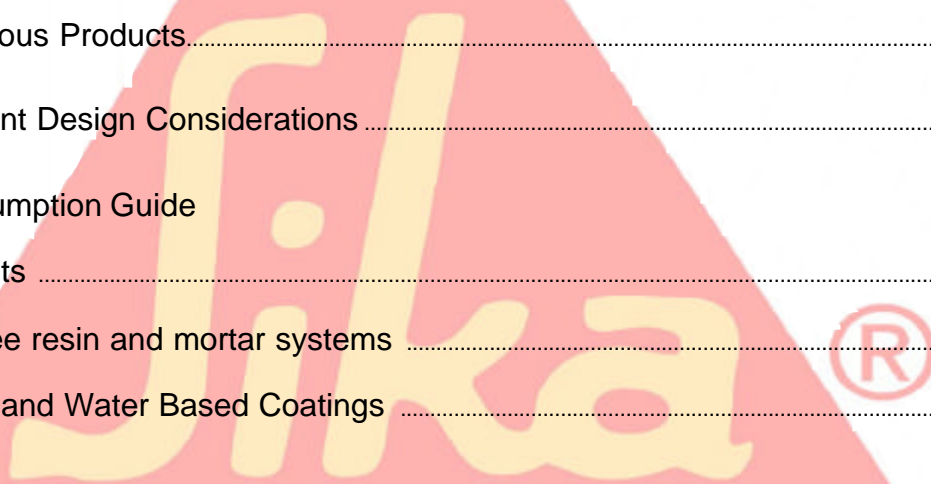




ENGINEERING AND ESTIMATING DATA

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1. A Selection of SI Units and their Decimal Multiples

Physical quantity	Unit	Decimal multiples
Length	m	km m mm Kilometre Metre 1000mm = 1m Millimetre
Area	m ²	m ² mm ² Square metre 1 000 000mm ² = 1m ² Square millimetre
Volume	m ³	m ³ mm ³ Cubic metre 1 000,000000mm ³ = 1m ³ Cubic millimetre
Mass	kg	Mg kg Megagram 1000kg = 1 Mg Kilogram
Density	kg/m ³	kg/m ³ Kilogram per cubic metre
Force	N	MN kN N Meganewton 1000kN = 1MN Kilonewton 1000N = 1kN Newton 10N approximately equals 1kg (on earth 9.81 N = 1kg)
Stress	N/mm ² Pa	kN/mm ² N/mm ² kN/m ² N/m ² Pa MPa Kilonewton per millimetre square Newton per millimetre square Kilonewton per metre square Newton per metre square 1000N/mm ² = 1 kN/mm ² Pascal Megapascal 1 MPa = 1 N/mm ²
Strain	No units	Unitless



2. Properties of Engineering Materials

	Density (kgm ⁻³)	Tensile Modulus of Elasticity E KN mm ⁻²	Tensile Strength Nmm ⁻²
Metals			
Cast Iron	7200	170	300 - 1000
Steels	7800	210	250 - 700
Aluminium Alloys	2750	70	70 - 600
Concrete			
Gravel Aggregate	2400 - 2500	20 - 50*	1 - 5 20 - 100*
Autoclaved Aerated Concrete	300 - 600	0.9 - 2.5*	1.8 - 4.0*
Concrete Blocks	500 - 1200	–	3 - 35*
Clay Bricks			
Fired	1600 - 2400	5 - 30*	0.5 - 4.0 5 - 100*
Timber			
Parallel to grain	500	4 - 17	8 - 40
Structural Adhesives			
Epoxy	1500	1 - 10	20 - 40
Polyester	1500	??	10 - 25
Polyurethane	1200	–0.5	15 - 25
Resins (Cast)			
Polyester	1200	3 - 4.5	50 - 75
Epoxy	1100	2 - 4.0	60 - 80
Vinyl Ester	1100	3 - 3.5	70 - 80
Phenolic	1200	1.5 - 2.5	24 - 40
Composite Fibres			
Carbon	1600 - 1900	150 - 300	3000 - 5000
Aramid	1400 - 1450	60 - 130	2700 - 3500
Glass (E)	2500 - 2600	70 - 85	1200 - 3000

* Compressive values

Note: All properties in this table are indicative of the probable range of values for each class of material. The mechanical properties (strengths and E values) given are for short term loading conditions. The properties of specific materials will be dependent on their composition, that is on the properties and proportions of their constituent materials, including moisture content. Their mechanical properties may additionally be dependent on their temperature and age and the rate of loading.



3. Coefficients of Linear Thermal Expansion of Engineering Materials

		x 10 ⁻⁶ deg C ⁻¹
Concrete		
Gravel Aggregate		8.0 - 12.0
Lightweight Aggregate		8.0
Limestone Aggregate		6.0
Concrete Blocks		8.0 - 12.0
Clay Products		
Bricks – Clay	Length	4.0 - 8.0
	Width	8.0 - 12.0
	Height	
Bricks – Calcium Silicate	Length	11.0 - 15.0
	Width	14.0 - 22.0
	Height	
Glass		
Plate		9.0
Timber		
Across Grain		50 - 60
Parallel to Grain		2.0 - 10.0
Metals		
Aluminium and Alloys		21 - 23
Brass		18.0
Bronze		20.0
Copper		17.0
Cast Irons		11 - 13.0
Lead		29.0
Stainless Steel		17.0
Mild Steel		12.0
Resins (Cast)		
Polyester		100
Epoxy		60
Vinyl Ester		80
Phenolic		80
Structural Adhesives		
Epoxy		30 - 70
Polyester		30 - 70
Polyurethane		40



4. Calculation of Dew-Points for Application of Coatings

Table of determination of dew-point

Air temperature +°C	Dew point temperature in °C with a relative air humidity of					
	40%	50%	60%	70%	80%	90%
25	10.5	13.9	16.7	19.1	21.3	23.2
24	9.6	12.9	15.8	18.2	20.3	22.3
23	8.7	12.0	14.8	17.2	19.4	21.3
22	7.8	11.1	13.9	16.3	18.4	20.3
21	6.9	10.2	12.9	15.3	17.4	19.3
20	6.0	9.3	12.0	14.4	16.4	18.3
19	5.1	8.3	11.1	13.4	15.5	17.3
18	4.2	7.4	10.1	12.5	14.5	16.3
17	3.3	6.5	9.2	11.5	13.5	15.3
16	2.4	5.6	8.2	10.5	12.6	14.4
15	1.5	4.7	7.3	9.6	11.6	13.4
14	0.6	3.7	6.4	8.6	10.6	12.4
13	-0.1	2.8	5.5	7.7	9.6	11.4
12	-1.0	1.9	4.5	6.7	8.7	10.4
11	-1.8	1.0	3.5	5.8	7.7	9.4
10	-2.6	0.1	2.6	4.8	(6.7 ^{*)}	8.4
9	-3.4	-1.0	1.6	3.8	5.8	7.5
8	-4.4	-1.5	0.7	2.9	4.8	6.5
7	-5.0	-2.4	-0.2	1.9	3.8	5.5
6	-5.8	-3.2	-1.0	0.9	2.8	4.5
5	-6.7	-4.0	-1.9	0.0	1.8	3.5

(*) Example

With an air temperature of +10°C (+50°F) and 80% relative humidity, dewing starts when the structure/substrate temperature is as low as +6.7°C (+44°F). If the contact thermometer shows a value only slightly above the dew-point temperature or below it, application of coatings should not be carried out.

The following procedure is to be adopted for dew-point control:

1. Attach contact thermometer to the structure (wait 15 minutes before reading the temperature so that thermometer can settle down to final temperature).
2. Read air temperature.
3. Read relative humidity of the air.
4. Look up dew-point temperature in chart (at point of intersection between air temperature and relative humidity).
5. Read object temperature on contact thermometer. If this is approximately 3°C (5 - 6°F) above the dew-point in the chart, then there is no objection to going ahead with the coating application. However, if the temperature of the structure is close to the dew-point or even below it, then work should be halted or not start due to the risk of condensation.

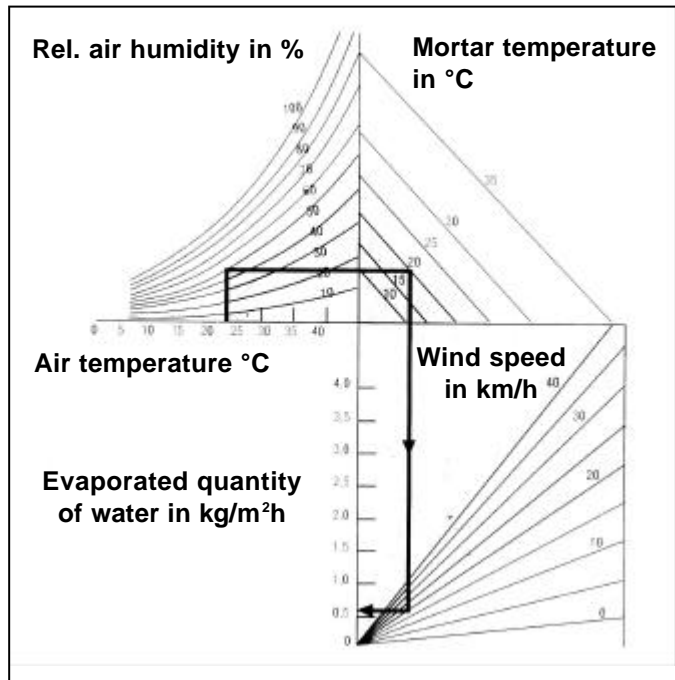


5. Curing of Cementitious Products

As with all cementitious materials, the correct curing is very important with repair mortars, renders and screeds. For products with a low w/c ratio it is necessary to ensure that sufficient water is retained for full cement hydration, and to minimize cracking.

Example: The table shows the quantity of water which evaporates at the surface if no curing takes place. With the following example we have a loss of approximately 0.6 litres per square meter per hour (l/m²h). This example is calculated with a 23°C air temperature, a 50% relative air humidity, a 20°C mortar temperature, and a 20 km/hr wind speed.

Curing methods should be adopted to maintain an evaporated quantity of water below 1.0kg/m²h.





6. Sikaflex Joint Sealant Design Considerations

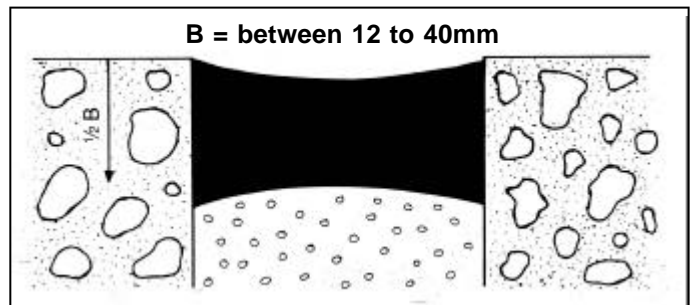
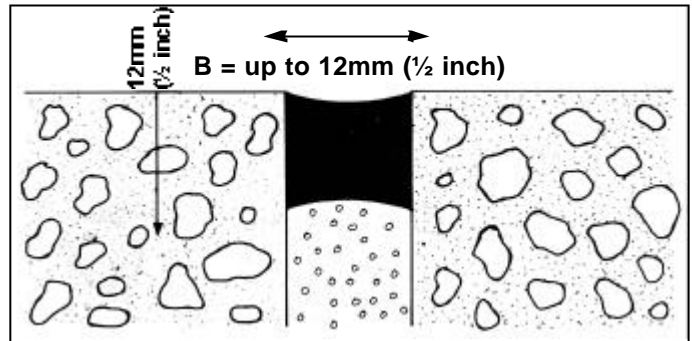
Width to Depth Ratio

Facade joint widths are normally in the range 15 to 30mm and the optimum width to depth ratio for facade sealing is 2:1.

For joint widths up to 12mm

$$\frac{\text{width}}{\text{depth}} = \frac{1}{1}$$

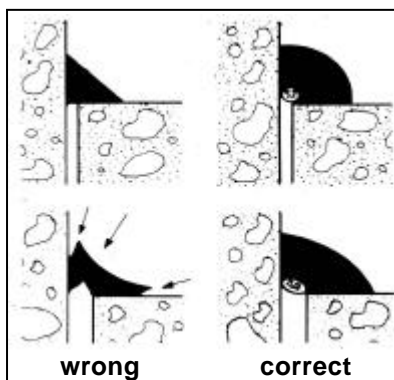
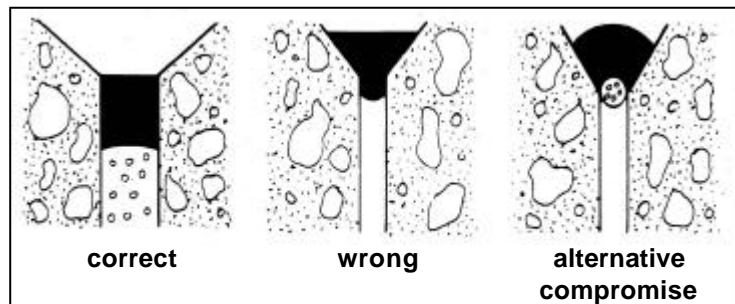
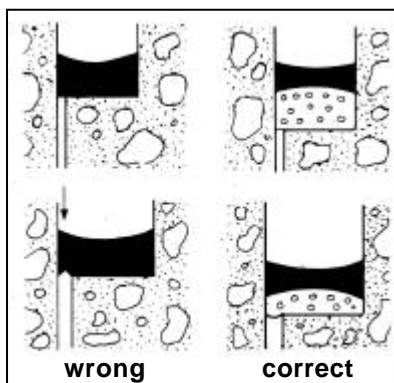
Minimum depth = 6mm



For joint widths 12mm - 40mm

$$\frac{\text{width}}{\text{depth}} = \frac{1}{0.5}$$

The base of the joint must not restrict the deformation of the sealant since this could result in failure during joint opening. The depth of the joint should be adjusted by inserting **Sika Joint Backing Rod**. If applying over a filler board or similar a **Bond Breaker Tape** must be applied.



In corner joints the insertion of a strip of **Backing Rod** is required, otherwise the sealant will fail during movement of the joint.

There is an absolute limit to depth of 6mm – the minimum to ensure adequate bond area for long term durability. Deep sections may be used in certain circumstances eg. where the seal is subject to traffic or pressure.



7. Sika Product Consumption Guide

(i) Sikaflex Sealants

Consumption Guide (for rectangular joints)

$$\text{Litres of sealant per metre run of Joint} = \frac{\text{Joint Width (mm)} \times \text{Joint Depth (mm)}}{1000}$$

$$\text{No of Cartridges/Sausages Required for Joint} = \frac{\text{Joint Width (mm)} \times \text{Joint Depth (mm)} \times \text{Length (m)}}{\text{Volume of Cartridge or Sausage (ml)}}$$

$$\text{Length of Joint (m) per 600ml} = \frac{600}{\text{Joint Width (mm)} \times \text{Joint Depth (mm)}}$$

(ii) Sika Solvent-free Resin and Mortar Systems

$$\text{Kg/m}^2/\text{mm thickness} = \text{Applied thickness (mm)} \times \text{Specific Gravity}$$

(iii) Sika Solvent and Water Based Coatings

$$\text{Kg/m}^2 = \frac{\text{Dry Film Thickness (microns)} \times \text{Specific Gravity}}{\text{Volume Solids (\%)} \times 10}$$

$$\text{Litres/m}^2 = \frac{\text{Dry Film Thickness (microns)}}{\text{Volume Solids (\%)} \times 10}$$

Note: The above is a theoretical guide only.
Allowances must be made for surface profile, wastage etc.