KINGKRETE® We Create Future ACADEMY

CPD SEMINAR CPD-WP-LA-01

Liquid-Applied Waterproofing for Roofs, Podiums and Wet Areas

Chemistries, standards, build-ups and site controls for seamless, fully bonded membranes

1.0 LEU	AIA LU|HSW	60 MIN	PRACTITIONER

RIBA core curriculum · Design, construction and technology · Sustainable architecture



BEFORE WE START

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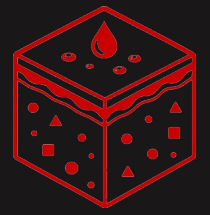
Questions about specific products or services are answered after the course, outside the time that earns credit.

Why this matters

Most liquid membrane failures start at a detail, a damp substrate or a thin spot in the film, not in the chemistry itself.

This course explains how liquid-applied membranes work, compares the main chemistries, maps the standards used to classify them, maps the standards used to classify them, and walks through build-ups for exposed and inverted roofs, podium decks and wet areas, ending with the preparation, thickness control and flood testing that make a specification enforceable.

FOR Architects, specifiers, façade and roofing consultants, and contractors



CREDIT

1.0 LEU · AIA LU|HSW

RIBA TOPIC

Design, construction and technology; Sustainable architecture

LEVEL

Practitioner

FORMAT

Live, in-office or self-paced

ASSESSMENT

10 questions, 80% to pass

LEARNING OBJECTIVES

By the end of this course you will be able to

01

Explain

how liquid-applied membranes form a seamless barrier and where the risks lie at the substrate, in moisture and in the details

02

Compare

polyurethane, polyurea, acrylic and cementitious membranes on elongation, crack bridging, UV resistance and trafficability

03

Select

a membrane and build-up for exposed roofs, inverted roofs, podium decks and internal wet areas

04

Specify

substrate preparation, priming, thickness control, detailing and flood testing that make the membrane watertight

HSW

HSW

HSW

AGENDA

How the next 60 minutes run

01	How liquid membranes work	LO1	11 min
02	Membrane chemistries compared	LO2	11 min
03	Standards and performance testing	LO1, LO2	11 min
04	Selecting membrane and build-up	LO3	11 min
05	Specifying application and testing	LO4	11 min
Q	Knowledge check and summary	LO1–LO4	5 min

01

MODULE 01 · 11 MIN · LO1

How liquid membranes work

Seamless, fully bonded barriers and where the risks lie

What a liquid-applied membrane offers

01

Seamless film

Cures in place as one continuous skin, with no laps or seams to weld, tape or fail.

02

Follows any shape

Wraps upstands, domes, gutters and dense penetrations that are slow and risky to detail in sheet.

03

Fully bonded

Adheres across its whole area, so a local defect cannot let water track laterally beneath it.

04

Cold or spray applied

Most systems need no naked flame, reducing fire risk on occupied buildings and refurbishments.

05

Easy to inspect

Defects are visible on the surface and can be cut out and over-coated with compatible material.

THE TRADE-OFF

The membrane is made on site, not in a factory

A sheet membrane arrives with its thickness built in. A liquid membrane only becomes a membrane once it is mixed, applied at the right thickness and cured on a sound, dry substrate. Site control is the product.



Four ways a liquid becomes a membrane

01	**Moisture cure**	Single-component polyurethanes react with air humidity; cure slows in dry or cold conditions.
02	**Chemical reaction**	Two-component polyurethanes and polyureas cure as base and hardener react; mix ratio is critical.
03	**Coalescence**	Water-based acrylics dry as water evaporates; rain or dew before the film forms can wash them off.
04	**Hydration**	Polymer-modified cementitious coatings cure as cement hydrates and need moisture, not rapid drying.

TYPICAL NUMBERS

Thin films leave little margin

1.5–2 mm

Typical dry film thickness for polyurethane roof membranes

28 days

Typical minimum age of new concrete before resin membranes

≤ 4%

Typical substrate moisture limit by mass for many resin primers

A 2 mm film that loses 0.5 mm over a rough substrate has lost a quarter of its thickness. These values are typical; always follow the system's stated limits.

WHERE THE RISKS LIE

Five risks behind most failures

01

Applicator skill

Thickness, mixing and detailing depend on the crew; training and supervision matter as much as chemistry.

02

Vapour blistering

Moisture vapour rising from a damp or warming slab can lift a non-breathable film into blisters.

03

Damp or weak substrate

Wet concrete, laitance, dust and curing compounds prevent bond and invite delamination.

04

Curing conditions

Heat, cold, humidity, dew and rain during cure change film quality, pot life and adhesion.

05

Thickness variation

Hollows fill thick while peaks and arrises end up thin; the thin spots set the life of the system.

Why full bond limits leak travel

Fully bonded liquid film

- Water entering at a defect stays near the defect
- Leak inside usually appears close to its source
- Repair is local and quick to locate
- Depends on a sound, clean, dry substrate

Loose-laid sheet

- Water can run under the sheet along falls and joints
- Leak may appear metres away from the defect
- Finding the source can mean opening large areas
- Less sensitive to substrate cracking and moisture

Full bond is only an advantage if bond is achieved; delamination turns a bonded membrane into a loose one.

Common defects and their usual causes

Defect	Usual cause	Prevention
Blisters	Vapour from a damp slab, or applying as the slab warms	Test moisture, use a suitable primer, apply as the slab cools
Pinholes	Outgassing from porous concrete, or one heavy coat	Seal porous substrates; apply in thinner multiple coats
Delamination	Laitance, dust, contamination or missed recoat window	Mechanical preparation, pull-off tests, respect recoat times
Splits at cracks	Film too thin, or no reinforcement over moving cracks	Measure thickness; pre-treat cracks and joints with fabric
Soft or tacky film	Wrong mix ratio, or cold, very dry air during cure	Mechanical mixing, check ratios, observe cure limits

A liquid membrane on a sunny concrete roof develops blisters within hours of application. What is the most likely cause?

A UV degradation of the uncured membrane surface

B Moisture vapour driven out of the warming slab

C Too much reinforcing fabric in the main field

D Excessive elongation of the cured membrane

A liquid membrane on a sunny concrete roof develops blisters within hours of application. What is the most likely cause?

A — UV degradation of the uncured membrane surface

B — Moisture vapour driven out of the warming slab

C — Too much reinforcing fabric in the main field

D — Excessive elongation of the cured membrane

WHY As the sun heats a damp slab, moisture turns to vapour and expands, lifting a film that cannot breathe. Testing moisture, priming and applying as the slab cools reduce the risk.

02

MODULE 02 · 11 MIN · LO2

Membrane chemistries compared

Polyurethane, polyurea, acrylic and cementitious systems side by side

Five families of liquid membrane

01

Polyurethane (PU)

Single- or two-component elastomers; tough and highly elastic, the workhorse for roofs and decks.

02

Polyurea

Fast-reacting two-component elastomer, usually spray applied; cures in seconds to a tough film.

03

Acrylic

Water-based, UV stable and easy to apply; suited to exposed roofs with good falls.

04

Cementitious

Polymer-modified cement slurry; flexible grades used under tiles, in tanks and on damp substrates.

05

Bituminous emulsion

Low-cost, water-based bitumen coatings, mainly for buried foundations; not for UV exposure.

Aromatic and aliphatic polyurethanes

Aromatic PU

- Lower cost, widely used as the base membrane
- Chalks, yellows and darkens in sunlight
- Needs a UV-stable topcoat if left exposed
- Ideal where buried under tiles, screed or ballast

Aliphatic PU

- Higher cost, colour and gloss stable in UV
- Used as a topcoat over aromatic membranes
- Available in light, solar-reflective colours
- Some grades serve as a full exposed membrane

Single-component PU moisture-cures from the air; two-component PU cures by reaction and is less humidity dependent.

What sets polyurea apart

01	**Cures in seconds**	Gel times of seconds allow foot traffic within minutes and a fast return to service.
02	**Specialist equipment**	Hot spray needs heated plural-component rigs, trained operators and ratio control.
03	**Primer is essential**	The fast reaction gives little time to wet out concrete, so a primer secures bond and seals pores.
04	**Pure vs hybrid**	Pure polyurea uses amine curatives; hybrids add polyols, cutting cost but also performance.
05	**Cold-spray grades**	Slower-reacting grades can be sprayed with simpler kit or hand applied at details.

Acrylic and cementitious membranes

Water-based acrylic

- Good UV stability; light colours reflect solar heat
- Suits exposed roofs with good falls
- Not for ponding water or below ground
- Must dry before rain, dew or low temperatures

Flexible cementitious

- Polymer-modified grades bridge fine cracks
- Bonds to damp but not wet substrates
- Ideal under tile adhesive and in tanks
- Lower elongation; not for exposed moving roofs

SIDE BY SIDE

Key properties at a glance

Chemistry	Elongation and crack bridging	UV resistance	Trafficability
Polyurethane	High; bridges moving cracks well	Aromatic poor; aliphatic good	Good; trafficable grades with wearing coat
Polyurea	High; tough, with good tear resistance	Aromatic grades chalk; topcoat if exposed	Very good; resists abrasion and impact
Acrylic	Moderate to high at full thickness	Very good	Light maintenance traffic only
Flexible cementitious	Low to moderate; fine cracks only	Good, but usually covered	Needs tiles or screed as wearing surface
Bituminous emulsion	Moderate	Poor; must be covered	None; protect before backfilling

Relative guide only. Compare actual products on test data at the same thickness and temperature.

READING THE NUMBERS

Typical values worth knowing

> 300%

Typical elongation at break of elastomeric PU and polyurea

< 10 s

Typical gel time of hot-sprayed pure polyurea

0.75 mm

Minimum crack bridging under standard conditions in EN 14891

Elongation alone does not keep water out. Crack bridging, adhesion, tear strength and how properties hold after heat and UV ageing say more about service life.

Compare like with like

01	**Same test method**	An elongation figure to ASTM D412 is not directly comparable with one from another method.
02	**Same thickness**	Crack bridging rises with thickness; check the film thickness at which each claim was tested.
03	**Same temperature**	Membranes stiffen in cold and soften in heat; look for low- and high-temperature results.
04	**After ageing**	Ask for properties after heat, UV and water ageing, not only on freshly cured film.

A polyurethane roof membrane will be left exposed to strong sunlight. Which arrangement is most appropriate?

A Aromatic PU membrane left without a topcoat

B Bituminous emulsion over an aromatic PU base

C Aromatic PU base with an aliphatic PU topcoat

D Cementitious slurry over an acrylic membrane

QUICK CHECK · LO2 · ANSWER

A polyurethane roof membrane will be left exposed to strong sunlight. Which arrangement is most appropriate?

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WHY Aromatic PU gives economical elasticity but degrades in UV. An aliphatic topcoat is colour and UV stable and protects the base membrane on an exposed roof.

03

MODULE 03 · 11 MIN · LO1, LO2

Standards and performance testing

How membrane kits are classified and how their performance is tested

Which standard covers which use

Standard	Scope	Use it to
EAD 030350-00-0402	Liquid-applied roof waterproofing kits (formerly ETAG 005)	Classify roof kits by working life, climate, load and slope
EN 14891	Liquid-applied products beneath ceramic tiling bonded with adhesive	Specify wet-area membranes under tiles
ASTM C836	High-solids, cold liquid-applied elastomeric membranes	Specify membranes protected by a separate wearing course
EN 1504-2	Surface protection systems for concrete	Specify coatings that also protect concrete, such as on decks

Test methods such as ASTM D412, C1305, D7234 and D5957 support these product standards.

EAD 030350 CATEGORIES

How roof kits are classified

European technical assessments declare performance in categories. Match each one to the project.

01

Working life

W1, W2 or W3: an assumed working life of 5, 10 or 25 years. Permanent roofs usually call for W3.

02

Climatic zone

M for moderate or S for severe climates; hot, high-UV regions call for S.

03

Imposed load

P1 to P4, from low to high resistance to foot traffic and loads in use.

04

Roof slope

S1 to S4, from flat roofs to steep slopes; confirms the kit stays in place on the gradient.

05

Surface temperature

TL (lowest) and TH (highest) classes show the temperature range the kit can tolerate.

KEY TEST METHODS

Tests that predict field performance

01	**ASTM D412 tension**	Tensile strength and elongation at break of the cured, free film.
02	**ASTM C1305 crack bridging**	Ability to bridge a crack opened and closed repeatedly at low temperature.
03	**ASTM D7234 / EN 1542**	Pull-off adhesion to concrete; confirms substrate strength and bond together.
04	**ASTM D5957 flood test**	Guide to flood testing completed horizontal waterproofing before it is covered.
05	**Water-tightness tests**	Resistance to water under pressure, often required for wet areas and below ground.

HOT CLIMATES

Heat and UV in hot, arid regions

70 °C+

Typical summer surface temperature of a dark, exposed roof

S

Severe climatic zone category to specify for roof kits

Heat speeds cure, shortens pot life and drives vapour from slabs; UV degrades aromatic binders. Specify severe-climate kits, reflective topcoats and cooler working hours.



Roof kit, under-tile or wearing-course membrane

Roof kit (EAD 030350)

- Complete kit: primer, membrane, fabric, topcoat
- Declared working life, climate and load categories
- Suits exposed and protected roofs

Under tiles (EN 14891)

- Tested with tile adhesive bonded on top
- Classes for crack bridging and chemical resistance
- Wet rooms, showers, balconies and pool surrounds

Wearing course (C836)

- Cold-applied, high-solids elastomeric membrane
- Must be covered by a separate wearing course
- Plazas, podiums and decks under paving or topping

Use the standard that matches how the membrane will be finished and loaded, not just its chemistry.

Questions to ask of any performance claim

01

Which standard?

Is it a recognised method, and is the full test report available on request?

02

Which components?

Was the whole kit tested together, or the membrane alone without primer and topcoat?

03

Which thickness?

Results apply to the tested film thickness; specify at least that thickness on site.

04

Which conditions?

Ageing, temperature and water exposure should reflect the project, especially in hot regions.

A wet room will be finished with ceramic tiles fixed in adhesive. Which standard best defines the membrane's performance?

A EN 14891 for products beneath ceramic tiling

B ASTM C836 for membranes under a wearing course

C EAD 030350-00-0402 for roof waterproofing kits

D EN 1504-2 for surface protection of concrete

QUICK CHECK · LO2 · ANSWER

A wet room will be finished with ceramic tiles fixed in adhesive. Which standard best defines the membrane's performance?

A **EN 14891 for products beneath ceramic tiling**

B ASTM C836 for membranes under a wearing course

C EAD 030350-00-0402 for roof waterproofing kits

D EN 1504-2 for surface protection of concrete

WHY EN 14891 tests liquid-applied membranes with tile adhesive bonded on top, including crack bridging and bond, which matches a tiled wet room.

04

MODULE 04 · 11 MIN · LO3

Selecting membrane and build-up

Exposed roofs, inverted roofs, podium decks and internal wet areas

SELECTION DRIVERS

Six questions before choosing a membrane

01

Exposed or covered?

UV and heat exposure decide whether a stable topcoat or a protective layer is needed.

02

What traffic?

Maintenance foot traffic, pedestrians and vehicles each need a different wearing surface.

03

Will water pond?

Flat areas and blocked outlets rule out water-sensitive membranes such as most acrylics.

04

What substrate?

Concrete, screed, metal or an old membrane each need specific preparation and primer.

05

What sits on top?

Tiles, insulation, soil or paving bring loads, roots and chemicals to the membrane.

06

Can it be reached?

Buried membranes are costly to repair, so they justify higher performance and testing.

Exposed roof build-up



UV-stable topcoat
Aliphatic or acrylic topcoat, ideally light coloured to reflect solar heat

Liquid membrane
PU, polyurea or acrylic at the specified thickness, reinforced at details

Primer
Seals pores, controls outgassing and secures bond to the substrate

Prepared substrate
Sound concrete or screed laid to falls, laitance removed, moisture checked

Design falls so water clears the roof; long-term ponding shortens membrane life.

Warm roof or inverted roof

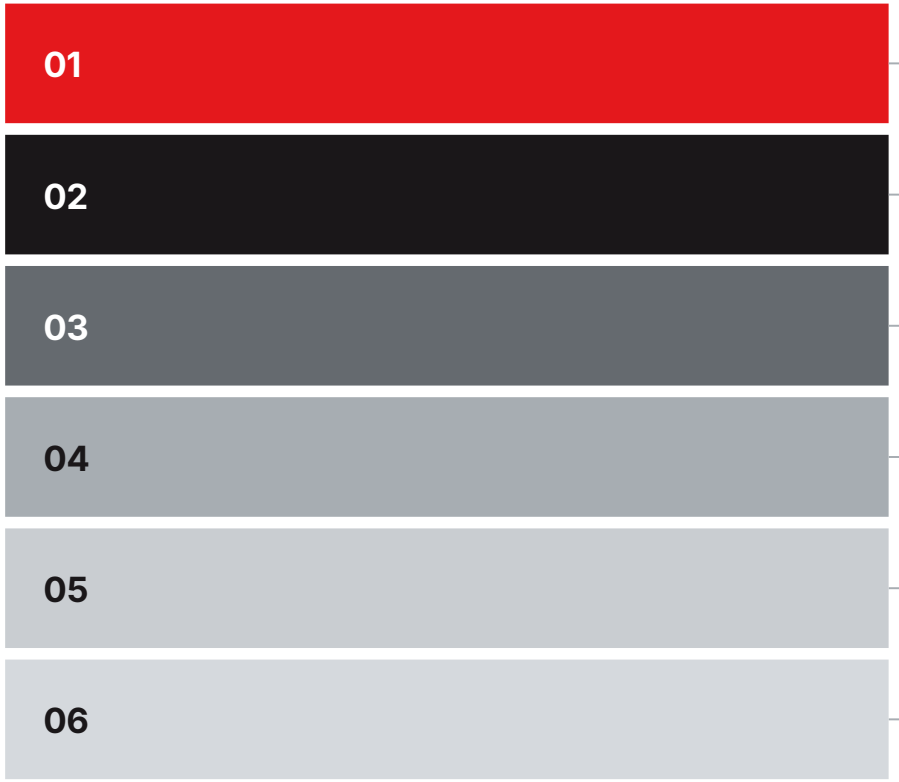
Warm roof

- Insulation below the membrane
- Membrane exposed to full heat and UV
- Vapour control layer needed below insulation
- Membrane bonded to insulation or a cover board

Inverted roof

- Membrane directly on the deck, insulation above
- Membrane protected from UV, heat and traffic
- XPS insulation needed, as it tolerates water
- Filter fabric and ballast or pavers on top

Podium deck with planting and paving



Soil or paving
Growing medium, or pavers on pedestals or bedding, as the wearing layer

Filter fabric
Geotextile that stops fines washing into and blocking the drainage layer

Drainage layer
Dimpled sheet or granular layer carrying water to outlets at deck level

Protection board
Shields the membrane from backfill, roots and construction traffic

Liquid membrane
Fully bonded PU or polyurea; root-resistant grade where planted

Primed concrete deck
Structural slab laid to falls, prepared and primed

In an inverted podium, XPS insulation sits between the membrane and the drainage layer.

Wet rooms under tiles

01	**Prime the substrate**	Prime screed or board to control suction and improve bond of the membrane.
02	**Tape corners and junctions**	Embed reinforcing tape at wall–floor junctions, corners and board joints first.
03	**Seal drains and penetrations**	Use preformed collars and drain flanges bonded into the membrane.
04	**Apply in two coats**	Flexible cementitious or PU membrane, taken up walls and beyond the wet zone.
05	**Tile with compatible adhesive**	Use the adhesive tested with the membrane, once the membrane has cured.

WORKED EXAMPLE

Selecting a podium deck build-up

THE BRIEF

Project

Landscaped podium over a basement car park

Climate

Hot, arid region with high UV and large daily temperature swings

Finish

Planters, paving and light vehicle access for maintenance

Substrate

Cast-in-place concrete slab, laid to falls, over 28 days old

Constraint

Membrane buried permanently; access for repair is very costly

01 Choose the membrane

Fully bonded two-component PU or polyurea with root resistance and high crack bridging.

02 Protect it

Protection board, drainage layer and filter fabric before any soil or paving goes on.

03 Detail the edges

Upstands at least 150 mm above finished level at walls, planters and thresholds.

04 Prove it

Measure thickness, pull-off test the bond and flood test before anything covers it.

SELECTION SUMMARY

Matching membrane to application

Application	Typical membrane	Key build-up point
Exposed roof	PU with aliphatic topcoat, polyurea, or acrylic	UV-stable, reflective topcoat and good falls
Inverted roof	PU, polyurea or cold-applied elastomeric	XPS, filter fabric and ballast above membrane
Podium or planted deck	Two-component PU or polyurea, root resistant	Protection, drainage and filter before overburden
Internal wet area	Flexible cementitious or PU under tiles	Tape corners; tile with compatible adhesive
Water tank	Flexible cementitious or approved coating	Check approval for contact with drinking water

A planted podium will carry soil over the membrane. Which layer stops soil fines from clogging the drainage layer?

A Protection board laid directly on the membrane

B Primer applied to the concrete deck

C XPS insulation boards above the membrane

D Filter fabric laid over the drainage layer

QUICK CHECK · LO3 · ANSWER

A planted podium will carry soil over the membrane. Which layer stops soil fines from clogging the drainage layer?

A Protection board laid directly on the membrane

B Primer applied to the concrete deck

C XPS insulation boards above the membrane

D Filter fabric laid over the drainage layer

WHY A geotextile filter fabric over the drainage layer lets water through but holds back soil fines, keeping the drainage path open to the outlets.

05

MODULE 05 · 11 MIN · LO4

Specifying application and testing

Preparation, priming, thickness, detailing and flood testing

SEQUENCE

From bare slab to proven membrane

01	02	03	04	05	06
Assess	**Prepare**	**Prime**	**Detail**	**Apply membrane**	**Test and protect**
Check substrate age, strength, moisture, falls and contamination.	Remove laitance by grinding or shot blasting; repair defects; clean.	Apply the specified primer within its conditions and recoat window.	Reinforce upstands, drains, penetrations and joints with fabric first.	Build the specified thickness in measured coats, checking as you go.	Verify thickness, flood test, then topcoat or protect promptly.

Make each stage a hold point: the next stage starts only when the previous one is inspected and recorded.

Substrate preparation that secures bond

01	**Remove laitance**	Grind or shot blast to an open, sound surface; acid etching is rarely adequate.
02	**Measure moisture**	Test to the method and limit that the system specifies, before priming.
03	**Test pull-off strength**	Typically at least 1.5 MPa by ASTM D7234 or EN 1542 for resin systems.
04	**Repair and profile**	Fill voids, round off sharp arrises and form fillets at internal corners.
05	**Keep it clean**	Vacuum dust; remove oil, curing compounds and old coatings that block bond.

Where leaks start: the details

01

Upstands

Turn up at least 150 mm above the finished surface and terminate into a chase or under a flashing.

02

Drains and outlets

Use outlets with a bonding flange, set low so water does not pond around them.

03

Penetrations

Bond preformed collars or reinforced fillets to pipes, posts and fixings.

04

Joints and cracks

Bridge cracks with reinforcing fabric; movement joints need a designed joint detail.

05

Terminations

Seal edges mechanically or with compatible sealant so water cannot get behind the film.

06

Internal corners

Form a fillet and embed reinforcing fabric before the main coats.

NUMBERS TO SPECIFY

Three figures every specification needs

≥150 mm

Typical minimum upstand height above the finished surface

48–72 h

Typical flood test duration before covering the membrane

1.5 MPa

Typical minimum pull-off strength of prepared concrete

These are typical values; national codes, the roof design and the system's instructions may set stricter limits for a particular project.



Three ways to verify thickness

Wet film gauge

- Comb gauge pressed into the fresh film
- Instant and cheap; use continuously
- Convert to dry film using volume solids
- Shows variation, not the final result

Coverage check

- Material used divided by area covered
- Gives average thickness per marked bay
- Count containers used per bay
- Cannot reveal local thin spots

Dry film measurement

- Ultrasonic gauge on cured film, non-destructive
- Destructive cut samples measured by gauge
- Repair each cut with compatible material
- Confirms final thickness at test points

Example: 2.0 mm dry at 80% volume solids needs 2.5 mm wet, about 2.5 L/m² before losses.

Specify the outcome and the proof

A specification that names a membrane but not a minimum dry film thickness, a moisture limit, hold points and a flood test leaves watertightness to chance. Write in the numbers and the evidence you will accept.

Running a flood test properly

01	**Before covering**	Test once the membrane is cured and before protection, screed or tiles hide it.
02	**Plug and dam**	Plug outlets and divide large areas into bays; check the structure can take the load.
03	**Fill and hold**	Flood to a shallow, uniform depth and hold, typically for 48 to 72 hours.
04	**Inspect below**	Check soffits, walls and penetrations for damp; record and photograph.
05	**Drain, repair, retest**	Repair any leak, then retest the affected bay before acceptance.

A wet film gauge reads 2.0 mm on a membrane with 80% volume solids. What dry film thickness should result?

A 2.5 mm

B 1.6 mm

C 2.0 mm

D 1.2 mm

A wet film gauge reads 2.0 mm on a membrane with 80% volume solids. What dry film thickness should result?

A 2.5 mm

B 1.6 mm

C 2.0 mm

D 1.2 mm

WHY Dry film thickness equals wet film thickness multiplied by volume solids: 2.0 mm × 0.80 = 1.6 mm.

SUMMARY

Four things to take away

LO1 Liquid membranes are seamless and fully bonded, but substrate, moisture, cure and thickness decide success

LO2 Compare chemistries on tested crack bridging, UV stability and trafficability at the same thickness

LO3 Match the build-up to exposure: UV topcoat when exposed, protection and drainage when buried

LO4 Specify preparation, priming, minimum dry film thickness, reinforced details and a flood test

EARN YOUR CREDIT

Complete the online assessment

10

questions drawn at random from the four objectives

80%

to pass; two attempts, reshuffled each time

1.0

LEU and AIA LU|HSW on your certificate

Sign in to SpecWorld, open the course and take the assessment. Your certificate is issued on passing and kept in your Workdesk under CPD & Certificates.

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Knowledge › CPD-WP-LA-01

Standards and references

EAD 030350-00-0402

Liquid applied roof waterproofing kits (European Assessment Document, formerly ETAG 005)

EN 14891

Liquid-applied water impermeable products for use beneath ceramic tiling bonded with adhesives

ASTM C836

High-solids, cold liquid-applied elastomeric waterproofing membrane for use with separate wearing course

ASTM C1305

Standard test method for crack bridging ability of liquid-applied waterproofing membrane

ASTM D412

Standard test methods for vulcanized rubber and thermoplastic elastomers — tension

ASTM D7234

Pull-off adhesion strength of coatings on concrete using portable pull-off adhesion testers

ASTM D5957

Standard guide for flood testing horizontal waterproofing installations

EN 1504-2

Products and systems for the protection and repair of concrete structures — Surface protection systems

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THANK YOU FOR ATTENDING

Questions?

Kashif Aijaz
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This concludes The American Institute of Architects Continuing Education Systems course.

