Time for Concrete Climate Action.

AnyWay

Low Carbon Emission Concrete for Walkways & Paths

Innovative Materials | Sustainable Design | Efficient Application

Presented by: Zeev Halber and Alex Campbell

Count on us for innovative infrastructure solutions

>70 years of global business experience

>20 years of engineering experience
throughout the developing world and emerging economies dealing with a wide variety of challenging projects in challenging conditions

Providing services for **all phases of projects**, from planning to asset management and beyond. Commitment to success from the start to end of a project

Professional technology-driven solutions

Multinational team of experts

Consulting firm focused on providing
climate resilient designs and solutions

Understanding What Matters

DEVELOPING MATERIAL TECHNOLOGIES SINCE 1998

1998
Stabilization technology for infrastructure pavements

2006
Suite of binders for use in Low-cost housing earth-based solutions

2010
Binder for earth-based plasters

2014
Powder based mineral paint

2024
Low Carbon Emission Concrete **PathWay**

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GLOBAL WARMING – the concrete factor

- Concrete is one of the most energy-intensive products used in construction worldwide.
- Manufacturing of cement accounts for 8% of total global CO_2 emissions.
- Hydraulic cement concrete is most used material after water
  - Almost 2 m^3\ person\ year
  - Civilization is literally built with concrete.
- Large economic, environmental and social impacts
- 92 million MT of cement manufactured in the US in 2022 (and growing)

A comprehensive approach to reducing carbon emissions from concrete products, addressing its components as well as construction elements and processes, is needed.

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The cement and concrete industry - call for action

> In September 2020, the **Global Cement and Concrete Association (GCCA)** released a **Climate Ambition** pledge that aspires to reduce concrete's carbon footprint and achieve carbon neutrality across the industry by 2050. Many cement and concrete companies have already signed this commitment and had their strategies third-party verified by the **Science Based Targets** initiative.

From the Global cement and concrete association: https://gccassociation.org/

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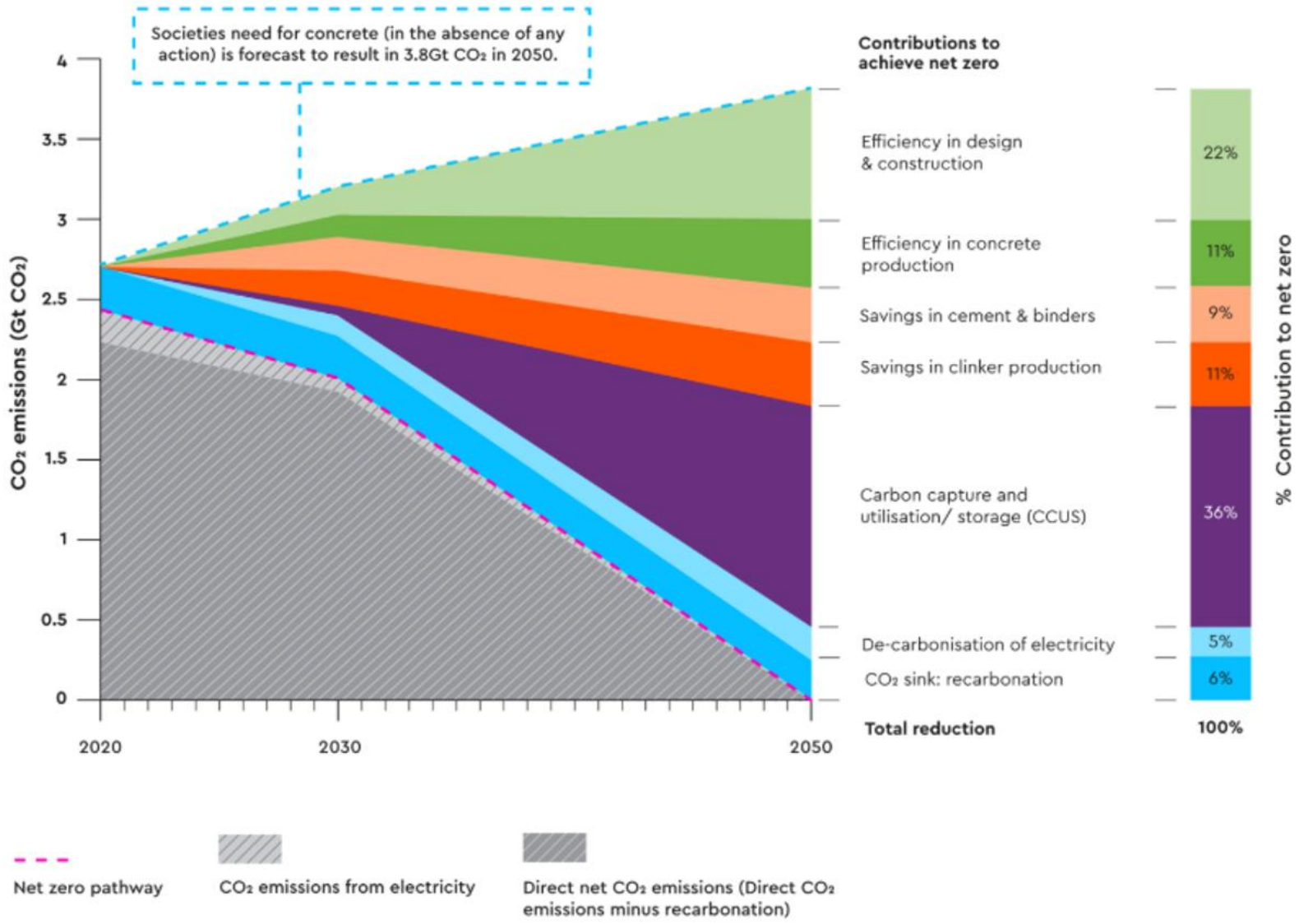
Getting to **NET ZERO**

https://gccassociation.org/concretefuture/getting-to-net-zero/



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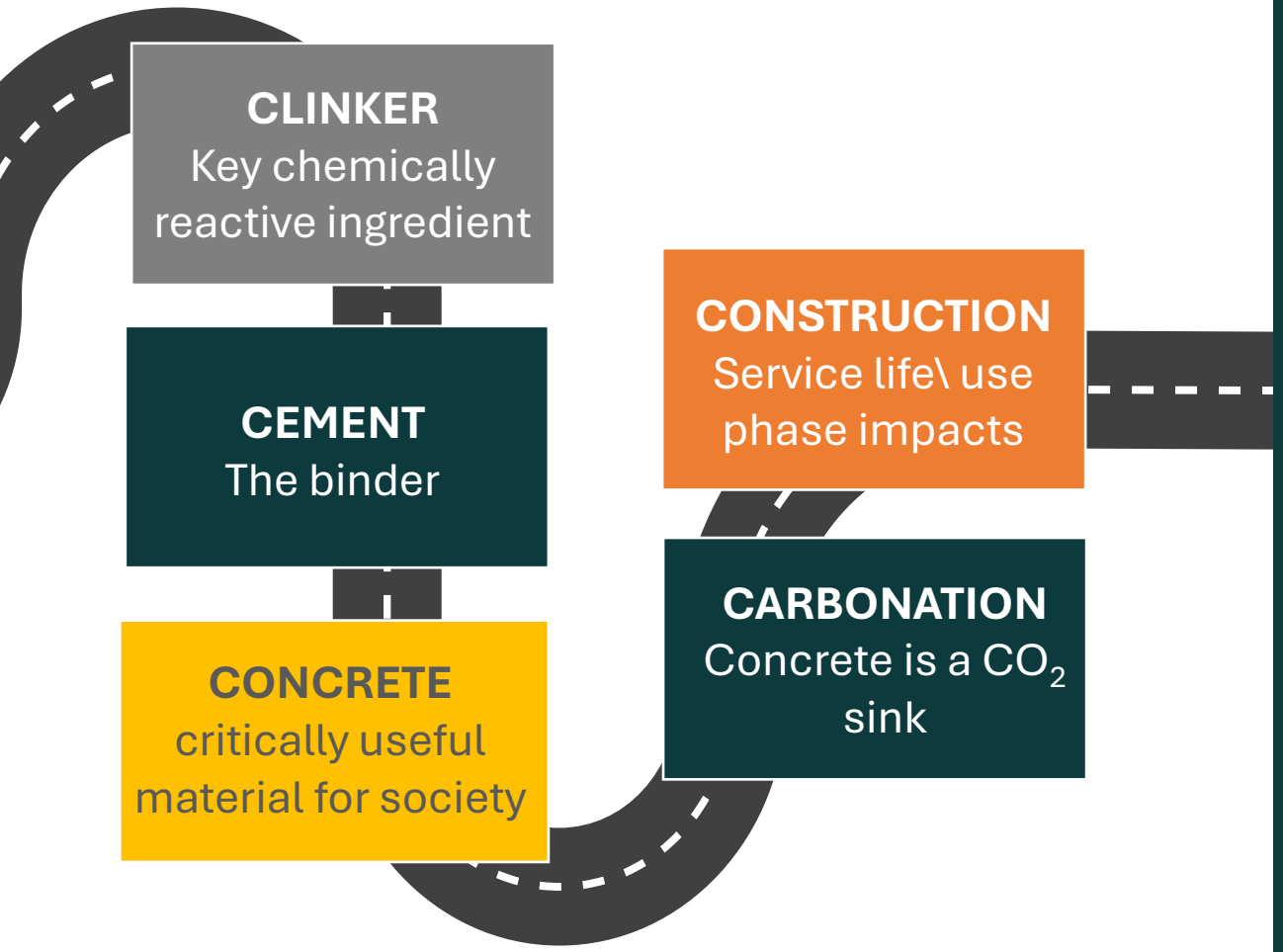
Concrete's Value Chain

Stakeholders must work together to ensure that the building sector is creating a built environment that is sustainable.



Aligning with industry goals

Identified seven goals that need to be acted upon in the near-term, mid-term, and long-term as follows:

1. **Replace raw materials with recycled materials;**
2. **Produce low-carbon cement mixes;**
3. **Optimize for the lowest life cycle emissions;**
4. Increase the use of alternative fuels;
5. Use renewable energy;
6. Carbon capture; and,
7. **Introduce new cement mixes.**

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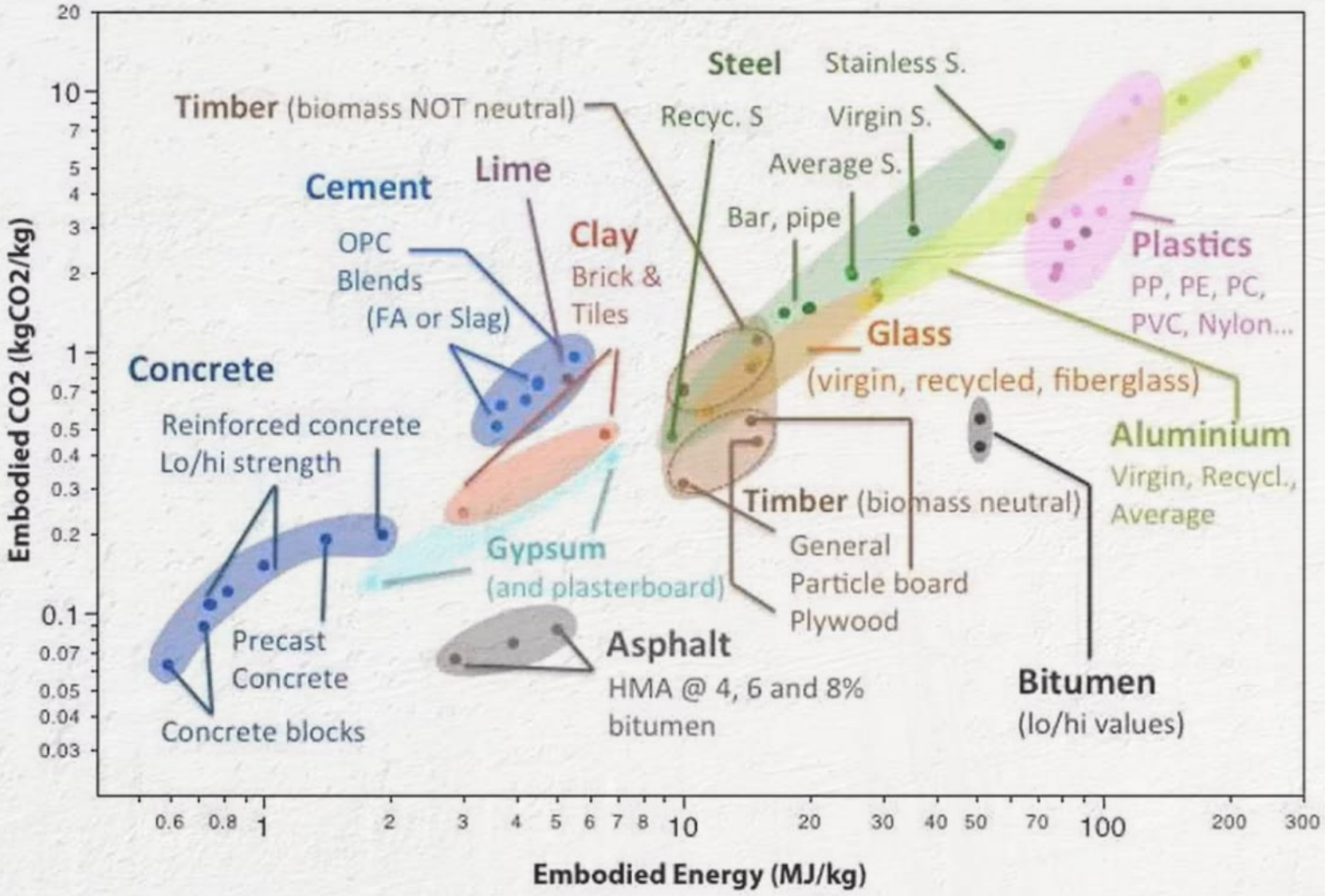
Embodied Carbon and Energy

From data provided by Hammond and Jones (2011), Inventory of Carbon & Energy V2

Embodied carbon = sum impact of all greenhouse gas emissions attributed to a material during its life cycle, including extraction, manufacturing, construction, maintenance, and disposal.

Embodied energy = energy use in all life-cycle phases of a built asset, regardless of energy source.



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Our Approach
PathWay

A holistic approach to developing a low carbon emission concrete solution.

" Our holistic approach Included looking at the cement, different aggregates including recycled materials, and different construction methods.

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Given AnyWay's experience with hydraulic materials and for creating fit-for-purpose solutions, we approached the problem from one that identified the required solution, then set out to create a cementitious product that satisfied the net-zero carbon goal.

We decided to deal with as many aspects of a new concrete mix, one that would address the need for new materials and updated construction methods that will all contribute to lowering the short and long-term carbon emission.

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How This Technology Meets Global Goals

Holistic approach to developing a low carbon emission concrete solution

PathWay is a unique combination of waste quarry materials and hydraulic binders

Provides the required strength and durability for all-season accessible path systems for individuals with disabilities

Reduced carbon emissions through mix design and fit-for-purpose application

Skid resistance
High durability

Excellent solution for walkways, path systems for pedestrians, cycling, wheelchairs and more

Preserves a natural, aesthetic look

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- ✓ **Recycled raw materials replace traditional inputs**
- ✓ **Optimized design for lowest life-cycle emissions**
- ✓ **Performance-based specifications for durability**
- ✓ **New low-carbon cement mix**

Testing Protocol Objectives

- Assess various mix designs both in the lab and field setting, including durability, strength, friction, shrinkage, and applicability at different mix ratios in a fit-for-purpose setting.
- Apply for Patent (received)
- Undergo refined testing at UC Davis (undergoing)

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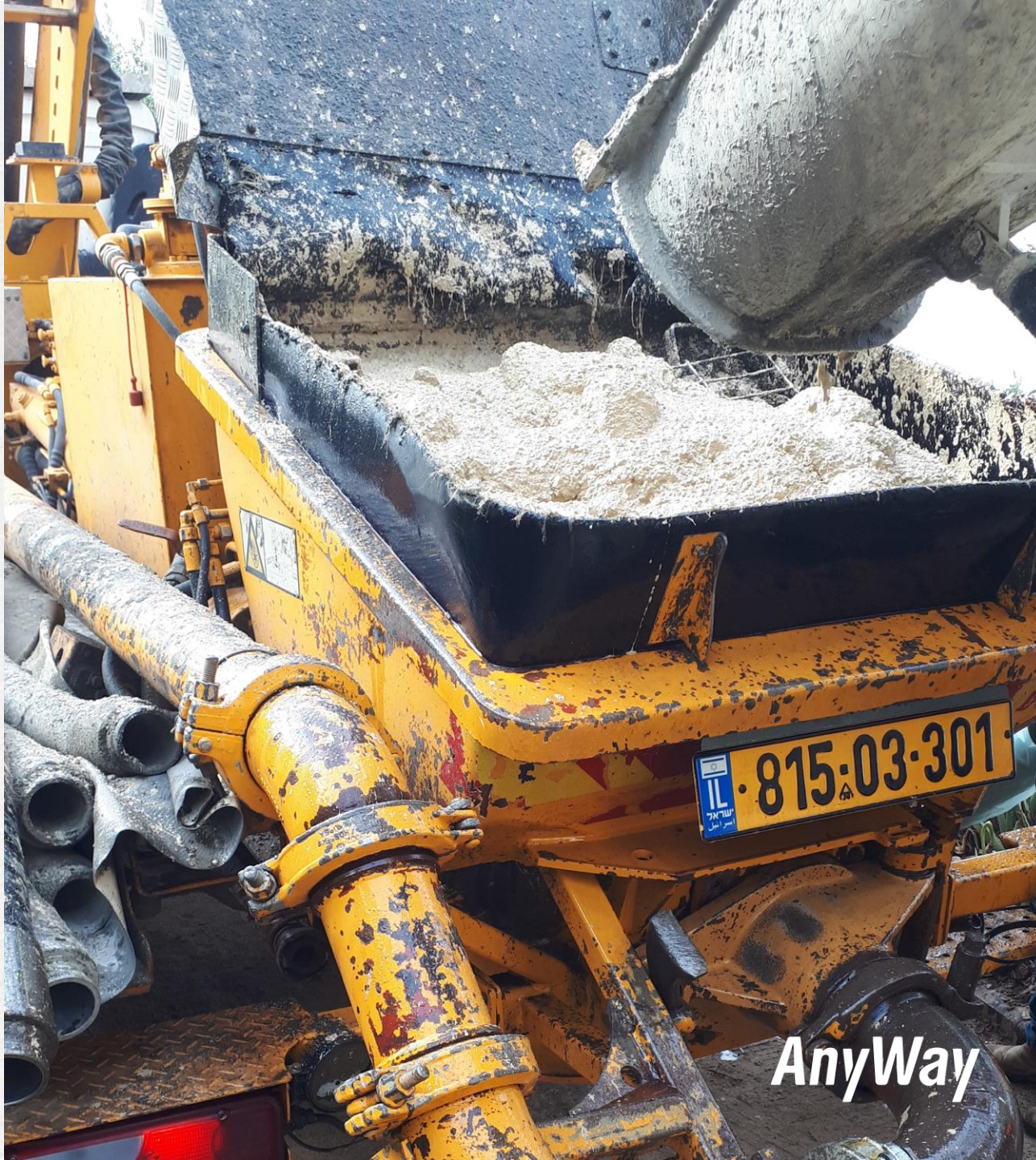
Our solution and benefits- **PathWay**

Strength & Durability

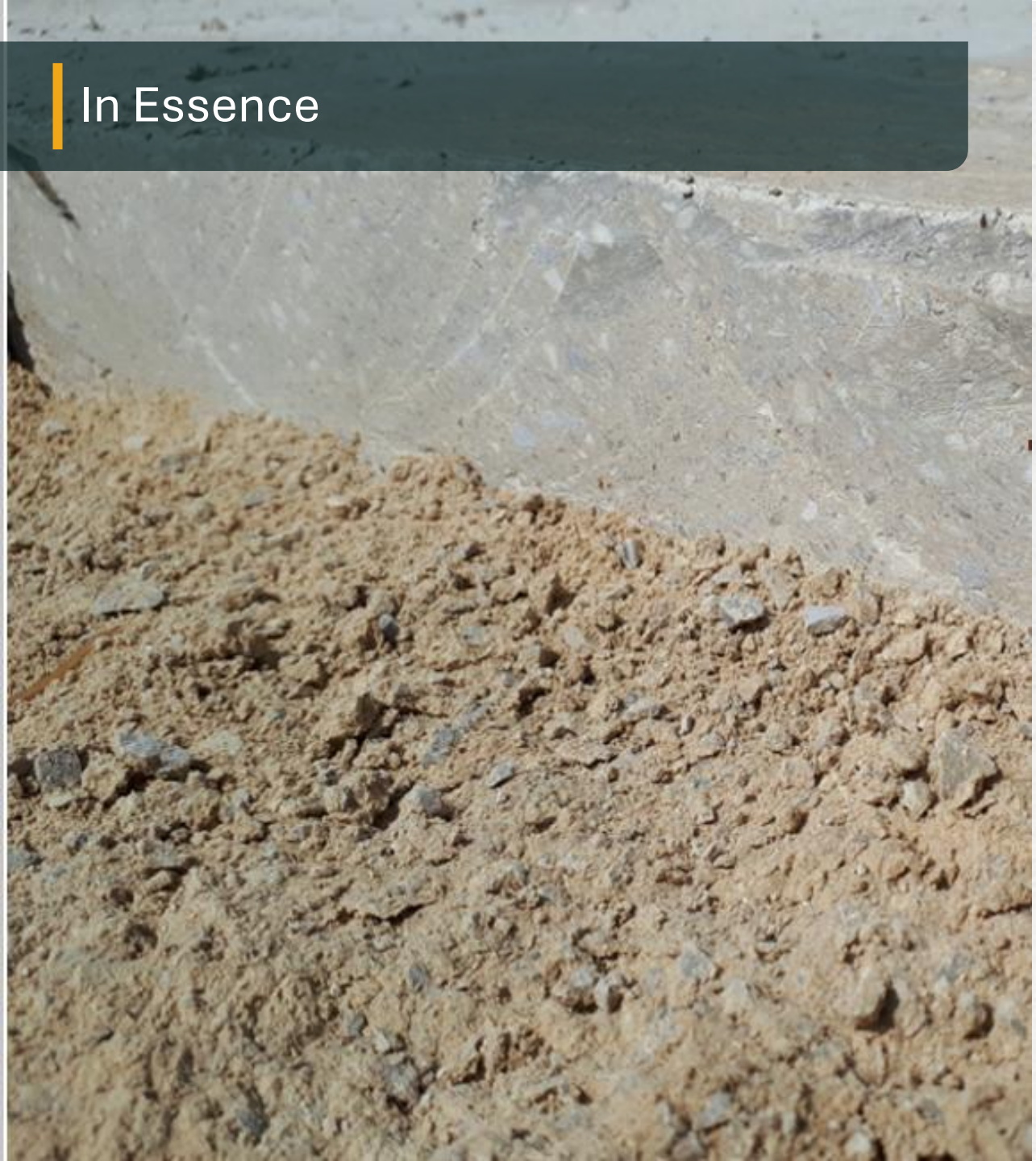
- Monofilament fibers reduce shrinkage cracks
- Dissipates load efficiently
- Long-lasting pavements with local materials
- Meets international accessibility standards for walkways and paths



A New Approach to Concrete

Sustainable Materials & Carbon Reduction

- Less than 2% OPC in the mix
- Ground Granulated Blast Furnace Slag (GGBFS) as pozzolan
- Recycled quarry waste aggregates
- Calcium oxides to enhance chemical reactions



In Essence

Waste quarry aggregates

+

Hydraulic binder

+

Water

+

3 day curing under plastic

=

PathWay, an environmental alternative to concrete with high durability and ease of application

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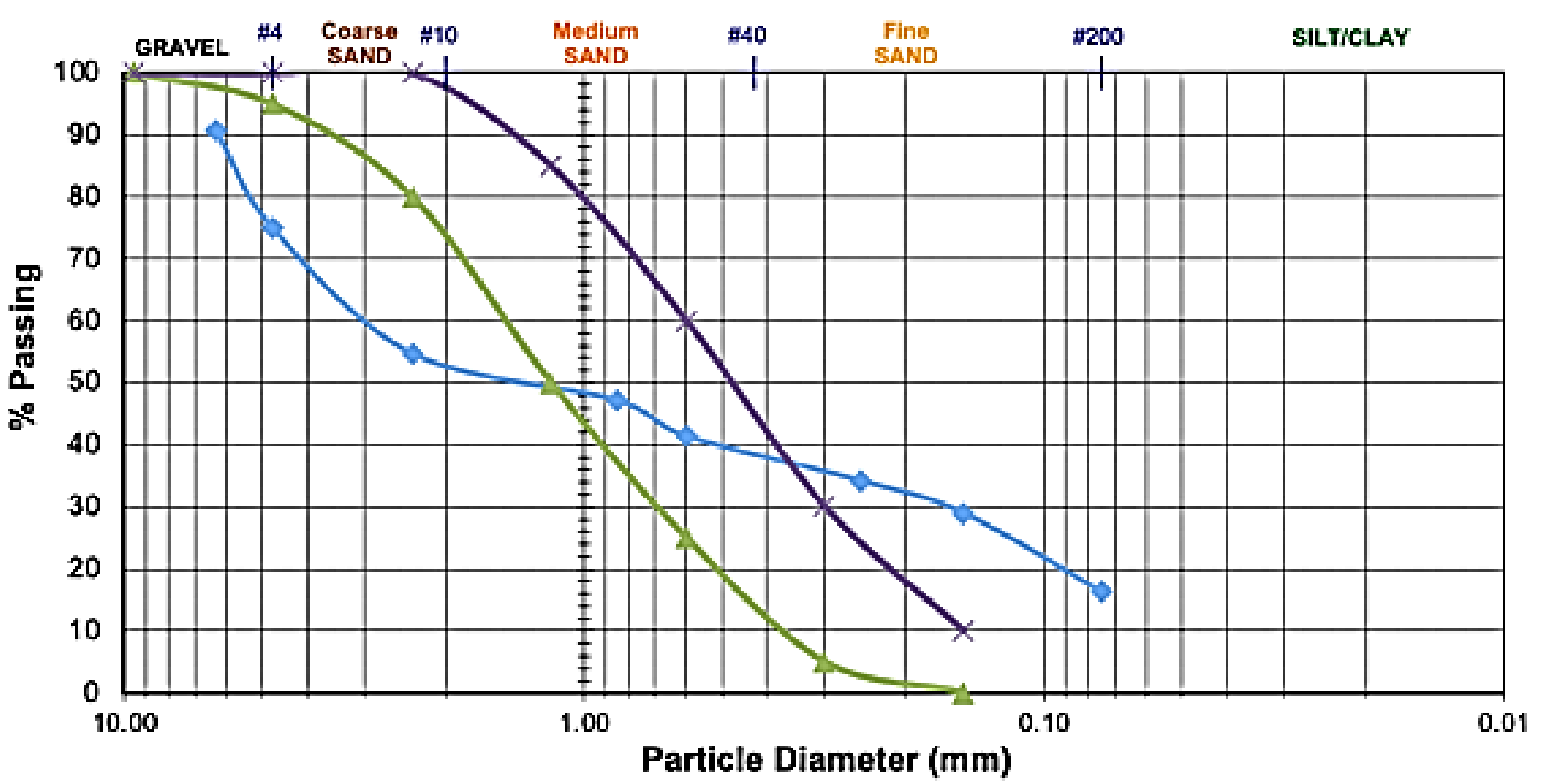
PathWay is a unique combination of waste quarry materials and hydraulic binders

Changing the main aggregates



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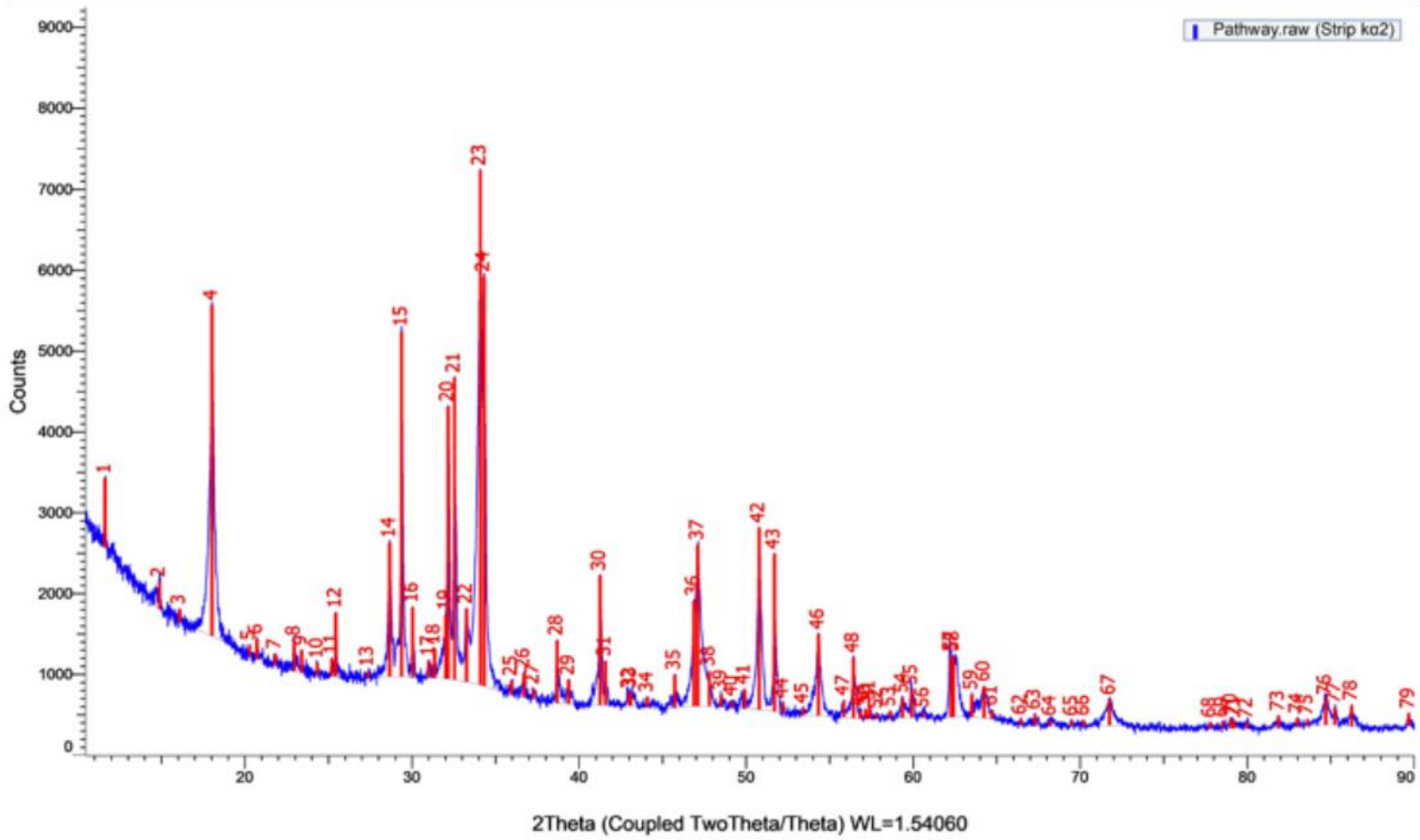
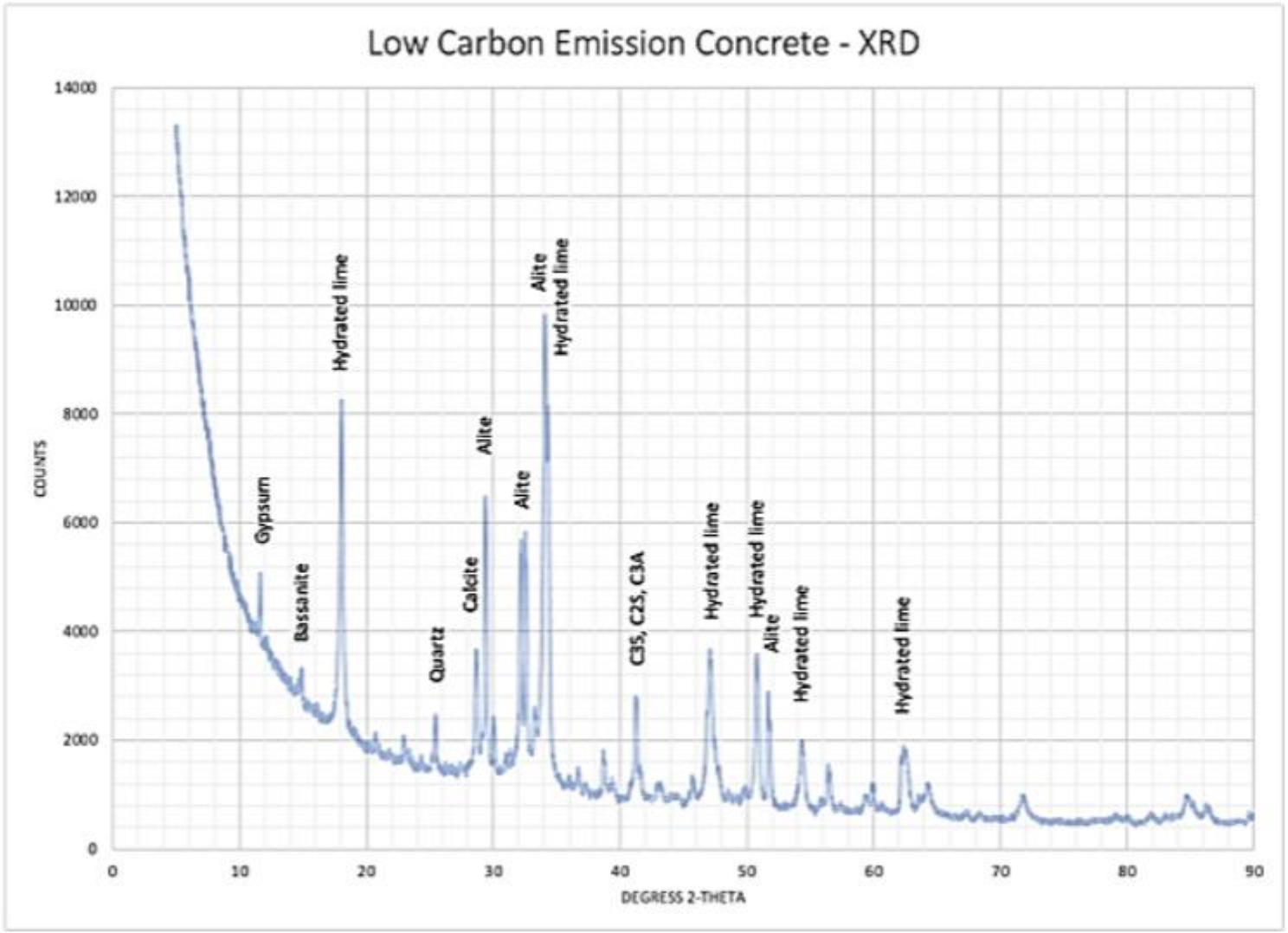


Introduce a Calcium Driven Cement



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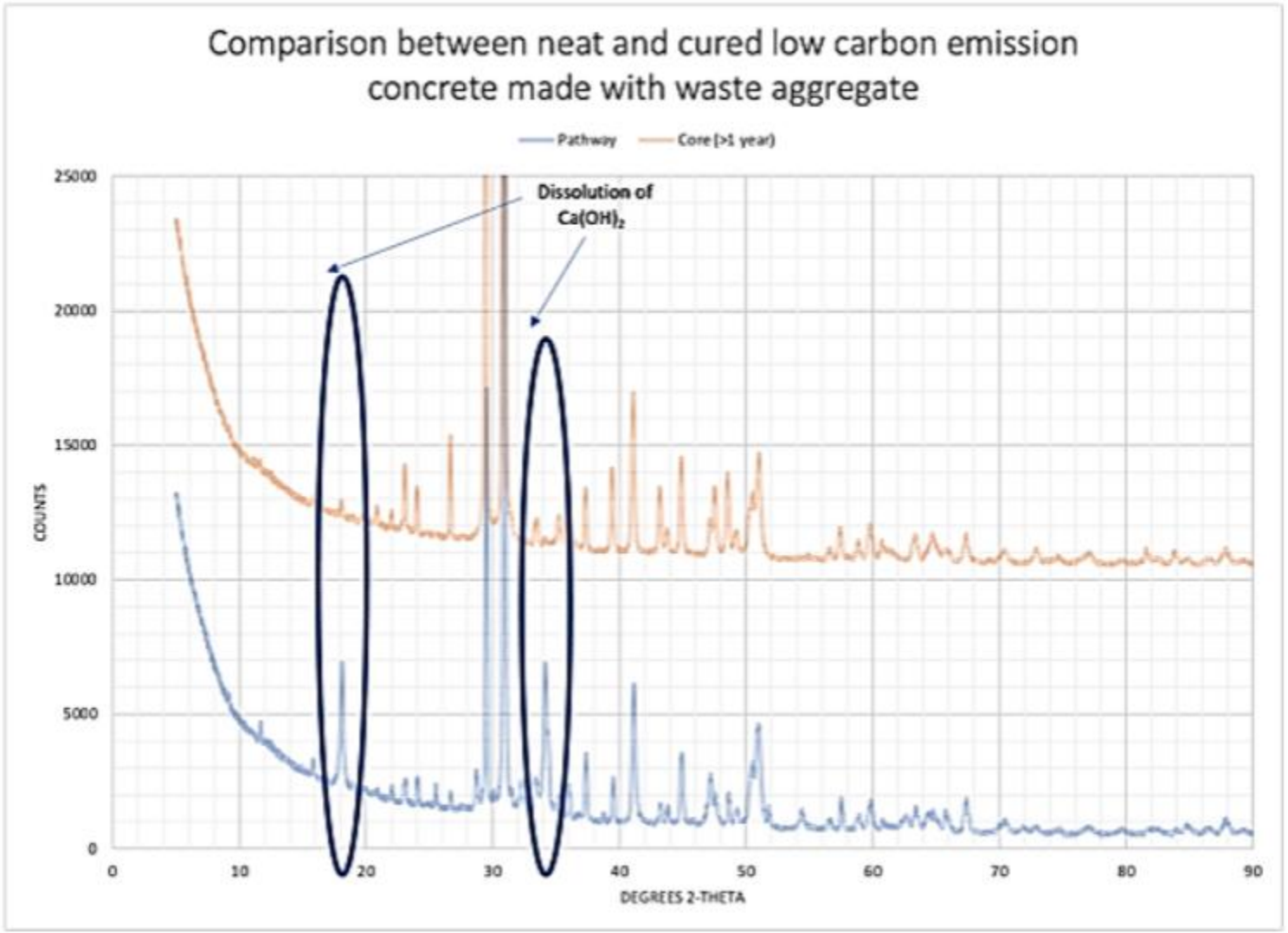
XRD analysis



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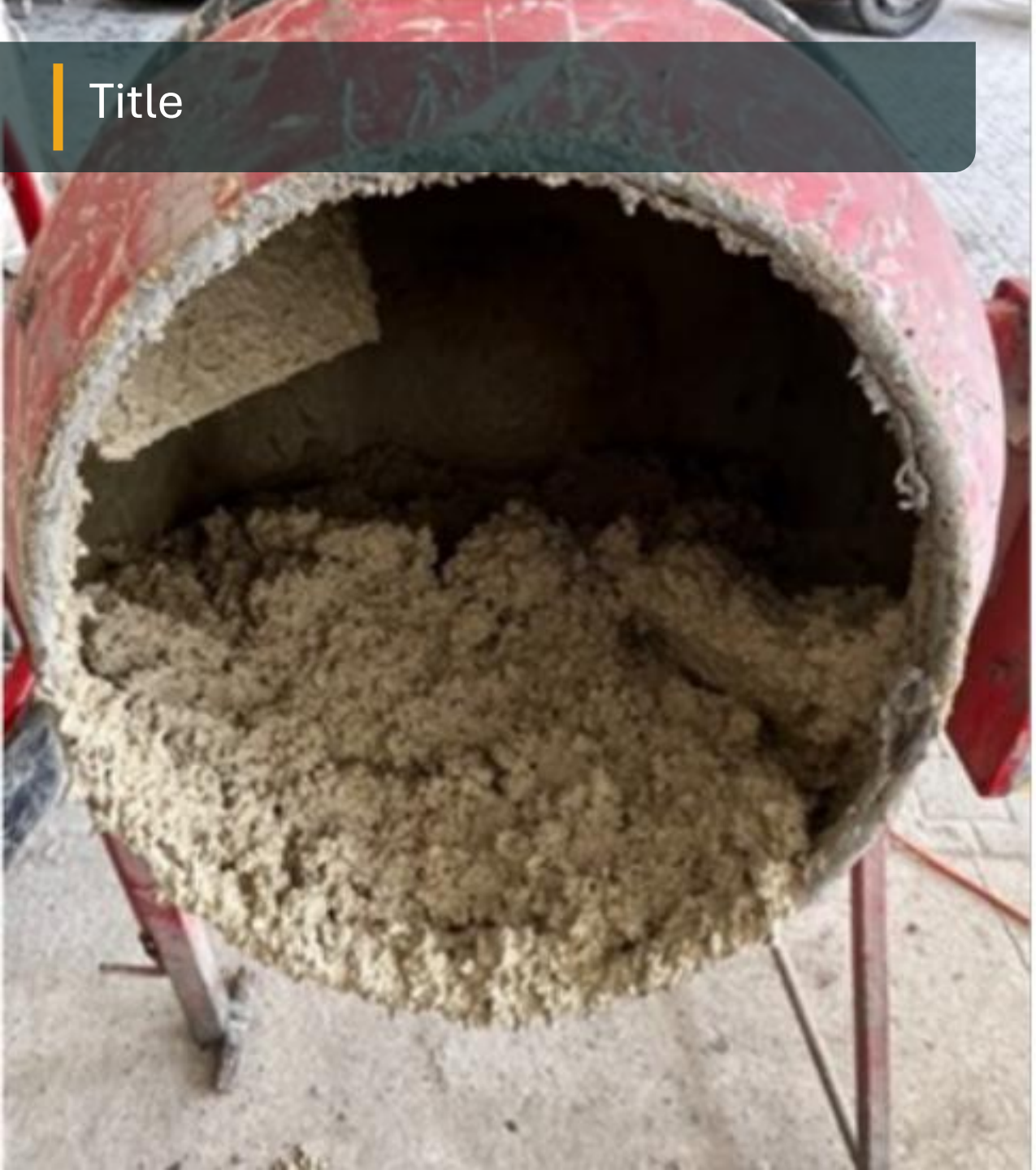

Strength testing of sampled cores

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Title needed

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Tests of shrinkage cracks with OPC and developed binder

OPC with Pathway Aggregate developed cracks within 24 hours

Pathway mix design – No cracks

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Durability and fatigue

Wheelchair Loaded with 80 Kg -Same track repetitive loading

250 Passes

500 Passes

1000 Passes

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Skid Resistance

R9 to R13 RATINGS For a floor where a person normally wears shoes	Pendulum Test Value or PTV on Horizontal Surface Also known as SRV or Slip Resistance Value	PTV at 5 degrees of slope Adjust DOWN by 1.76PTV for every degree of slope	Slip Characteristics No Slope
R 9 (No Values below R 9)	11 to 18 PTV	2 to 9 PTV	VERY POOR Slip Injuries certain to occur
R 10	18 to 34 PTV	9 to 25 PTV	POOR Slip Injuries likely to occur
R 11	34 to 51 PTV	25 to 42 PTV	BETTER But can still fail Pendulum Tests
R 12	51 to 70 PTV	42 to 61 PTV	GOOD Minimum Recommended
R 13	70+ PTV	61+ PTV	BEST Especially on slopes and high floor wear areas

The R-value for low carbon emission concrete was determined to be R-13 with a slip angle of 42.3-degrees

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Calculated embodied carbon emission

	Embodied CO2	Concrete Sidewalk A (12.5 cm concrete, 15 aggregate, rebar, geotextile)		Concrete Sidewalk A (12.5 cm concrete, 15 aggregate, no rebar, no geotextile)		Green concrete sidewalk solution (10 cm concrete, 15 cm basecourse, no rebar, no geotextile)		Low Emission Thin Concrete (8 cm LEC, 15 cm basecourse, no rebar, no geotextile)		Low Emission Concrete (10 cm LEC, 15 cm basecourse, no rebar, no geotextile)	
Component	Kg/Kg	Kg in slab	Kg CO2	Kg in slab	Kg CO2	Kg in slab	Kg CO2	Kg in slab	Kg CO2	Kg in slab	Kg CO2
Cement Type 1	0.860	30.00	25.80	30.00	25.80	12.00	10.32				
Pathway Binder	0.464							16.80	7.80	21.00	9.74
Slag	0.080					12.00	0.96				
Rebar	0.412	4.50	1.85								
Water	0.003	55.50	0.18	55.50	0.18	44.40	0.15	42.00	0.14	42.00	0.14
Geotextile	2.280	0.41	0.92								
Concrete Aggregate (fine and coarse)	0.006	210.00	1.30	210.00	1.30	168.00	1.04				
Basecourse aggregate	0.006	330.00	2.05	330.00	2.05	330.00	2.05	330.00	2.05	330.00	2.05
Recycled Aggregate layer	0.000							147.00	0.00	147.00	
TOTAL			32.11		29.33		14.51		9.98		11.93

Note:

Concrete composition: Air 1.5%, Cement 10%, Water 18.5%, Fine aggregate 25%, Coarse aggregate 45%, Density 2400Kg/m3

Green concrete: 50:50 cement/slag

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Technical information

- Use of quarry waste aggregates with FM of <3.1
  - The larger the fineness modulus, the coarser the aggregate.
- A hydraulic binder that is calcium driven and includes industrial waste materials as a substitute for OPC is needed.
- Does not require a plastic sheet below the slab or metal reinforcement within the slab.
- Reduces curing time to as short as 72 hours before use.
- Complies with international standards and regulations for accessible paths for people with disabilities – skid resistance R13.
- Embedded carbon emission of only 9.59 kg/kg.

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Our solution and benefits

Environmental & Economic Impact

- Smaller environmental footprint
- Uses widely available local materials
- Reduced raw material costs
- Faster, more efficient construction

Seeing is Believing

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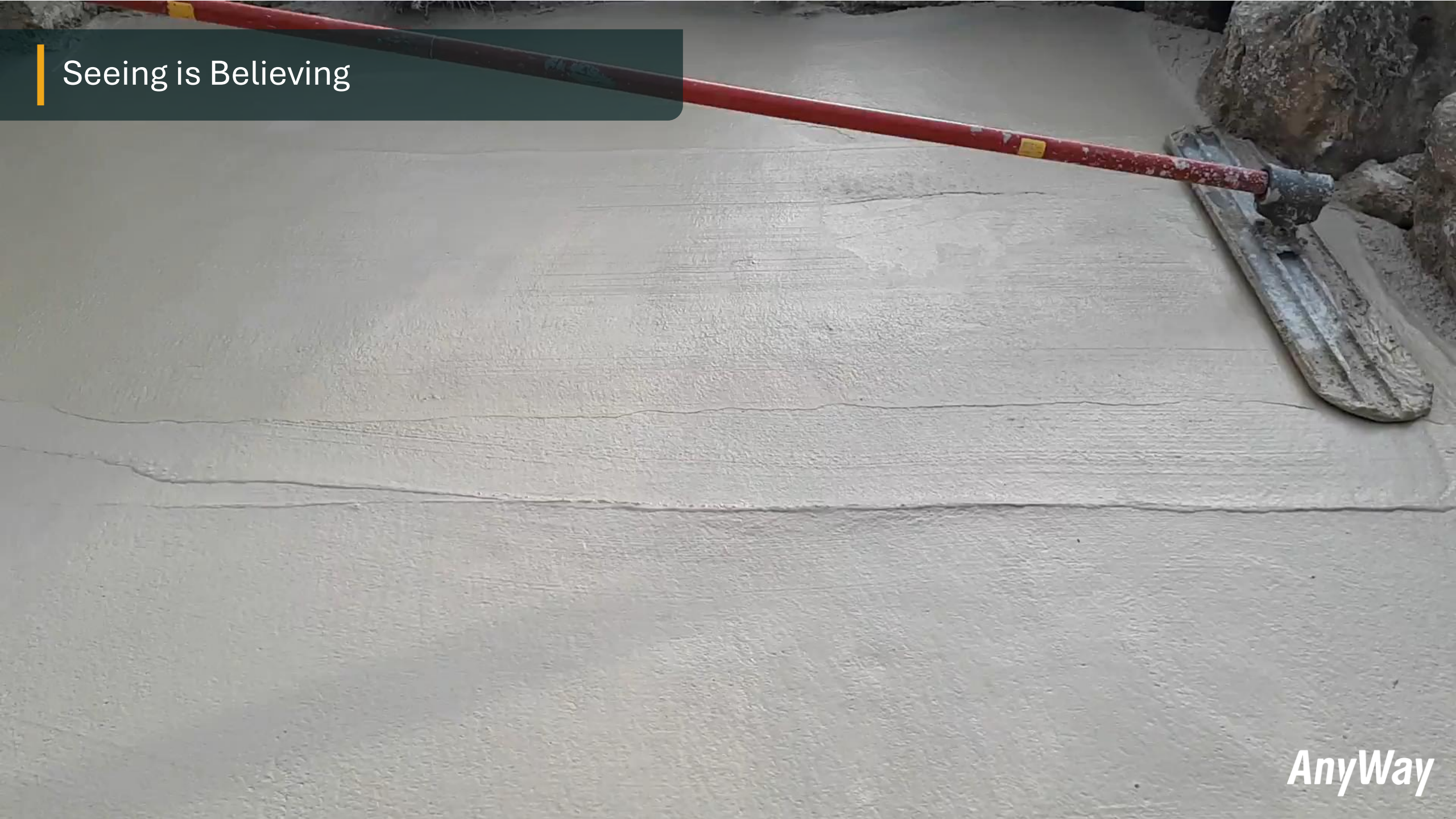
Seeing is Believing

Seeing is Believing



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Seeing is Believing

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PathWay – Observatory Garden

TEL AVIV – JAFFA MUNICIPALITY

SCAN ME

AnyWay's Role

AnyWay handled the work related to garden preparations for the casting of PathWay and supplied the PathWay low-carbon emission concrete and concrete mixers to the site. Additionally, we leveraged our contacts to arrange for the concrete slabbing.

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The Government of Israel – The Authority of Antiquities

ROSH HA'AYIN, ISRAEL

SCAN ME

AnyWay's Role

AnyWay supplied PathWay with concrete mixers to the site and coordinated the application by a specialist concrete slabbing company also using concrete pumps.

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Founders' Trail Kfar Vradim

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Time for concrete climate action

Founders' Trail –

The Municipality of Kfar Vradim

KFAR VRADIM, ISRAEL

The Project

AnyWay supplied PathWay in concrete mixers to the site and coordinated the application by a specialist concrete slabbing company using also concrete pumps.

The Results

The trail was opened to public about two weeks after completion of all additional works around it, providing sitting benches and drawing stands overlooking the valley below.

The trail since then has been the center of many social activities for the Local community of Kfar Vradim.

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Key takeaways – A Smarter Concrete Solution

- Innovative mix designs
- use of recycled material waste
- Meets required standards for designated use
- Simplified construction methods
- Lower Carbon emissions and environmental footprint


Time for Concrete
Climate Action.
Low Carbon Emission Concrete
for Walkways & Paths
Innovative Materials | Sustainable
Design | Efficient Application
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THANK YOU

Understanding What Matters

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