ARKEMA

Arkema coating resins for construction application

Arkema coating resins – markets and applications

Broad and diverse range of market expertise and product offerings

- **Adjacent market developments can be leveraged for higher performance**

Concrete Sealers

Industrial Coatings

Elastomeric Roof Coatings

Traffic Markings

Sealants

EIFS and Admixtures

Architectural

Construction Adhesives

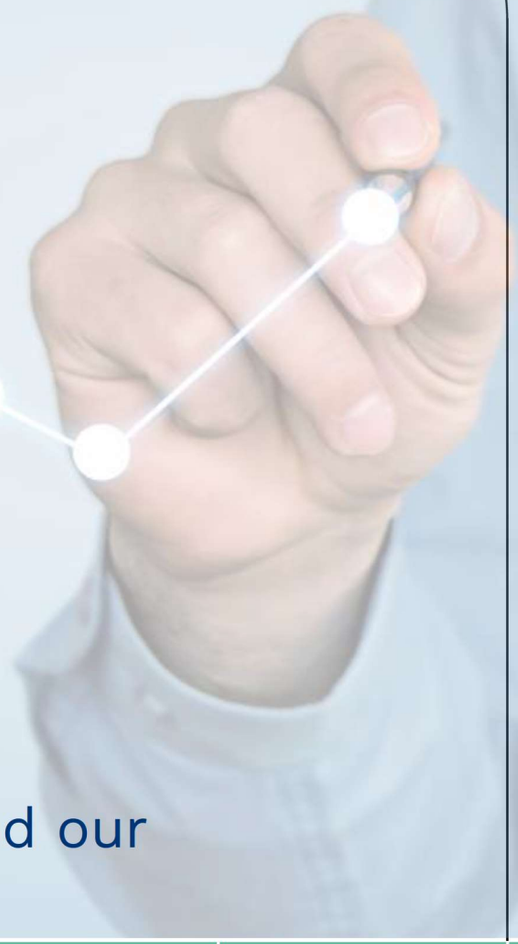
Tape Joint and Spackling Compounds

ARKEMA IN THE Building & Construction MARKET

→ A reliable supplier of high quality products used in leading industry brands
→ More than 20 years experience serving customers in North America
→ Strong portfolio of products and technologies

- ENCOR® waterborne acrylic resins
- KYNAR-AQUATEC® PVDF based emulsions
- NEOCAR® vinyl versatate modified latexes
- CRAYVALLAC® rheology modifiers
- CHEMPOL® Solvent-borne acrylic resins
- COATEX® rheology modifiers and dispersants
- BOSTIK ® adhesives & sealants
- PLASTISTRENGTH ® process aids & Clearstrength ® impact modifiers
- VIKOFLEX ® Bioplasticizers and reactive diluents
- ROAD SCIENCE ® specialty surfactants

→ Global manufacturing and customer support
→ Global R&D and technical resources
→ A strong commitment to sustainability in both our products and our processes

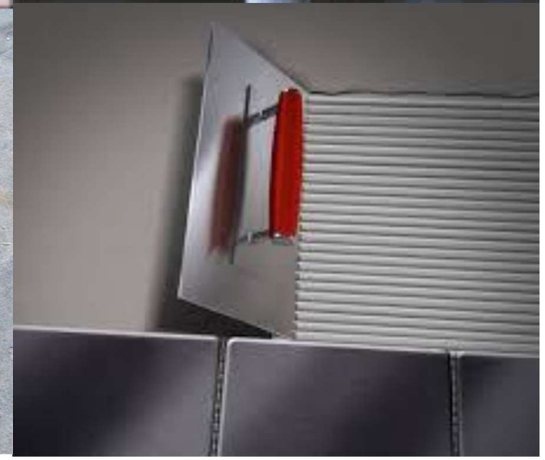


ARKEMA Coating Resins For Construction

WATERPROOFING MEMBRANES

SEALANTS AND JOINT FILLERS

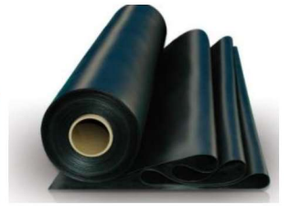
MORTAR AND GROUT MODIFIERS



CERAMIC TILE ADHESIVE

Waterproofing products classification

- Waterproofing products
  - Prefabricated material
    - Sheets



  - Liquid applied waterproof
    - Cementitious waterproof (2K)
      - cementitious membrane
      - Waterproofing slurry
      - Waterproofing mortar
    - Polymer based waterproof (1K)
      - Polyurethane (PU)
      - Acrylic
      - Asphalt

waterproofing membranes

2K Cement-based flexible waterproofing membranes application areas

- Protection and waterproofing of concrete structures, such as bridge decks, roads, roofs, terraces even where continuous water contact is expected
- Protection of facades (also with decorative purposes). .
- Waterproofing of swimming pools, water reservoirs, aqueducts, garages, foundations even in presence of positive/negative water pressure.
- Waterproofing slurries for wet rooms
- Protection of concrete from physical and chemical attack in industrial environments (effluent drains, pharmaceutical and food factories, acid proof floors, ….

1K waterproofing membranes application areas

- Protection of roofing substrates of different nature: concrete, metal,
- weathered bitumen and asphalt.
- Protection of facades.

Polymer-modified cement compounds for waterproofing

The important index:

- L/P (the ratio of liquid to powder) = the weight of liquid component / the weight of powder part

  Generally, L/P is 1:1 ~ 1:4 in the market. The ratio of powder is higher; generally, the film should be more rigid.

- P/C (the ratio of polymer to cement) = the weight of solid content of polymer (deducting water) / the weight of cement (deducting sands and other aggregates)

  Generally, 1 ~ 0.1 in the market. The ratio is lower and the film is more rigid

- W/C (the ratio of water to cement) = the total water weight (including the water in latex) / the weight of cement (deducting sands and other aggregates)

  Generally, 1 ~ 0.3 in the market. The ratio is lower and the hardness is higher

- Solid content = the weight of dry film / the weight of wet film

  Generally, 70% ~ 80%. The solid is higher and the film should be more thick.

Typical ingredients for waterproof membranes

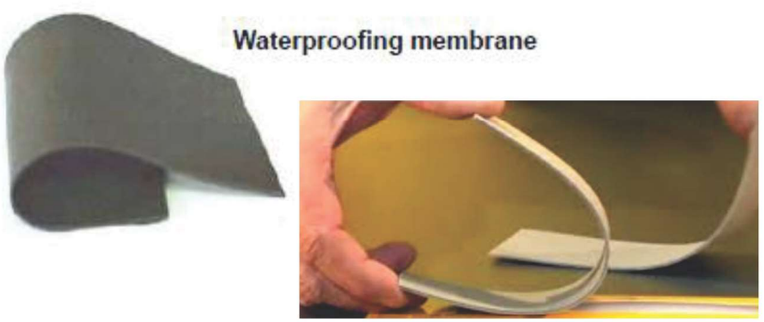
2K cement waterproofing

Part 1: Liquid Component

- → Emulsion Polymer
- → Water
- → Defoamer
- → Preservative

Part 2: Powder component

- → Cement Portland 425
- → Silica Sand (0,1- 0,3 mm)



1K mastic / elastomeric waterproofing

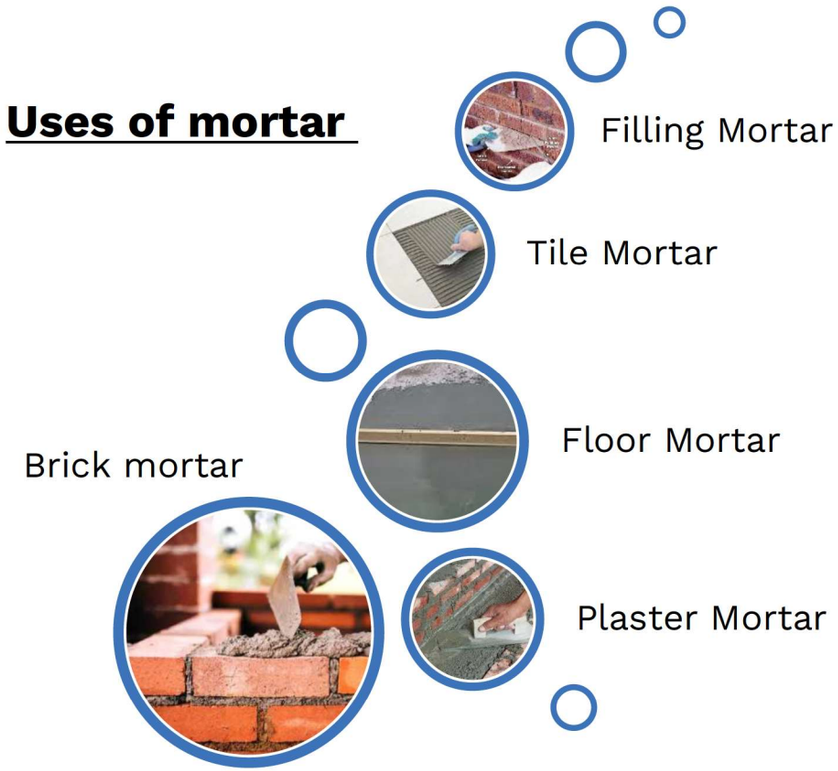
Materials	FUNCTION
Latex: Acrylic, styrene Acrylics, Vinyl Acrylic etc	Forms continuous layer of films and bind the pigment and filler, also called binder.
Dispersant / Wetting agent	Assist in disperse pigment for colour development and stabilize the pigment.
Defoamer	Eliminate bubbles while shearing
pH regulator	keep paint stability.
Pigment / Filler	For color decoration or special function: hardness, rust inhibition…
Co-solvent	Freeze-thaw stability
Coalescing / plasticizer	Assist film forming / plasticizing effect
In-can & Dry film biocides	In can preservative / Dry film anti fungus & mildew.
Water	Liquid that can dilute the paint

Cement Mortar

- → Mortar is commonly used for binding building blocks and for plastering the masonry surface.
- → Cement mortar is a mixture of cement, sand and water. The ratio of cement and sand is 1: 2 to 1: 6.
- → An ideal mortar need to adhere completely and durably to all masonry, resist to all environmental factors:
  - **Rain, frost**
  - **chemical salts i.e sulfate attack**
  - **Accommodate movement of structure**
  - **Aesthetic appearance**

Composition of mortar

Uses of mortar



Cement Mortar

Why polymer modification?

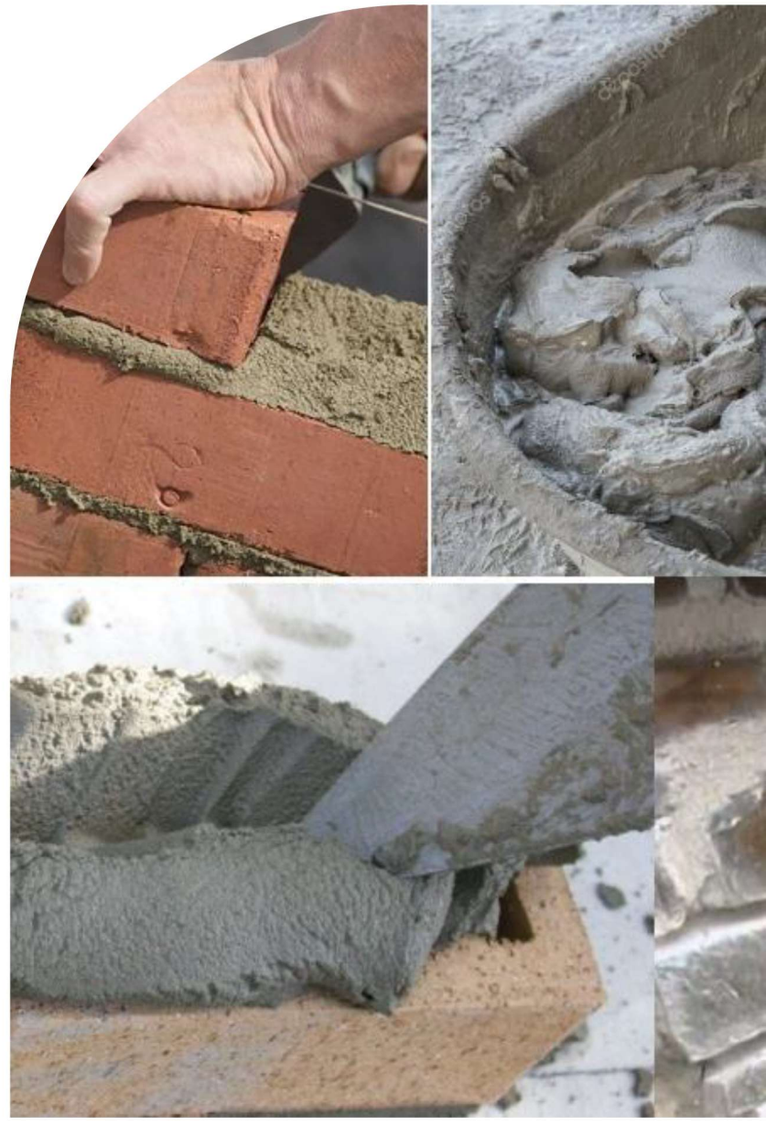
Polymer modification provides several benefits to the mortar.

Wet stage

- **Allow reduction of water demand**
- **Confers good workability and rheological behavior to the obtains mortar**
- **Imparts the necessary wet adhesion to the substrates**
- **Do not require moist cure condition**

Dry stage

- **Lower elastic modulus / higher flexural strength without looses in compressive strength**
- **Improve adhesion**
- **Increase water resistance**
- **Improve Chemical and abrasion resistant**



Polymer based waterproof (1K) standard

Standard	JC/T 408-2005 Asphalt base		JC/T 864-2008 1k waterproof		JG/T 375-2012 ERC
	L	H	I	II	
Solid content/% ≥	45	45	65	65	65
Elongation，% ≥	600	600	300	300	150
Tensile strength，MPa ≥			1	1.5	1.5
Bonding strength/MPa ≥	0.3	0.3			
Low temp. flexibility	-10 ℃/ Φ10mm	0 ℃/ Φ10mm	-10 ℃/ Φ10mm	-20 ℃/ Φ10mm	-30 ℃/ Φ10mm
Weathering	Required	Required		Optional	Required
Water absoption/% ≤					15
Others					DPUR
Application field			Non-exposure		Metal roof

Cementitious waterproofing (2K) standard

Standard	GB/T 23445-2009			JC/T 2090-2011		JC/T 984-2011	
	JS I	JS II	JS III	II	I	I	II
Elongation，% ≥	200	80	30				
Tensile strength，MPa ≥	1.2	1.8	1.8				
Low temp. flexibility	-10 °C/ Φ10mm			10 °C/ Φ10mm			
Transverse deformation/mm ≥					2	1	1
Compressive strength/Mpa ≥					12	18	24
Flexural strength/Mpa ≥					4	6	8
Bonding strength/MPa ≥	0.5	0.7	1	0.7	0.7	1	1.2
Application field	Roof	General		Kitchen, toilet	Kitchen, toilet	Kitchen, toilet	Kitchen, toilet, basement

Soft → **Rigid**

GB /T 23445-2009 Polymer-modified cement compounds for waterproofing membrane

NO.	Test item		Standard		
			I	II	III
1	Solid content %	≥	70	70	70
2	Tensile strength	Normal ,MPa ≥	1.2	1.8	1.8
		Heat treatment retention ≥	80	80	80
		Alkali treatment retention ≥	60	70	70
		Water treatment retention ≥	60	70	70
		UV treatment retention ≥	70	-	-
3	Elongation %	Normal ≥	200	80	30
		Heat treatment ≥	150	65	20
		Alkali treatment ≥	150	65	20
		Water treatment ≥	150	65	20
		UV treatment ≥	150	-	-
4	Low temperature flexibility, Φ10mm		-10℃	-	-
5	Bonding strength MPa	Normal ≥	0.5	0.7	1.0
		Wet substrate ≥	0.5	0.7	1.0
		Alkali treatment ≥	0.5	0.7	1.0
		Water treatment ≥	0.5	0.7	1.0
6	Water tightness,0.3Mpa 30min		Pass	Pass	Pass
7	Impermeability ,MPa ≥		-	0.6	0.8

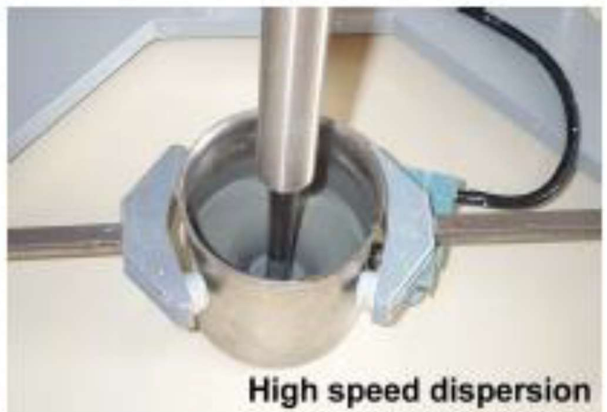
JC/T 984-2011 polymer modified cement mortar for waterproof

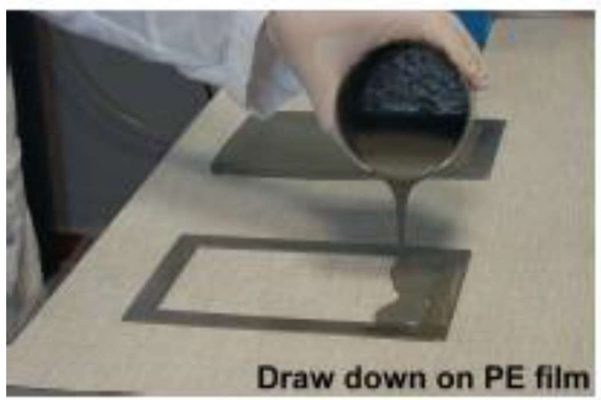
No.	Test item		Type I	Type II
1	Setting time	Initial,min	≥45	
		Final,h	≤24	
2	Impermeability pressure / MPa	Coating specimen 7d	≥0.4	≥0.5
		Mortar specimen 7d	≥0.8	≥1.0
		Mortar specimen 28d	≥1.5	≥1.5
3	Compressive strength/MPa		≥18.0	≥24.0
4	Flexural strength/MPa		≥6.0	≥8.0
5	Flexibility（Transverse deformation）mm		≥1.0	
6	Bonding strength, MPa	7d	≥0.8	≥1.0
		28d	≥1.0	≥1.2
7	Alkali resistance		No crack, peeling off	
8	Heating resistance		No crack, peeling off	
9	Freeze-thaw cycle		No crack, peeling off	
10	Shrinkage rate%,		≤0.30	≤0.15
11	Water absorption,%		≤6.0	≤4.0

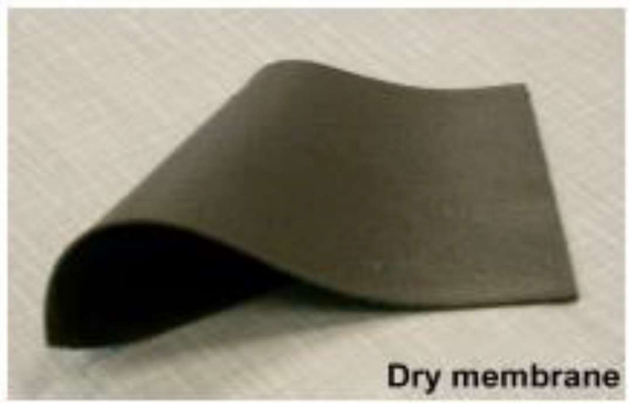
TESTING IN CONSTRUCTION MATERIALS

Preparation for 2K cement based membranes

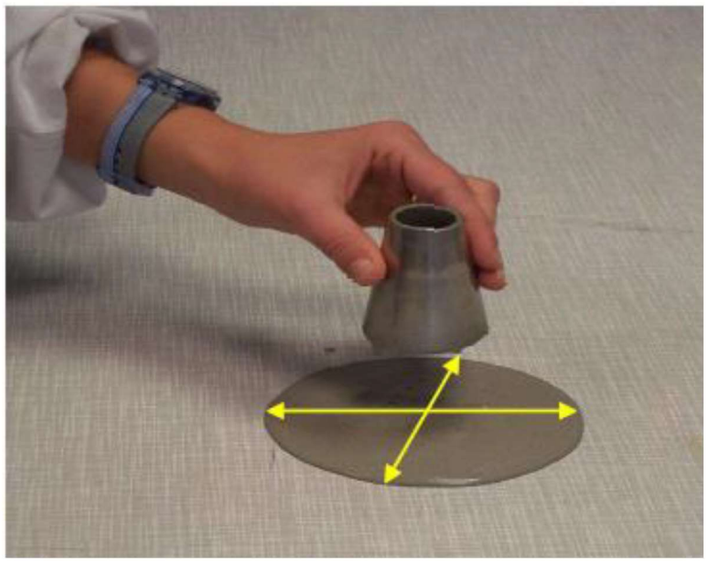
→ Here is preparation of waterproofing membrane for testing







Waterproofing Membrane - Properties in the wet state



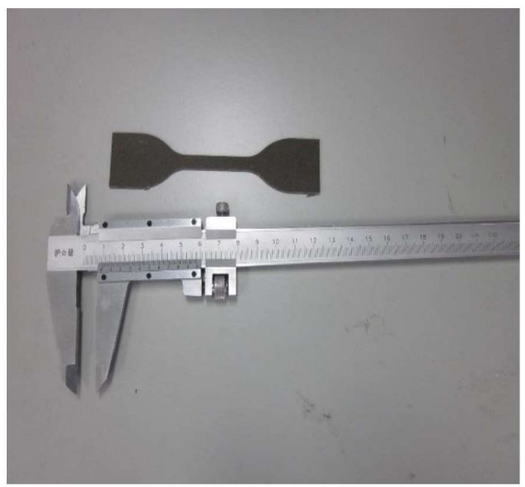
Mini-slump at 23°C : 13-15 cm

Density at 23°C : > 1,8 g/cc

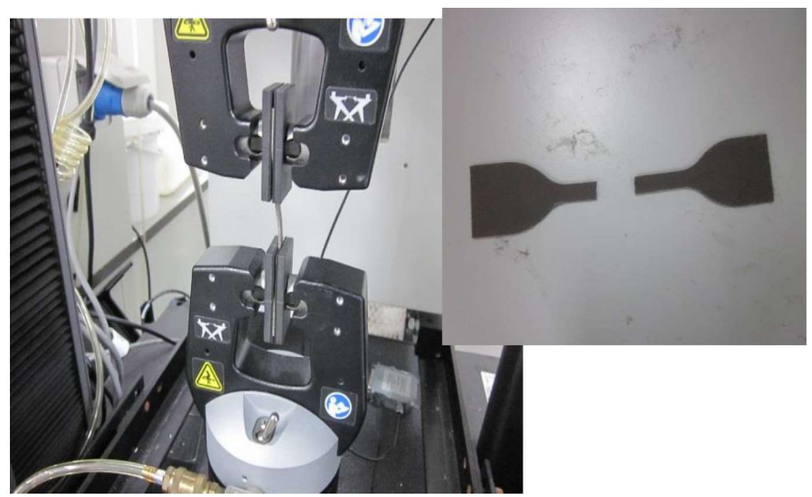
Waterproofing Membrane - Elongation & tensile strength

→ tensile elongation is the stretching that a material undergoes as it is pulled in tension. Tensile elongation is a measure of both elastic deformation and plastic deformation, and is commonly expressed as a percentage. It is used in conjunction with stress and strain values to help determine the mechanical properties of a material when performing a tensile test.

1. Cut the aged membrane into dumbbell shape



2. Measure the dry film thickness



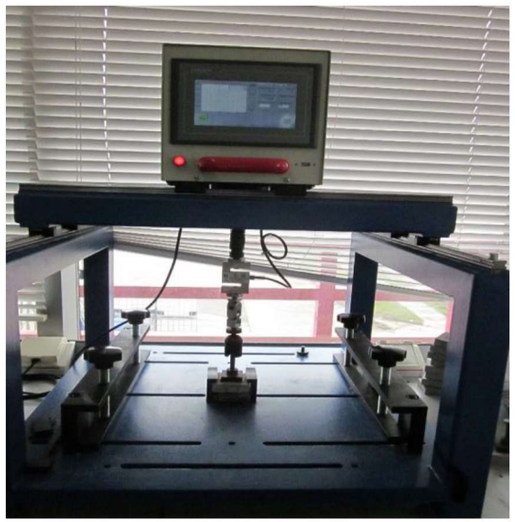
3. Put the stripe on the clamp and control the grip length with 60mm, and gauge length with 25mm.

Mortar/Tile adhesives – Bonding / adhesion strength

→ to test the adhesive strength a material will maintain between itself and a substrate or between two mating or joined substances

1. Apply on cement block about 1.5mm thick by brush

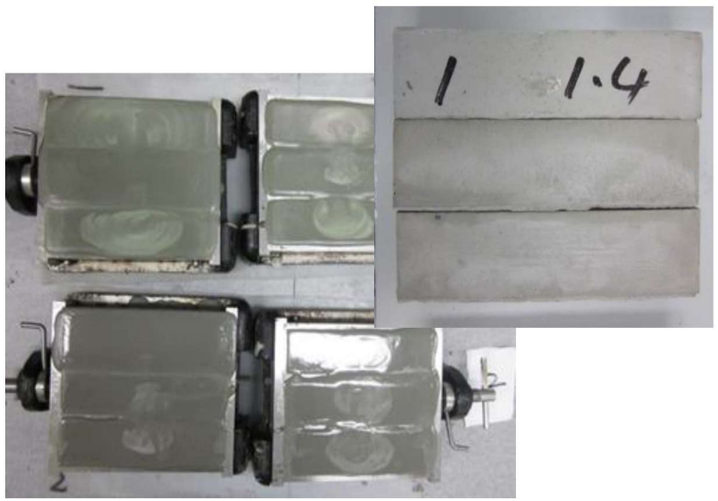
2. Stick 1kg weight using 2k epoxy adhesive on the top of coated cement block



3. After 1 day, the cement block is placed on the machine an pull off slowly at required speed-the strength is measured

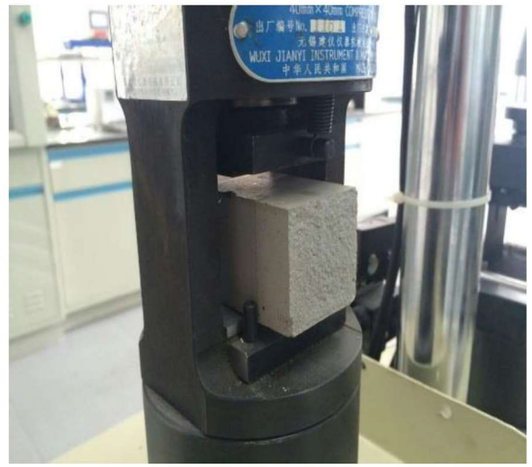
Mortar - Compressive strength and flexural strength test

→ Flexural strength is one measure of the tensile strength of concrete. It is a measure of an unreinforced concrete beam or slab to resist failure in bending.



1. Prepare cement mortar block. Cure it as per require duration.

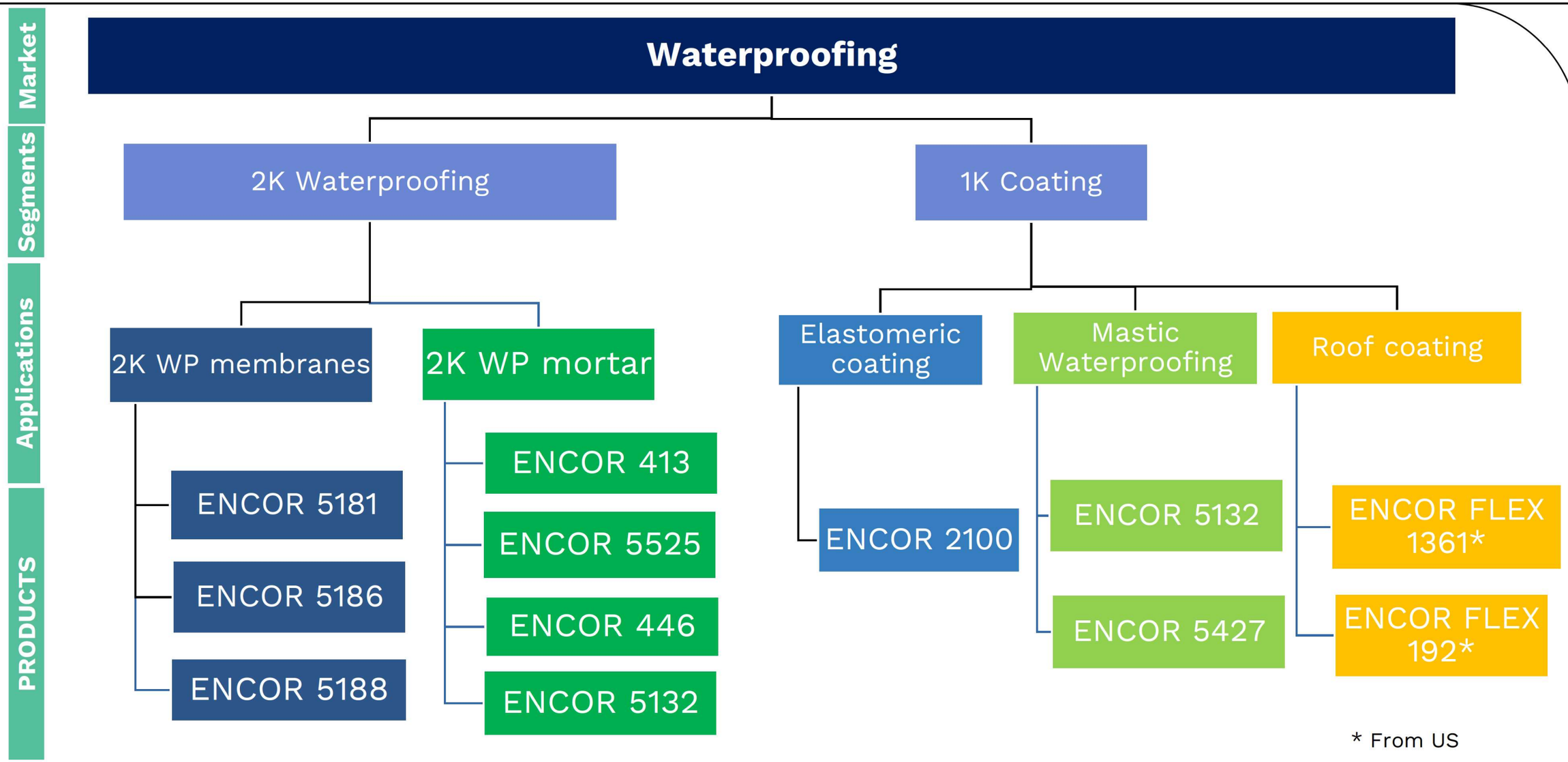
Flexural strength test



Compressive strength test

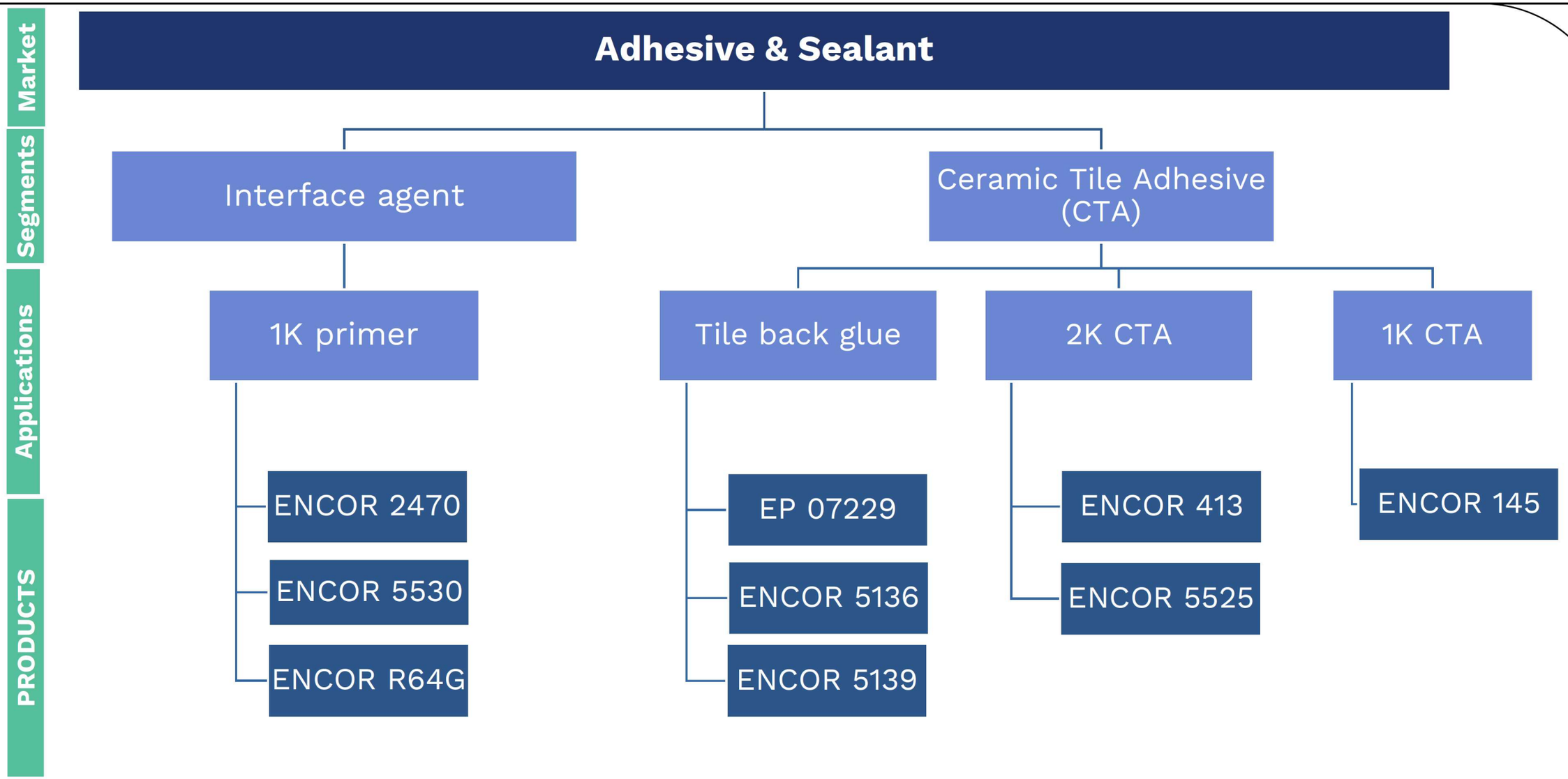
ACR China Construction Product Line

ACR China Construction Product Line - Waterproofing



* From US

ACR China Construction – Adhesive & Sealant



Products range

Product	Chemical nature	Solid content,%	pH	Brookfield viscosity,cp	Particle size,nm	Tg/Mid point, ℃	MFFT, ℃
ENCOR 5181 CS	Styrene-acrylic	56	7	<1500	300	-8	<1
ENCOR 5186	Styrene-acrylic	56	7	<1500	300	-8	<1
ENCOR 5188	Styrene-acrylic	56	7	<1500	300	-12	<1
ENCOR 5132	Styrene-acrylic	47	7	<200	260	20	18
ENCOR 5525 CS	Styrene-acrylic	49	7	<300	300	16	15
ENCOR 446 CS	Styrene-acrylic	62	6	<1000	300	12	6
ENCOR 413 CS	All acrylic	47	9.5	<100	200	13	11
ENCOR 2100 CS	Styrene-acrylic	50	7.5	<2500	150	8	<1
ENCOR Flex 192	Styrene-acrylic	60	8	<500	350	-21	<1
ENCOR Flex 1361	All acrylic	55	7.5	<120	250	-12	<1
ENCOR 5427	Styrene-acrylic	47	7.5	<3000	150	23	21
ENCOR 2470	Styrene-acrylic	47	8	<4000	120	20	19
ENCOR R64G	Styrene-acrylic	30	8	<20	50	6	<1

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Guide formulation

GUIDE FORMULA – 2K CEMENTITIOUS MEMBRANE

Typical Formulation

Material Name	% Total formulation
Liquid Part A:	
ENCOR 5181	99.70%
Foamaster™ NXZ	0.30%
Powder Part B:	
Portland Cement (42.5 MPa)	50.00%
Sand 200 Mesh	50.00%

wet film thickness	0.8mm per coat
number of coat	2-3
application method	brush or roller
powder: liquid	1.4:1

Testing specimen preparation

Note: 1 - 2mm DFT, cured in room temperature for 28 days before testing

GUIDE FORMULA – 1K WATERPROOFING

RMs	Function\supplier	wt.%
ENCOR 2100 CS	Latex\Arkema	480.00
ECODIS P30	Dispersant\Arkema	6.00
Foamaster MO NXZ	Defoamer\Basf	2.00
ACTICIDE LA1209	Biocide\Thor	1.00
PG	Anti-freeze/local	7.00
CC-325	Heavy $CaCO_3$/local	380.00
TALC 800mesh	Talc/local	100.00
Texanol	Coalescence/Eastman	10
Water		9.5
Foamaster MO NXZ	Defoamer\Basf	2.00
AMP 95	PH adjustment\Angus	1
Rheotech 4800	Thickener\Arkema	1.5
Total		1000.00

Solid content 72%

GUIDE FORMULA – 1K WATERPROOFING

RMs	Function\supplier	wt.%
ENCOR 2470	Latex\Arkema	450.00
DOP	Plasticizer\local	50
ECODIS P30	Dispersant\Arkema	6.00
Foamaster MO NXZ	Defoamer\Basf	2.00
ACTICIDE LA1209	Biocide\Thor	1.00
PG	Anti-freeze/local	7.00
CC-325	Heavy $CaCO_3$/local	425.00
TALC 800mesh	Talc/local	50.00
Water		7
Foamaster MO NXZ	Defoamer\Basf	2.00
Total		1000.00

Solid content 74%

GUIDE FORMULA - 1K MASTIC WATERPROOFING

RMs	Function/supplier	Wt,%
ENCOR 5132	Latex/Arkema	372.00
Ecodis P30	Dispersant/Arkema	3
HBR 250	HEC/Ashland	1
AMP 95	pH adjustment/Angus	1
TiO_2	Titanium dioxide/Lemon	50
$CaCO_3$ 325mesh	Heavy $CaCO_3$/Guangfu	240
Talc 800mesh	Talc/Guangfu	40
Loxanol PL 5060	Coalescence/BASF	12
Rheotech 3800	Thickener/Arkema	2.5
Foamaster MO NXZ	Defoamer/BASF	4
Water		274.5
Total		1000.00

PVC 40

1k Ceramic Tile Adhesive

Ceramic tiles water resistant paste adhesive formulation

Ingredients	Producer	Function	Parts by weight
ENCOR 145	Arkema	Binder	22.50
Water			4,30
Acticide LA	Thor Chemical	Preservative	0.10
BYK 154	BYK	Dispersing agent	0.30
BDGA		Coalescing agent	0.80
BYK 011	BYK	Defoamer	0.05
Silica sand (200-400 µ)		Extender	43.00
Silica sand (1-200 µ)		Extender	28.50
Ammonium Hydroxide (20%)		Neutralizing agent	0.10
HYCRYL 0262 (30%)	Arkema	Thickener	0.35

Main Properties	
Solids content (%)	83
Brookfield Viscosity at 20 rpm (Pa.s)	150
Initial shear adhesion strength (N/mm^2)	> 1.0
Adhesion strength after water immersion (N/mm^2)	> 0.5

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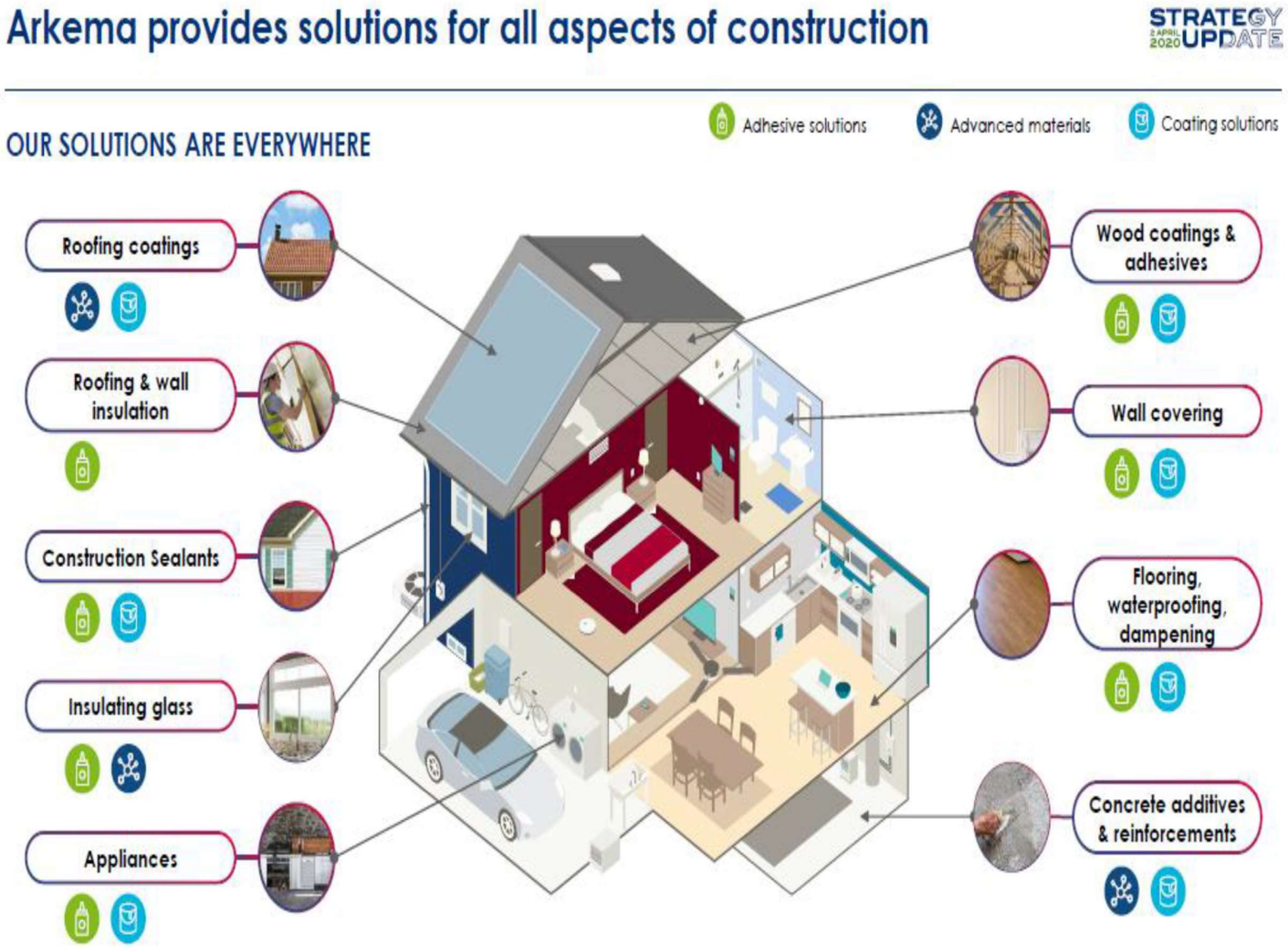
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Advanced materials
Coating solutions
Roofing coatings
Roofing & wall insulation
Construction Sealants
Insulating glass
Appliances
Wood coatings & adhesives
Wall covering
Flooring, waterproofing, dampening
Concrete additives & reinforcements