of that of fiberglass laminated mat. Yet, when U-PICA MAT is incorporated into a laminate, it can form a stronger composite than solid FRP of the same weight. Furthermore, U-PICA MAT dramatically reduces the telegraphing of reinforcements.

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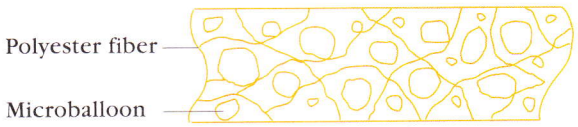
U-PICA MAT is a low-density, non-woven continuous-strand laminate bulker/print control mat containing approximately 45% by volume of microballoons and having a density of 0.045g/cm3.



U-PICA MAT has excellent wet-out property for unsaturated polyester resin and absorbs about 55% by volume of the resin.

No change in the thickness of U-PICA MAT is observed even after the resin has been cured, if an appropriate quantity of the resin is impregnated into U-PICA MAT.

Features of U-PICA MAT

- ☐ Excellent wet-out.
- ☐ Dimensionally stable and has minimal thickness variations after wet-out and cure.
- ☐ Has excellent conformability which makes it especially suitable for use in thin or complex laminated parts where rigidity and light weight are required.
- ☐ Reduces telegraphing or print-through of other reinforcements.
- ☐ Provides excellent impact strength.
- ☐ Provides superior acoustic and thermal insulation.
- ☐ Unlaminated light weight makes it easy to cut and handle.
- ☐ Decreases laminating time, particularly in thin structures.
- ☐ Decreases exotherm.
- ☐ Continuous-strand structure provides a dramatic increase in wet and dry tensile strengths.
- ☐ U-PICA MAT laminates have greater flexural strength and stiffness than solid FRP.
  U-PICA MAT laminates are also lighter, which means weight saving and materials saving you save weight, you can also save on the amount of materials required.

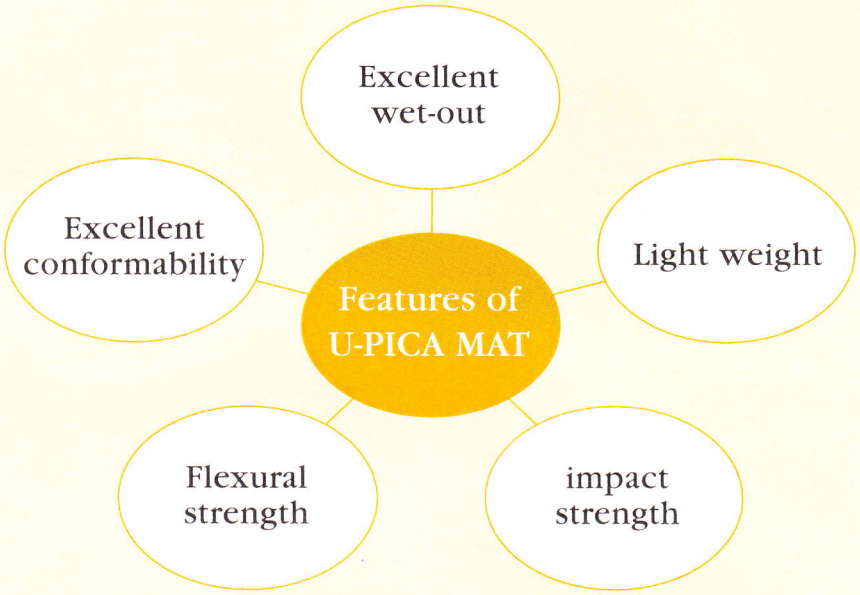


Table1. Physical properties of various core materials for FRP laminates

Core material		Bulk density (g/cm^3)	Tensile strength (MPa)	Compressive strength*1 (MPa)
U-PICA MAT	Before molding	0.045	1.18 ~ 1.96	—
	After molding	0.70 ~ 0.80	5.88 ~ 9.81	21.6
Rigid polyurethane foam		0.024 ~ 0.29	0.11 ~ 4.81	0.11 ~ 7.55
Polyvinyl chloride foam		0.032 ~ 0.095	0.88 ~ 1.67	0.31 ~ 1.77
Acrylic foam		0.04 ~ 0.10	0.98 ~ 1.67	0.49 ~ 1.96
Balsa(perpendicular to geain)		0.096 ~ 0.248	9.32 ~ 30.4	5.10 ~ 22.6
Lauan plywood		0.62 ~ 0.71	43.1 ~ 83.4	—

*1 Compressive strength when a specimen is compressed until 10% of the ultimate compressive distortoin (in accordance with JIS K 6911).

Application of U-PICA MAT

U-PICA MAT is ideal for the following applications.

- ☐ In ships and boats (hull, decks, roofs, bridges and other riggings)
- ☐ For motor vehicles (spoiler, fenders, roofs, container panels, etc.,)
- ☐ For housing (bathroom units, water tanks, septic tanks, drain lids, floor linings, swimming pool, etc.,)
- ☐ Others (crawls, feed tanks, molds, etc.,)

U-PICA MAT can be widely used for many applications of marine field, because it has been approved by Lloyd's Register of Shipping.

Typical Properties of U-PICA MAT

There are five standard grades of U-PICA MAT as T-1000, T-2000, T-3000, T-4000 and T-5000 their designation is indicated in Table 2-1.

There are also three soft grade of U-PICA MAT ("S" type) as S-3000, S-4000 and S-5000.

Their designation is indicated in Table 2-2.

Table2-1 U-PICA MAT "T" TYPE designation

Item	Unit	T-1000	T-2000	T-3000	T-4000	T-5000
Thickness dry	mm	1.6	2.1	3.1	4.1	5.1
wet	mm	1.5	2.0	3.0	4.0	5.0
Weight	g/m²	60	90	135	160	200
Apparent density	g/cm³	0.040	0.045	0.045	0.040	0.040
Resin absorption	vol.%	55	60	55	55	55
Width	mm	1,000	1,000	1,000	1,000	1,000
Roll length	m	50	50	50	50	25
Roll weight	kg	app.4	app.5	app.7	app.8	app.10
Roll diameter	cm	33	40	48	55	60
Roll volume	m³	0.08	0.12	0.18	0.25	0.28
Packaging	—	*Wound on a paper core, wrapped with polyethylene film*				

WIDTH MAX .1370mm AVAILABLE

Table2-2 U-PICA MAT "S" TYPE designation

Item	Unit	S-3000	S-4000	S-5000
Thickness dry	mm	3.1	4.1	5.1
wet	mm	3.0	4.0	5.0
Weight	g/m²	120	145	195
Apparent density	g/cm³	0.040	0.035	0.040
Resin absorption	vol.%	60	55	55
Width	mm	1,000	1,000	1,000
Roll length	m	50	50	25
Roll weight	kg	app.7	app.8	app.10
Roll diameter	cm	48	55	60
Roll volume	m³	0.19	0.24	0.28
Packaging	—	*Wound on a paper core, wrapped with polyethylene film*		

Storing and Handling of U-PICA MAT

- ☐ Keep U-PICA MAT dry at all times.
- ☐ Store U-PICA MAT in well-ventilated space away from direct sunlight.
- ☐ Store U-PICA MAT rolls vertically. Horizontal storage or piling may affect thickness.
- ☐ Avoid exposing U-PICA MAT directly to corrosive materials such as raw catalysts.

Laminating Procedures with U-PICA MAT

Calculating the Amount of Resin Required:

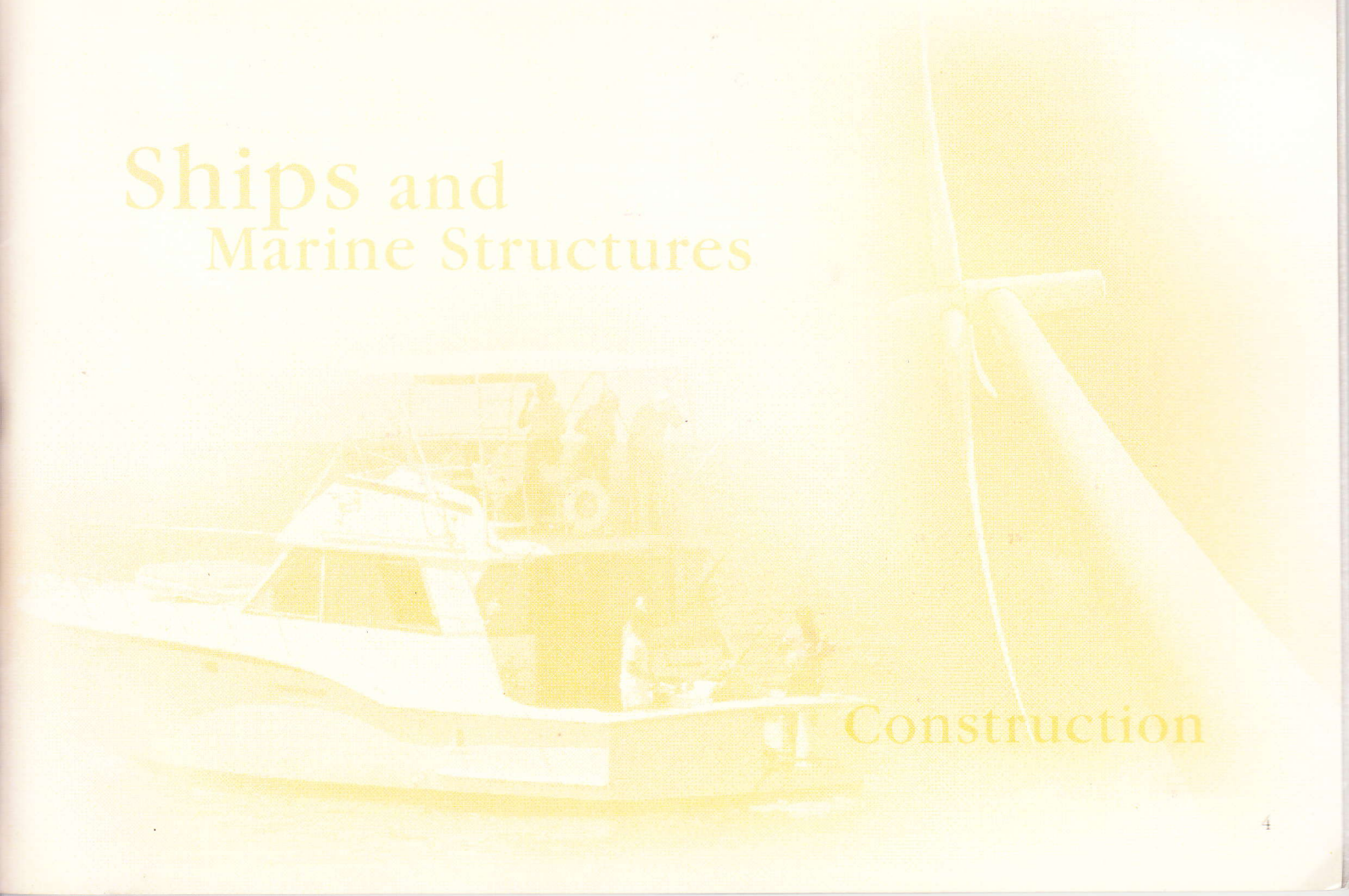
Follow the quantities per square meter (foot) as indicated in "Mat Designations."

Laminating with U-PICA MAT:

- ☐ Use U-PICA MAT in hand lay-up the same way you use glass mat or woven roving.
- ☐ Don't use U-PICA MAT as a final layer.
- ☐ Never place U-PICA MAT against a gel-coated surface.
- ☐ When using U-PICA MAT T-1000 (1 mm thick) and T-2000 (2mm thick), apply 20-30% of the required resin to the bed mat. Position U-PICA MAT on the laminate. Then apply all the remaining resin and roll out. Take care to insure that there are no voids between the U-PICA MAT and the bed mat.
- ☐ Proper wet-out of U-PICA MAT is essential. When using U-PICA MAT T-3000 (3mm) and S-3000 (3mm), apply 1/3~1/4, T-4000 (4mm) S-4000 (4mm) and T-5000 (5mm) S-5000 (5mm), apply 1/3~1/4 of the required resin to the down side of the U-PICA MAT. Apply the remaining to the top side, and roll out.
- ☐ Solvents such as acetone, methylene chloride and others will degrade U-PICA MAT and inhibits its cure, so be sure to shake out rollers and brushes before you laminate.
- ☐ It is recommended that you always apply another ply or reinforcement over U-PICA MAT and that both these layers cure at the same time. This will insure sufficient mass and exotherm to properly cure the resin.

Butt Joint:

- ☐ Unlike other reinforcements, U-PICA MAT does not require overlapping. Butt the sheets of U-PICA MAT, and fill any gap wider than 2mm with a strip of U-PICA MAT cut with a knife or scissors.



TOLERANCES

grade	thickness (mm)	Resin Adsorption (%)	Permeability*		Weight (g/m²)
			T.O. (sec)	W.O. (sec)	
T-1000	1.6±0.2	55±10	Max. 20	Max. 30	60±10
T-2000	2.1±0.3	60±10	Max. 20	Max. 30	90±10
T-3000	3.1±0.4	55±10	Max. 40	Max. 40	135±15
T-4000	4.1±0.5	55±10	Max. 60	Max. 70	160±20
T-5000	5.1±0.6	55±10	Max. 90	Max. 90	200±20
S-3000	3.1±0.4	55±10	Max. 20	Max. 35	130±15
S-4000	4.1±0.5	55±10	Max. 30	Max. 50	145±20
S-5000	5.1±0.8	55±10	Max. 30	Max. 80	195±20
Test method	In-house method (no-load method)	In-house method	In-house method	In-house method	In-house method

* PLEASE REFER THE FOLLOWING TEST METHOD

*The Methodology of impregnation test

Permeability (Through Out = T.O.)

Three samples, each of 10cm width and 10cm length, taken from both ends and the middle of a roll of U-PICA MAT, are placed on top of a transparent beaker of 9cm diameter, and 300cc of unsaturated polyester resin (Viscosity 300cps/25°C), is dripped instantaneously onto the sample surface and the time taken for all the resin to permeate into the interior of the sample is measured.
The greatest of the values for the three is taken as the permeability (T.O. seconds).

Permeability (Wet Out = W.O.)

Three samples, each of 3cm width and 3cm length, taken from both ends and the middle of a roll of U-PICA MAT, are floated separately, the side with the larger hole facing upward, on the liquid surface in a beaker containing 100cc of unsaturated polyester resin (Viscosity 300cps/25°C), and the time taken for the liquid to soak through and completely cover the surface of the sample is measured.
The greatest of the values for the three samples is taken as the permeability (W.O. seconds).

manufactured by Toyo Cloth Co.,Ltd