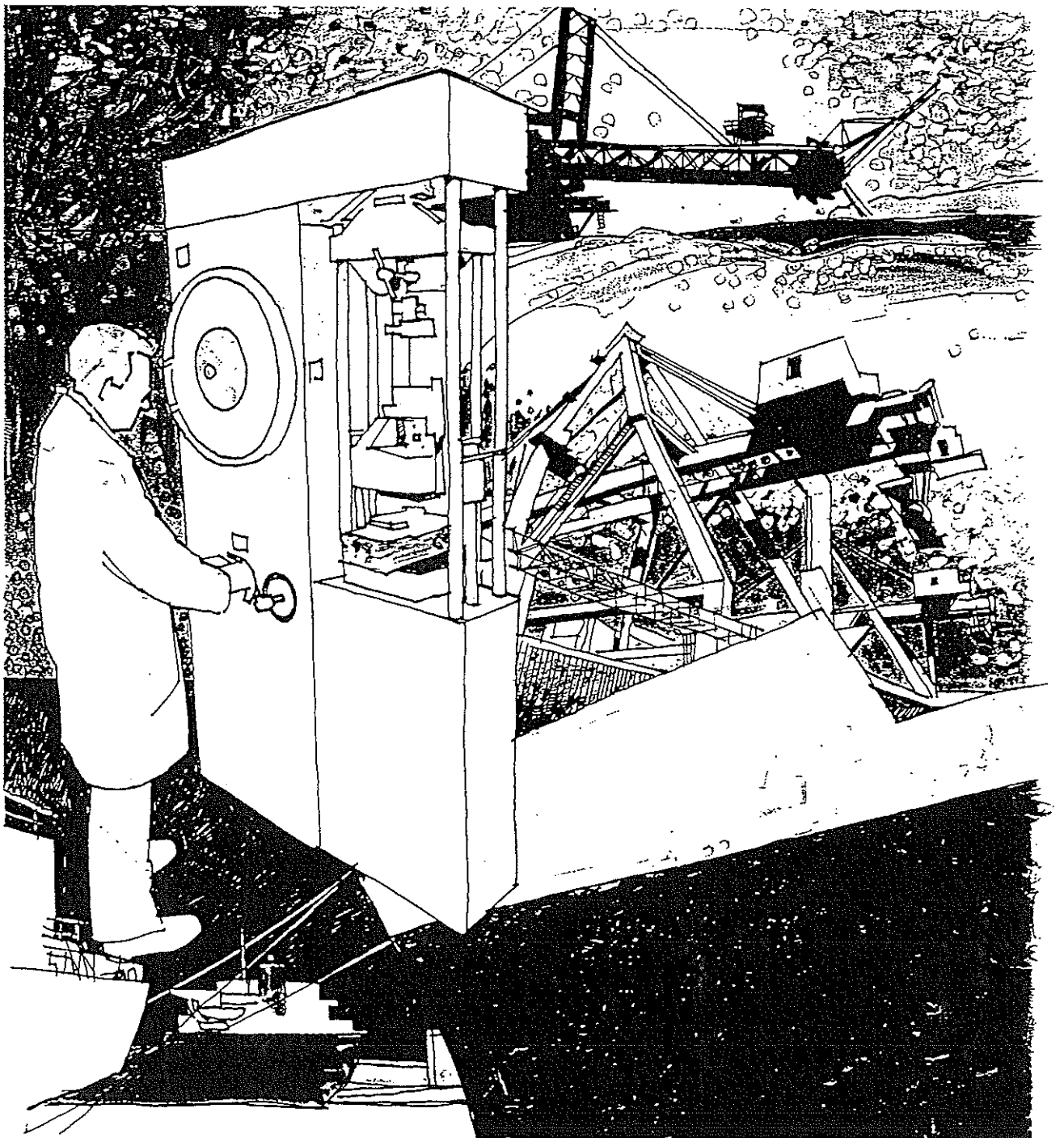




# industrial laminates

## PHYSICAL AND MECHANICAL PROPERTIES





## industrial laminates

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### Physical and mechanical properties

Formica industrial grade laminates are supplied in a number of grades with varying physical and mechanical properties. They are manufactured to Australian and British Standard specifications. Quality control is rigorously maintained by sample testing in Formica's NATA registered laboratories. Formica industrial laminates are made by impregnating a web of reinforcement (such as paper, fabric, asbestos cloth, wood veneer or glass) with a resin which has been dissolved in a suitable solvent.

The resins most commonly used in laminate manufacture are phenolics and melamines. Phenolics have good mechanical, physical and generally good electrical properties except in extreme environmental conditions. Melamine resins are similar but have slightly lower mechanical properties because they are more brittle. Melamines have better flammability, heat resistance, arcing and anti-tracking properties. They are substantially harder than phenolics and are self-extinguishing.

One of the major factors influencing the electrical and mechanical properties of the laminate is the ratio of reinforcement to resin. Generally higher proportions of resin give better electrical properties and lower mechanical properties.

Typical values of the physical and mechanical properties of Formica industrial laminates are given in the individual reference pages.

Where appropriate, the following tests are carried out in Formica's NATA registered laboratories and/or by independent testing authorities.

Tensile strength	Power factor
Crossbreak strength	Arc resistance
Impact strength	Tracking resistance
Shear strength	Flammability
Crushing strength	Heat resistance
Modulus of elasticity	Thermal conductivity
Water absorption	Coefficient of friction (surface)
Insulation resistance	Wear rate
Electric strength (in oil)	Specific gravity
— flatwise and edgewise	Machinability.

Note. Some laminates have special properties which need additional tests. These are carried out as required to provide users with complete product information.

## industrial laminates

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### Chemical reaction

Formica industrial laminates are unaffected by most chemical compounds. The following information is given as a general guide only and is based on tests made under static conditions in Formica's NATA registered laboratories.

Different results can be obtained in practice depending on actual working conditions, such as degree of flow, agitation, temperature and the presence of other chemicals etc.

Formica's technical advisers will be pleased to discuss with potential users the reaction of Formica industrial grade laminates with chemicals and to supply laminate samples for testing in actual working conditions.

Formica industrial grade laminates resist the following solvents.

Aliphatic Hydrocarbons

Alcohols

Aromatic Hydrocarbons

Chlorinated Hydrocarbons

Ketones

Petrol and Paraffin

Most grades of Formica industrial laminates are suitable for use with the following at temperatures up to 50°C and at the concentrations indicated.

Acetic Acid	(80%)
Ammonia	(20%)
Bromine Water (Saturated)	
Calcium Hypochlorite	(15%)
Chlorine Water (Saturated)	
Chromic Acid	(25%)
Hydrochloric Acid	(80% Saturated)
Hydrogen Peroxide	(20 Vol.)
Nitric Acid	(5%)
Bleaching Powder	(10%)
Phenol	(Molten)
Potassium Hydroxide	(5%)
Phosphoric Acid	(80%)
Sodium Silicate	(80%)
Sodium Hydroxide	(2%)
Sodium Hypochlorite	(10%)
Sulphurous Acid	(Conc.)
Sulphuric Acid	(10%)
Triethanolamine	(15%)
Detergents	(1%)

Users should make sure that Formica industrial laminates are suitable for their working conditions and chemical mixtures.



# industrial laminates

## *PRODUCT RANGE Properties – Typical Values*

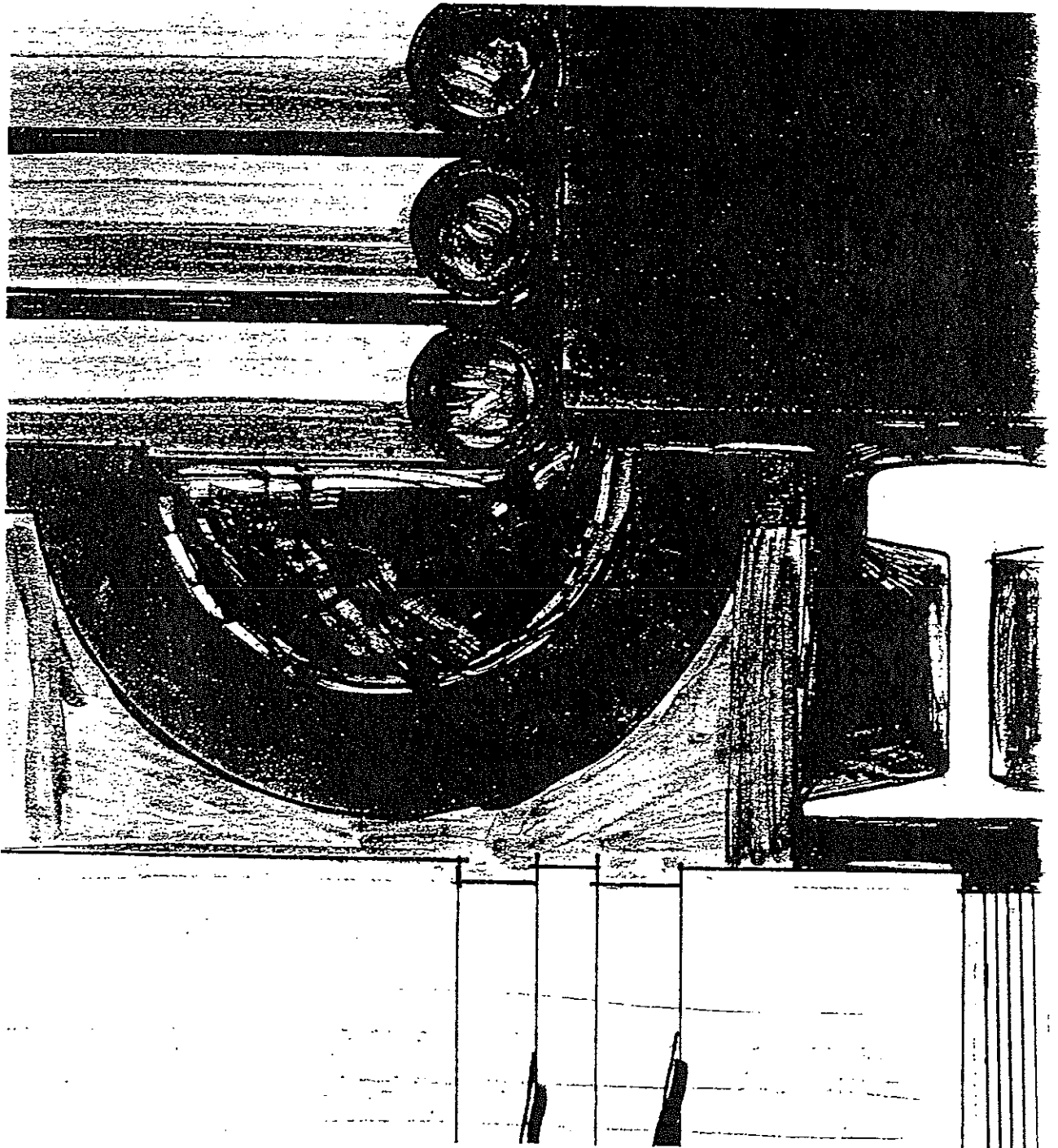


TABLE 1

REINFORCEMENT	CELLULOSE PAPER										GLASS FABRIC	GLASS MATT				
	PHENOLIC												MELAMINE	PHENOLIC	MELAMINE	POLYESTER
	P1	PX1	GP1	P3	PP3	Novapanel	Switchpanel	BN8	MP1	P20A						
PROPERTY*	UNITS															
Tensile strength	130	130	—	100	85	—	—	120	—	—	—	—	130	400	—	62
	18850	18850	—	14500	12850	—	—	17400	—	—	—	—	18850	5800	—	9000
Tensile strength	100	100	—	85	70	—	—	100	—	—	—	—	—	280	—	62
	14500	14500	—	12350	10150	—	—	14500	—	—	—	—	—	37700	—	9000
Crossbreak strength	180	180	—	170	150	—	—	160	—	—	—	—	—	400	—	170
	26100	26100	—	24650	21750	—	—	23200	—	—	—	—	—	58000	—	24650
Crossbreak strength	140	140	—	130	120	—	—	130	—	—	—	—	—	300	—	170
	20300	20300	—	18850	17400	—	—	18850	—	—	—	—	—	43500	—	24650
Impact strength parallel	0.4	0.2	0.25	0.2	0.1	—	—	0.6	—	—	—	—	0.4	10*	—	7.7*
	12.7mm	12.7mm	—	0.08	0.44	—	—	0.44	—	—	—	—	0.25	7.38**	—	5.68**
Shear strength	85	85	60	80	40	—	—	90	—	—	—	—	63	200	—	100
	12350	12350	8700	11600	5800	—	—	13050	—	—	—	—	9750	29000	—	14500
Compressive strength perpendicular	350	350	—	200	172	—	—	—	—	—	—	—	290	480	—	310
	50750	50750	—	29000	24950	—	—	—	—	—	—	—	42050	69600	—	44950
Compressive strength parallel	190	190	—	—	—	—	—	—	—	—	—	—	150	—	—	190
	27550	27550	—	—	—	—	—	—	—	—	—	—	21750	—	—	27550
Modulus of elasticity in flexure L	12000	12000	—	—	—	—	—	—	—	—	—	—	—	20000	—	7000 (in tension)
	1740400	1740400	—	—	—	—	—	—	—	—	—	—	—	2900700	—	1015200
Modulus of elasticity in flexure T	9000	9000	—	—	—	—	—	—	—	—	—	—	—	15000	—	—
	1305300	1305300	—	—	—	—	—	—	—	—	—	—	—	2900000	—	—
Water absorption	210	140	450	60	44	200	—	—	—	—	—	—	340	0.5%	0.3%	—
	8.4	9.5	1.8	9.5	1.6	8	—	6	—	—	—	—	12.7	1.6	3.2	—
Insulation resistance after immersion in water	50	500	1.5	2000	2000	100	—	500	—	—	—	—	2	50000	—	50000
Electric strength in oil — flatwise	10	12	8	40	12	5	—	—	—	—	—	—	5	>60	>50	>50
Electric strength in oil — edgewise	8	12	15	40	30	8	—	—	—	—	—	—	4	>60	40	—
Loss tangent at 1 MHz	—	—	—	0.038	0.038	—	—	—	—	—	—	—	—	—	—	—
Permittivity at 1 MHz	—	—	—	4.5	4.5	—	—	—	—	—	—	—	—	—	—	—
Arc resistance	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Tracking resistance	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Flammability	—	>50	—	—	—	—	—	>50	—	—	—	—	—	>300	>50	>50
Heat resistance	140	140	120	120	120	—	—	140	—	—	—	—	160	Class 0	Class 0	Class 0
	284	284	284	284	284	—	—	284	—	—	—	—	338	190	192	192
Thermal conductivity	0.2	0.2	—	—	—	—	—	—	—	—	—	—	—	374	374	374
	—	—	—	—	—	—	—	—	—	—	—	—	—	0.41	—	—
Coefficient of friction — surface (against mild steel)	0.17	0.17	—	—	—	—	—	—	—	—	—	—	—	0.24	—	—
dynamic	—	—	—	—	—	—	—	—	—	—	—	—	—	0.20	—	—
g/100 cycles	—	0.06	—	—	—	—	—	—	—	—	—	—	—	0.03	—	—
Wear rate	1.4	1.4	1.4	1.3	1.3	1.4	—	1.4	—	—	—	—	—	1.90	—	1.8
Specific gravity	Pass	Pass	Pass	Pass	Pass	Pass	—	Pass	—	—	—	—	—	Pass	Pass	Pass
Machinability	Poor	Poor	Fair	Good	Good	Poor	—	Poor	—	—	—	—	—	Poor	Poor	Poor
Resistance to: acids	Fair	Fair	Fair	Fair	Fair	Fair	—	Fair	—	—	—	—	—	Good	Good	Good
alkalis	Good	Good	Good	Fair	Fair	Good	—	Good	—	—	—	—	—	Very Good	Very Good	Very Good
solvents	Good	Good	Good	Fair	Fair	Good	—	Good	—	—	—	—	—	Good	Good	Good

\* In lbs per 1/2 in. \*\* In lbs per 2 1/2 in.





# industrial laminates

# industrial laminates

### Properties

— Typical values

\*Note: Properties appropriate to each grade, are tested to required standard specification. See individual data sheets.

### Conversion factors

#### SI to Imperial

- 1 MPa = 1 MNm<sup>2</sup> = 145 psi
- 1 joule = 0.7376 ft lb
- 1 °C = 5/9 (°F-32)
- 1 kg = 2.205 lb
- 1 mm = 0.0394 in
- 1 KN = 222 ft lb
- 1 m<sup>2</sup> = 10.763 ft<sup>2</sup>
- 0.0929 m<sup>2</sup> = 1 ft<sup>2</sup>
- 1 sheet 1220 mm x 915 mm (48 in x 36 in)
  - = 1.114 m<sup>2</sup>
  - = 12.0 ft<sup>2</sup>

The information on these data sheets is intended to give a general indication of the characteristics of the material. While all possible care has been taken to ensure that this information is correct the manufacturer cannot accept any liability, nor is any liability on the part of the manufacturer to be implied as a result of the data given.

All measurements shown are nominal unless otherwise stated.

The information on this data sheet conforms to the information and is subject to the conditions of sale.

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