100% Silane

Eco-Friendly

Long Life

ZYCOSIL™

Breathable Waterproofing

Heat & UV Resistant

Zydex

ZYCOSIL™

WHAT IS A NANO ?

Human Hair ……. 1 0 0, 0 0 0 nanometers

Pin head 1mm ……. 1 0 0 0, 0 0 0 nanometers

Products and technologies utilizing up to 99 nm size are termed as nanotechnologies

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INSPIRED BY NATURE'S NANOTECHNOLOGY

Breathable water repellent leaf

Cylindrical Wax heads

Breathable Waterproofing .....

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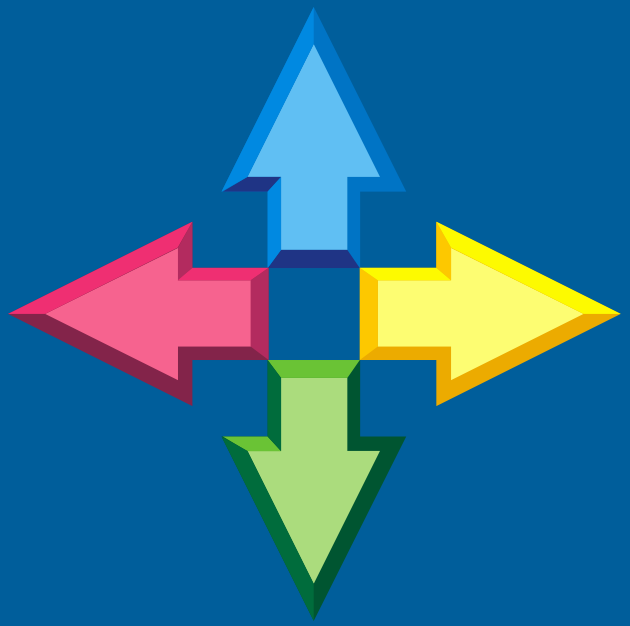
WHAT WATERPROOFING SHOULD BE?

Long Life* 20+ years

(*abrasion, UV resistant)

Easy to apply



Low cost

Eco friendly
(Low VOC'S)

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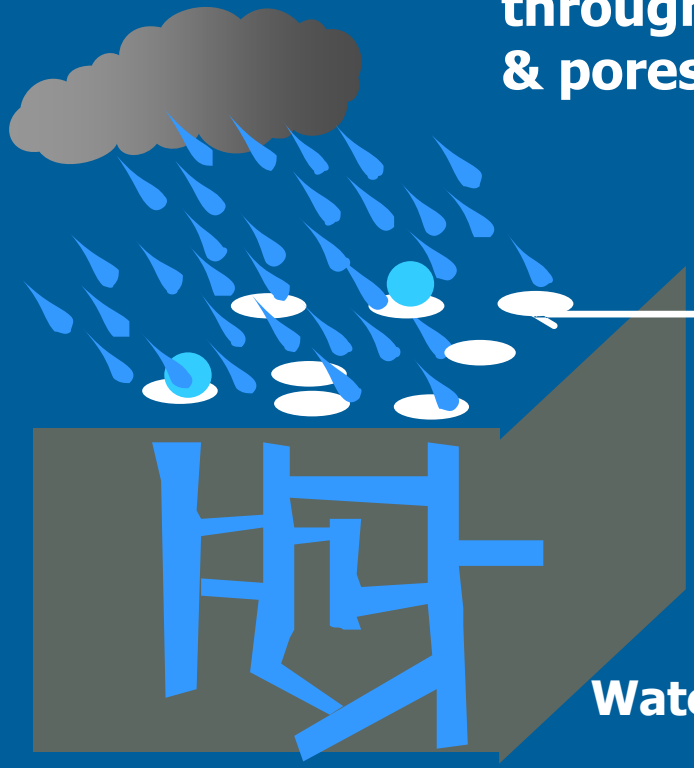
WATER
The Great Destroyer

ZYCOSIL™

RAIN WATER : ENTRY INTO STRUCTURES

Rain Water seeps through micro cracks & pores



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AESTHETIC DAMAGE

- Efflorescence
- Paint Peel Off/ Blisters
- Fungus
- Mold (Mildew)
- Dirt Pick Up

The solution to avoid these damages, lies in control of water ingress / seepage

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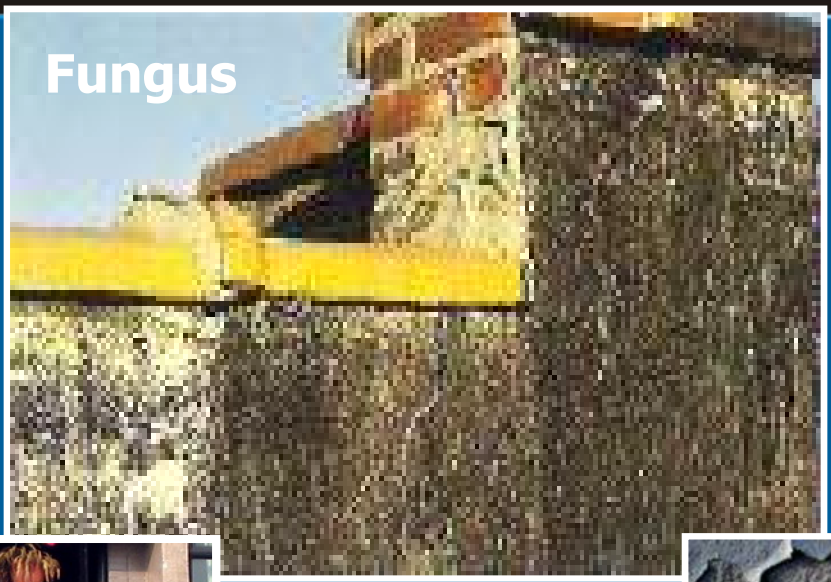
AESTHETIC DAMAGE



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STRUCTURAL DAMAGE

Cement strength loss due to:

- ASR - Alkali Silica Reaction
- Freezing - Thawing
- Carbonation

Corrosion of Reinforced Steel Bars

- Ductility loss and volume expansion leads to cracking

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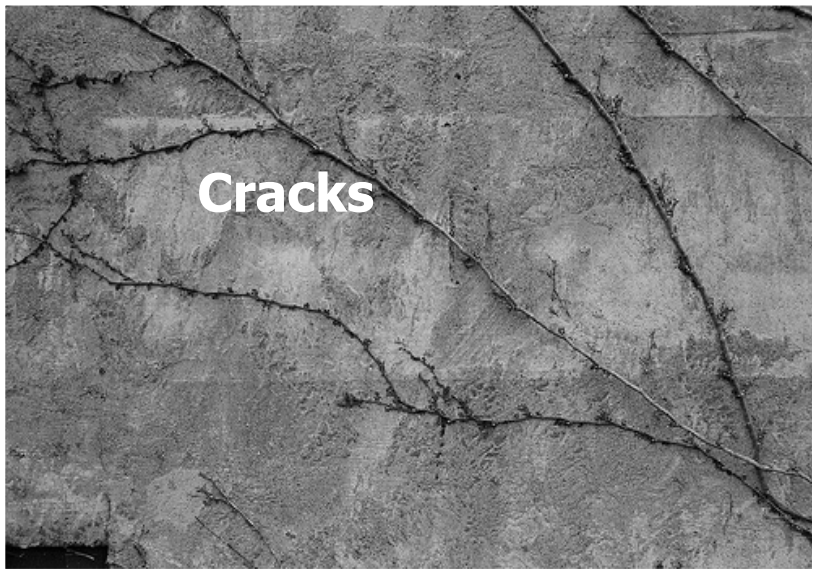
STRUCTURAL DAMAGE



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ALKALI SILICA REACTION

ASR occurs due to reaction between water and reactive forms of silica in aggregate in presence of hydroxyl ions in alkaline cement concrete

$$\equiv Si\text{-}O\text{-}Si\equiv + H_2O \xrightarrow[\text{Strong Base}]{[OH^-]} \equiv Si\text{-}OH.....OH\text{-}Si\equiv$$

Silicate		Silica Gel
Volume – 100%	⟶	**Volume – 400%**

Silica Gel 4 times volume expansion, leads to cracking and further accelerated deterioration

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FREEZING - THAWING

Water expands 9 to 10 % on freezing

Below freezing temperatures, water converts to ice and the volume expansion leads to cracking

The accumulative effect of successive freeze-thaw cycles causes expansion and cracking, scaling, and crumbling of the concrete, bricks etc

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CARBONATION

Rain water absorbs CO_2 to form Carbonic acid. Water absorption by concrete, allows it to react with free Calcium Hydroxide reducing the pH forming Calcium Carbonate.

Step 1: $H_2O + CO_2 \rightarrow H_2CO_3$ (Carbonic acid)

Step 2: $Ca(OH)_2 + H_2CO_3 \rightarrow CaCO_3 + 2H_2O$

Calcium Hydroxide

Calcium Carbonate

Repetitive cycles cause loss of strength of cement concrete / plaster

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CORROSION

Iron + Oxygen + Water in presence of Chloride leads to Fe_2O_3

Chloride ions help in promoting the corrosion reaction without getting consumed. It also helps in allowing the conductivity of electron movement in aqueous medium.

Preventing the ingress of water and soluble chloride is the real defense against corrosion process.

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CONVENTIONAL TECHNOLOGIES

FILM FORMERS : Acrylates / Epoxy / Silicones

SILANE SILOXANE : Di-methyl Siloxane and Silane

CRYSTALLINE : Sodium Silicate

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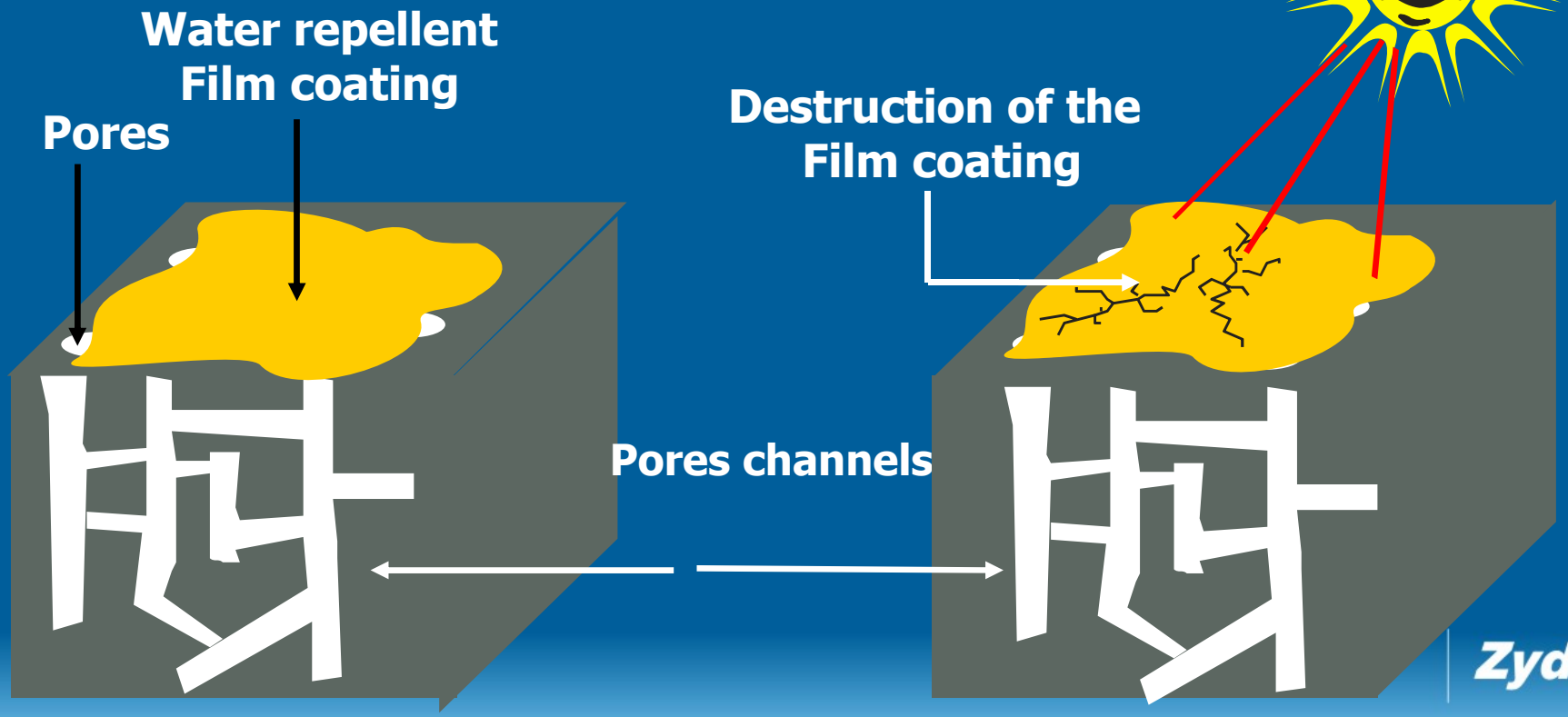
FILM FORMERS : ACRYLATES / EPOXIES / SILICONES

- Blocks Breathability
- No penetration
- Effective for 2-5 Years
- Poor UV stability



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SILANE – SILOXANES - LIMITATIONS

Silanes - Siloxanes combine Silicones film formation and Silanes penetration, making them water based utilizing water insoluble Silanes

However, 60-70% Di-methyl Siloxane content leads to Poor Penetration, Poor UV resistance and Blackening after weathering

The 100 % Silane Zycosil nanotechnology overcomes all these limitations

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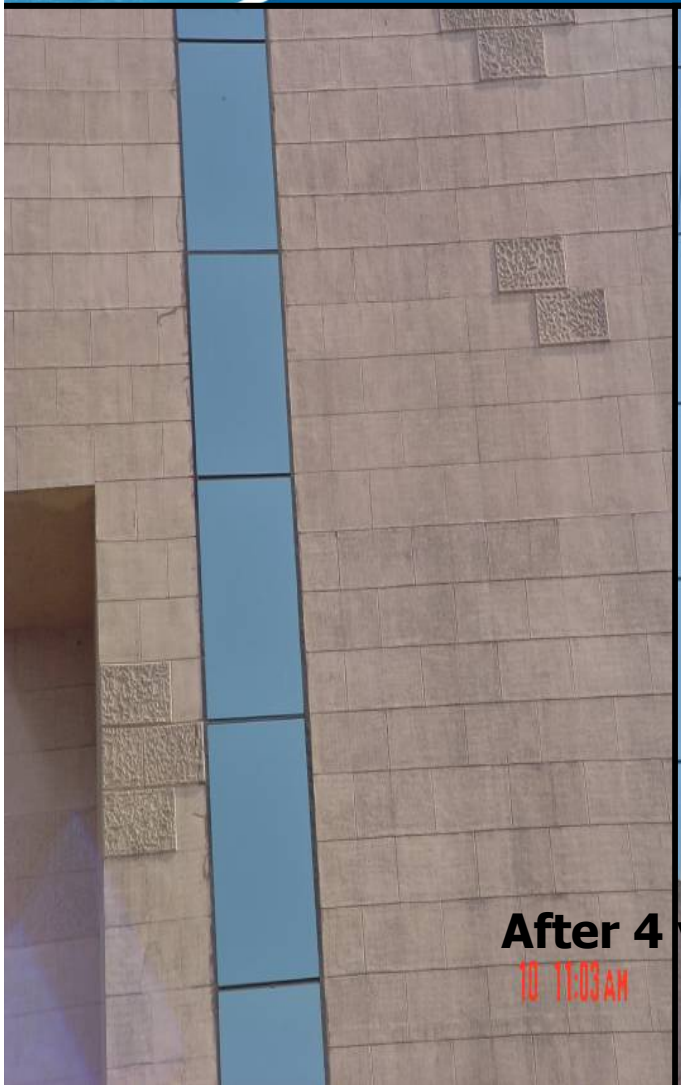
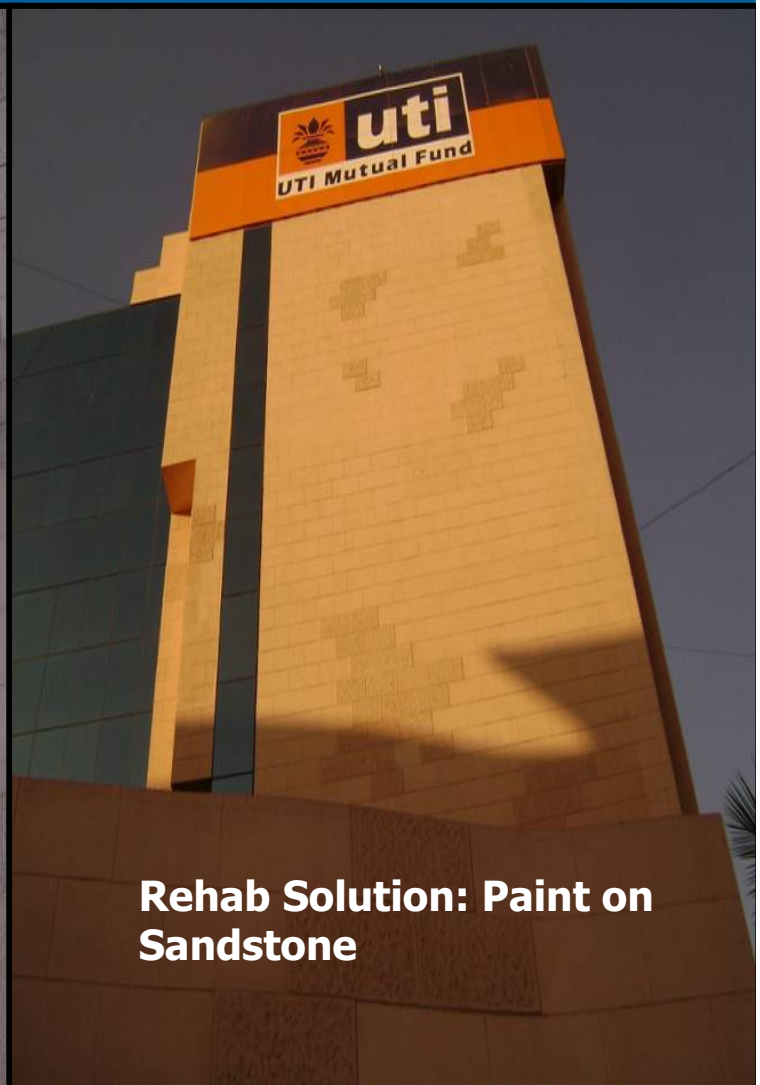
FAILURE : SILANE/SILOXANE ON SAND STONE



After 4 years



Rehab Solution: Paint on Sandstone

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FILM FORMERS Vs ZYCOSIL

Property	Film Formers	ZYCOSIL
Simulated 10 Years Abrasion Test	Loses 90% protection	Loses only 2% protection
UV Stability	Not stable	Stable
Breathability	Not breathable	Breathable
Depth of Penetration (nm)	< 0.2 mm	1 to 3 mm
Durability	< 5 Years	20 + Years

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GLOSS Vs NATURAL LOOK

Film former product gives shine on treated surface after drying

Zycosil is reactive and penetrative nanotechnology which goes inside the pores of substrates

Zycosil gives nano modification, maintaining natural look without gloss

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CRYSTALLINE TECHNOLOGY

Effective in new concrete only. In old concrete most of the surface $Ca(OH)_2$ converts to $CaCO_3$ by carbonation, reducing its effectiveness due to non uniform distribution

Na_2SiO_3	+	$Ca(OH)_2$	→	$CaSiO_3$	+	2 NaOH
Sodium Silicate		Calcium Hydroxide		Calcium Silicate		Sodium Hydroxide

Generates free strong base catalyst (NaOH) which promotes ASR (forms cracks) in concrete. Swelling of the gels can cause de-lamination of concrete

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CRYSTALLINE TECHNOLOGY

Reduces the pore size only, but does not remove surface affinity for water

Is Corrosive material with pH 12^{+} & requires special handling and precautions in application

Poor acid and alkaline resistance

Not Versatile – has limited applications. Cannot be used for stones, bricks, tiles, clay etc

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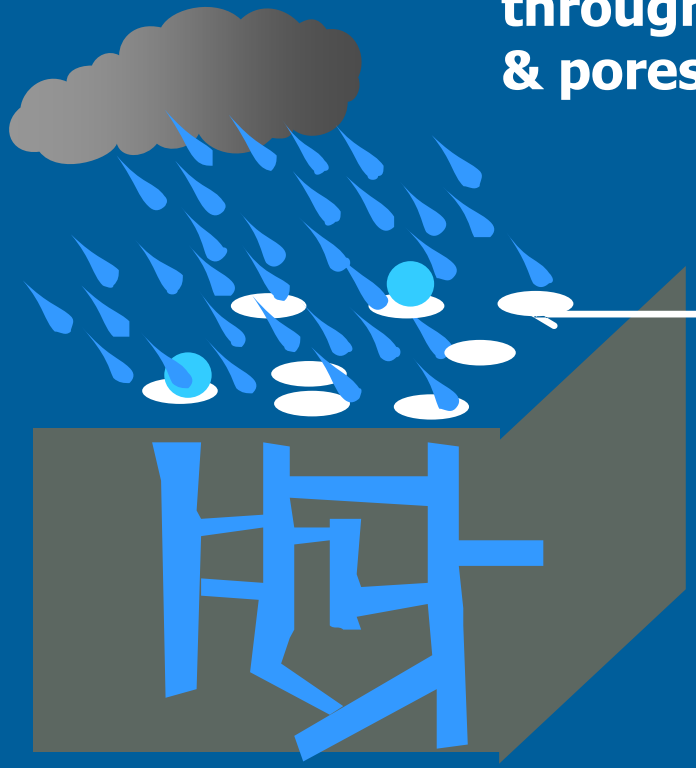
WATER MOLECULE TO DROPLET ?

Rain Water seeps through micro cracks & pores



Substrate pore = 5 – 2,000 nm

Water Molecule = 0.18 nm

Water Droplet = 100000 nm

Salt/ Acid rain ~ 1 - 2 nm

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WATER MOLECULE TO DROPLET ?

Surface tension of water molecules on a hydrophobic surface, makes the water molecules to remain in physical droplet form

This prevents the water molecule to enter into the pore structure, as the droplet size is larger by an order of magnitude

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DEVELOPMENT OF ZYCOSIL - FEATURES

Water soluble, nano size, penetrative

Chemically reactive at room temperature

Forms Si-O-Si Siloxane bond (mother nature's strongest bond which survives for centuries)

Nano Siliconize surfaces by converting silanol groups (water absorbing) to Alkyl Siloxane surfaces (water repellent)

Non leachable chemistry

Easy application

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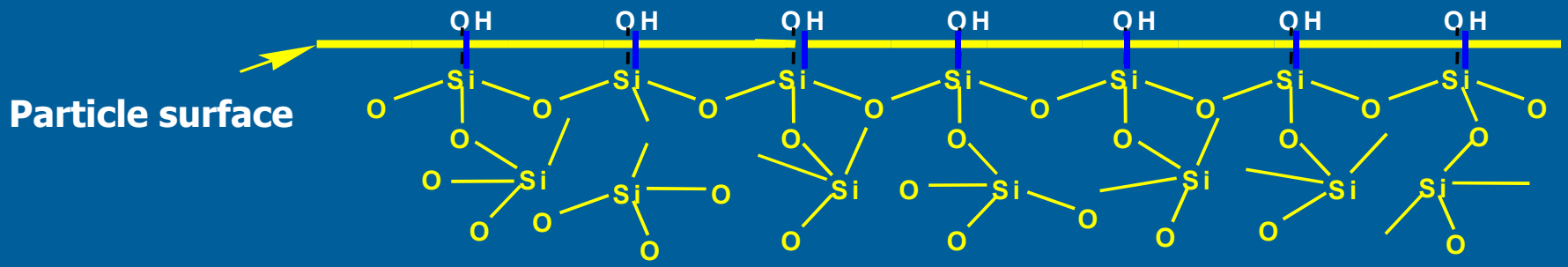
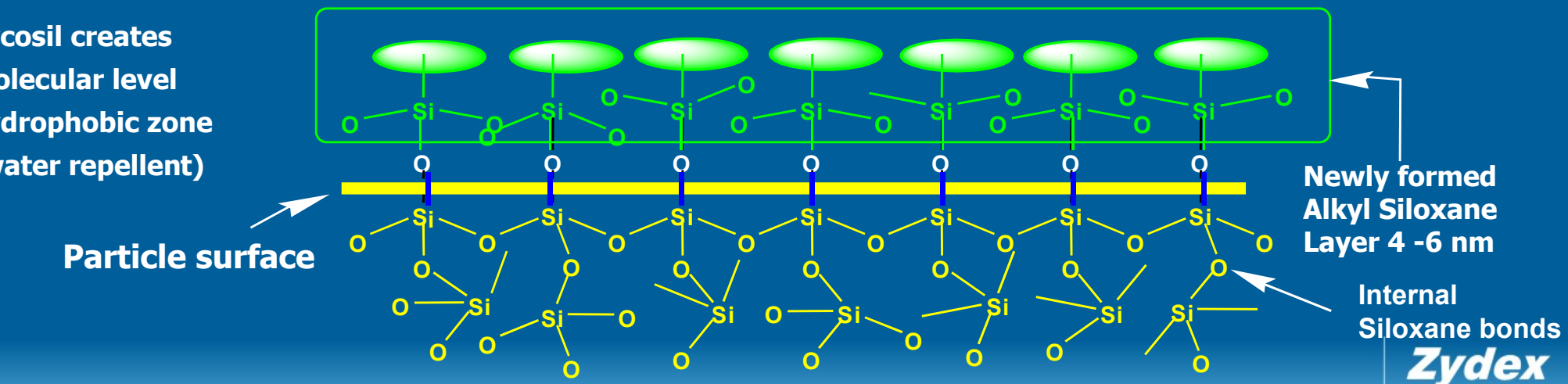
ZYCOSIL - THE CHEMICAL ACTION

-OH groups make surface very hydrophilic (water loving)



Concrete particle surface silicate structure



Concrete particle surface silicate structure after Zycosil reaction

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ZYCOSIL – DRYING THE CRITICAL STEP

$$Si - OH + OH - Si = Si - O - Si + H_2O \uparrow$$

Evaporate

Drying at least once is critical to complete the reaction and achieve hydrophobicity

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WATERPROOFING IN WET CONDITION

Force Drying - Use halogen lamp, industrial hot air gun

Reduce Zycosil to water dilution ratio to 1:5, 1:3. Ensure Zycosil consumption per m^2 is maintained

Apply again one more coat of diluted Zycosil and allow it to dry at room temperature

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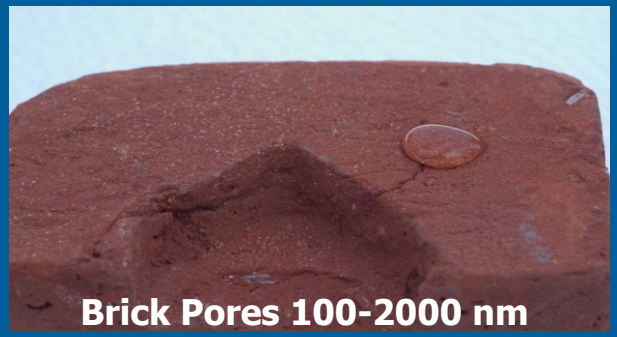
WATERPROOFED SUBSTRATES



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SATURATION – THE CRITICAL STEP

Saturation of each and every pore up to 1 mm depth ensures complete hydrophobation.

This ensures complete Seepage Control

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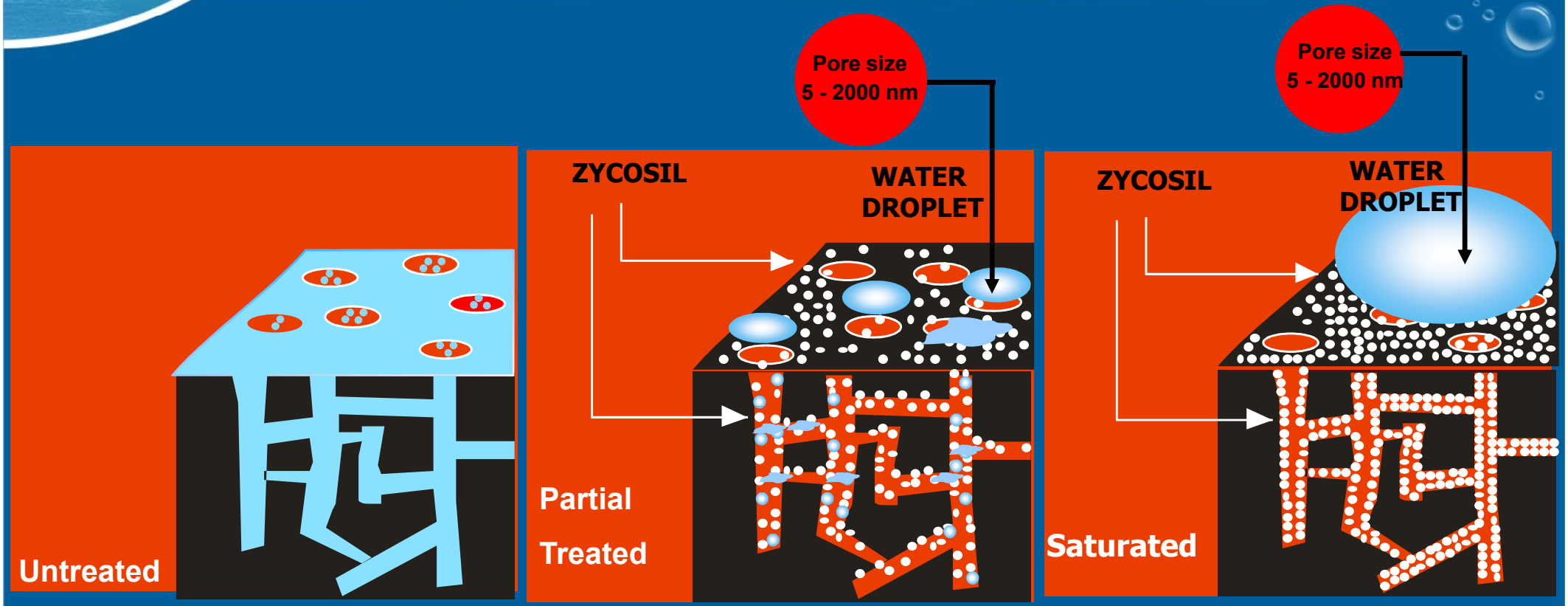
SATURATION – KEY TO PERFORMANCE



Total Failure | **Possible Failure** | **Complete Relief**

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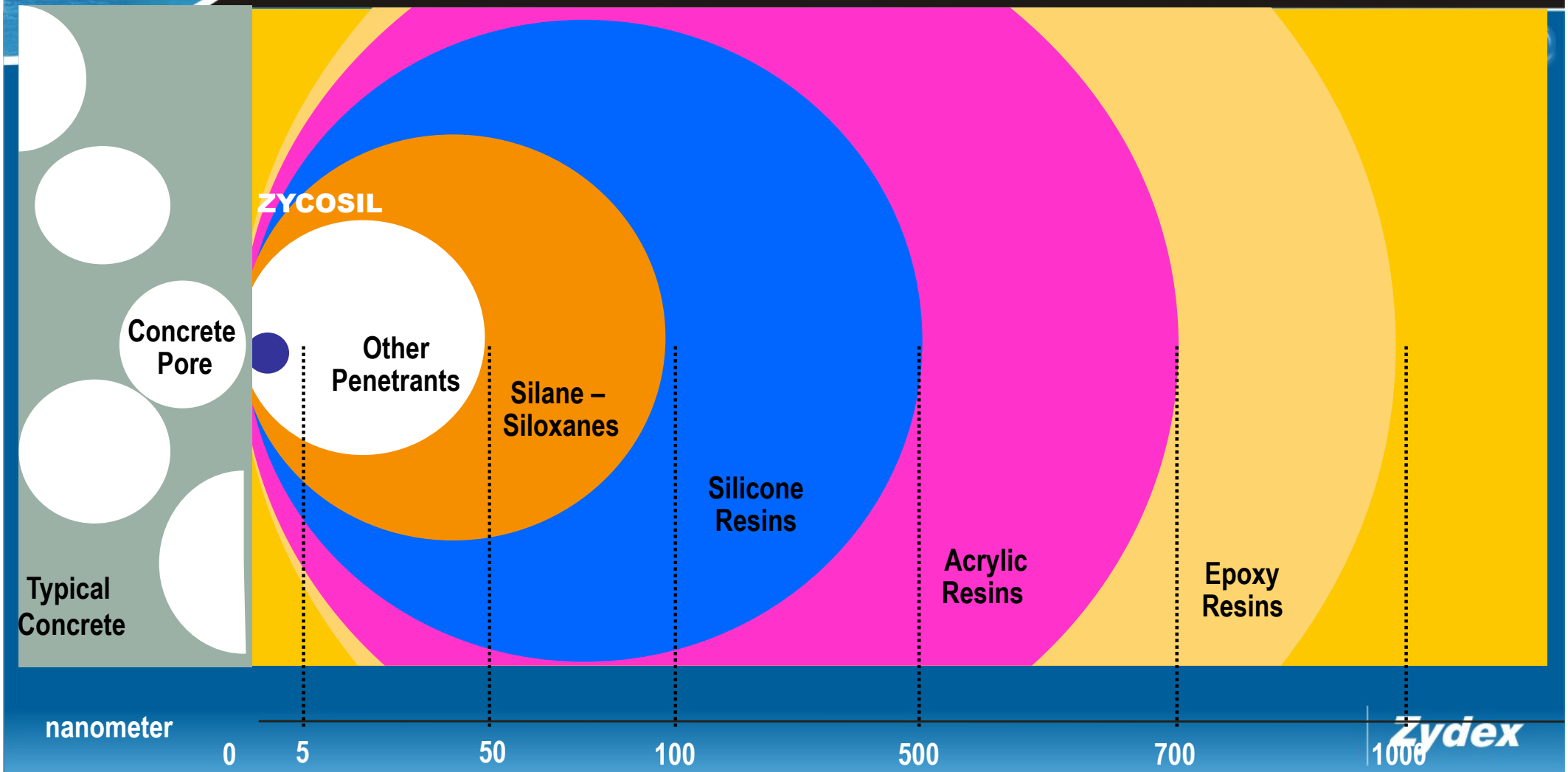
SIZE Vs PENETRATION



Particle sizes for different types of water repellents

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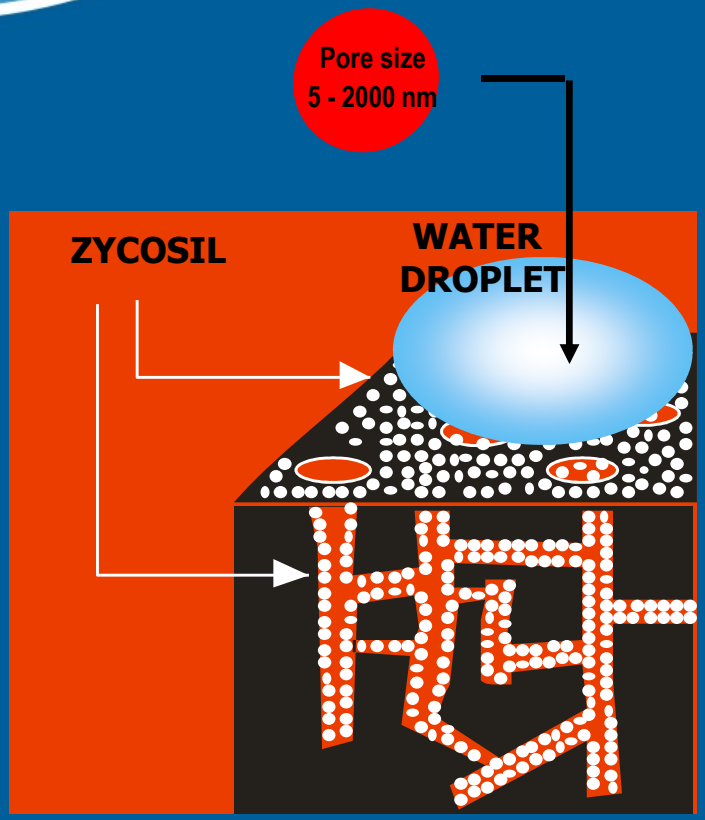
PENETRATION – KEY TO PERFORMANCE



Zycosil reacts and converts the siliceous surface to alkyl siloxane surface

This happens at a nano level, is non leachable, penetrates 0.5 – 1 mm and UV stable.

Molecule to droplet is the key to achieve water resistance

Maintains breathability

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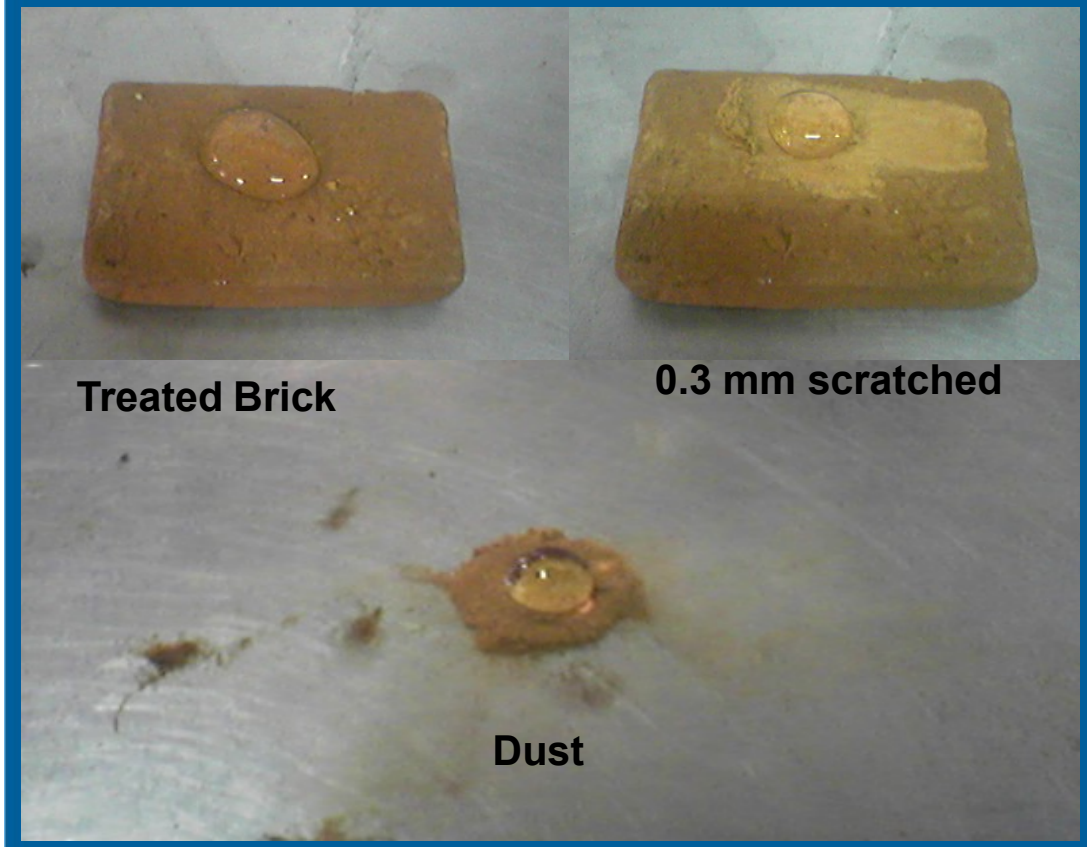
SCRATCH TEST



Scratch 0.3 mm of the Zycosil treated & dried surface with a blade

Put a drop of water on the scratched surface and on the scratched powder material

Non wetting of the surface and the powder material confirms the acceptable depth of penetration and saturation

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WATER RESISTANCE Vs SURFACE REPELLENCE

Nano modified Zycosil surface when exposed to Sun and organic matter in pollen, oil and dust will have degraded layer of organic material

The above surface has apparent wetting of water droplet on the treated surface, within 3 - 6 months of exposure

Is it loss of water resistance or surface wetting?

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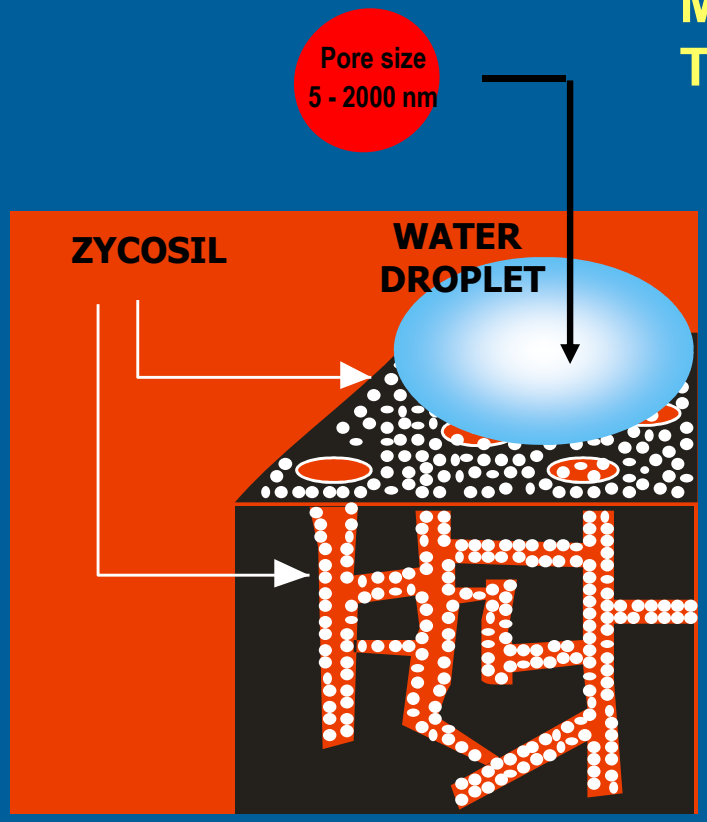
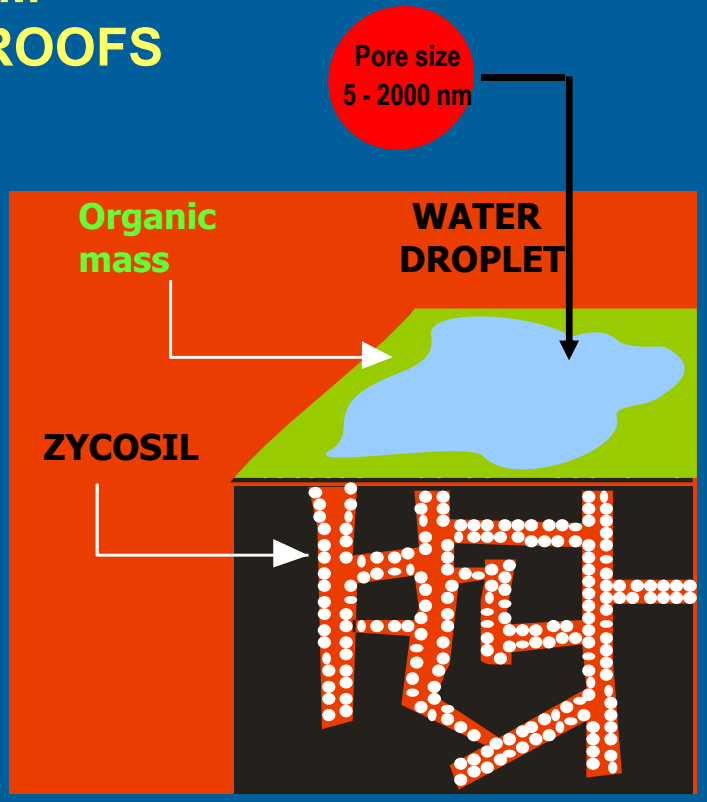
WATER RESISTANCE Vs SURFACE REPELLENCE

MECHANISM – TREATED ROOFS



After 1 day



After 3 - 6 months

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WATER RESISTANCE Vs SURFACE REPELLENCE

Loss of repellence is only surface wetting phenomena. It does not mean loss of water resistance

The water tightness (waterproofing efficacy) of the treated surface can be confirmed by doing a Rilem test

Zycosil is not a water repellence solution, but a long lasting waterproofing solution.

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WATERPROOFING – CRACKED STRUCTURE (MICRO/MACRO)

Zycosil being nano sized, water like solution penetrates deep into the thinnest hair line cracks creating a water resistant crack.

This mechanism makes Zycosil waterproofing a very forgiving technology for application especially for cracked structure as a primary method of waterproofing.

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FUNGUS – MOLD / MILDEW

- Retards Fungus & Mold
- Fresh and clean surfaces for long life

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RILEM TEST

Affix Rilem tube on substrate's surface & fill water column up to 5ml

Water absorption of less than 0.2 ml confirms acceptable waterproofing

The water column pressure in RILEM test is equivalent to the pressure generated by, 140 Km/hr wind driven rain

Zycosil treated bricks, Concrete, Plaster, Cement sheets & Sand Stone show 98-99 % reduction in water absorption

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ACCELERATED WEATHERING TEST ASTM G-154

UV exposure of 21 hours followed by 1 hour rain shower and subsequent drying at 110 °C for 2 hours for 80 cycles conducted on:

Concrete blocks, Bricks, Plaster, Sand Stone and Cement Sheet

All the samples retained over 98% of water repellency simulating a life of 20 plus years

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COMPLETE WATERPROOFING SOLUTIONS

ZYCOSIL™ — Waterproofing for cement concrete

Zycoprime — 100 % Acrylic Bonding Agent

Elastobar — 100 % Acrylic membrane barrier for microcracks & cracks

ZycoBOND — 100 % Acrylic Bonding Agent between Zycosil waterproofed soil and cementitious surface (screed / IPS)

Zydex

Zycoprime

ZYCOSIL™

ZYCOAT FORMULATION

Mix 1 kg cement and 1 kg fine sand /100 mesh fine silica. Add 1 kg Zycoprime to this mix and stir thoroughly. Brush apply one coat of Zycoat to get 200 microns thick coat.

Coverage: 3-4 m^2 of the above Zycoat formulation

Application: Bonding agent on Zycosil treated surface

Zydex

Elastobar

ZYCOSIL™

ELASTOCOAT FORMULATION

Excellent UV stability, high strength and elongation of 200 – 250 %

Mix 1 part Elastobar + 1 part cement to get brush able consistency. Brush apply and allow to air dry for 3 – 6 hours before the next coat

Coverage: 0.8 – 1mm coating with above mixture gives a coverage of 1 m2 per kg

Applications: Toilet, balconies & utilities, Podiums, Water Tanks & STP's, Basements , Retaining Walls etc

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WATERPROOFED SOIL

Breathable waterproofed membrane on the compacted soil

Prevent capillary rise at soil level

Application technique: Spray – Dry – Spray

Solution for making wet land to dry land

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MAKE WATERPROOFED SOIL

- Add 1 kg Zycosil in 100 liters water and mix thoroughly by manual / mechanical stirring
- Start rotating the concrete mixer with the dry soil and spray Zycosil solution, till it is just free flowing. Saturate the soil only up to formation of lumps
- Spread the treated soil in an open area and allow it to sun dry, till it shows water repellency. In the case of no repellency, reduce the dilution ratio to 1:50 or 1:75 immediately

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MAKE WATERPROOFED SOIL

- Check waterproofing of treated dry soil by drop test
- If the soil has high moisture content, reduce the dilution ratio to ensure that more of Zycosil is penetrating per liter. The Zycosil quantity to be used per unit area remains the same.
- Take the waterproofed dry soil and spread 15 to 20 mm on wet land and compact to achieve dry bed

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WATERPROOFED SOIL

- Treated Vs untreated soil demo – water column photo
- Water droplet on waterproofed soil - photo

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ZycoBOND

Zycobond solution preparation method:

Mix 1 parts of Zycobond with 100 parts of water to make homogeneously, keep solution overnight and stir well to make homogenous solution

Dosage: 1.5 liters / m^2 by spray

Coverage → 60 m^2 per kg (approx.)

Application on waterproofed soil followed by cement concrete or screed / plaster

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APPLICATIONS

Areas: Cement Concrete / Plaster, Bricks, Stones, Granites, Clay Tiles

1. **Basements / Elevator Pits / Podiums**
2. **Overhead Tanks /Toilets, Balconies & Utility Areas**
3. **Swimming Pools / STP's**
4. **Roof Terraces / Soil Coba – Insulated Green Roofs**
5. **Walls & Claddings**

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APPLICATIONS - INFRA

Cement Concrete Pipes / Sheets

Bridges / Flyovers / Tunnels

Rail Road Sleepers

Marine Piers / Docks / Ship Yards

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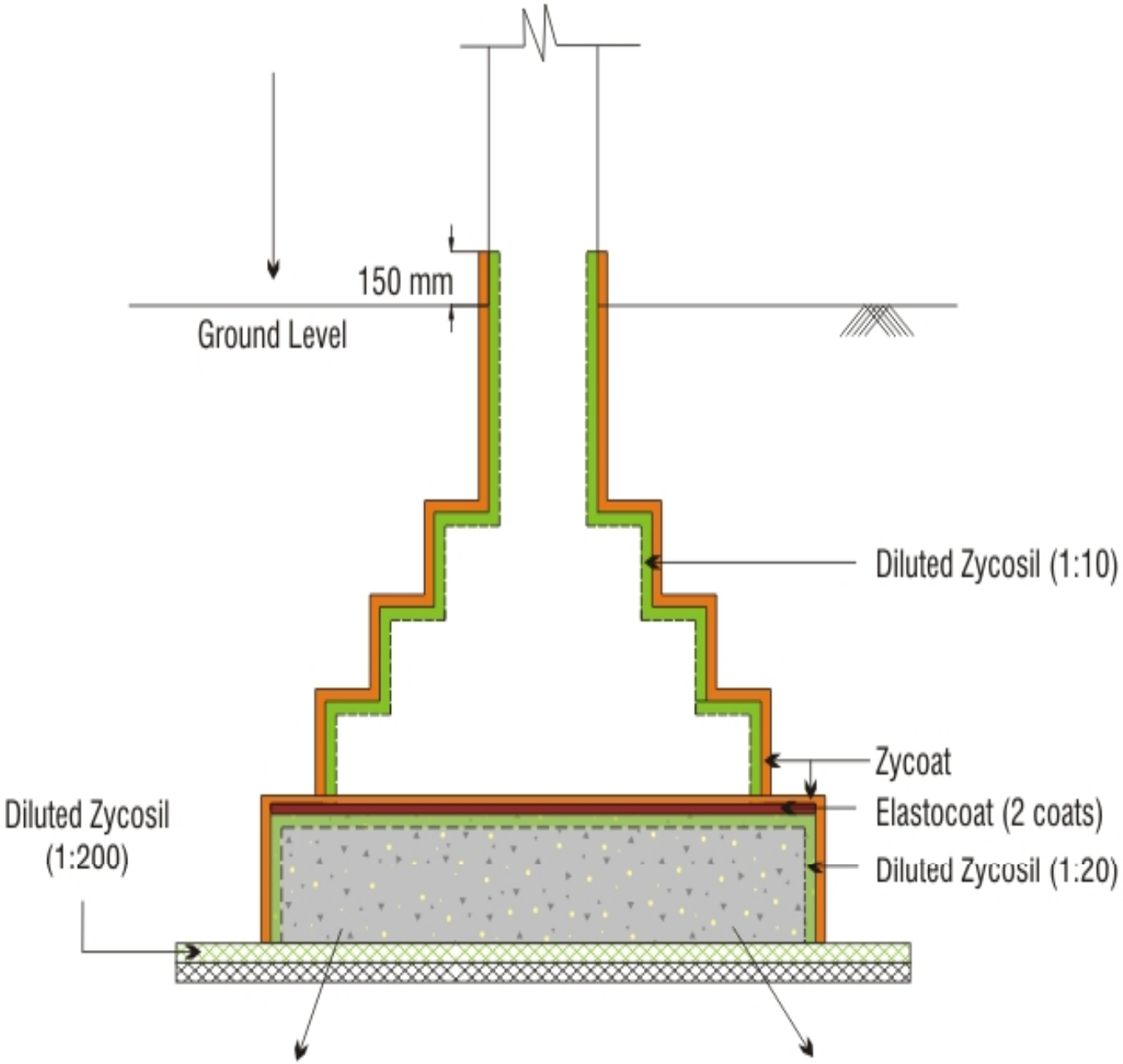
Zycosil

Zycoat

Elastocoat

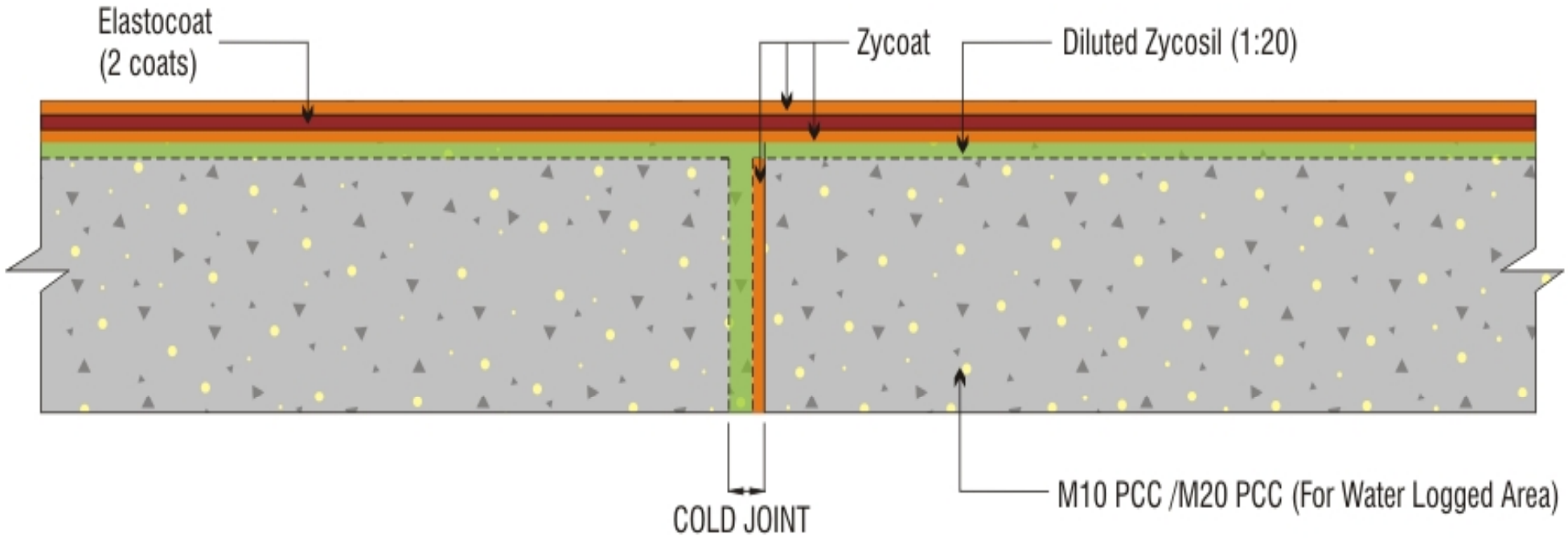
Zycomix



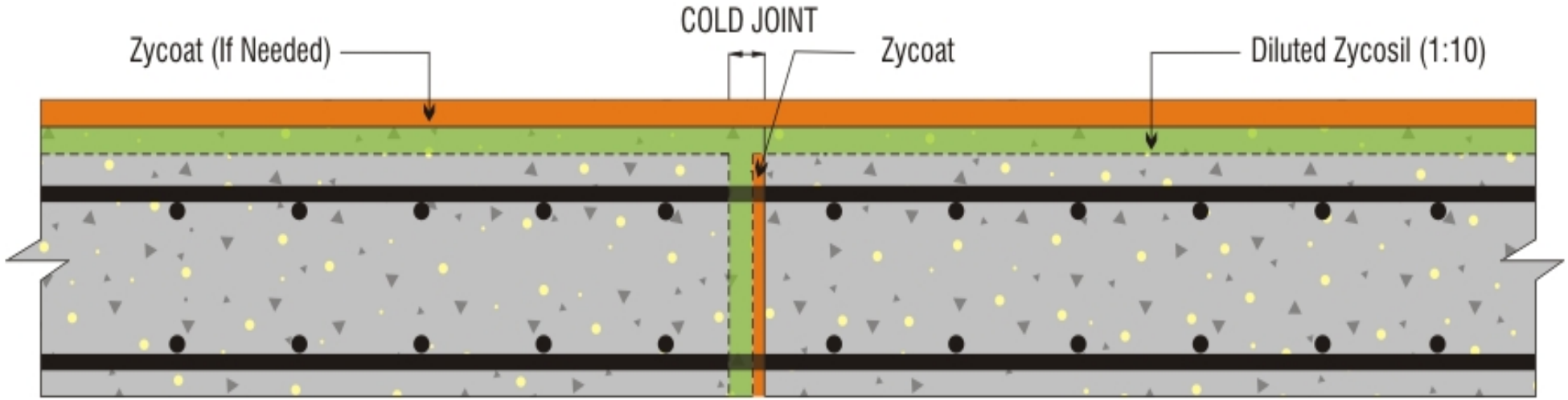
M10 PCC

M20 PCC (WATER LOGGED AREA)

BASEMENT WITH ISOLATED FOOTINGS

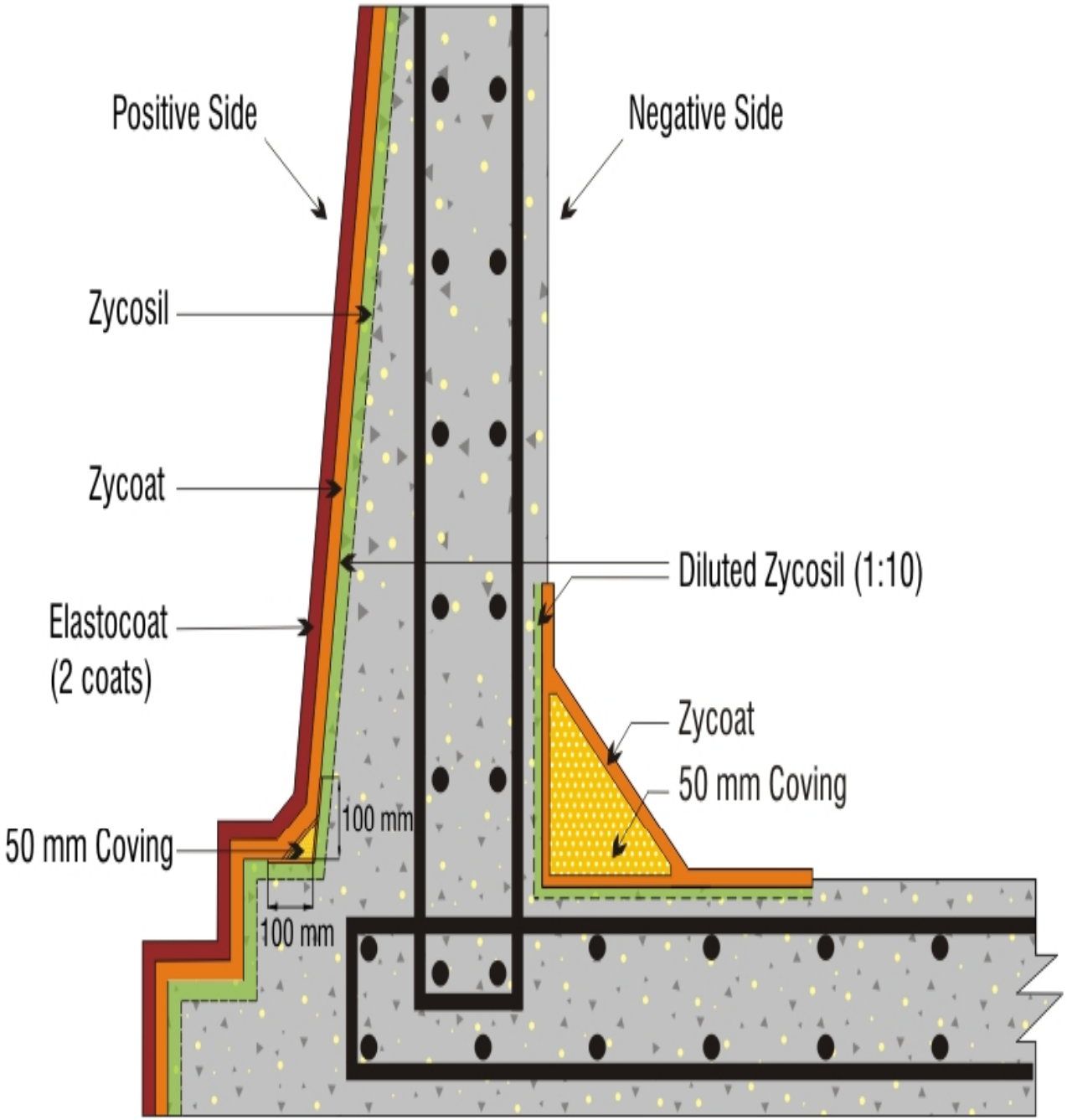


BASEMENT – BELOW GRADE P.C.C.

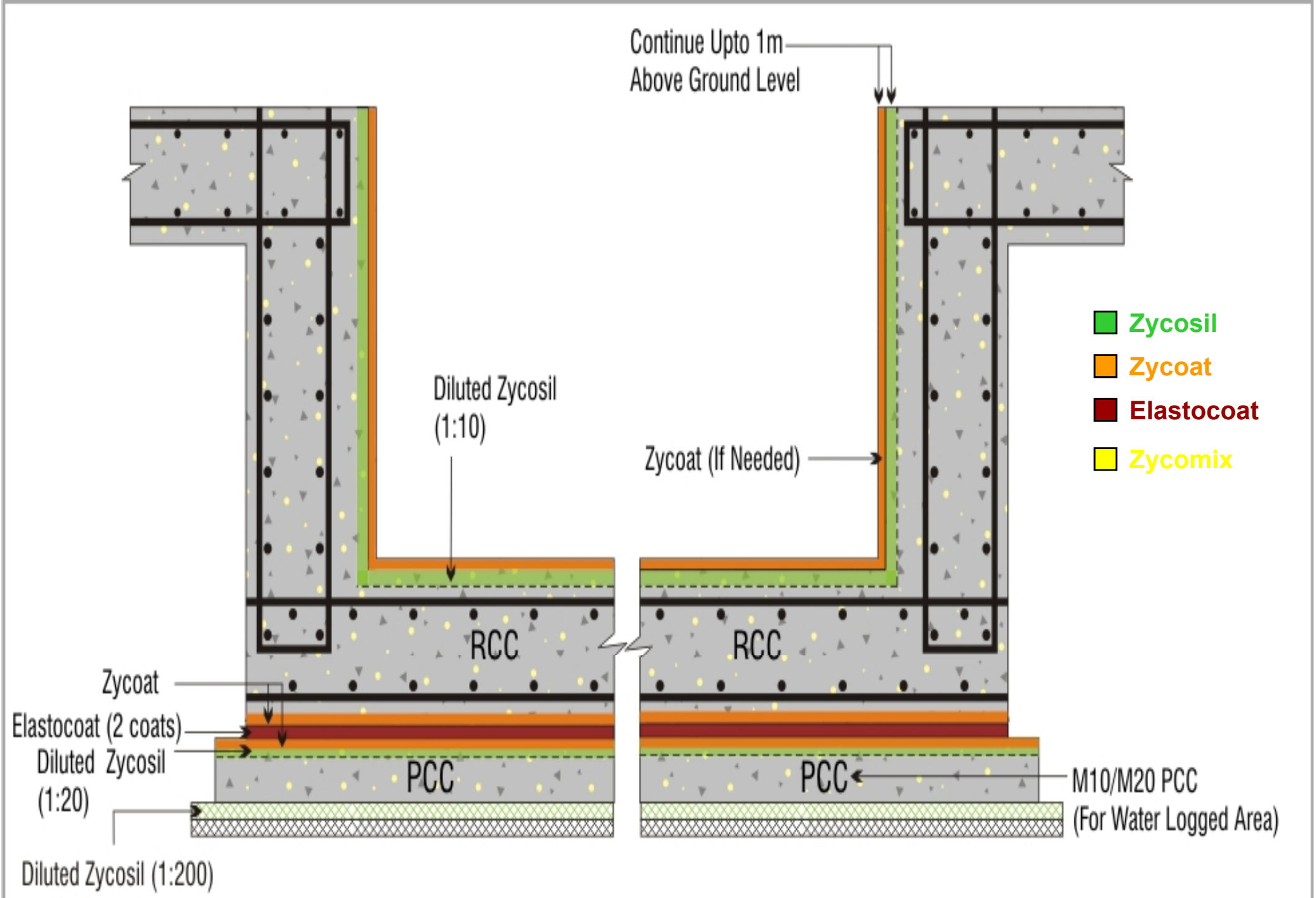


BASEMENT – ON GRADE SLAB

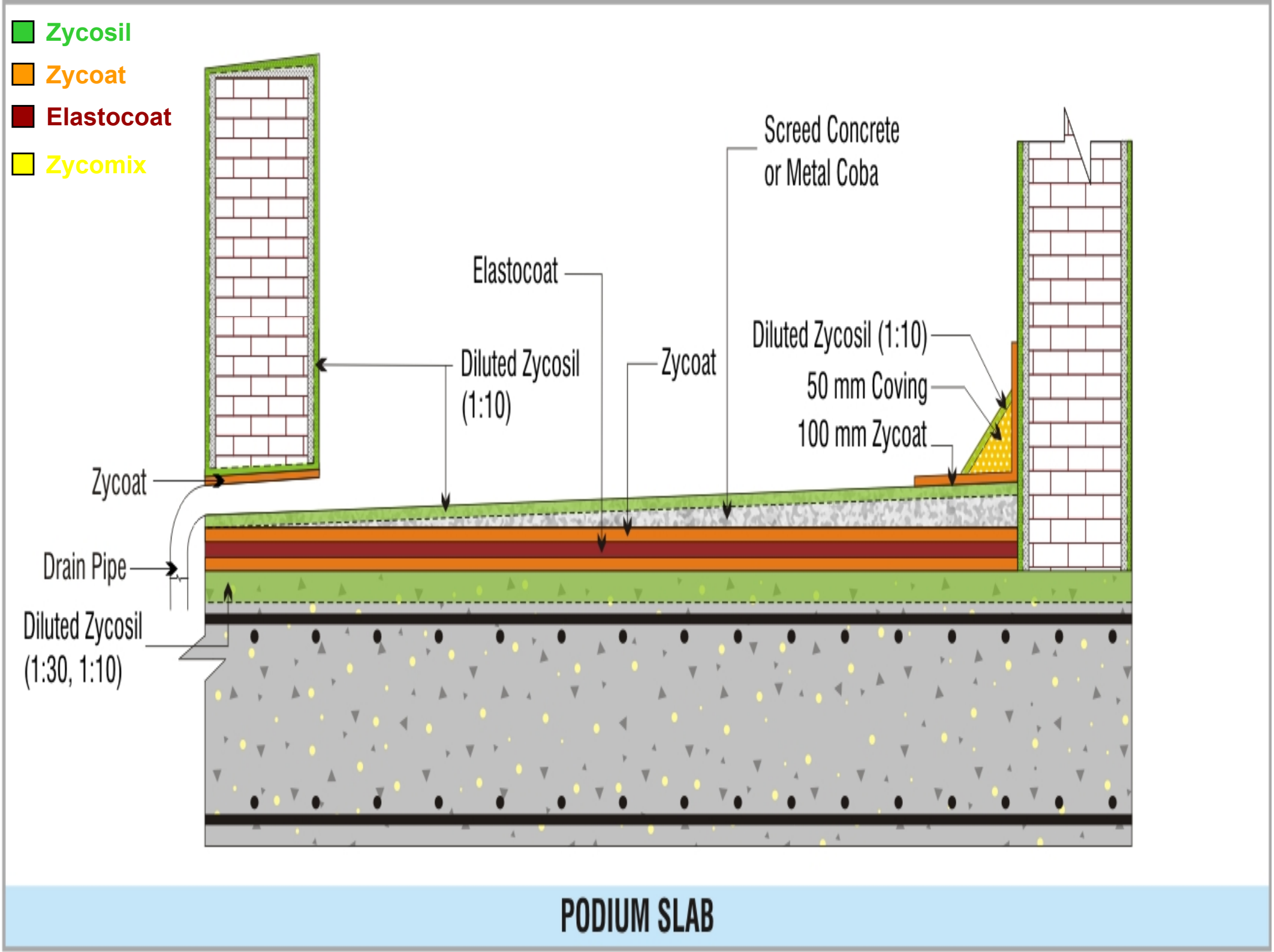
- Zycosil
- Zycoat
- Elastocoat
- Zycomix



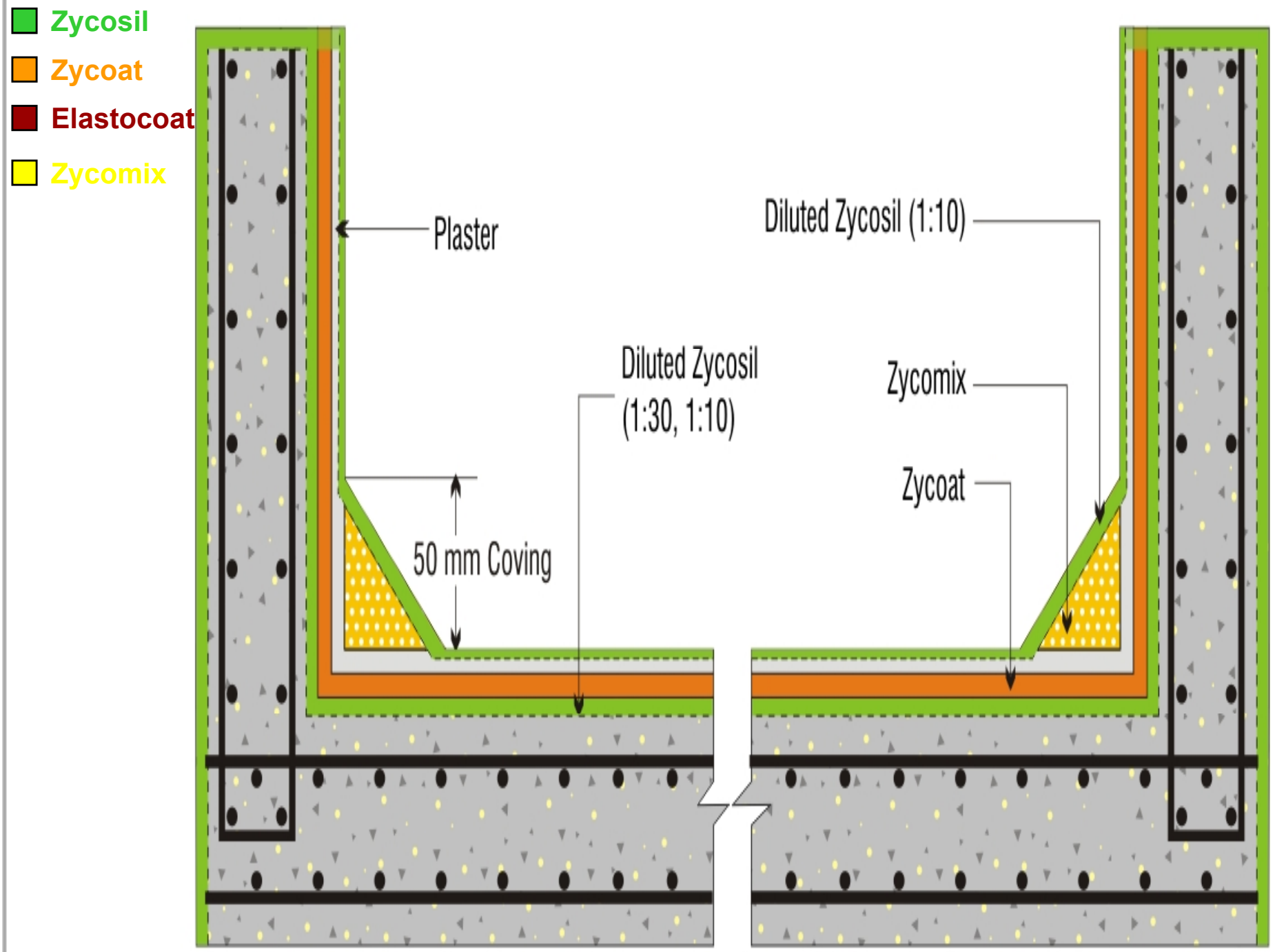
BASEMENT – RETAINING WALL



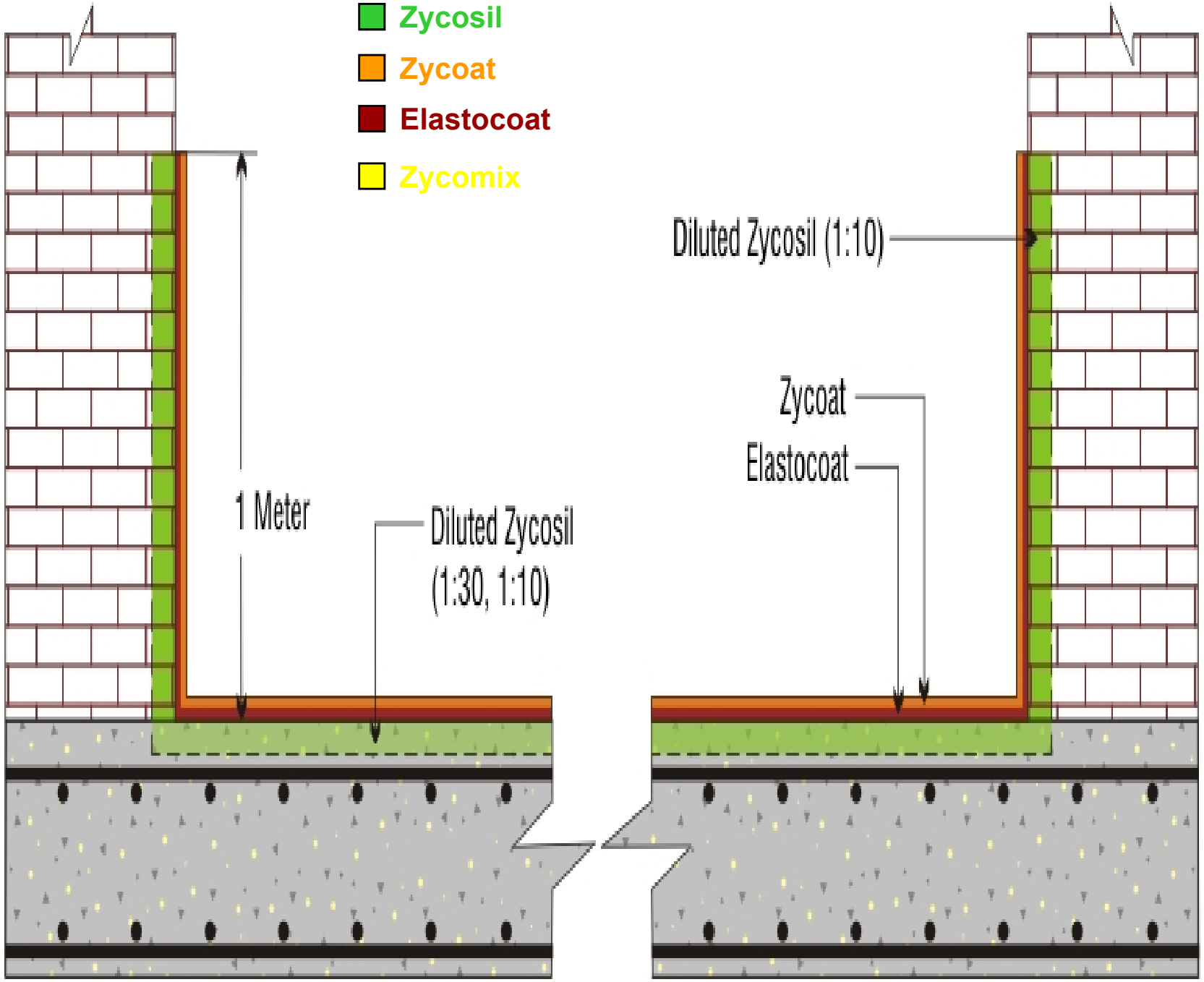
ELEVATOR PIT – P.C.C. AND R.C.C. SLAB


Zycosil
Zycoat
Elastocoat
Zycomix
Screed Concrete
or Metal Coba
Elastocoat
Diluted Zycosil
(1:10)
Zycoat
Diluted Zycosil (1:10)
50 mm Coving
100 mm Zycoat
Zycoat
Drain Pipe
Diluted Zycosil
(1:30, 1:10)

PODIUM SLAB



OVERHEAD TANKS – R.C.C. AND TANK WALLS



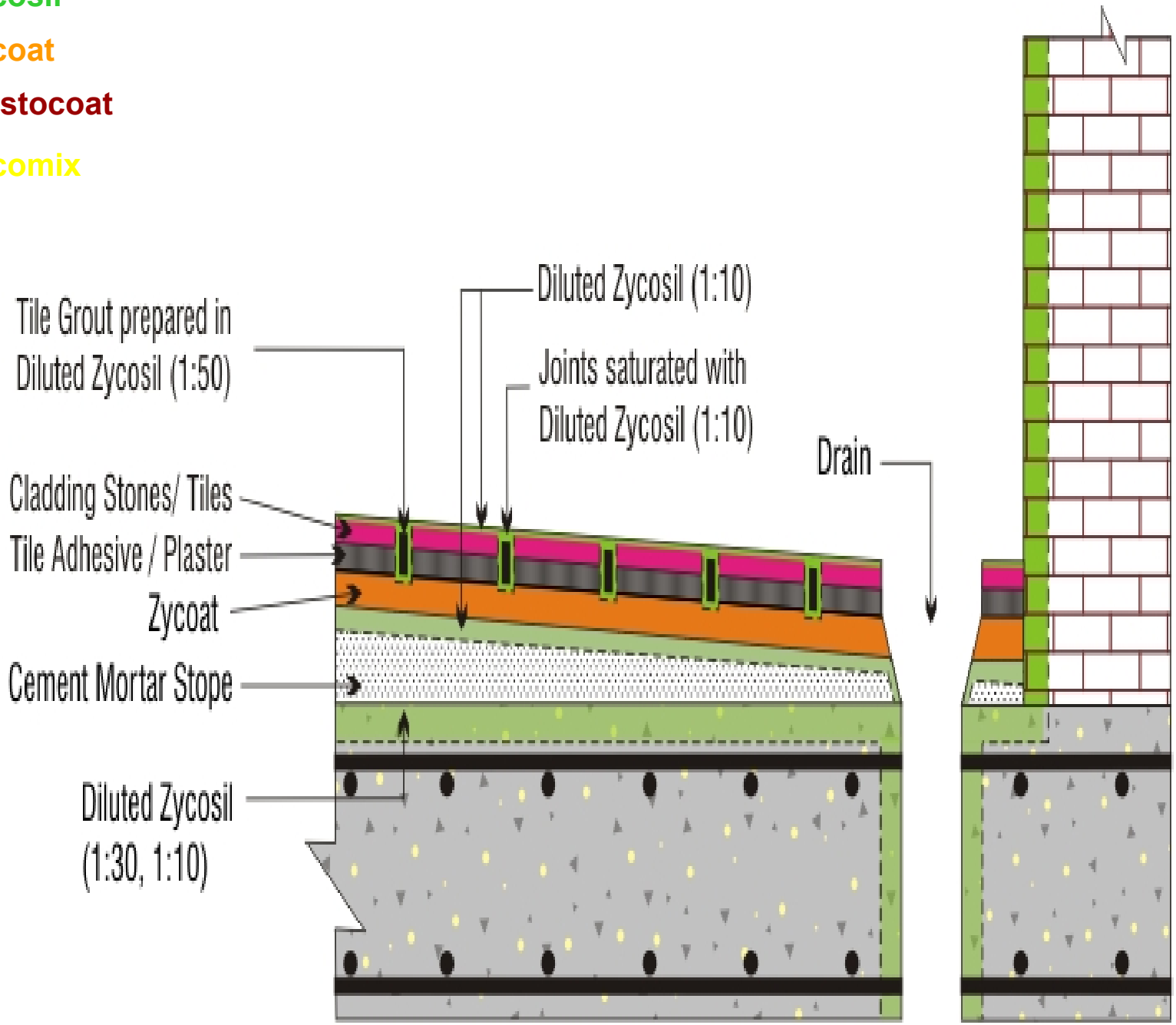
TOILETS, BALCONIES AND UTILITY AREAS

Zycosil

Zycoat

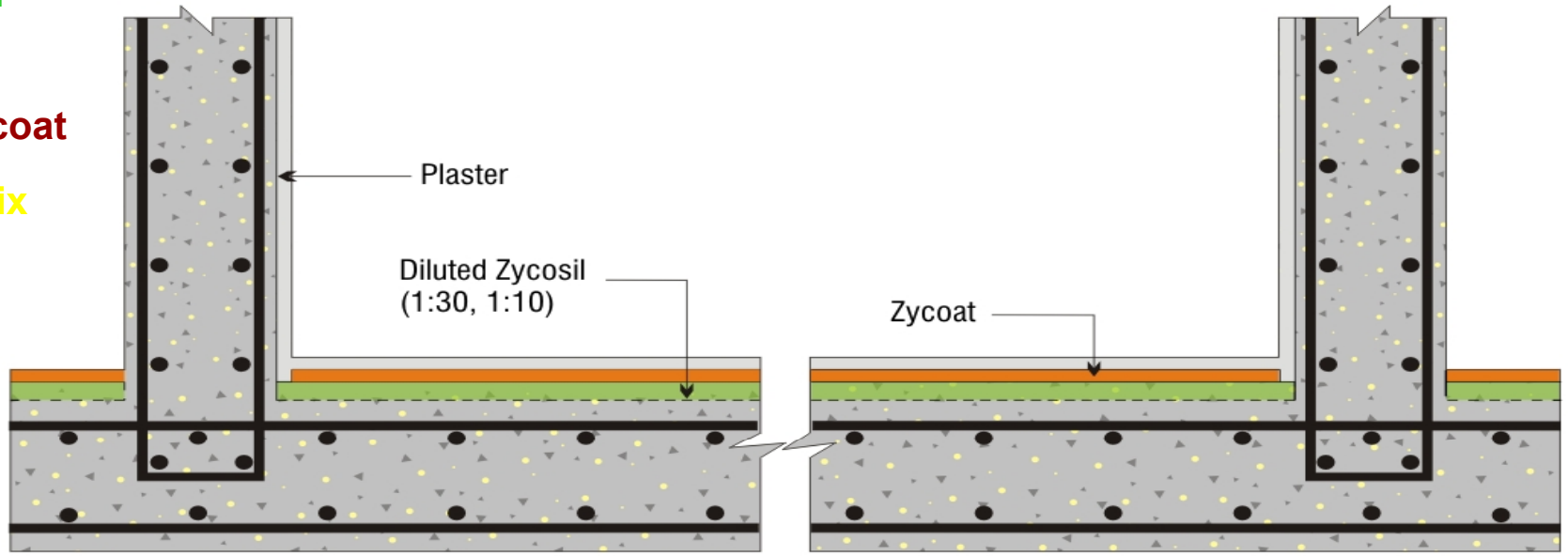
Elastocoat

Zycomix

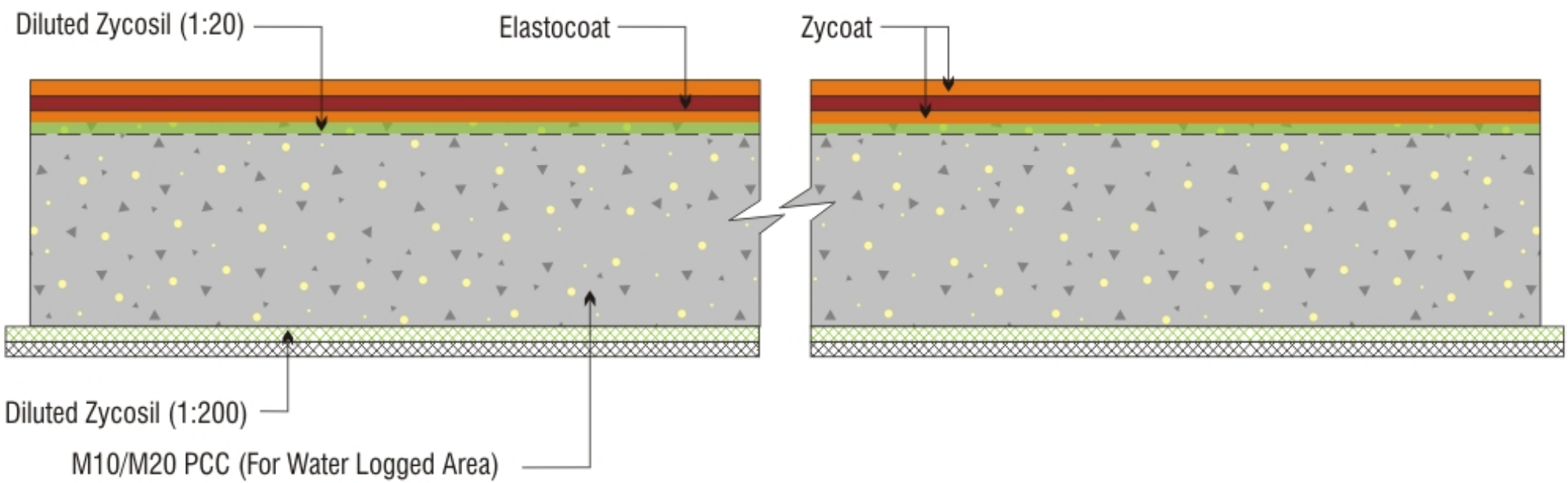


SLOPE CREATION

Zycosil
Zycoat
Elastocoat
Zycomix



SWIMMING POOL/SEWAGE TREATMENT PLANT (STP) AND OTHER WATER BODIES - R.C.C. SLAB



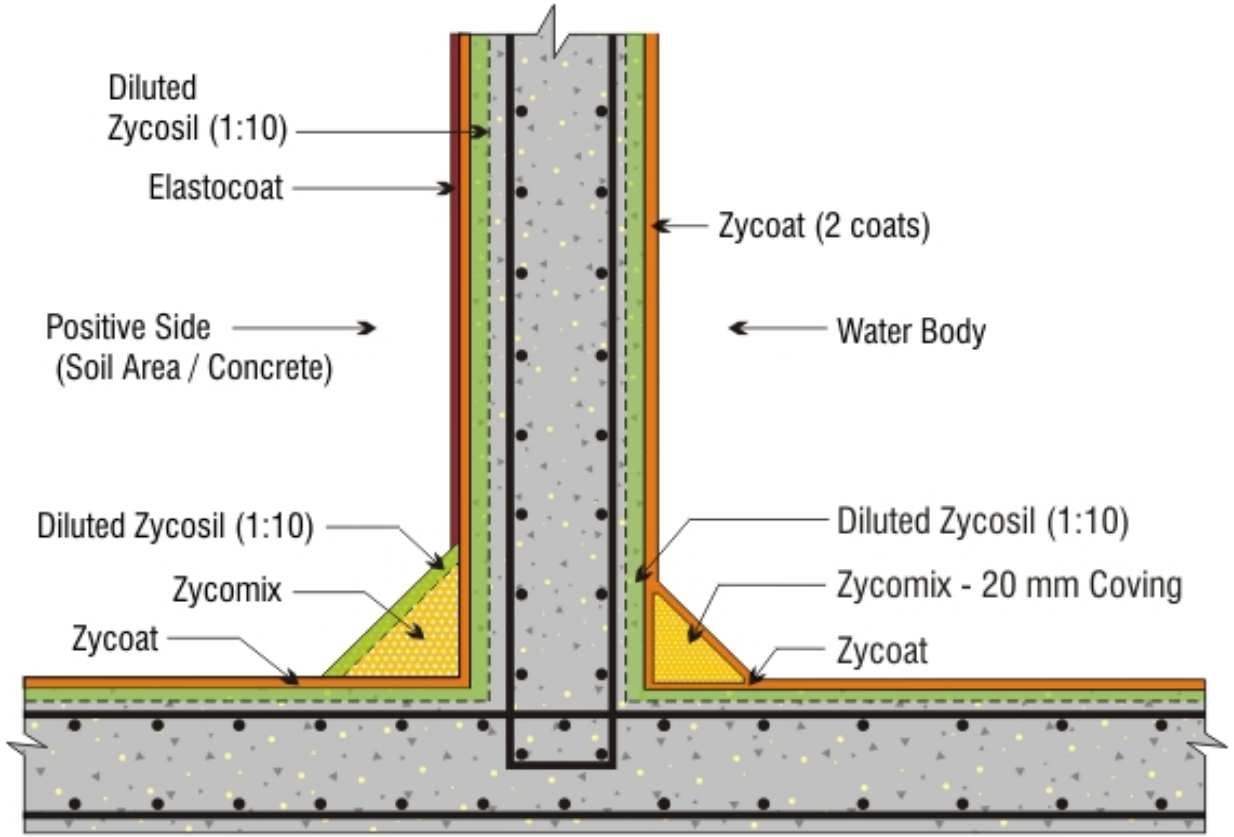
SWIMMING POOL /SEWAGE TREATMENT PLANT (STP) AND OTHER WATER BODIES - P.C.C. SLAB

Zycosil

Zycoat

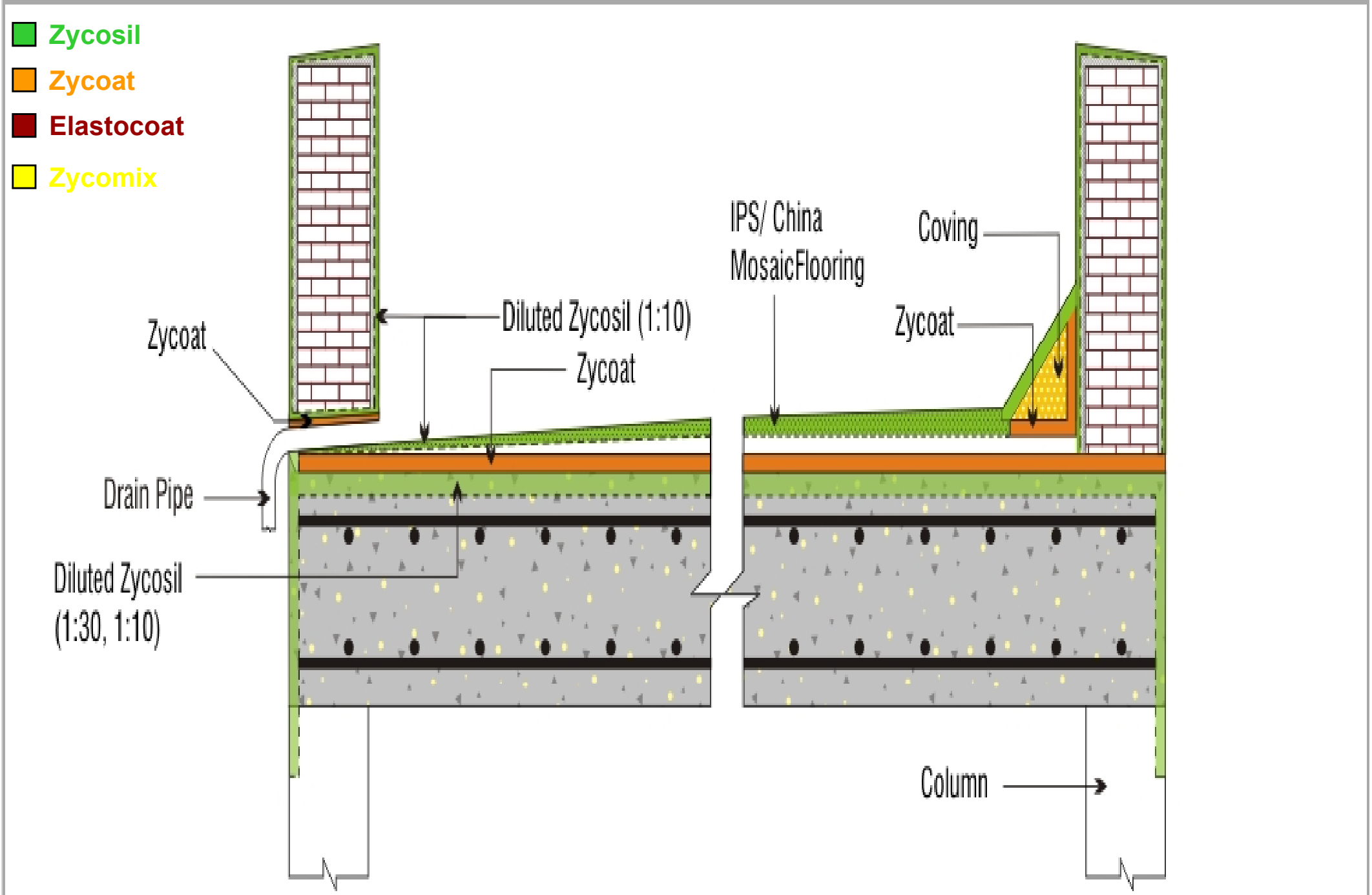
Elastocoat

Zycomix

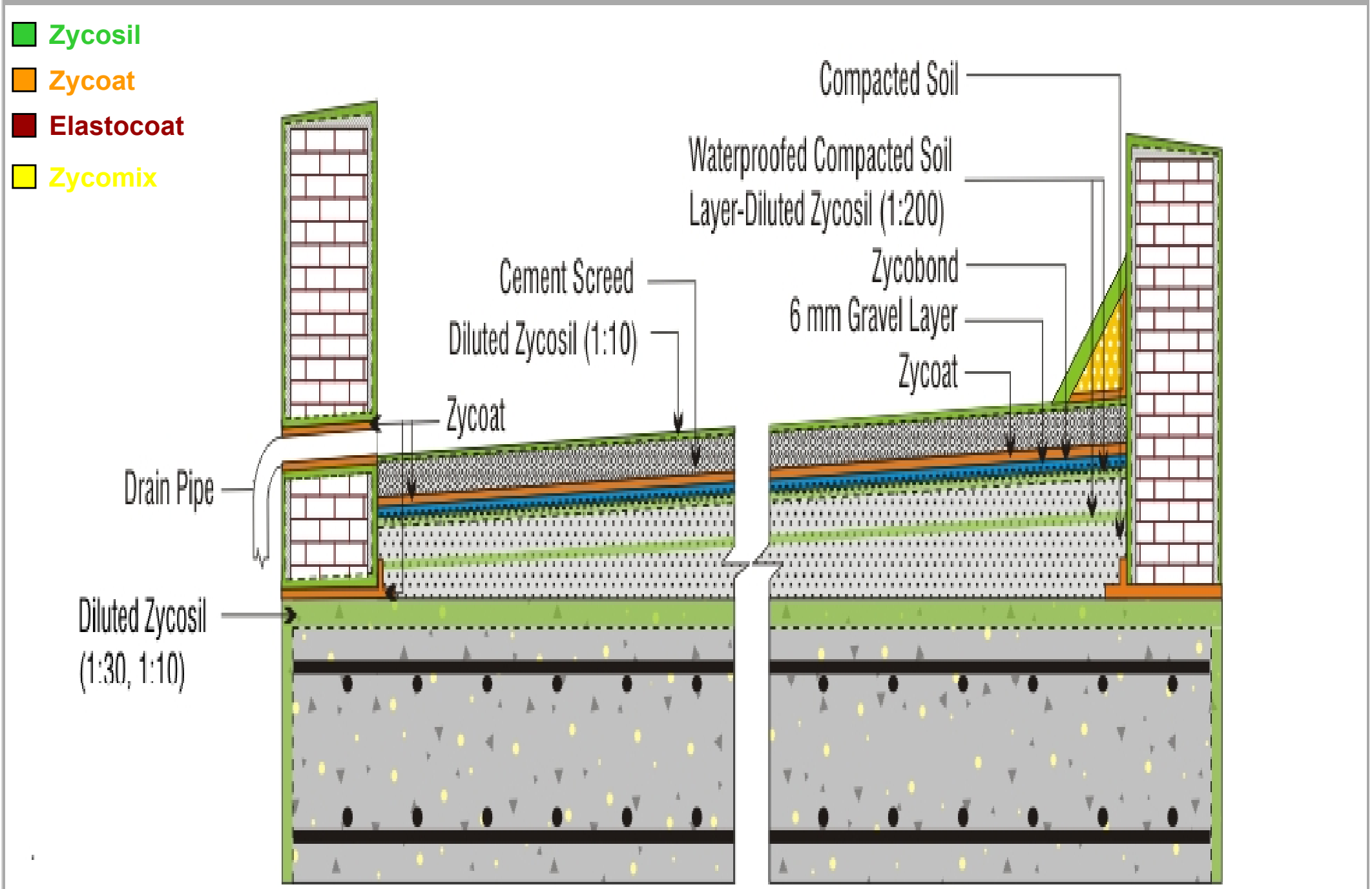


VERTICAL WALL

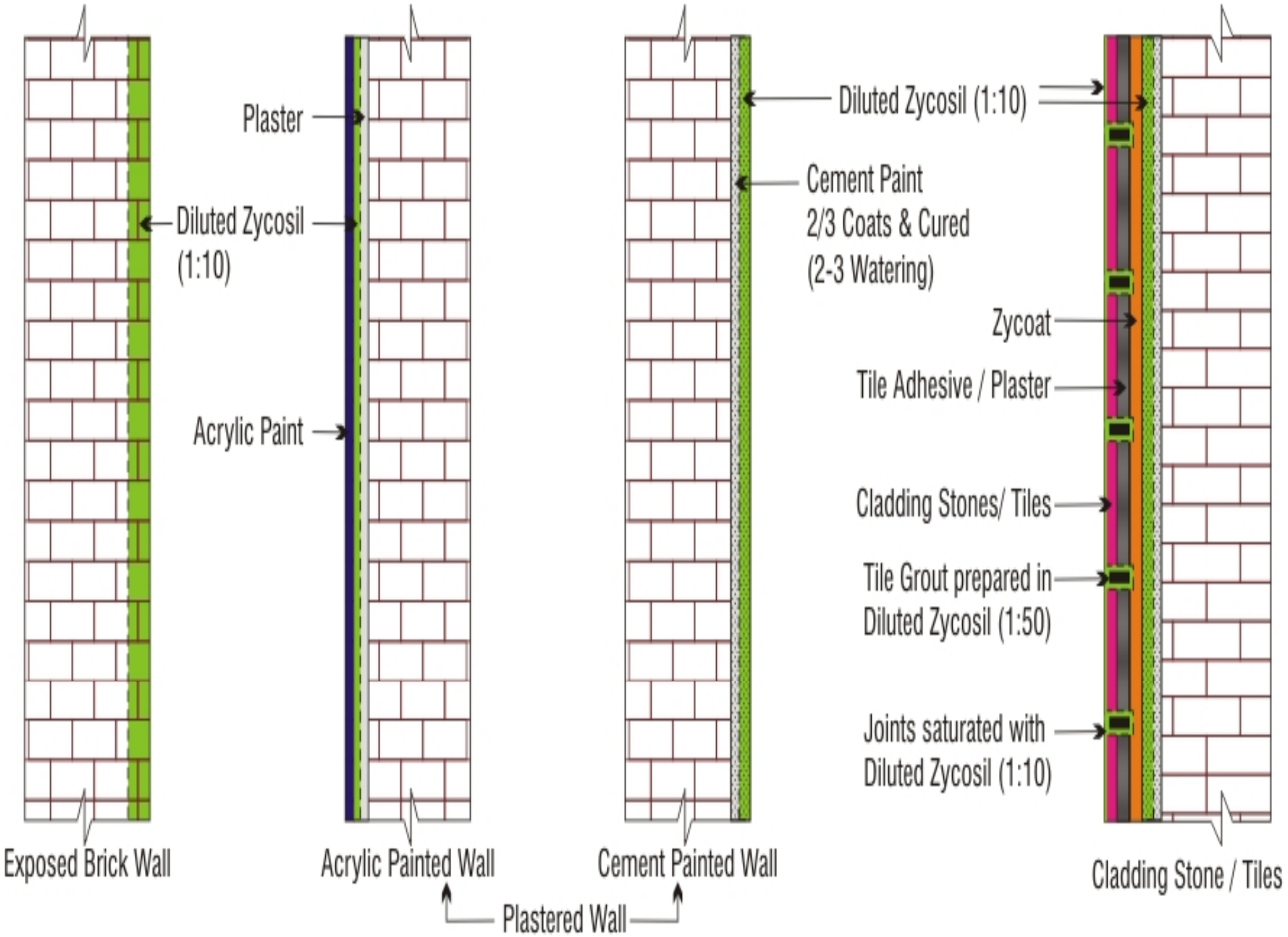
TILING



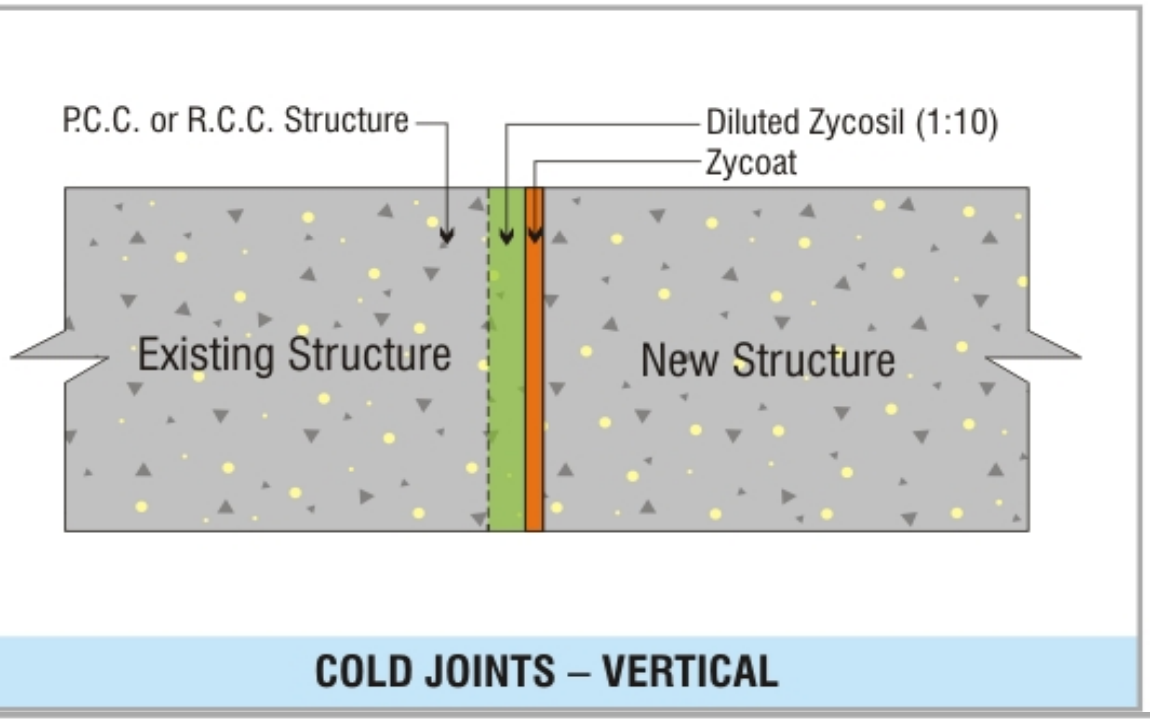
ROOF TERRACES



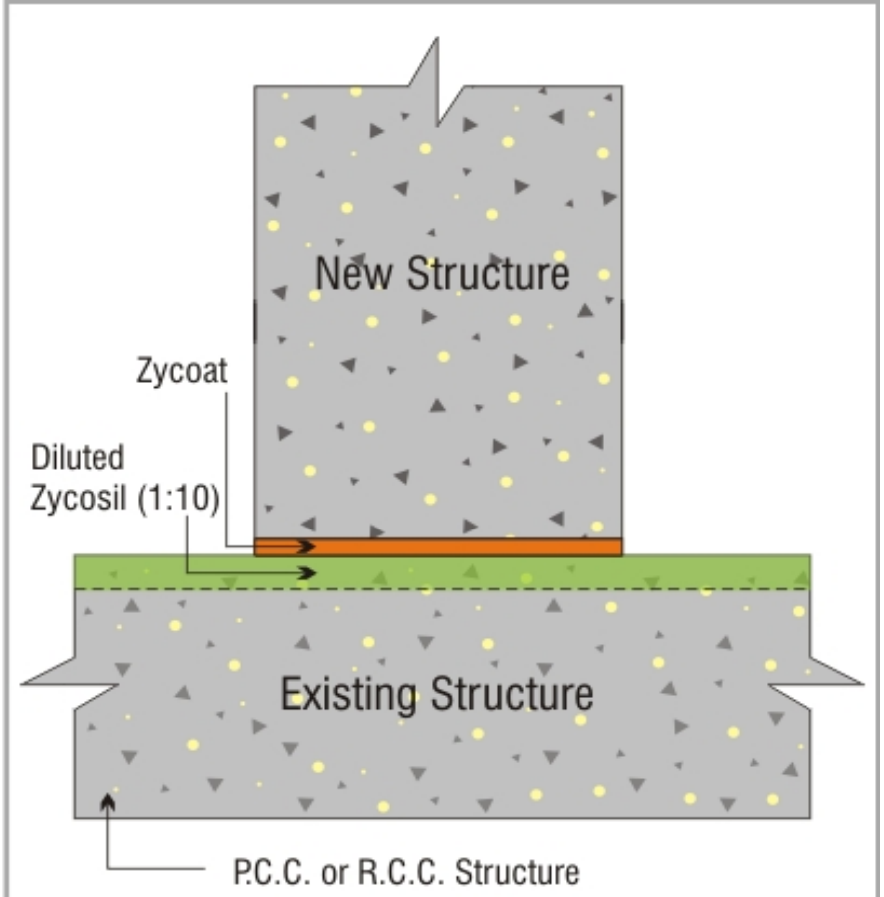
SOIL COBA – INSULATED GREEN ROOFS



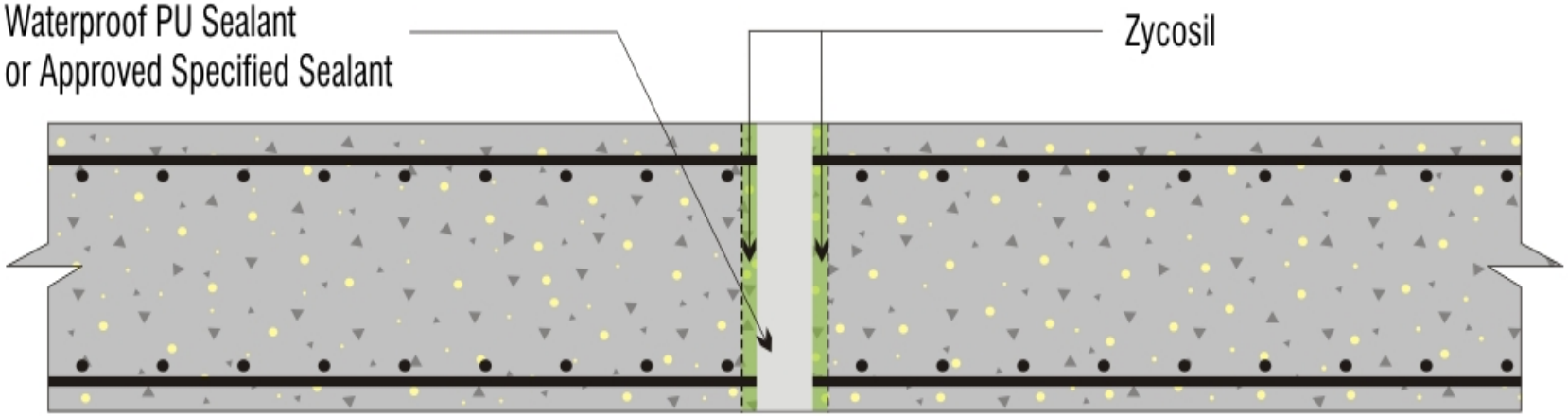
WALLS AND CLADDINGS



COLD JOINTS – VERTICAL



COLD JOINTS – HORIZONTAL



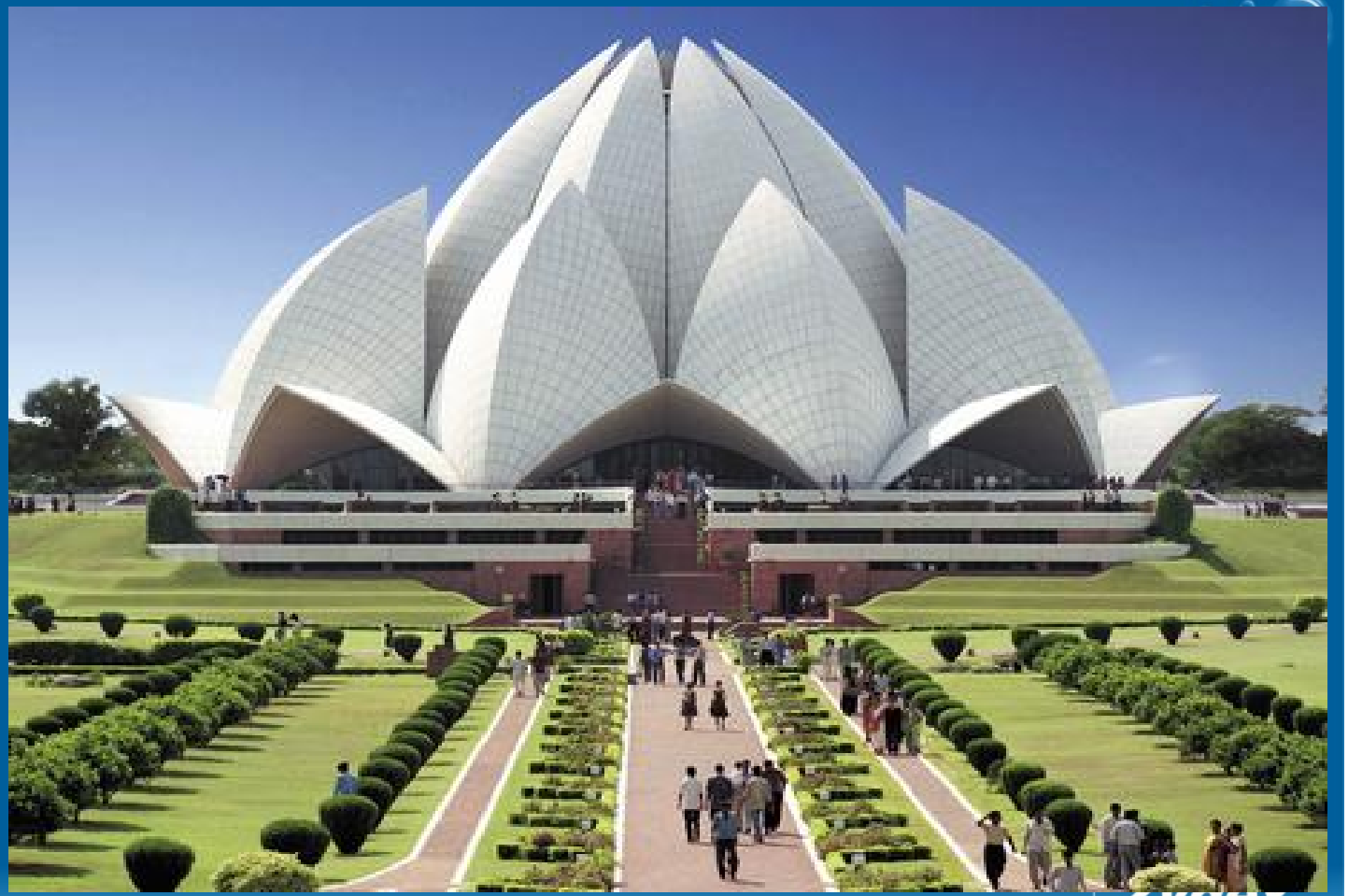
EXPANSION JOINTS

ZYCOSIL™

ARCHITECT'S DREAM -------- BEAUTIFUL FOREVER

ZYCOSIL –

A DREAM COME TRUE



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Thank you

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