PRINCIPLES OF BELOW GRADE COMPOSITE WATERPROOFING - SIK510

BRUCE ZHU
PRODUCT ENGINEER
SIKA CORPORATION / TM B&P
E-mail: Zhu.Bruce@us.sika.com
Mobile: (314)706-8259

BUILDING TRUST

INTRODUCTION

BRUCE ZHU
Product Engineer– Waterproofing

SIKA CORPORATION
3400 Tree Court Industrial Blvd.
St. Louis, MO 63122
United States

Mobile: (314)706-8259
Zhu.Bruce@us.sika.com · usa.sika.com

SIKA IN WATERPROOFING

Sika was founded in Switzerland in **1910**.

The first key project:

- Waterproofing of the Gotthard Tunnel (at the time, longest railway tunnel in the world) with the waterproofing admixture Sika-1.
- Over 100 year of experience in below grade concrete waterproofing.

In **2025**, global leader of construction chemicals

Key Figures:

- Broad range of product from basement to roof
- Over 25,000 employees
- Local subsidiaries in over 100 countries
- Over 300 plants worldwide

SIKA CORPORATION

- Sarnafil Roofing – PVC & Liquid Applied
- Concrete – Admixtures, shrinkage reducers, crystalline waterproofing
- CRSB – Sealants, Concrete Repair & Protection
  - Balconies and Parking Garages – Epoxy and Urethane
- Industrial Flooring – Epoxy, Urethane, Underlayments
- Waterproofing - Sheet Membranes, Greenstreak Waterstops, Injections
- Decorative Concrete – Scofield, Butterfield Color
- Insulation – RMAX
- Emseal
- Fibermesh (Propex)
- American Hydrotech
- MBCC

This is the start of the AIA portion of the presentation.

provider name: **Sika Corporation**
program title: **Principles of Below Grade Structural Waterproofing**
provider number: **J492**
presentation number: **SIK510**

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AIA approved for 1.0 LU Credit

LEARNING OBJECTIVES

- Understand the difference between Dampproofing and Waterproofing
- Examine the difference between below grade waterproofing and the remaining building envelope
- Discuss the typical applications which require waterproofing
- Understand the types of waterproofing products available for below grade waterproofing
- Discuss advantages of each type of waterproofing product
- Discuss the limitations of each type of waterproofing product

DAMPPROOFING VS WATERPROOFING

Dampproofing

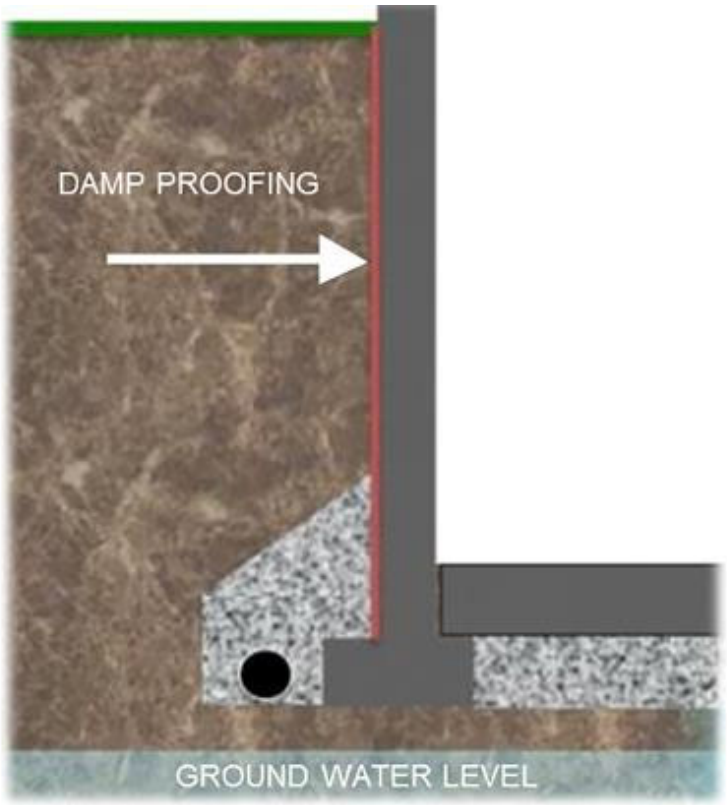
- Prevention of only water vapor intrusion
- No hydrostatic pressure

Waterproofing

- Prevention of water intrusion under hydrostatic pressure

DAMPPROOFING

"…. Treatment of a surface or structure to resist the passage of water in absence of hydrostatic pressure." Charles O. Pratt



1 . "Waterproofing - Problems in Terminology," Building Deck Waterproofing, ASTM STP 1084

DAMPPROOFING

07110 – Dampproofing

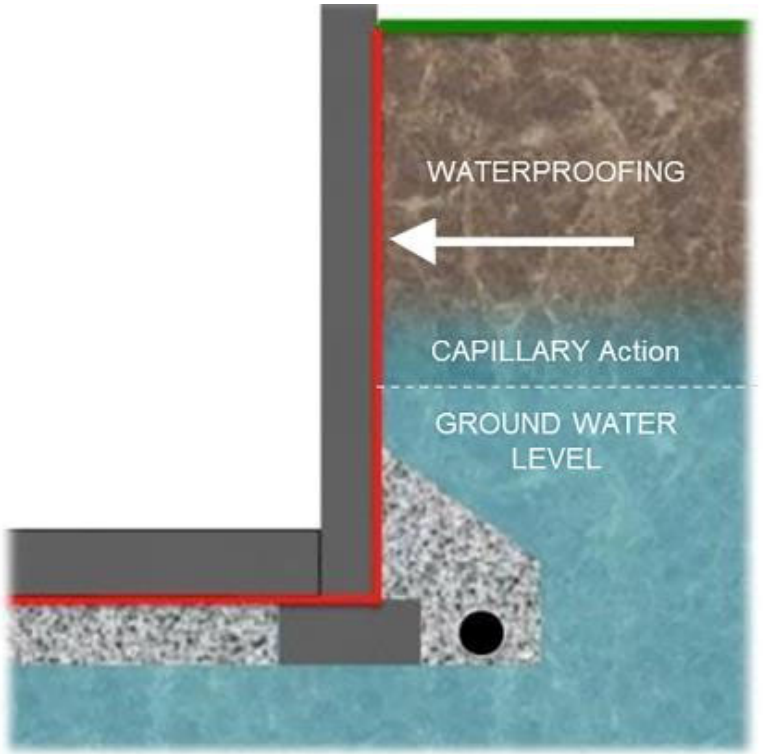
- Typically Liquid Membranes
- Variable Thickness
- Easy to Apply
- Low Cost
- Limited Life
- Material Only Warranty

07261 – Underslab Vapor Barriers

- Thin Mil Poly Sheeting
- ~6-10mil Thick
- Loose Laid on Substrate
- Taped together at seams

WATERPROOFING

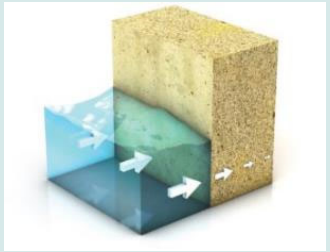
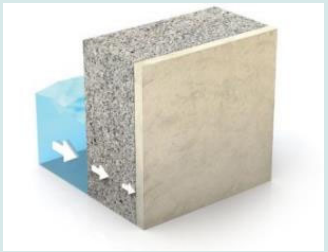
"…. Treatment of a surface or structure to resist the passage of water under hydrostatic pressure."
Charles O. Pratt



1 . "Waterproofing - Problems in Terminology," Building Deck Waterproofing, ASTM STP 1084

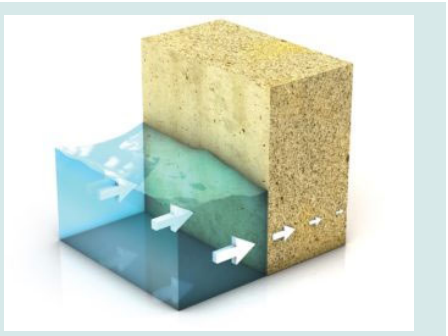
TYPE OF WATERPROOFING PROTECTION

One, or a combination, of the following types of waterproofing protection should be selected:

Integral protection	Barrier Protection	
		
INTEGRAL WATERPROOFING SYSTEM	INTERNAL WATERPROOFING SYSTEM	EXTERNAL WATERPROOFING SYSTEM

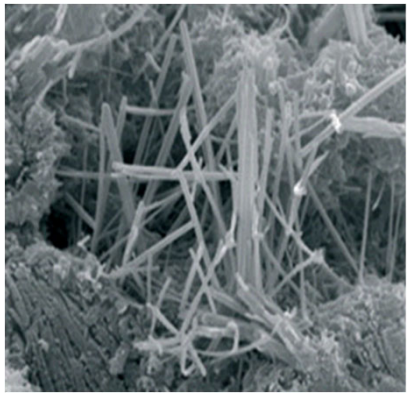
INTEGRAL WATERPROOFING

Integral Protection



INTEGRAL WATERPROOFING SYSTEM

- Admixtures normally added to the concrete during batching, integrated into the concrete structure.
- Liquid water penetration is stopped by the structure itself and cannot entirely pass through into the structure.



Crystalline

- Increase density to fill voids

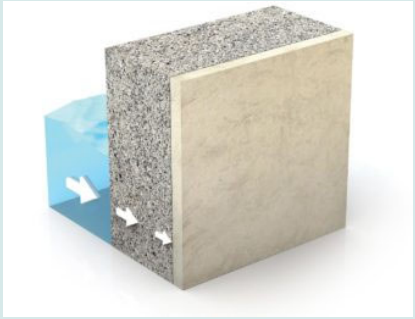
Hydrophobic

- Repel water

BARRIER PROTECTION

NEGATIVE SIDE WATERPROOFING

Barrier Protection

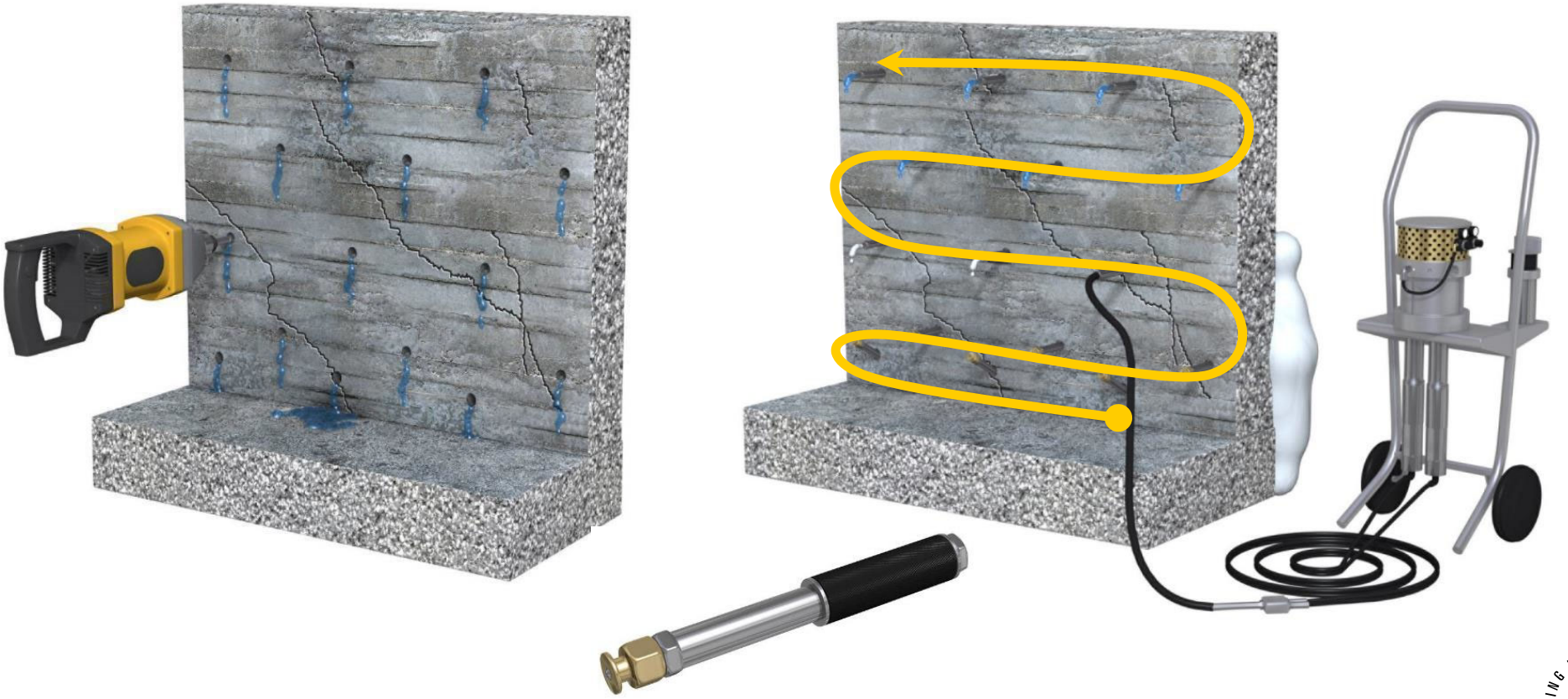


INTERNAL WATERPROOFING SYSTEM

- A waterproof barrier is applied on the internal surfaces of the structure (negative side)
- Applied as coatings for refurbishment
- Does not prevent damage to the structure from water ingress or due to aggressive chemicals in the soil.

BARRIER PROTECTION

NEGATIVE SIDE WATERPROOFING – CURTAIN WALL INJECTIONS



BARRIER PROTECTION
NEGATIVE SIDE WATERPROOFING – CURTAIN WALL INJECTIONS

Polyurethane foams
- Foams with contact to water
- Higher Viscosity
- Plugs Active Leaks
- Requires Solvent for Cleaning Equipment

Acrylate resins
- Forms Gel-like Material
- Lower Viscosity
- Does not require water contact to activate
- Not for Active Leaks during Application
- Time Adjustable Activation
- Easy to Clean

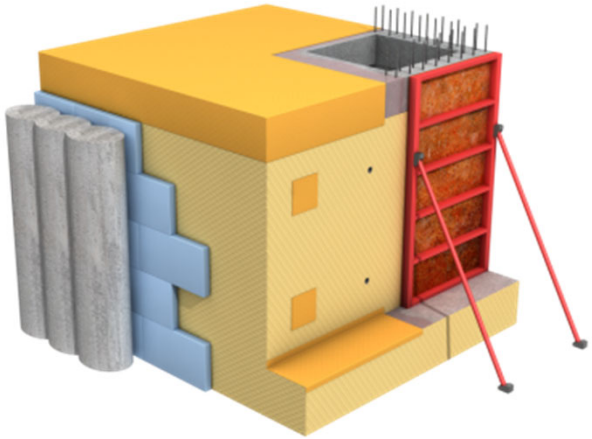
BARRIER PROTECTION

POSITIVE SIDE WATERPROOFING

Barrier Protection

EXTERNAL WATERPROOFING SYSTEM

- Applied to <u>exterior</u> or “wet” side of structure
- New or Existing Construction
- Can be installed prior to placing formwork against soil retention system (blindside) or after formwork has been removed.



HOW IS BELOW GRADE WATERPROOFING UNIQUE?

- Waterproofing is expected to stay wet
- Potential hydraulic head
- Systems are inaccessible
- Warranties differ
- Weatherability is not an important factor

WHERE IS WATERPROOFING MOST COMMONLY FOUND?

- Land costs in metropolitan areas
  - Vertical construction instead of horizontal
  - Zero Lot Line

- Commercial/Residential requirements on below grade use
  - Parking
  - Server rooms
  - Home Gym / Guest rooms

ITEMS TO CONSIDER

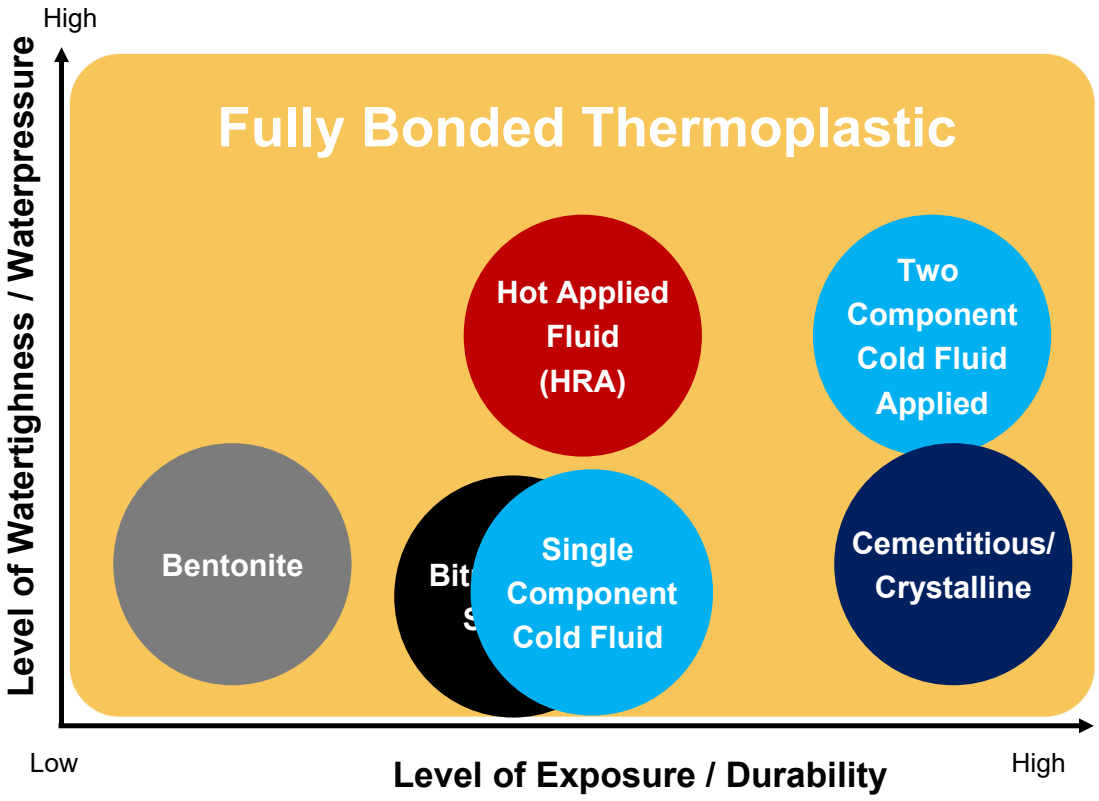
- What's the application?
  - free-standing wall
  - property line
  - plaza deck
  - Planter

- Substrate Condition?
  - Smooth/Rough
  - Mud Slab/ Compacted Aggregate
  - Stone/Brick/Existing Concrete

- Other Considerations
  - Penetrations/Unique Detailing
  - Temperature
  - Odor
  - Warranty Terms/Length
  - Amount of Head Pressure

BARRIER PROTECTION

EXTERNAL WATERPROOFING SYSTEM



Common Types of Waterproofing

High Risk

- Sheet Applied
  - Fully Bonded for **permanent head pressure**
  - Hot Applied (HRA)
  - Two-Component Cold Fluid Applied

Low Risk

- Sheet Applied
  - Fully Bonded for **temporary head pressure**
- Bentonite
- Bituminous
- Single Component Cold Fluid Applied

BARRIER PROTECTION

FULLY BONDED THERMOPLASTIC – SECTION 07133

Fully Bonded

- Thermoplastic Membranes composed of various materials
- Bonded (Mechanical, Chemical, or both) to concrete
- For new construction
  - Typically loose laid/pre-applied before concrete is placed*
- Chemically Resistant
- No odor
- No Cure time
- Various Price Ranges
- 40 – 100 mils

BARRIER PROTECTION

FULLY BONDED THERMOPLASTIC – SECTION 07133

Fully Bonded

Advantages

- High Head Pressure Resistance
- Fully Bonded to concrete prevents lateral water migration
- Can be installed in damp conditions
- Up to 90 days UV exposure*
- Up to 20 year Warranties
  - Material and Labor

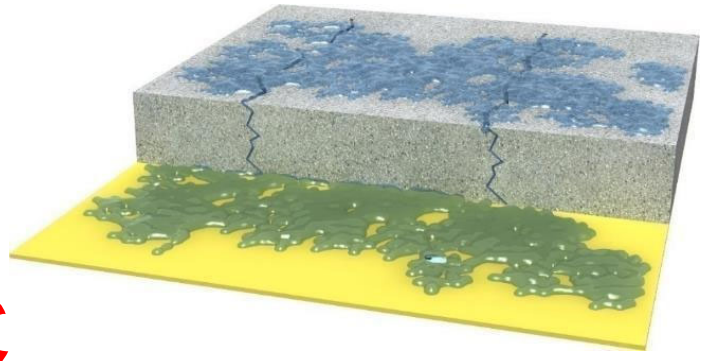
Disadvantages

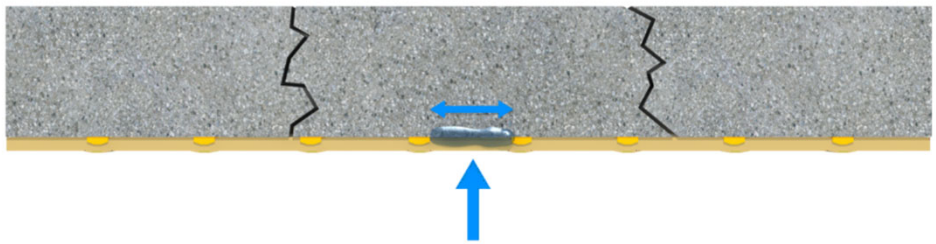
- Higher Cost
- Detailing Critical
- Not all systems are equal, many “fully bonded” systems exist

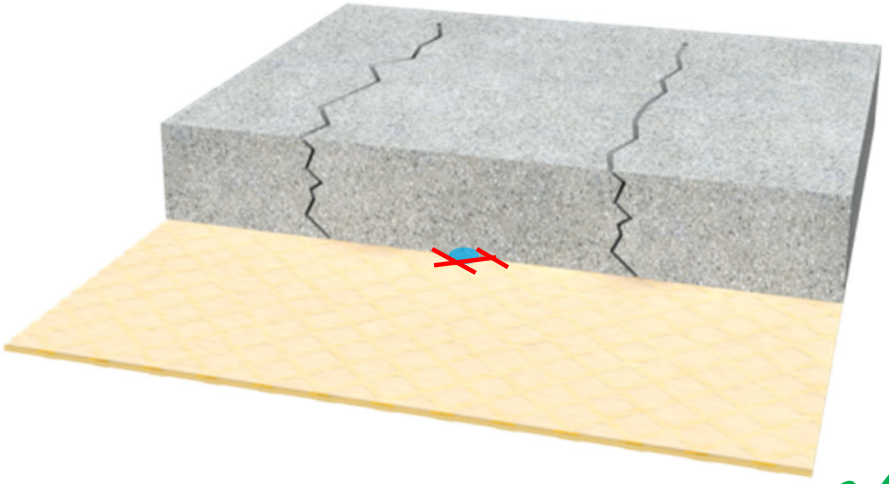
BARRIER PROTECTION

FULLY BONDED THERMOPLASTIC – SECTION 07133

Fully Bonded





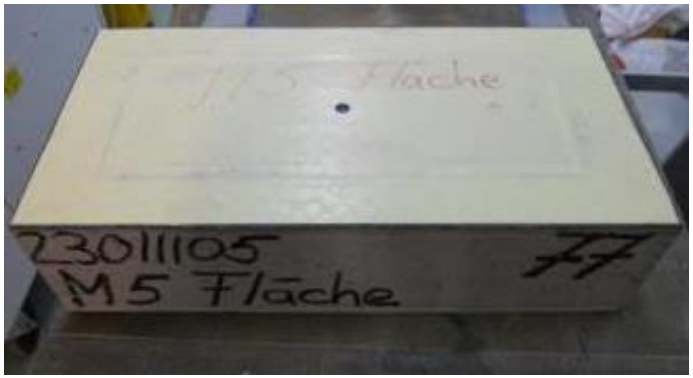


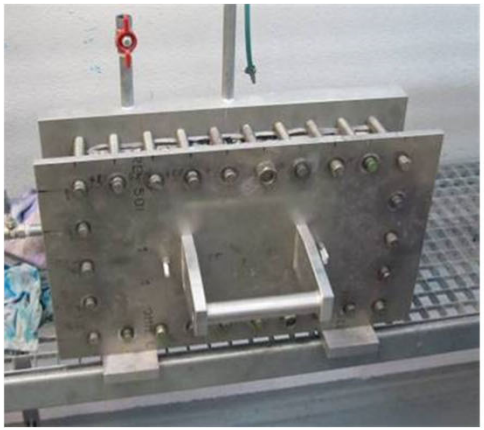
BARRIER PROTECTION

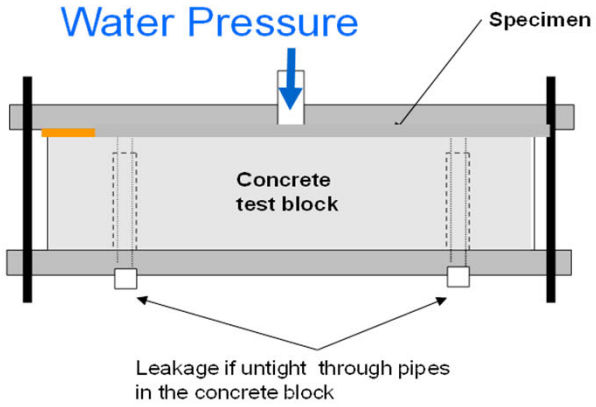
FULLY BONDED THERMOPLASTIC – SECTION 07133

Fully Bonded

FUNCTION TESTS PER ASTM D 5385 MOD.







BARRIER PROTECTION

FULLY BONDED THERMOPLASTIC – SECTION 07133

Fully Bonded

FUNCTION TESTS PER ASTM 5385D MOD.

No lateral water migration tested up 7 bar (~101 psi) water pressure

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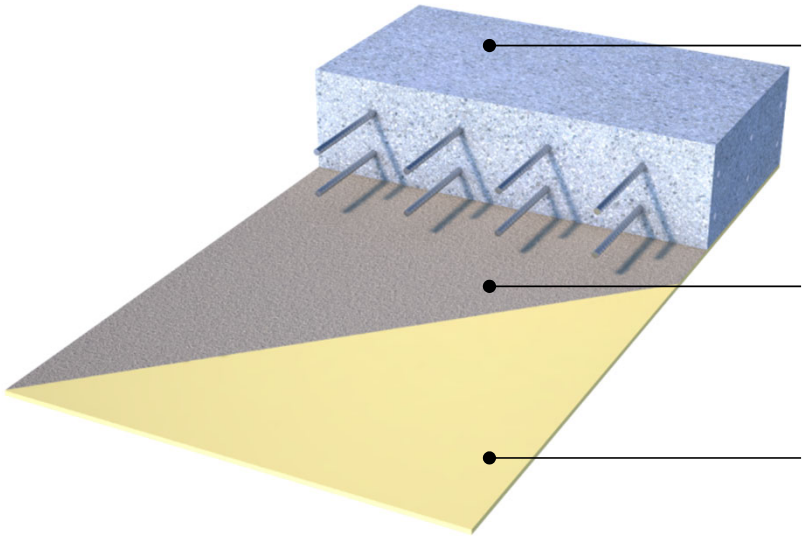
BARRIER PROTECTION

FULLY BONDED THERMOPLASTIC – SECTION 07133

Fully Bonded

HOW DOES IT WORK?



Structural Concrete

Bonding Layer

Waterproofing Layer

Mechanical Bond:
- Non-woven fleece
- Sand/Granulates

Adhesive Bond:
- Adhesive Layer

Dual Bond (mechanical & adhesive):
- Rough structured bonding layer with adhesive polymers

- Different chemical basis:
  - HDPE, PP, FPO/TPO, PVC
- Different physical properties:
  - Puncture Resistance, Elongation, Thickness

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BARRIER PROTECTION

FULLY BONDED THERMOPLASTIC – SECTION 07133

Fully Bonded

BARRIER PROTECTION

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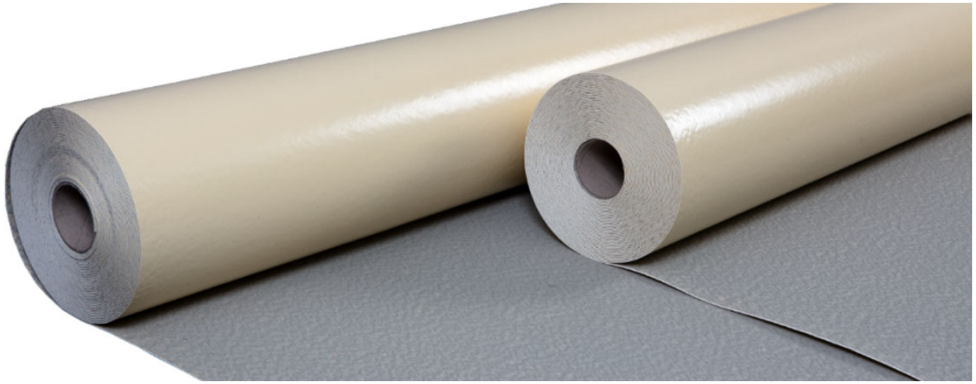
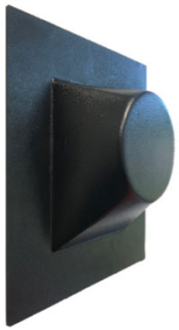


Post-Applied

Detailing (e.g. Penetration, Pile Head, Tie Back, etc.)



BARRIER PROTECTION

FULLY BONDED THERMOPLASTIC – SECTION 07133

Fully Bonded

Self-Adhesive Edge

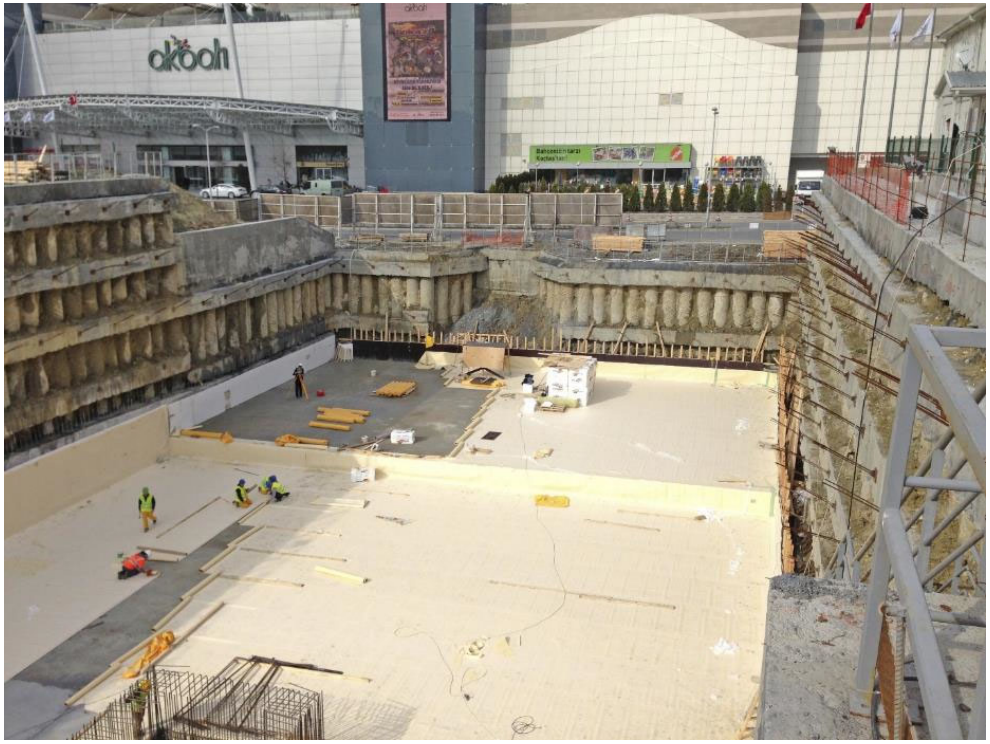
Taping

Welding

BARRIER PROTECTION

FULLY BONDED THERMOPLASTIC – SECTION 07133

Fully Bonded



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BARRIER PROTECTION

FULLY BONDED THERMOPLASTIC – SECTION 07133

Fully Bonded

BARRIER PROTECTION

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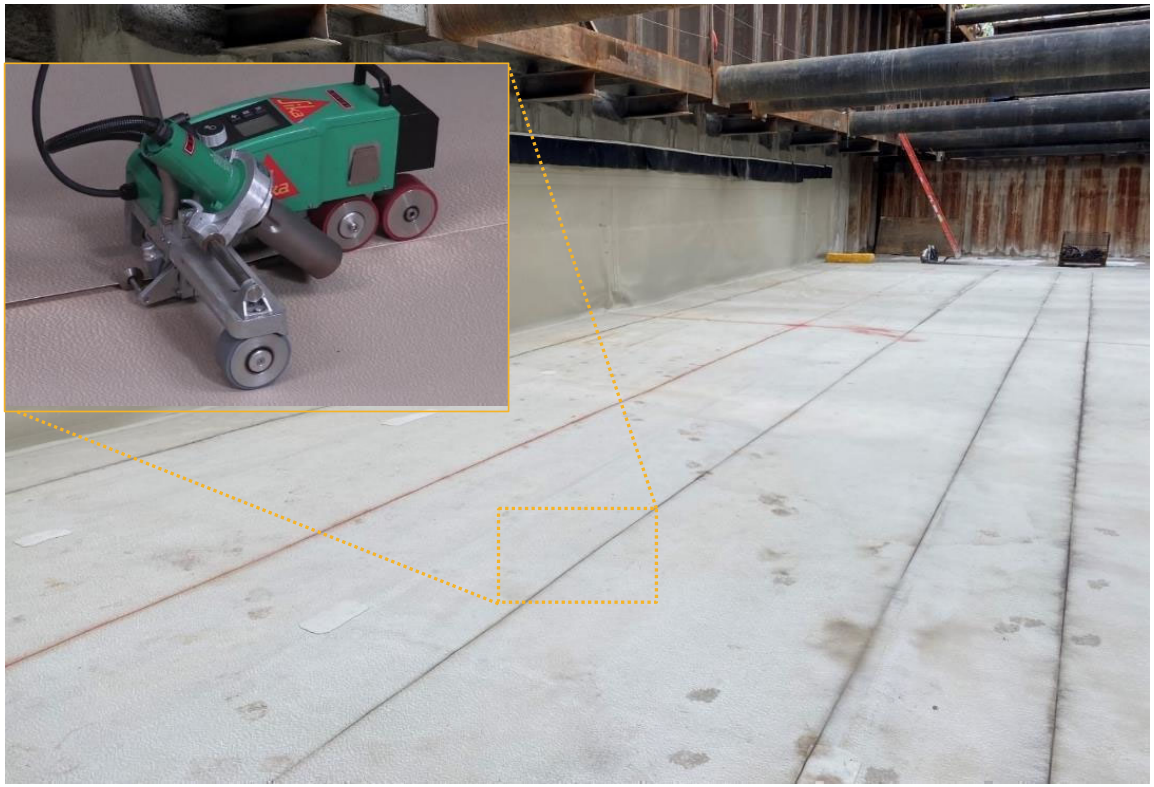

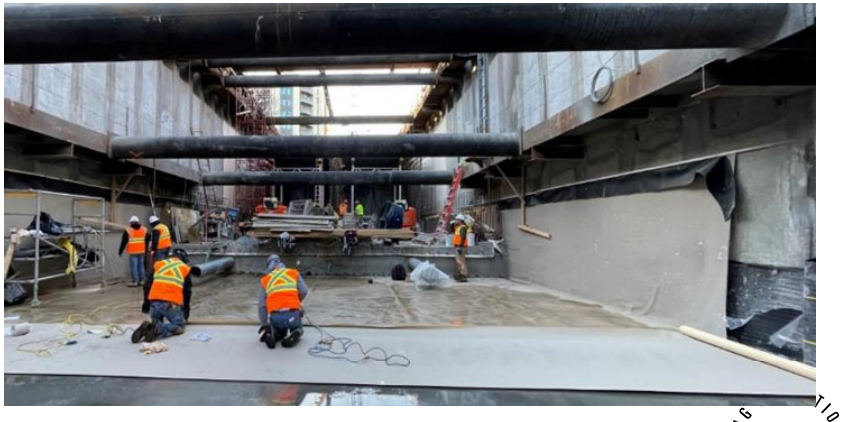

BARRIER PROTECTION

FULLY BONDED THERMOPLASTIC – SECTION 07133

Fully Bonded

INSTALLATION

PRE-Applied

POST-Applied

CONTINUING EDUCATION AIA

BARRIER PROTECTION

FULLY BONDED THERMOPLASTIC – SECTION 07133

Fully Bonded

INSTALLATION

Adhesive Application

Membrane Application

CONTINUING EDUCATION AIA

BARRIER PROTECTION

FULLY BONDED THERMOPLASTIC – SECTION 07133

Fully Bonded

Transition from blindside system to **Liquid Applied Membrane (LAM)** system

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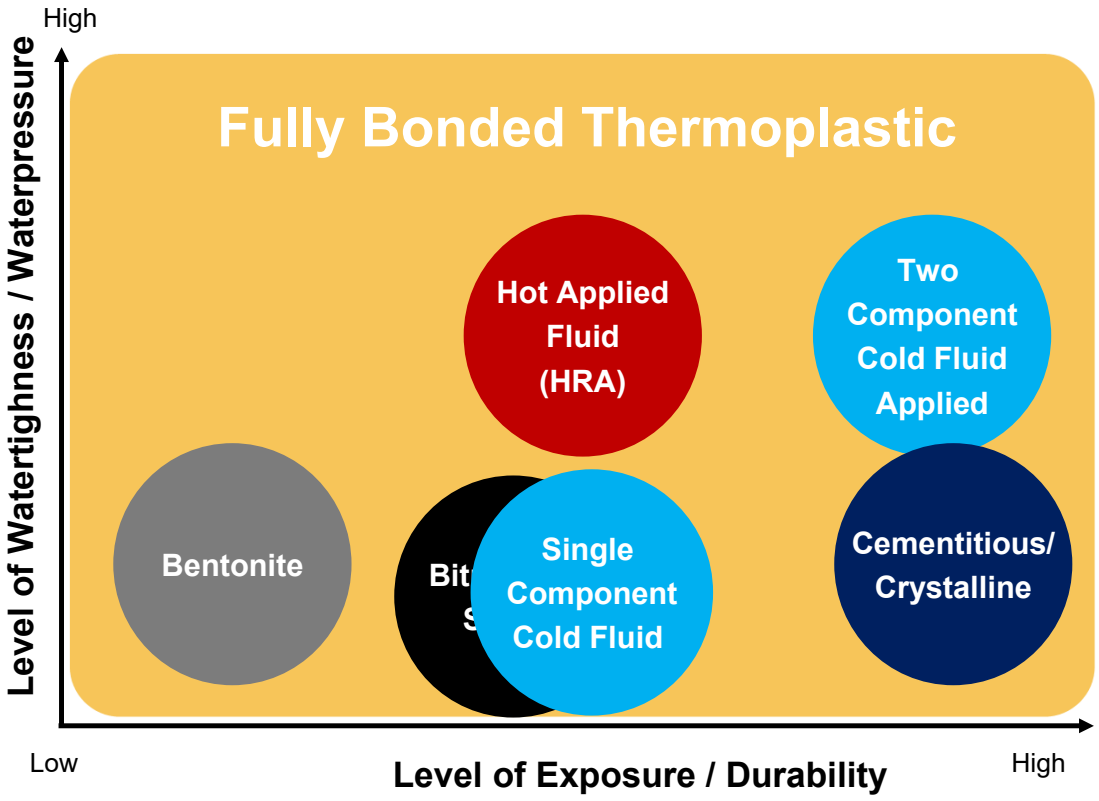
BARRIER PROTECTION

EXTERNAL WATERPROOFING SYSTEM



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  - Two-Component Cold Fluid Applied

Low Risk

- Sheet Applied
  - Fully Bonded for **temporary head pressure**
- Bentonite
- Bituminous
- Single Component Cold Fluid Applied

BARRIER PROTECTION

BENTONITE – SECTION 07170

Bentonite

- A clay system designed to expand when moisture comes in contact with system
- Pre-applied/loose laid under slabs or mechanically fastened against lagging before concrete walls are poured or mechanically fastened/post applied after concrete walls are poured
- Limited chemical resistance
- Water Contact Required to “activate”
- Requires Proper Compaction

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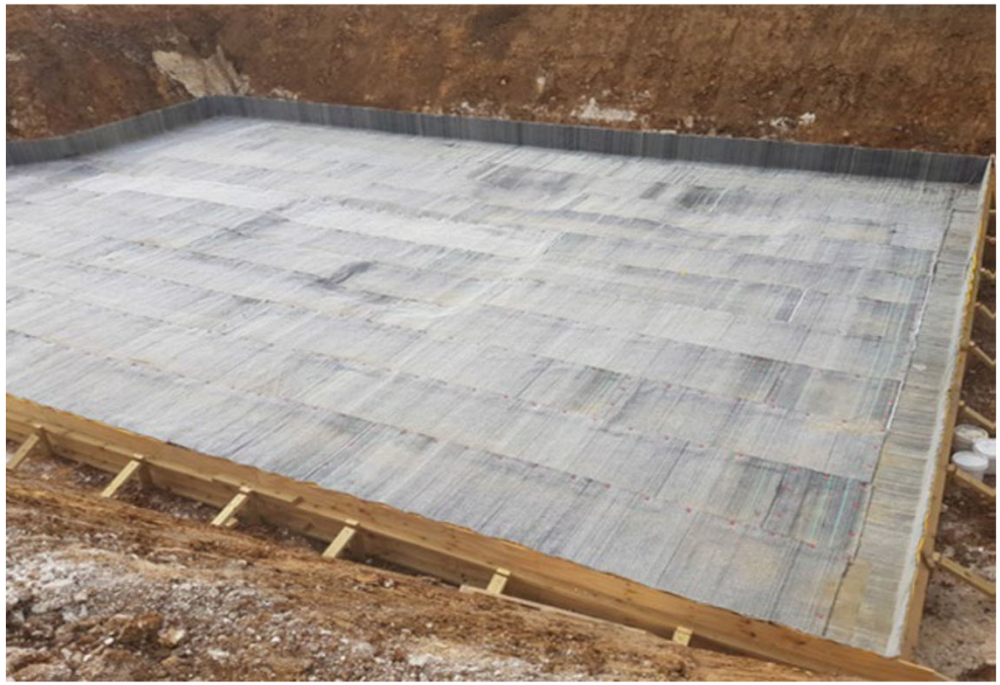
BARRIER PROTECTION

BENTONITE – SECTION 07170

Bentonite



Advantages

- No odor
- Simple installation
- Suitable for Green Concrete
- No Primer
- Suitable for cold temperatures
- Low cost

Disadvantages

- Easily Damaged
- Sensitive to Water Contact
- Requires Water Contact to Swell and function
- Requires proper compaction of substrate (post applied)
- No bond to concrete
- No chemical resistance
- Limited Warranty

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BARRIER PROTECTION

BITUMINOUS MEMBRANE – 07131 SECTION

Bituminous Sheets

- Asphalt Based Membrane
- Post applied Application after concrete is placed
- Requires Primer
- Typically 60 mils thick
- Self-Adhering

CONTINUING EDUCATION AIA

BARRIER PROTECTION

BITUMINOUS MEMBRANE – 07131 SECTION

Bituminous Sheets

Advantages

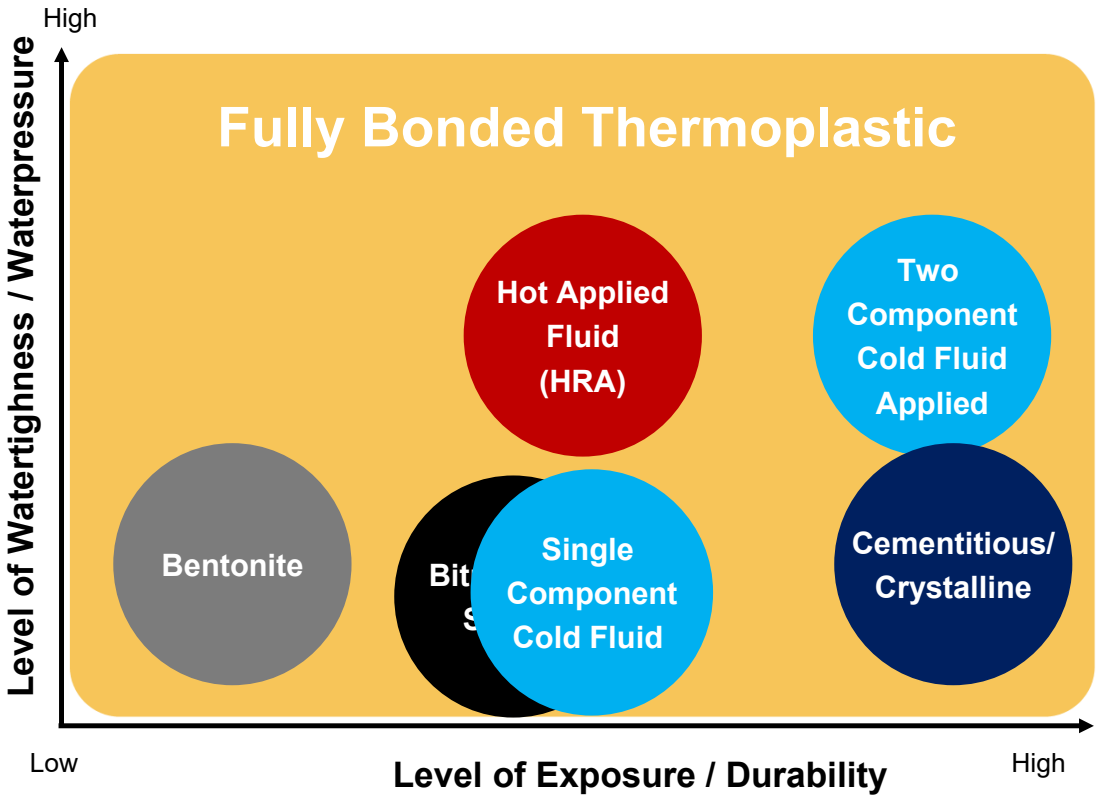
- No odor
- Simple installation
- Suitable for Green Concrete
- Low cost
- Adheres to Concrete
- Consistent Thickness

Disadvantages

- Not intended for submerged applications
- Requires Primer
- Temperature Sensitive (Primer)
- Concrete Must be Cured*
- Limited Crack Bridging Capability
- Material Warranty Only
- Limited chemical resistance

BARRIER PROTECTION

EXTERNAL WATERPROOFING SYSTEM



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BARRIER PROTECTION

HOT FLUID-APPLIED LIQUID MEMBRANES – SECTION 07142

Hot Applied Fluid (HRA)

- Asphalt/Rubber Based Membrane
- Hot applied
  - Kettle or Heaters required
- 180 – 215 mils
- Typically Reinforced

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BARRIER PROTECTION

HOT FLUID-APPLIED LIQUID MEMBRANES – SECTION 07142

Hot Applied Fluid (HRA)

Advantages

- "Seamless" Waterproofing
- Adheres to Substrate
- Thick Systems
- Suitable for Plaza decks/pavers, flat surfaces
- Can be submerged permanently
- No temperature limitations
- No "curing"
- Material and Labor Warranty available

Disadvantages

- Odor
- Messy
- Requires experience to install
- Kettles/heaters required

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BARRIER PROTECTION

COLD FLUID-APPLIED LIQUID MEMBRANES – SECTION 07141

Cold Fluid Applied

- Single or Two Component Cold Fluid Applied
- ~5 gallon buckets
- Asphalt Modified Urethane
- 60 – 120 mils
- Optional Reinforcement

BARRIER PROTECTION

COLD FLUID-APPLIED LIQUID MEMBRANES – SECTION 07141

Cold Fluid Applied

Advantages

- "Seamless" Waterproofing
- Adheres to Substrate
- Suitable for Plaza decks/pavers, flat surfaces*
- Can be submerged permanently*
- Easy to apply
- UV Stable*
- Chemically Resistant*

Disadvantages

- Some Odor
- Messy
- Temperature Limitations
- Non-uniform Thickness

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BARRIER PROTECTION

CEMENTITIOUS – SECTION 07161

Cementitous/
Crystalline

- Cementitious Waterproofing Coating
- Trowel/Roller Applied
- Typically used as belt and suspenders product

BARRIER PROTECTION

CEMENTITIOUS – SECTION 07161

Cementitous/ Crystalline

<u>Advantages</u>

- UV Stable
- Low Cost
- Positive OR Negative Side
- Durable

<u>Disadvantages</u>

- Not elastic
- Limited Head Pressure Resistance
- No Uniform Thickness
- Vapor Permeable

This concludes The American Institute of Architects Continuing Education Systems Course

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BRUCE ZHU
Product Engineer - Waterproofing
Sika Corporation

Mobile: (314)706-8259
Email: Zhu.Bruce@us.sika.com