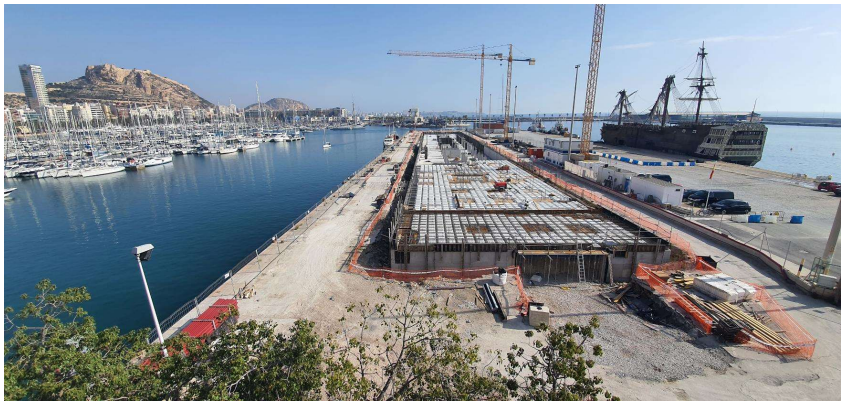
Who is Krystaline Technology S.A.?

- **Provide waterproof concrete that is sustainable, durable and competitive.**
- Tanking system where the concrete itself is the waterproof membrane
- International experience in more than 25 countries
- Corporate headquarters located in Alicante (Spain).

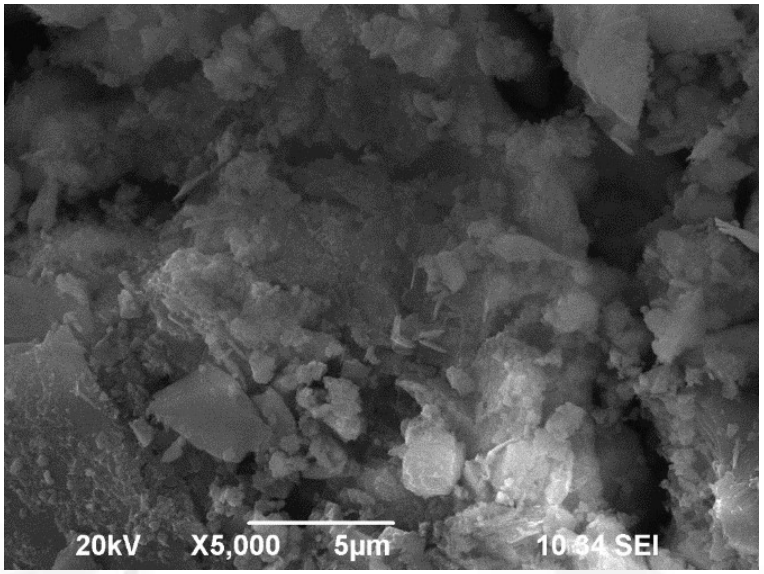
Aditivos para impermeabilizar hormigón con CSH - Krystaline



C-S-H Technology

The NEXT generation of crystalline concrete waterproofing!

What is C-S-H?

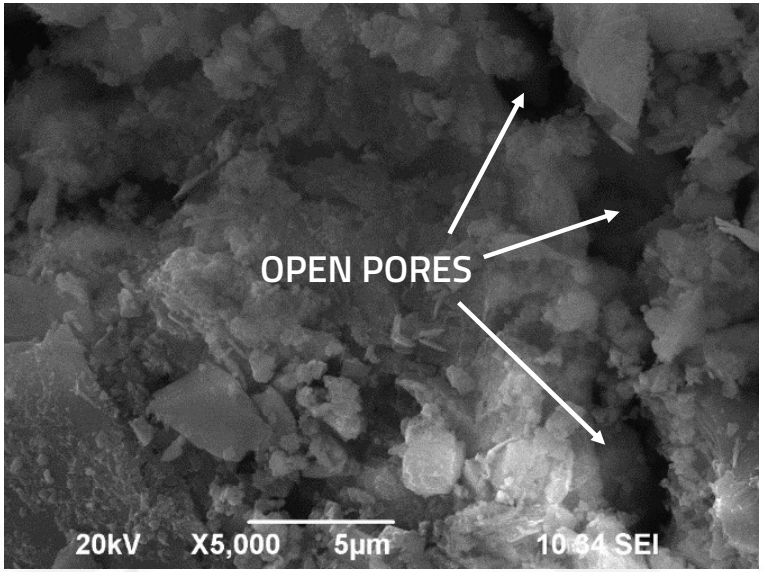


C-S-H = Calcium Silicate Hydrate

Calcium = CaO = Calcium Oxide
Silicate = SiO_2 = Silicon Dioxide
Hydrate = H_2O = Water

- It is created during the hydration process and continues in the long term in the presence of water
- It is a non-soluble concrete binder
- It is considered a hybrid as its structure shares both crystalline and gel-like characteristics.

What is C-S-H?



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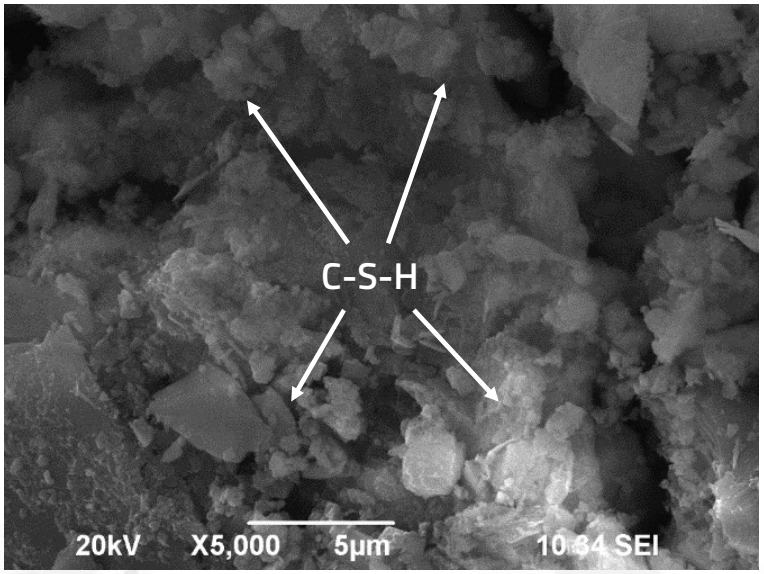

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- It is a non-soluble concrete binder
- It is considered a hybrid as its structure shares both crystalline and gel-like characteristics.

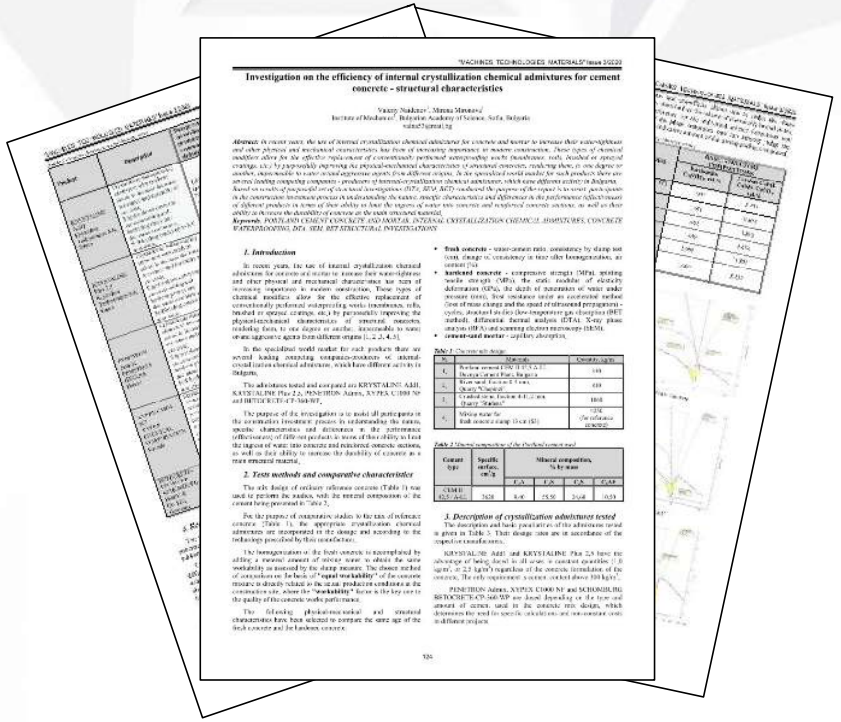
What makes Krystaline C-S-H Technology different?

C-S-H Technology = A technology that increases/enhances C-S-H gels and crystals to waterproof the concrete

Quality Proven Technology

Differential-thermal analysis results (DTA)

	Calcium Hydroxide $Ca(OH)_2$ (rel %)	Calcium Silicate Hydrate C-S-H (rel %)
Reference Concrete	1.937	8.733
Krystaline Concrete	1.455 (- 25%)	11.880 (+36%)

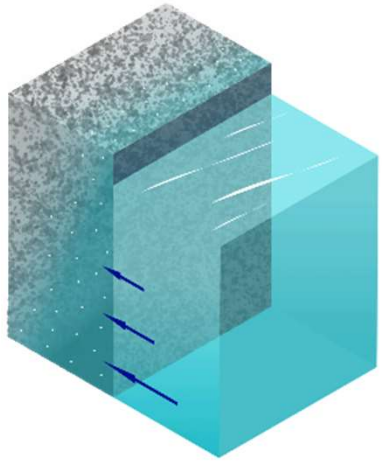

"MACHINES. TECHNOLOGIES. MATERIALS" Issue 3/2020

Investigation on the efficiency of internal crystullization chemical admixtures for cement concrete - structural characteristics

Published - **MACHINES. TECHNOLOGIES. MATERIALS INTERNATIONAL SCIENTIFIC JOURNAL** ISSN PRINT 1313-0226, ISSN WEB 1314-507X, YEAR XIV, ISSUE 3 / 2020

Krystaline Add1 (Admixture)

- Low addition rate compared to standard crystalline technology products (as low as 1 kg per m^3)
- Compatible with most admixtures
- Replaces set retarders and plasticizers subject to mix design
- Can be added to dry mix or wet mix



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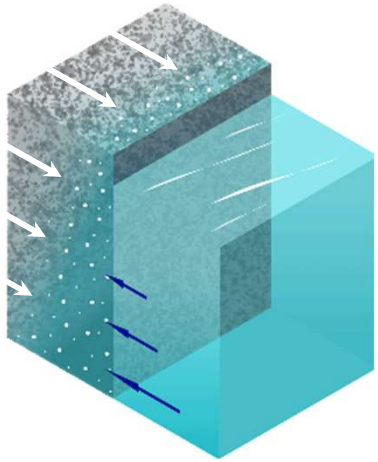

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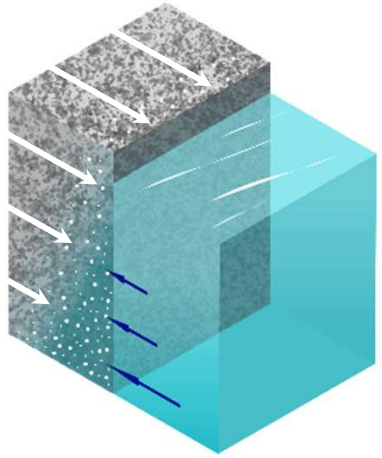

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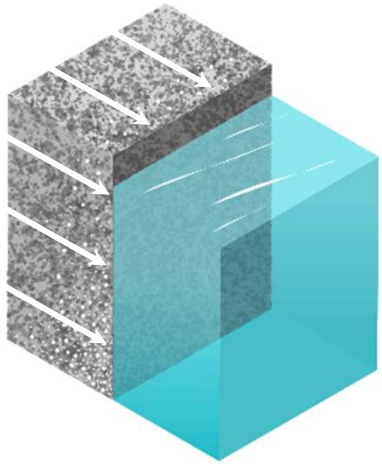


DIT plus

Nº 649pR/20

How does C-S-H Technology compare to other admixtures?

vs Reference Concrete	Kryton KIM	Xypex C1000	C-S-H Technology Admixture
Water penetration reduction	50.0%	46.6%	72.2%
Compressive strength increase	17.2%	27.6%	39.6%
Capillary absorption reduction	21.1%	24.3%	37.3%
Total pore volume reduction	30.8%	22.2%	46.2%
Average pore size reduction	5.7%	13.3%	33.3%

- As per comparative independent 3rd party testing
- Compressive strength @ 28 days
- Capillary Absorption @ 7days

What about dosage differences

Xypex C1000 – 1.5% of cement vs Krystaline Add1 - 1 kg per m^3

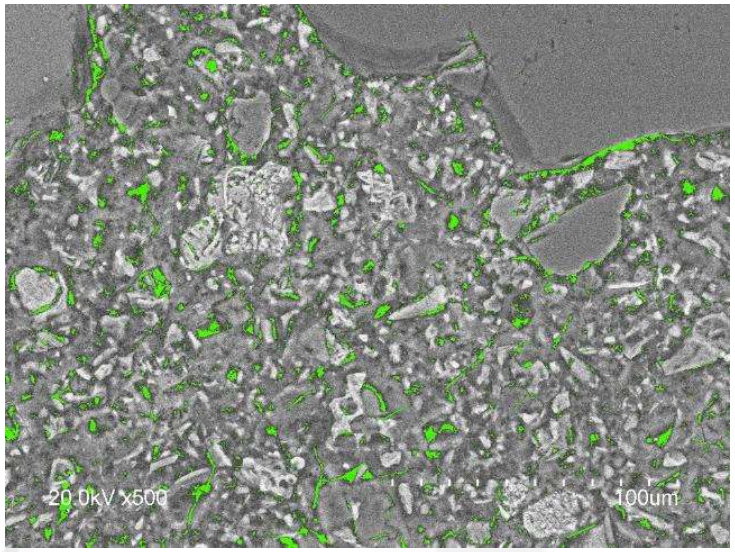
Based on a concrete mix design of 350 kg per m3 at dosage as per technical datasheets

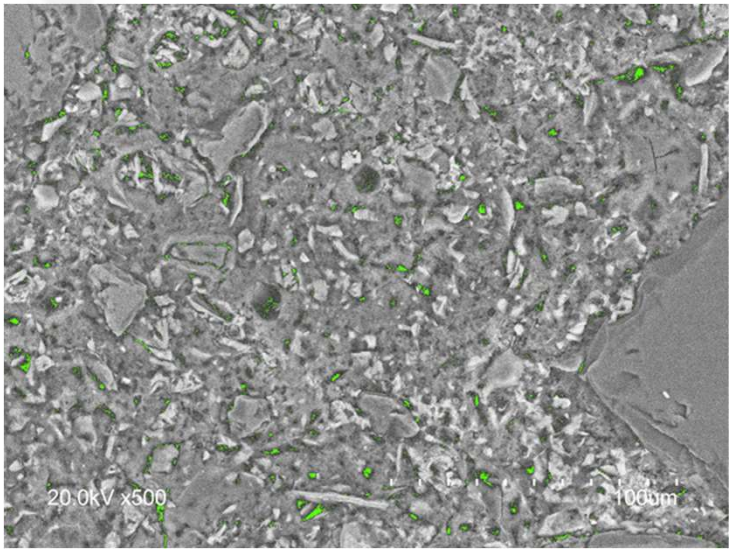
5.25 times more Xypex C1000 required per m^3

Quantity of Concrete	Quantity of Xypex C1000 (5.25 kg/m^3)	Quantity of C-S-H Technology admixture (1 kg/m^3)	Difference
1,000 m^3	5,250 kg	1,000 kg	4,750 kg
5,000 m^3	26,250 kg	5,000 kg	21,750 kg
10,000 m^3	52,500 kg	10,000 kg	42,500 kg

The C-S-H Difference?

Reference 500X Krystaline C-S-H





Comparison of Reference Concrete versus C-S-H Concrete

Self-Healing Abilities

Third party testing and on-site experience proves self-healing ability

Replacing Membranes

Eliminates the difficulties of placing membrane

Applications in wet areas are an advantage for C-S-H treated concrete

Effective protection for the life of the concrete

Removes the need for accessibility:

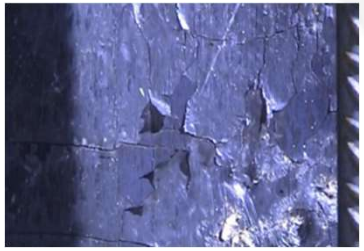
Over-excavation is not required

Membranes and positive side applications are subject to deterioration when exposed to water borne contaminants.

C-S-H technology admixtures, unlike membrane systems, are not based on petroleum or other environmentally unfriendly materials and are completely VOC (volatile organic compound) free.

Increases productivity

Small Problems = Big Cost



When membranes fail it is almost impossible to locate the failure.

Future problems and maintenance are also prone to lack of accessibility and very difficult and expensive to resolve.

Should Krystaline fail the problem is exactly where the failure occurs and can be treated from the negative side.

Testing

Independent 3rd party tests have also proven the following benefits:

- Up to 79% reduction of water penetration
- Reduced cracking
- Higher compressive, flexural and tensile strengths
- Increased freeze/thaw resistance
- Improved flow and cohesiveness

Proven Safe for Potable Water/Environment

Proven in Aggressive Environments

CSIC

August 6th 2021

Attn: Jenny Farina
Krystaline Technology B.A.
C/ Avenida de Bussi, 52 20220
Edificio parque industrial
(Alicante) ESPAÑA

RE: Evaluation of the resistance against sulphate attack of concretes with additives

Dear Jenny

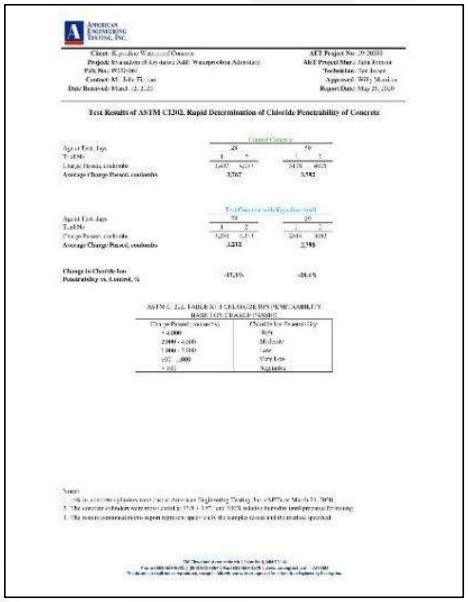
It is our pleasure to provide you with the following progress update regarding the Evaluation of the resistance against sulphate attack of concretes with Krystaline additives.

Two concrete samples using Krystaline Add1 additive at 10 cycles in the sulphatic attack test (the equivalent of 15 to 30 years in a high sulphate environment according to a modified version from the US Bureau of Reclamation test C488-4008) have shown good resistance against sulphatic attack. There has not been any significant modification detected in the volume or the weight of the samples. There is only incipient damage observed in the edges/corners of the samples. Moreover, after 10 cycles the compressive strength of the concrete with Krystaline Add1 additive was not decreased. In fact, this value slightly increased (51.5 after 10 cycles vs 50.5 MPa at 28 days of site standard).

At the time the samples have undergone 22 cycles in the sulphate attack test (the equivalent of between 33 to 66 years in a high sulphate environment). The concrete samples with Krystaline Add1 additive are currently in good conditions with no significance modification detected in the volume or the weight of the samples. The damages in the edges/corners of the samples are slightly more significant than after 10 cycles, but there is no mass loss yet. Thus, the concrete samples with Krystaline Add1 additive are showing high resistance against sulphate attack.

Yours sincerely,

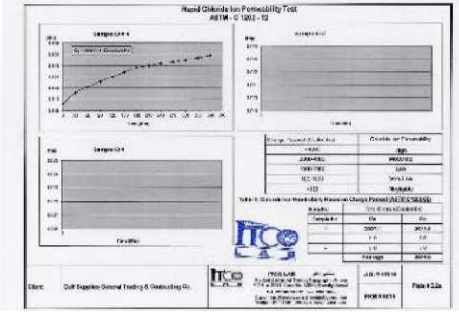
Head of the Concrete Laboratory, Service Unit
Institute for Construction Sciences Eduardo Torroja (IETcc-CSIC)



AMERICAN ENGINEERING TESTING, INC.

Test Results of ASTM C1202, Rapid Determination of Chloride Penetrability of Concrete

Rapid Chloride Ion Permeability Test
ASTM - C 1202 - 12

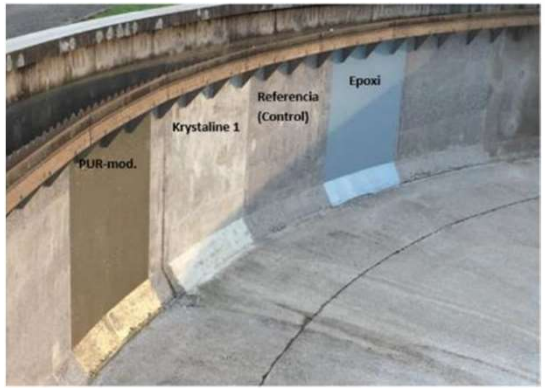


Rapid Chloride Ion Permeability Test
ASTM - C 1202 - 12

Certifications and Endorsements

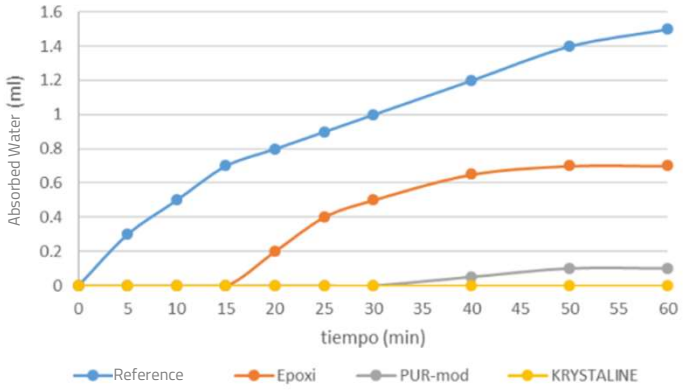
- Self Heals cracks to 0.5mm
- Is a replacement for waterproofing membranes
- Is a replacement for waterproof coatings
- Is usable in heavy hydrostatic conditions
- Is usable with potable water
- Is safe for concrete

Surface Applied C-S-H Technology

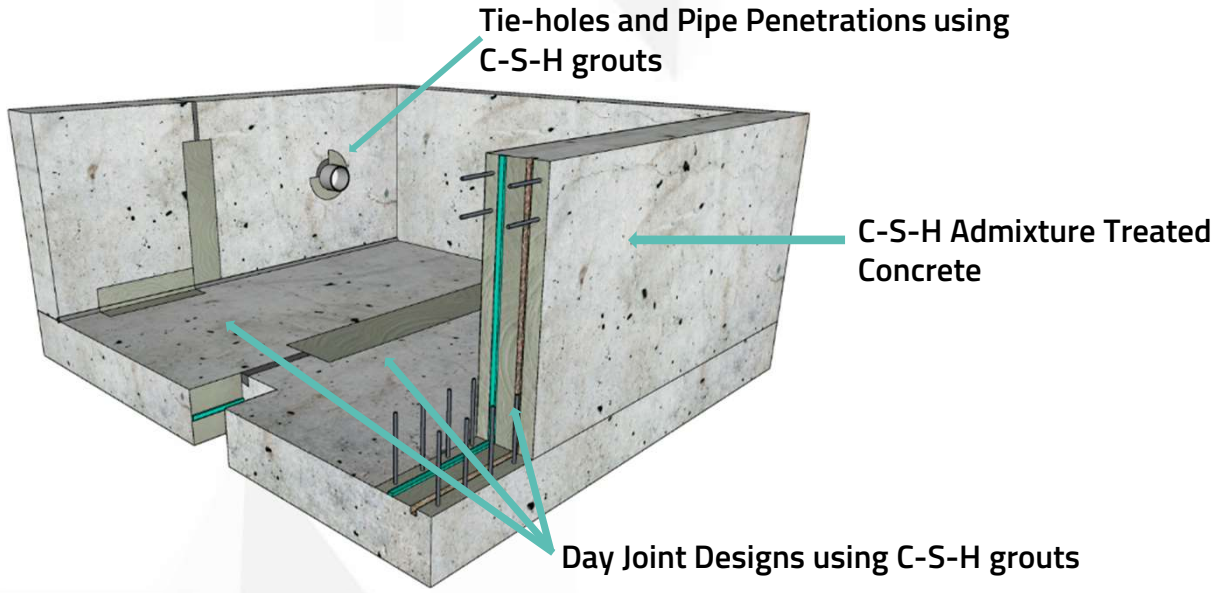


A Krystaline C-S-H surface slurry application was compared to PU, Epoxy and Reference inside a secondary settling tank.

At 2 years the only surface applied product to show no water penetration was the Krystaline C-S-H technology slurry.



CSH Technology in White Tank Systems



KRYSTALINE
WATERPROOF CONCRETE

PROJECT EXAMPLES

KRYSTALINE
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19 Apartamentos Harbour Lofts

Palma de Mallorca


KRYSTALINE
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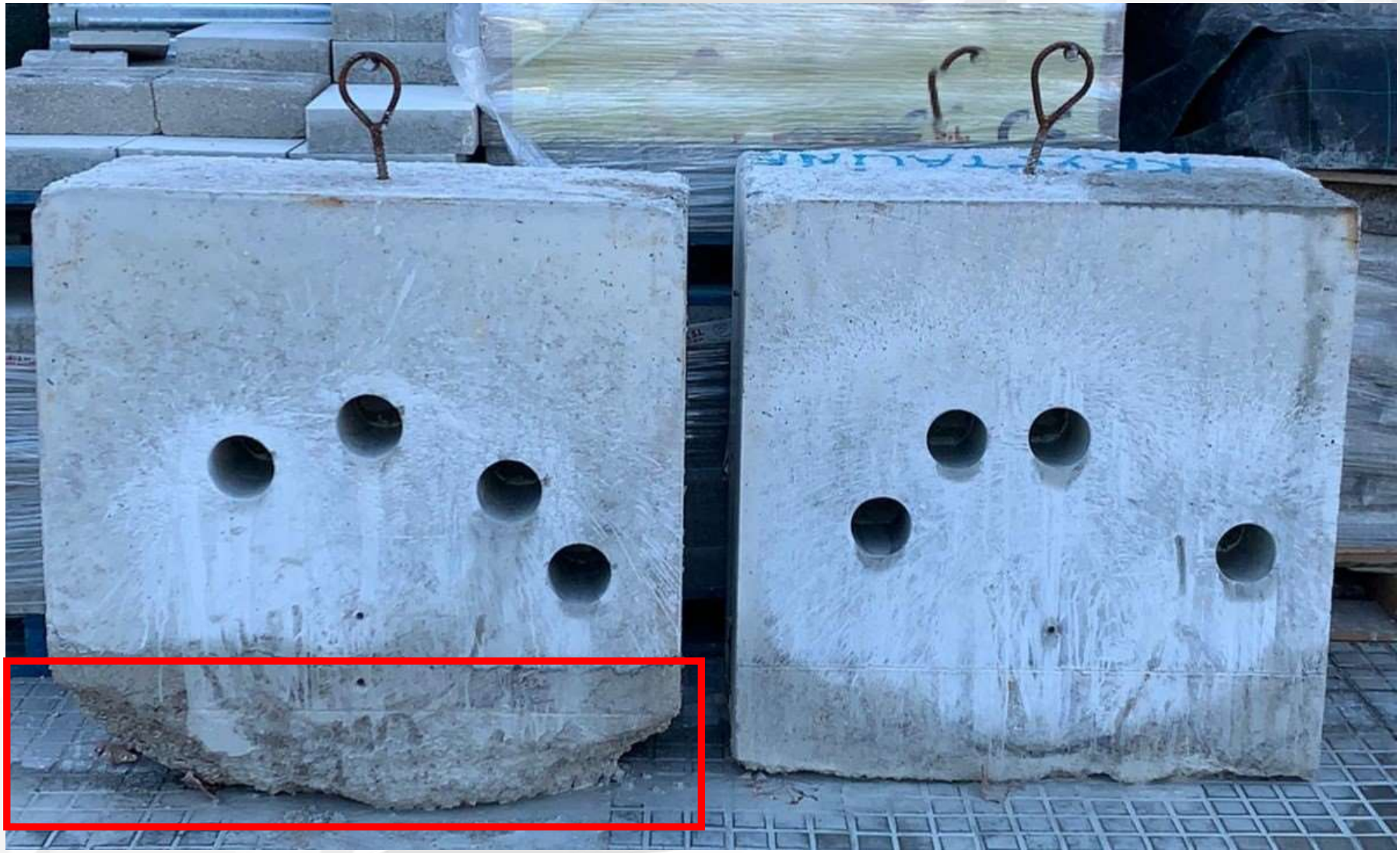
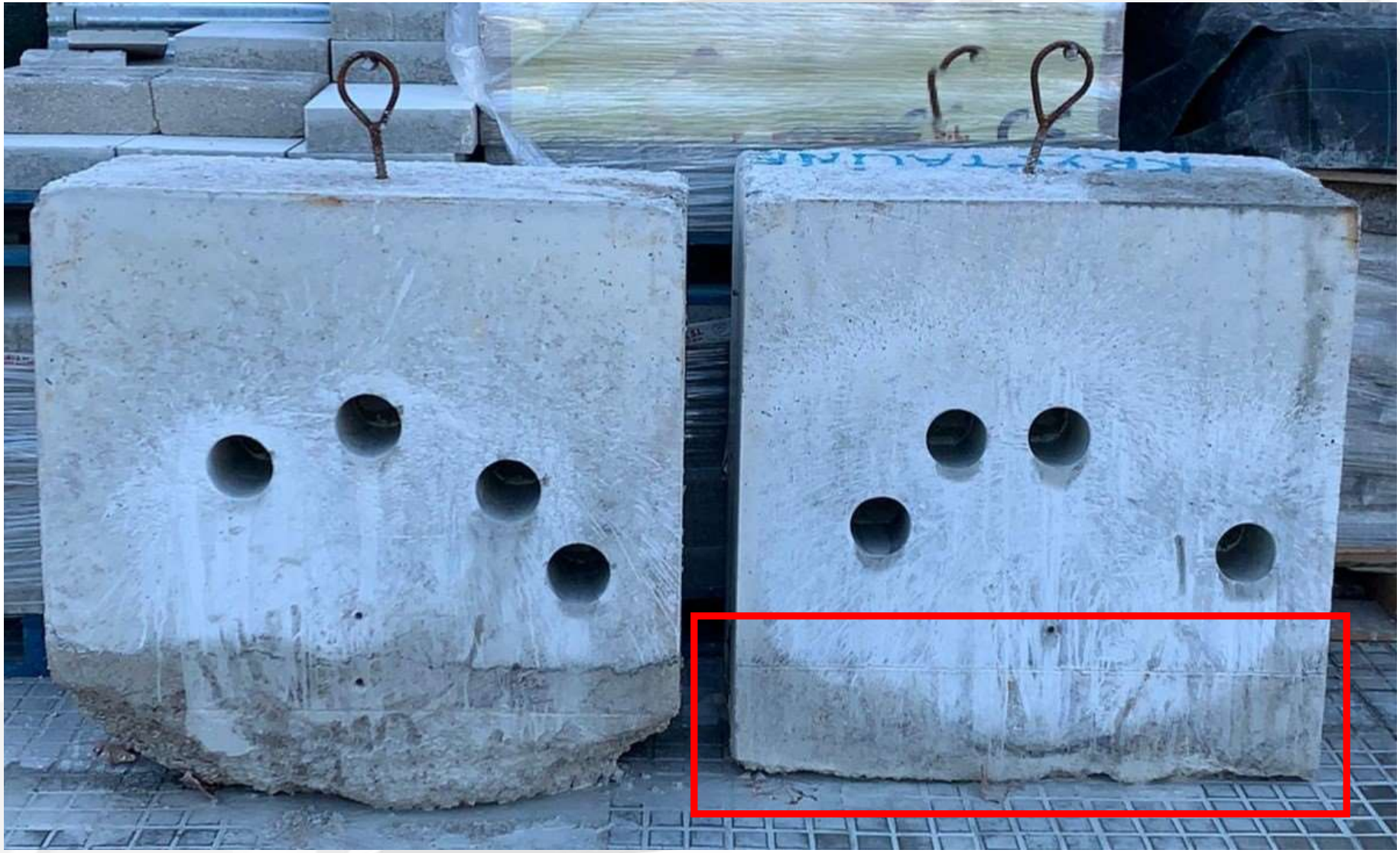
KRYSTALINE





R/L	SITUACIÓN DEL PUNTO DE EXTRACCIÓN	DENSIDAD (g/cm^3)	RELACIÓN h/D	CARACTERÍSTICAS MECÁNICAS ENSAYO A COMPRESIÓN				
				CARGA DE ROTURA		RESIST. COMPRESIÓN		
				kp	kN	(kp/cm^2)	MPa	MPa(**)
3274	t1 losa krystaline	2,25	1,30	32970	323,4	455,5	44,7	49,2
3275	t2 losa kristaline	2,26	1,22	34950	342,9	482,9	47,4	52,1
3276	t1 losa	2,27	1,23	30220	296,5	417,5	40,9	45,0
3277	t2 losa	2,31	1,21	29950	293,8	413,8	40,6	44,7

El nuevo Código Estructural publicado en el BOE el 29 de Junio del 2021 (Real Decreto 470/2021) regula sobre la impermeabilidad del hormigón en su artículo 43.3.2 utilizando los mismos criterios límite que la anterior EHE08 a la que sustituye:

"En el caso de elementos estructurales ubicados en ambientes muy agresivos..., el hormigón deberá presentar un comportamiento suficientemente impermeable, determinado según UNE-EN 12390-8..., según los criterios recogidos en la tabla 43.2.2":

Clase de exposición ambiental			Prof. máxima	Prof. media
XS1, XS2	*Corrosión por cloruros marinos*	Cualquier caso	≤ 50 mm	≤ 30 mm
XD1, XD2, XD3	*Corrosión por cloruros no marinos*			
XF1, XF2, XF3, XF4	*Ataque hielo/deshielo*			
XM	*Erosión*			
XA1	*Agresividad química débil*			
XA2	*Agresividad química moderada*	Elem. en masa o armados	≤ 50 m	≤ 30 mm
XS3	*Corrosión por cloruros marinos en zonas de carrera de mareas (oleaje o salpicaduras).*	Cualquier caso	≤ 30 mm	≤ 20 mm
XA3	*Agresividad química alta*			
XA2	*Agresividad química moderada*	Elementos pretensados	≤ 30 mm	≤ 20 mm

VERTIDO:	PASEO MARITIMO. CUBETA TESTIGOS LOSA			Fecha fabricación:	06-11-20	
Datos suministrados por el peticionario a fabricante						
HORMIGÓN	Solicitado por: CONVENCIONAL POR ESPECIFICACIÓN			Tipo hormigón:	HA-30/B/20/IIIB+QB+SR	
Suministrador:		Planta: PALMA		Camión: -	Albarán -	
ENSAYO	Condiciones ambientales: Ambiente de laboratorio		Fecha inicio ensayo 18-12-20	Hora: 11:00	Edad (días):	42
Condiciones período de secado previo al ensayo:	72 horas a 50± 5º C (según Art. 86.3.3 EHE-08)					
Tipo agua utilizada:	Red abastecimiento	Dirección de aplicación:	Dirección de hormigonado			

CÓDIGO DE MUESTRA:		101282020003309	
PENETRACION MÁXIMA	(mm)	26	27
PENETRACION MEDIA (UNE EN 12390-8:2009/1M:2011)	(mm)	17	17

VERTIDO:	PASEO MARITIMO. CUBETA TESTIGOS LOSA con KRISTALINE			Fecha fabricación:	06-11-20	
Datos suministrados por el peticionario a fabricante						
HORMIGÓN	Solicitado por:	CONVENCIONAL POR ESPECIFICACIÓN		Tipo hormigón:	HA-30/B/20/IIIB+QB+SR	
Suministrador:		Planta:	PALMA	Camión:	-	Albarán -
ENSAYO	Condiciones ambientales:	Ambiente de laboratorio	Fecha inicio ensayo	18-12-20	Hora: 11:00	Edad (días): 42
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CÓDIGO DE MUESTRA:		101282020003308	
PENETRACION MÁXIMA	(mm)	18	19
PENETRACION MEDIA (UNE EN 12390-8:2009/1M:2011)	(mm)	11	8

CERTIFICADO DOSIFICACION

s/Anejo 22 - EHE-08

Cliente:	CONST. LLULL SASTRE S.A.
Obra:	HARBOUR LOFTS
Tipo de Hormigón:	HA-30/AC-E2/20/IIIb+Qb SR
Planta suministro:	Cemex España Operaciones S.L.U. - Planta de Palma de Mallorca

Se ha sometido al tipo de hormigón y a su dosificación indicados a los ensayos que se relacionarán a continuación:

Ensayo de Permeabilidad: (mm)

Profundidad máxima (Zm):

Z1	11
Z2	8
Z3	9
Zm	9,3

Profundidad media (Tm'):

T1	6
T2	7
T3	6
Tm	6,3

Ensayo Resistencia: (N/mm2)

X1	44,1
X2	42,5
X3	43,4
Xmedia	43,3

Fc,dosif = Xmedia - 1,35*(Xmáx-Xmín)

Fc,dosif =	41,2

Ensayos llevados a cabo en laboratorio de autocontrol de: mex España Operaciones S.L.U. - Planta de Palma de Mallo

Para el hormigón tipificado como: HA-30/AC-E2/20/IIIb+Qb SR

cuya dosificación es la siguiente:

	Tipo	Procedencia	Kg/m3 ó %
Cemento:	CEM I/42,5 R/SR	CEMEX	365
Agua:		CEMEX	145
Arena:	AF-T-0/4-C	CANTERA CALMO	55%
Arido:	AG-T-8/16-C	CANTERA CALMO	10%
Arido:	AG-T-16/22-C	CANTERA CALMO	35%
Aditivo:	Isoplast 1550	CEMEX	1,10%
Aditivo:	Isoflex 501	CEMEX	0,80%
Aditivo:	Krystaline Add1		1,00
Rel A/C:			0,4

Periodo de validez del presente certificado, hasta: 18/06/2021

En Palma de Mallorca a 17/12/2020

Juan Vilanova Vilanova
Gerente Calidad Baleares

CERTIFICADO DOSIFICACION

s/Anejo 22 - EHE-08

Cliente:	CONST. LLULL SASTRE S.A.
Obra:	HARBOUR LOFTS
Tipo de Hormigón:	HA-30/AC-E2/20/IIIb+Qb SR
Planta suministro:	Cemex España Operaciones S.L.U. - Planta de Palma de Mallorca

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Xmedia	43,3

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Fc,dosif = 41,2

Ensayos llevados a cabo en laboratorio de autocontrol de: mex España Operaciones S.L.U. - Planta de Palma de Mallo

Para el hormigón tipificado como: HA-30/AC-E2/20/IIIb+Qb SR

cuya dosificación es la siguiente:

	Tipo	Procedencia	Kg/m3 ò %
Cemento:	CEM I/42,5 R/SR	CEMEX	365
Agua:		CEMEX	145
Arena:	AF-T-0/4-C	CANTERA CALMO	55%
Arido:	AG-T-8/16-C	CANTERA CALMO	10%
Arido:	AG-T-16/22-C	CANTERA CALMO	35%
Aditivo:	Isoplast 1550	CEMEX	1,10%
Aditivo:	Isoflex 501	CEMEX	0,80%
Aditivo:	Krystaline Add1		1,00
Rel A/C:			0,4

Periodo de validez del presente certificado, hasta: 18/06/2021

En Palma de Mallorca a 17/12/2020

Juan Vilanova Vilanova
Gerente Calidad Baleares

Ensayo de Permeabilidad: (mm)

Profundidad máxima (Zm):

Z1	11
Z2	8
Z3	9
Zm	**9,3**

Profundidad media (Tm'):

T1	6
T2	7
T3	6
Tm	**6,3**

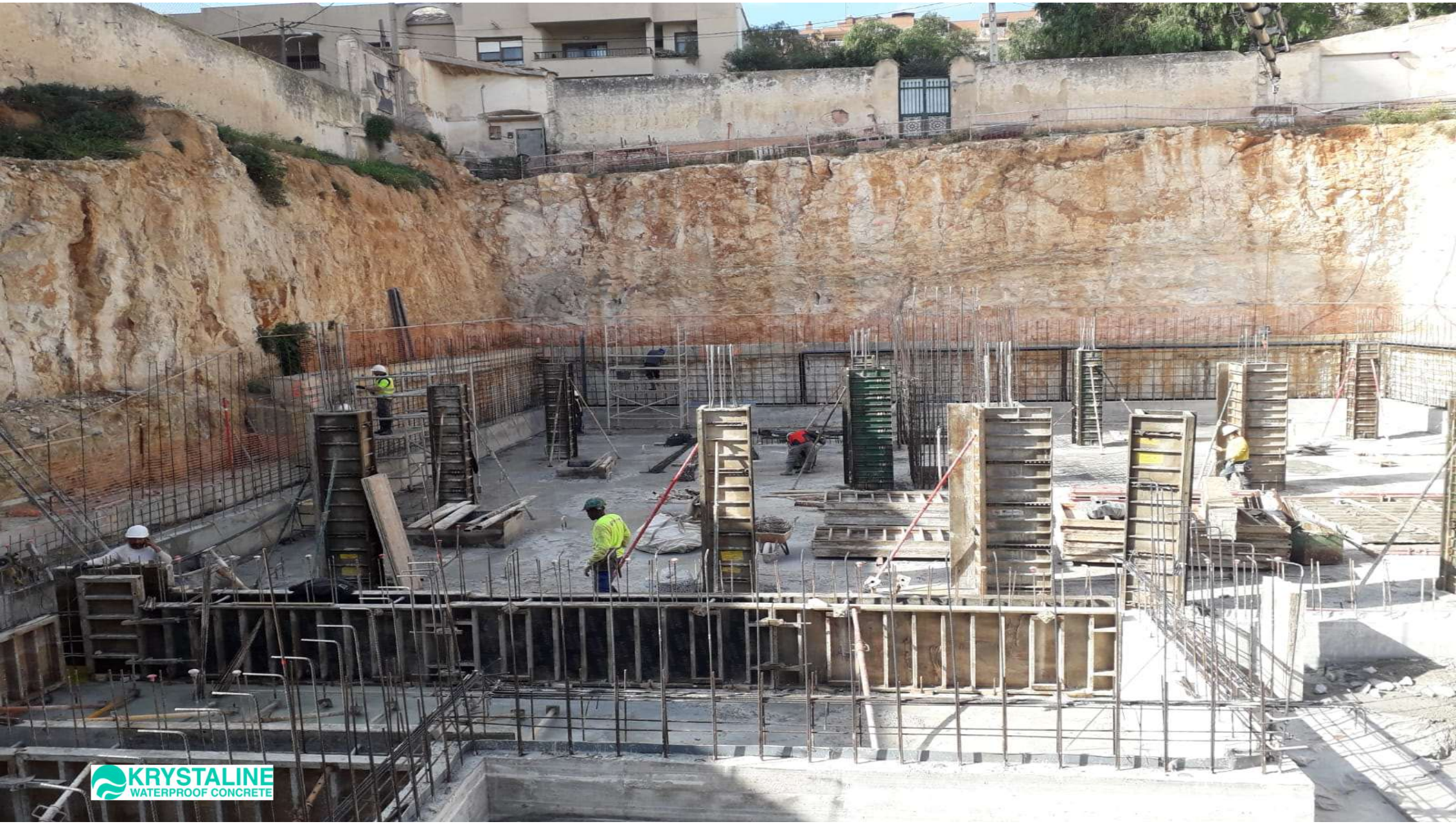
mex España Operaciones S.L.U. - Planta de Palma de Mallo

HA-30/AC-E2/20/IIIb+Qb SR

	Tipo	Procedencia	Kg/m3 ò %
Cemento:	CEM I/42,5 R/SR	CEMEX	365
Agua:		CEMEX	145
Arena:	AF-T-0/4-C	CANTERA CALMO	55%
Arido:	AG-T-8/16-C	CANTERA CALMO	10%
Arido:	AG-T-16/22-C	CANTERA CALMO	35%
Aditivo:	Isoplast 1550	CEMEX	1,10%
Aditivo:	Isoflex 501	CEMEX	0,80%
Aditivo:	Krystaline Add1		1,00
Rel A/C:			0,4


KRYSTALINE
WATERPROOF CONCRETE


KRYSTALINE
WATERPROOF CONCRETE


KRYSTALINE
WATERPROOF CONCRETE


KRYSTALINE
WATERPROOF CONCRETE

KRYSTALINE
WATERPROOF CONCRETE

New headquarters of Booking.Com

Amsterdam (Netherlands)

KRYSTALINE
WATERPROOF CONCRETE

Aktull Parkgarage

hochwertigen EK& Appartmenzentrums Amsterdam Centrum

NUEVA SEDE BOOKING

CONSTRUCTORA ZÜBLIN (STRABAG)

SUPERFICIE: 9000 M2

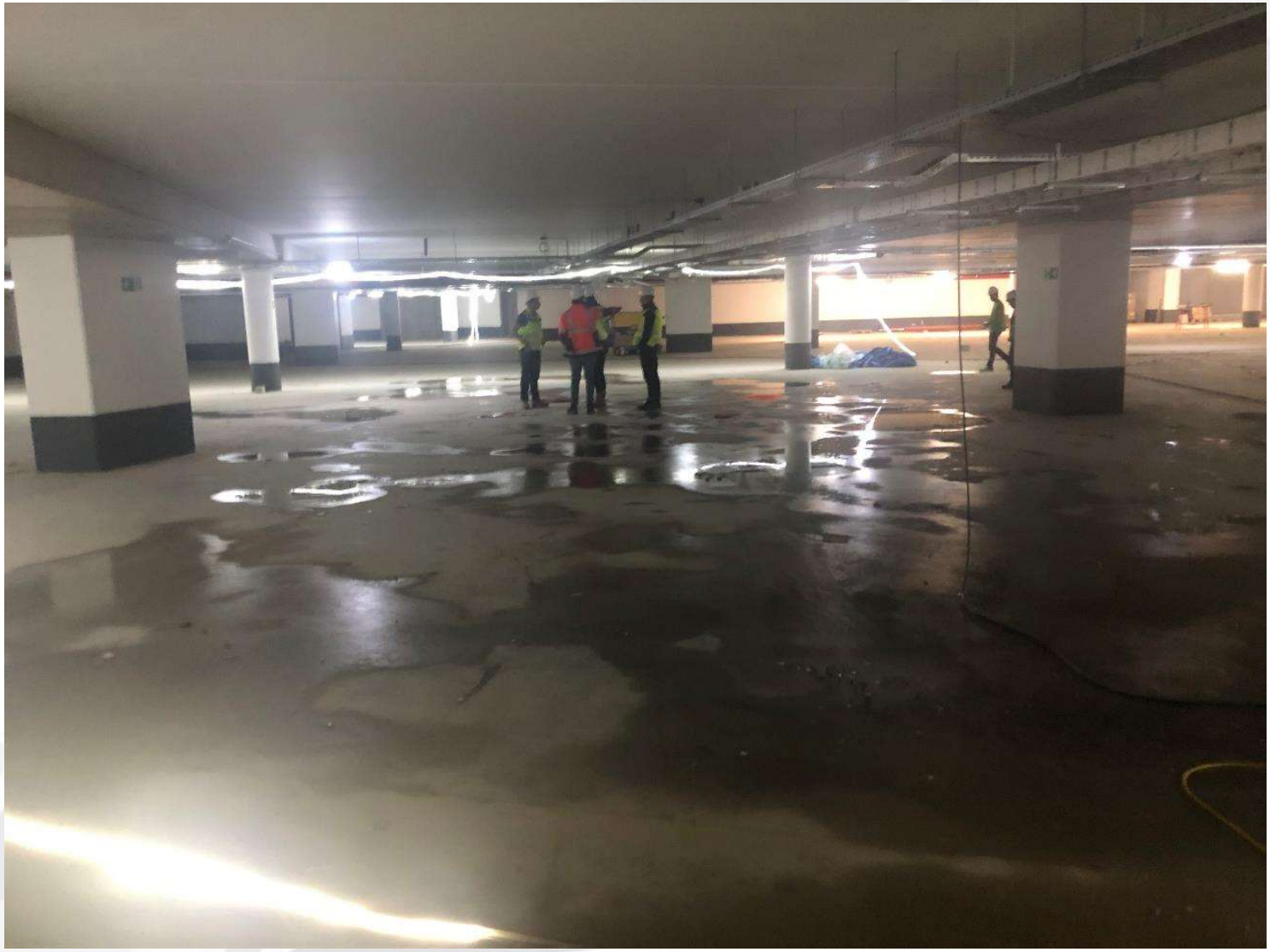
Canto Losa: 1,30 m

KRYSTALINE
WATERPROOF CONCRETE

Water reactive polyurethane injection

in 2500 m of joints and cracks

400.000 €



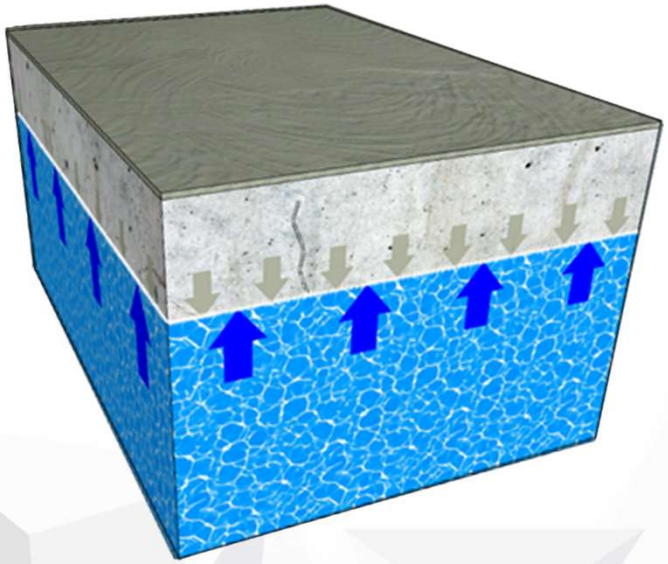
KRYSTALINE
WATERPROOF CONCRETE

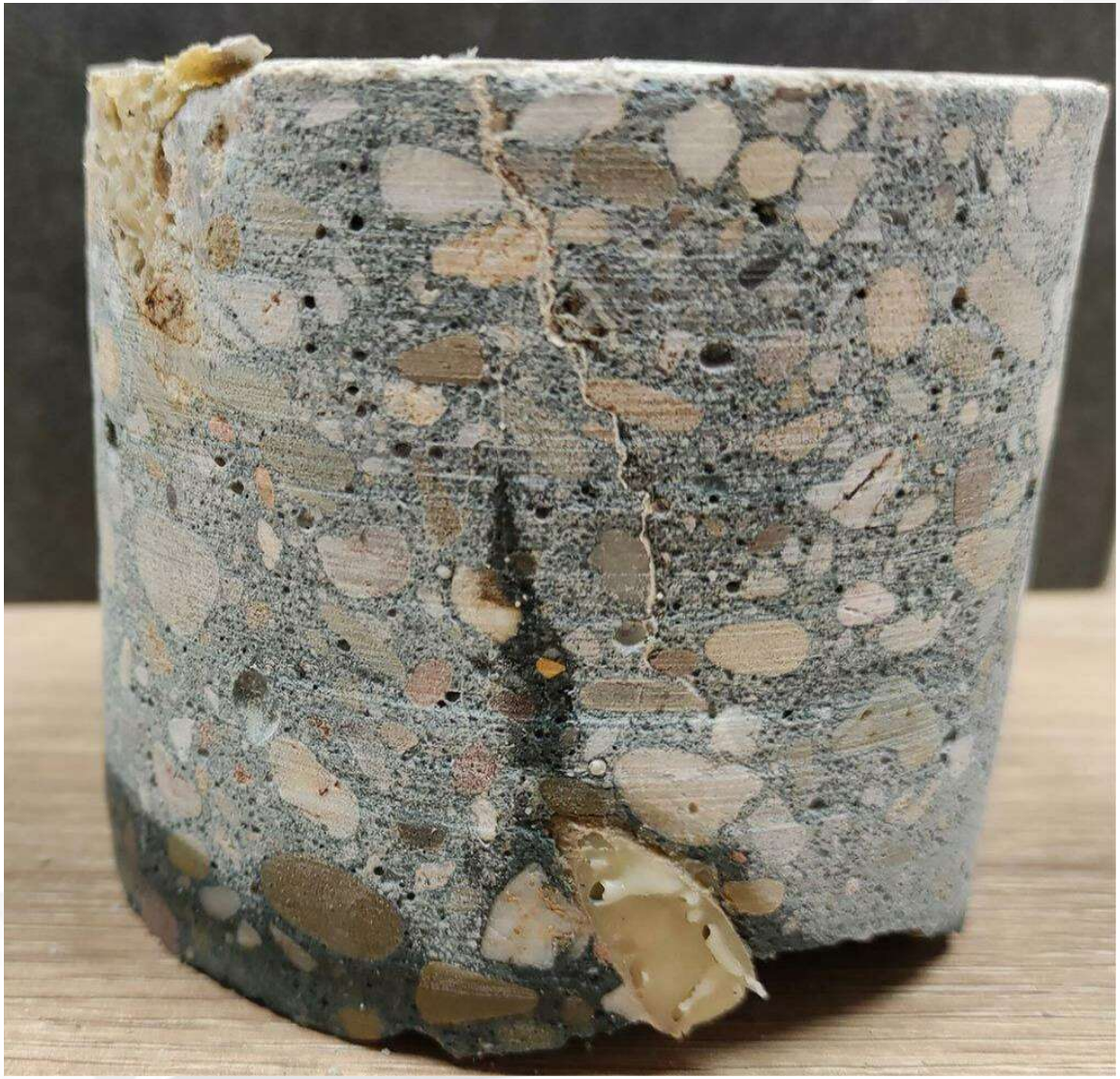
All new cracks were treated

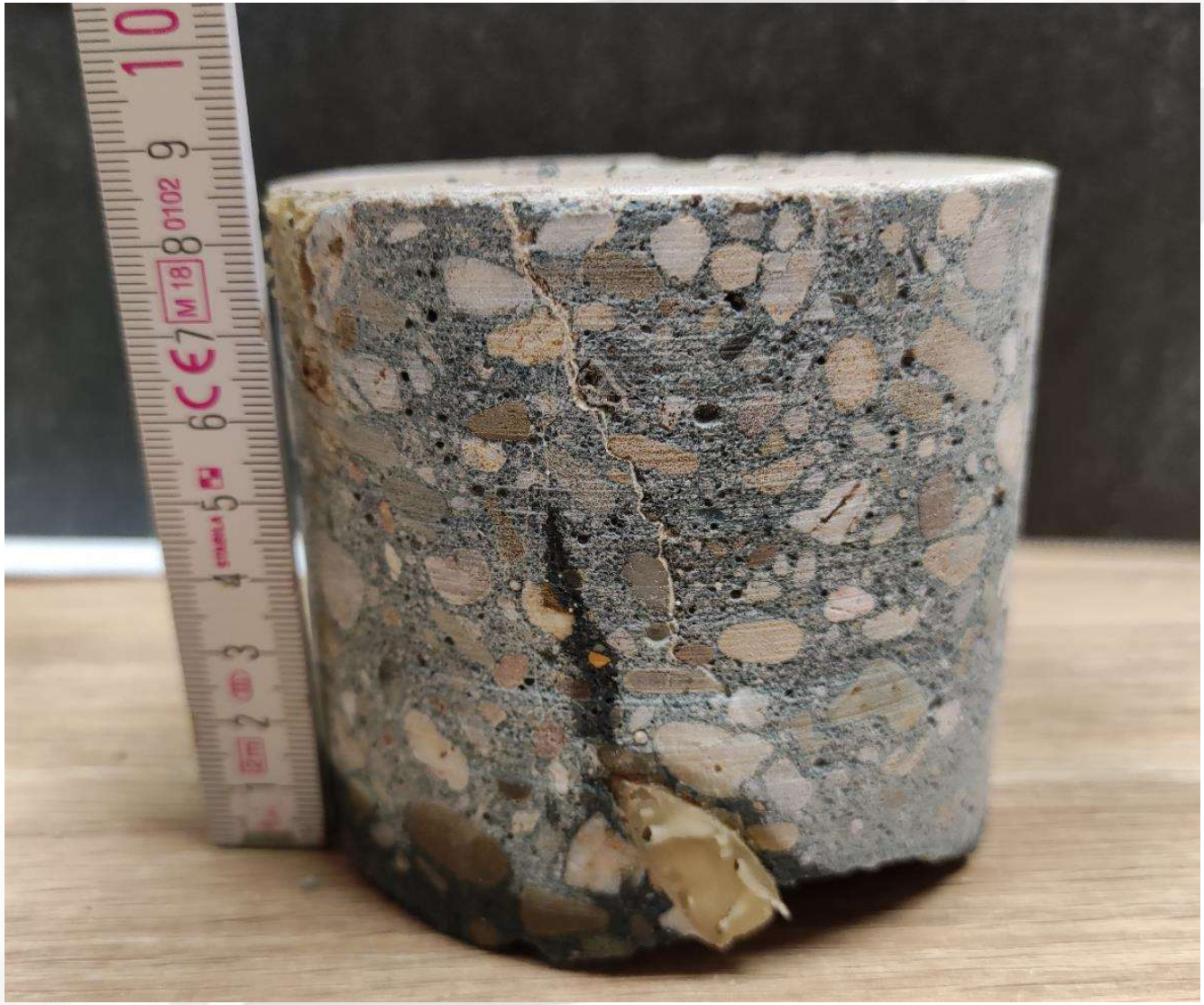
with Krystaline 1 (1000 m approx.)

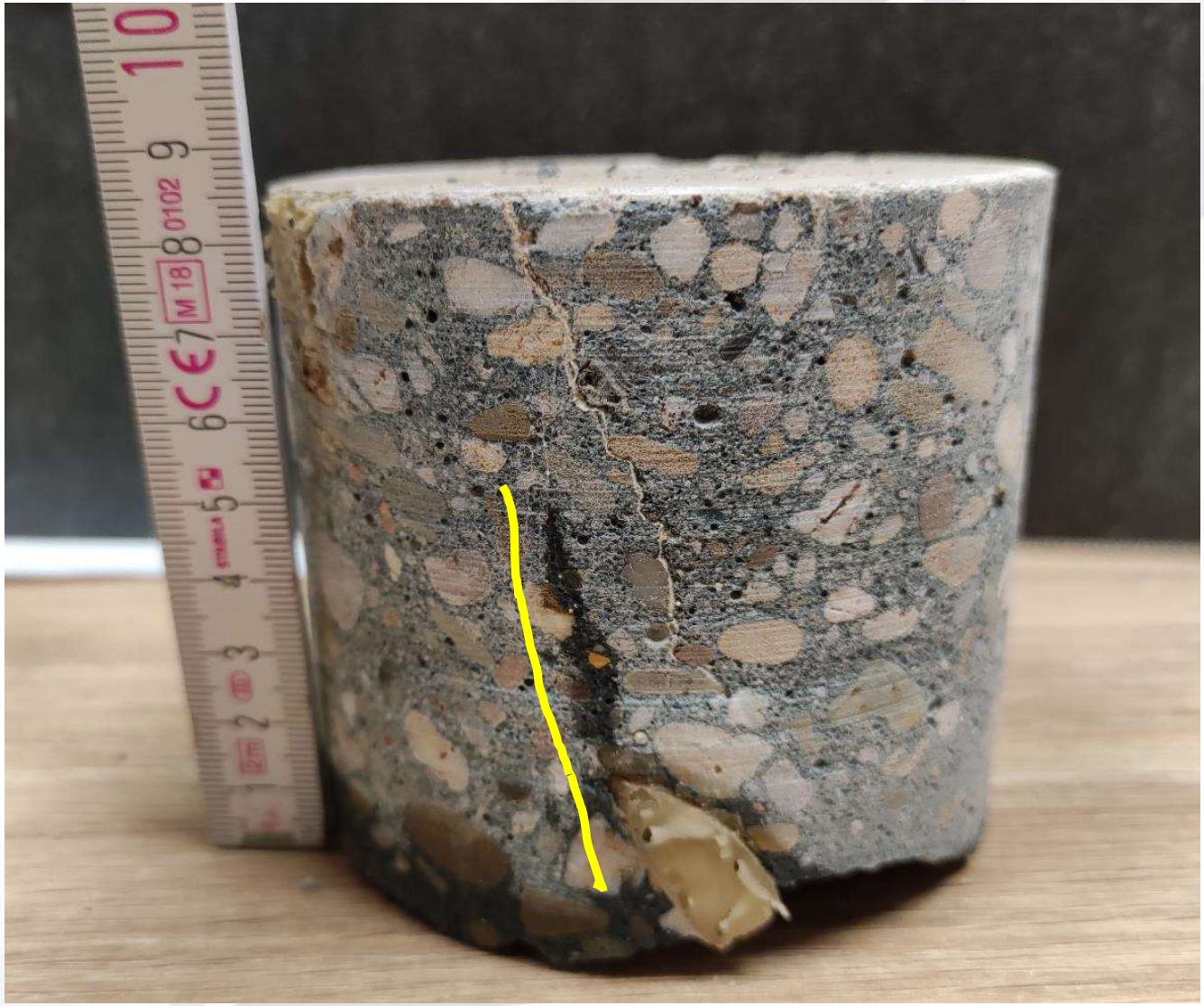
40.000 €

Surface Applied C-S-H Technology









Local Projects

Local Projects

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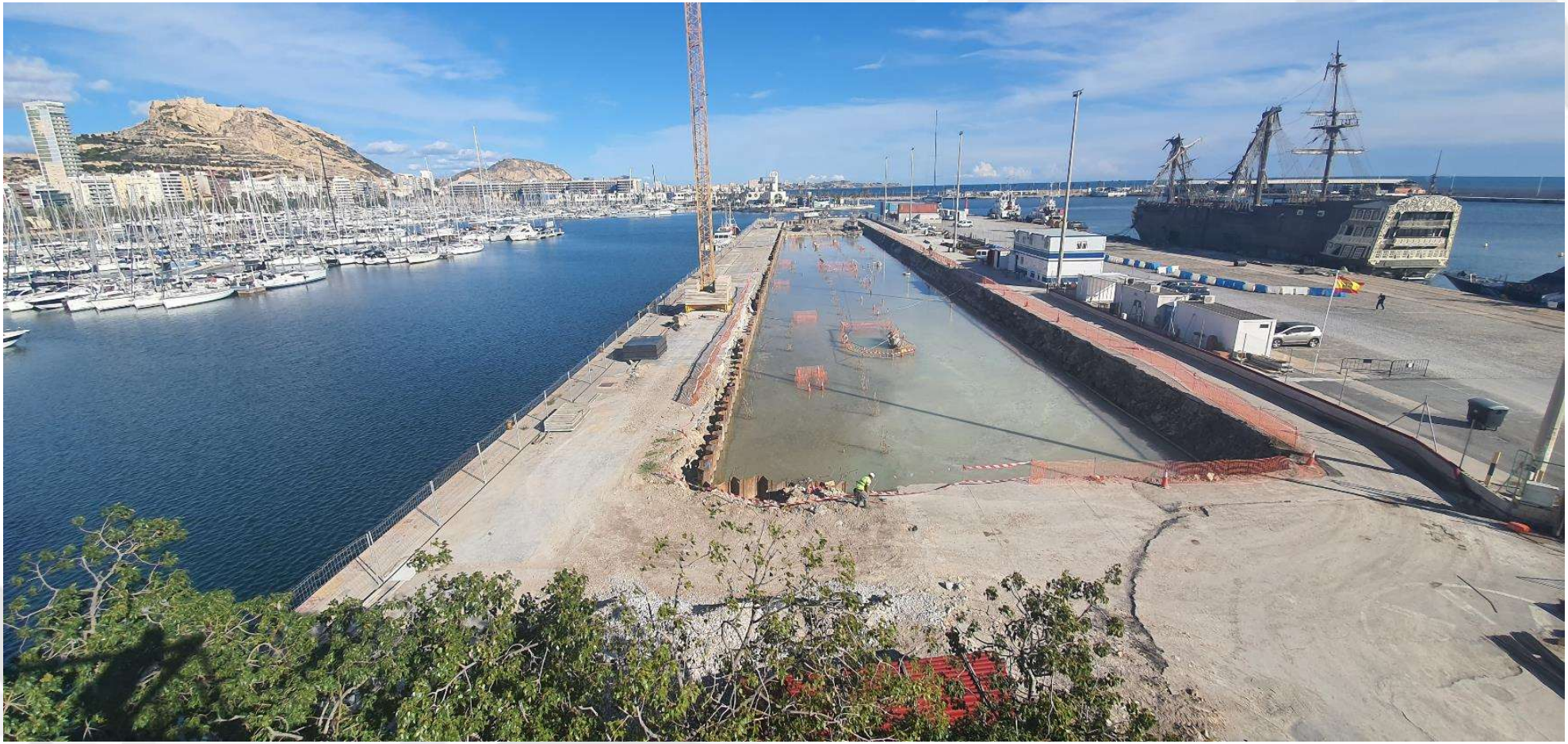
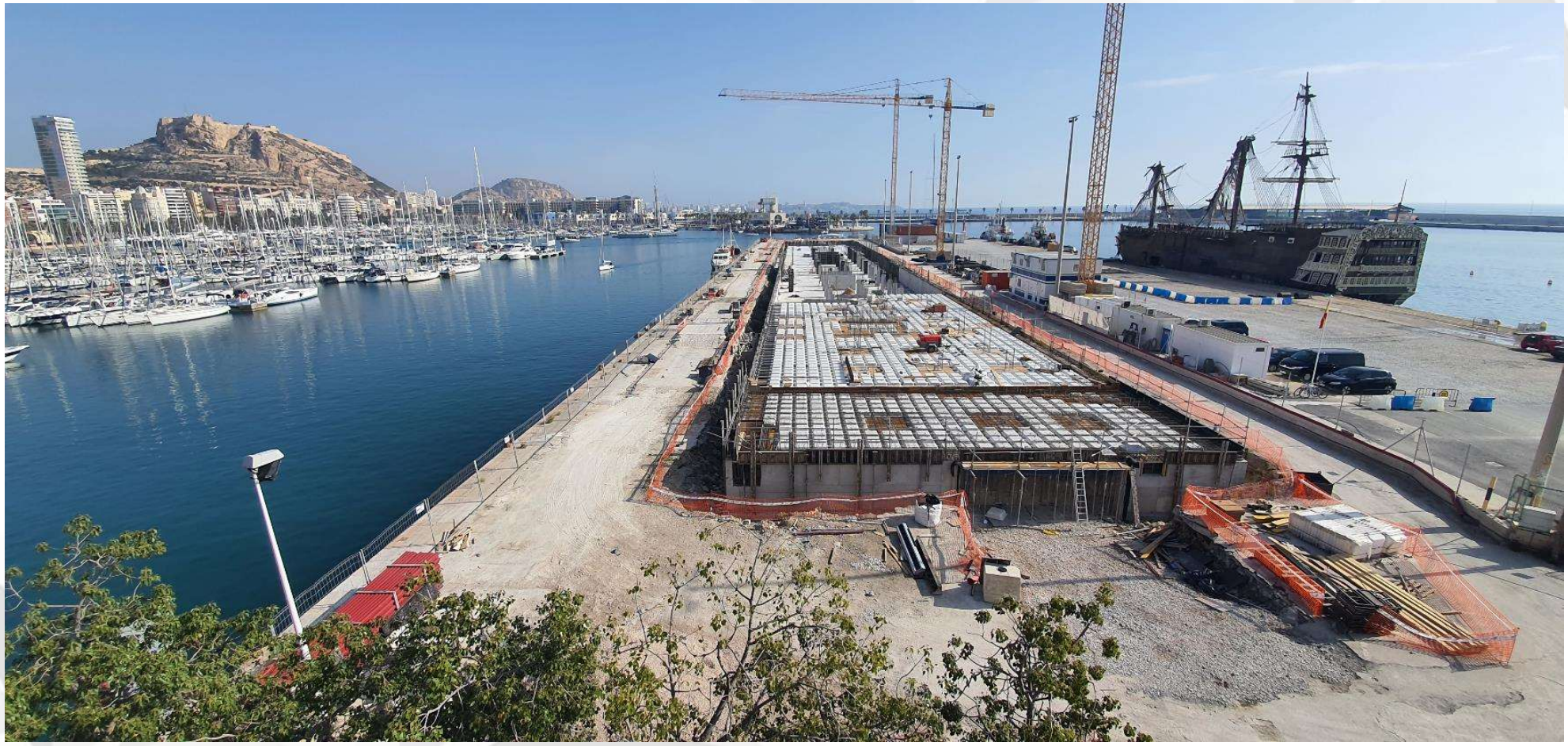
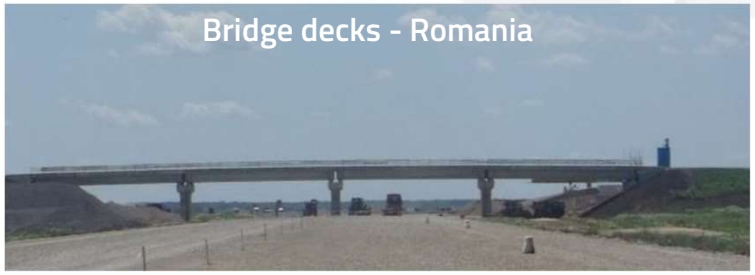


Local Projects

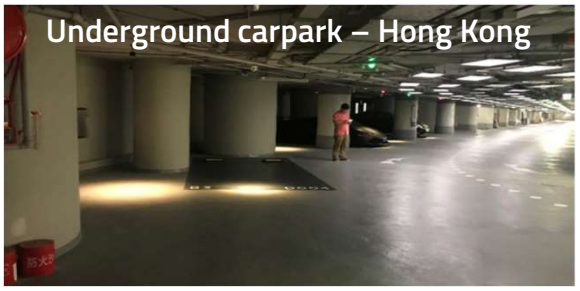


Krystaline International C-S-H Projects


Artificial lake - Bulgaria


Bridge decks - Romania


Water retaining dam - Peru


Underground carpark – Hong Kong


Underwater pour for museum - Poland


High-rise - India


Hospital - Spain


Seaside resort - South Africa


Wastewater treatment plant - Romania

Thank you very much!