<u>בחינת קרצינוגניות לחומר DURHAIT Crystal Ad 3000</u>

חברת 'סילטק – חברה קבלנית בע"מ' ביקשה לבחון האם החומר DURHAIT Crystal Ad 3000 או אחד ממרכיביו הינם קרצינוגניים או בעלי השפעות מסרטנות כלשהן. חומר זה מוגדר כמוסף איטום גבישי נוזלי אשר תוכנן לשמש מערכת איטום אינטגרלית ועמידה למים לכל אורך חיי הבטון (מתוך אתר החברה, www.sealtec.co.il).

החומר מתאים לפרויקטים שונים בבטון בהם ישנה דרישה לעמידות ולאיכות כאשר נדרשת עמידות מקסימלית למים.

אפליקציות אופייניות לחומר כוללות:

- מבנים ימיים כגון רציפים ומעגנים;
- סכרים, אגני מים, מבנים בהם אוגרים מים כגון בריכות שחיה;
- מנהרות ומבנים תת-קרקעיים;
- מתקנים לטיפול בפסולת;
- מרתפים ויסודות;
- בטון precast;
- מבנים למי נגר.

לצורך בחינה זו נמסרו לידי חברת הייעוץ 'אמירים' שני קבצים:

- קובץ גיליון בטיחות (SDS – Safety Data Sheet) של החומר, הכולל נתונים אודות החומר ואודות רכיביו;
- תוצאות אנליזות שונות אשר נערכו על ידי MPA Hannover.

להלן הממצאים:

1. <u>גיליון הבטיחות של החומר</u>

בגיליון הבטיחות של החומר, בסעיף 2 (זיהוי החומר, Hazards identification), אין סימון, פיקטוגרמה או משפטים המצביעים על כך שהחומר הינו מסרטן, חשוד כמסרטן או מהווה סיכון קרצינוגני.

בנוסף, בסעיף 11 לגיליון הבטיחות (Toxicological information), סעיף בו מתארים תוצאות בדיקות רעילות של החומר, רשום במפורש כי על בדיקות שונות שנעשו החומר אינו מסרטן ((Based on available data, the classification criteria are not met) (ר' עמוד 5 סעיף 11.1 בגיליון הבטיחות, נספח א').

על פי גיליון הבטיחות, החומר DURHAIT Crystal Ad 3000 מכיל Potassium carbonate, חומר איאורגני בעל הנוסחה K_2CO_3. מדובר במלח לבן המסיס במים ויוצר תמיסות אלקליות חזקות.

מלח זה נחשב לחומר מסוכן והוא בעל גיליון בטיחות, לפיו החומר אינו מוגדר כחומר מסרטן או כמעלה חשד לסרטן וכן הוא מאושר לשימוש על ידי ה- FDA (Food and Drug Administration) האמריקאי. גיליון הבטיחות של Potassium carbonate מצורף למסמך זה כנספח ב', אישור ה- FDA מצורף למסמך זה כנספח ג'.

כלומר, גם החומר DURHAIT Crystal Ad 3000 וגם מרכיבו העיקרי, Potassium carbonate, אינם קרצינוגניים או חשודים כמסרטנים.

2. <u>אנליזות MPH</u>

בכדי לקבל אישור לחומר בוצעו מגוון בדיקות, הכוללות:

- Flow table test על פי תקן DIN EN 12350-5:2019-09;
- Bulk density test על פי תקן DIN EN 12350-6:2019-09;
- Air content על פי תקן DIN EN 12350-7:2019-09;
- Compressive strength and bulk density על פי תקן DIN EN 12390-3:2019-10;
- Depth of penetration of water under pressure על פי תקן DIN EN 12390-8:2019-10;
- Determination of capillary adsorption על פי תקן DIN EN 13057:2002;
- Freeze-thaw-salt resistance על פי שיטת BAW-Merkblatt "Frostprufung von Veton", 2012;
- Chloride migration resistance על פי שיטת BAW-Merkblatt "Chlorideindringwiderstand von Beton (MCL)", 2004.

כלל בדיקות אלה אינן קשורות לבחינת קרצינוגניות החומר כי אם מדובר בבדיקות פיזיקליות של החומר. תוצאות הבדיקות מצורפות למסמך זה כנספח ד'.

3. <u>סיכום</u>

על פי הנתונים שהתקבלו ומבחינת הרכבת החומר ומאפייניו, נראה כי <u>החומר DURHAIT Crystal Ad 3000 אינו קרצינוגני ואינו חשוד כקרצינוגני</u>.

בברכה,

ד"ר טל גולן

ראש תחום הגנת סביבה

אמירים בריאות וסביבה

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052-3678355

נספחים

נספח א' - גיליון בטיחות של החומר DURHAIT Crystal Ad 3000.

נספח ב' – גיליון בטיחות של החומר Potassium carbonate.

נספח ג' – אישור FDA לחומר Potassium carbonate.

נספח ד' – אנליזות MPA לחומר DURHAIT Crystal Ad 3000.

נספח א'

גיליון בטיחות של החומר DURHAIT

Crystal Ad 3000

המעיין 4, ליגד סנטר 2, מודיעין 71724/ טל. 08-3730057 / פקס. 08-3730055
info@amirim-he.co.il / www.amirim-he.co.il

Safety data sheet

according to 1907/2006/EC, Article 31

Printing date 30.04.2020 *Version number 1.03* *Revision: 30.04.2020*

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SECTION 1: Identification of the substance/mixture and of the company/ undertaking

- **1.1 Product identifier**
- **Trade name: DURAHIT Crystal Ad 3000**
- **Article number:** 3652
- **1.2 Relevant identified uses of the substance or mixture and uses advised against**
No further relevant information available.
- **Application of the substance / the mixture** Construction chemicals
- **1.3 Details of the supplier of the safety data sheet**
- **Manufacturer/Supplier:**
Ha-Be Betonchemie GmbH
Stuevestrasse 39
31785 HAMELN, GERMANY
- **Further information obtainable from:** info@ha-be.com
- **1.4 Emergency telephone number:**
0049 5151 587-0
Only available during office hours.

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SECTION 2: Hazards identification

- **2.1 Classification of the substance or mixture**
- **Classification according to Regulation (EC) No 1272/2008**

GHS07

Skin Irrit. 2 H315 Causes skin irritation.
Eye Irrit. 2 H319 Causes serious eye irritation.

- **2.2 Label elements**
- **Labelling according to Regulation (EC) No 1272/2008**
The product is classified and labelled according to the CLP regulation.
- **Hazard pictograms**

GHS07

- **Signal word** Warning
- **Hazard statements**
H315 Causes skin irritation.
H319 Causes serious eye irritation.
- **Precautionary statements**

P264	Wash thoroughly after handling.
P280	Wear protective gloves / eye protection / face protection.
P302+P352	IF ON SKIN: Wash with plenty of soap and water.
P321	Specific treatment (see on this label).
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P332+P313	If skin irritation occurs: Get medical advice/attention.
P362+P364	Take off contaminated clothing and wash it before reuse.
P337+P313	If eye irritation persists: Get medical advice/attention.

- **2.3 Other hazards**
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.

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- **vPvB:** Not applicable.

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SECTION 3: Composition/information on ingredients

- **3.2 Chemical characterisation: Mixtures**
- **Description:**
mixture contains following components:
Mixture of substances listed below with nonhazardous additions.

- **Dangerous components:**

CAS: 584-08-7 EINECS: 209-529-3	potassium carbonate	Acute Tox. 4, H302; Eye Irrit. 2, H319	25-50%

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SECTION 4: First aid measures

- **4.1 Description of first aid measures**
- **General information:** Immediately remove any clothing soiled by the product.
- **After inhalation:**
In case of unconsciousness place patient stably in side position for transportation.
Supply fresh air; consult doctor in case of complaints.
Take affected persons into fresh air and keep quiet.
- **After skin contact:**
Immediately wash with water and soap and rinse thoroughly.
If skin irritation continues, consult a doctor.
- **After eye contact:** Rinse opened eye for several minutes under running water. Then consult a doctor.
- **After swallowing:** Drink plenty of water and provide fresh air. Call for a doctor immediately.
- **4.2 Most important symptoms and effects, both acute and delayed**
No further relevant information available.
- **4.3 Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

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SECTION 5: Firefighting measures

- **5.1 Extinguishing media**
- **Suitable extinguishing agents:** Use fire extinguishing methods suitable to surrounding conditions.
- **5.2 Special hazards arising from the substance or mixture**
Formation of toxic gases is possible during heating or in case of fire.
- **5.3 Advice for firefighters**
- **Protective equipment:**
Do not inhale explosion gases or combustion gases.
Wear self-contained respiratory protective device.

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SECTION 6: Accidental release measures

- **6.1 Personal precautions, protective equipment and emergency procedures**
Ensure adequate ventilation
Avoid formation of dust.
Wear protective equipment. Keep unprotected persons away.
- **6.2 Environmental precautions:**
Dilute with plenty of water.
Do not allow to enter sewers/ surface or ground water.
- **6.3 Methods and material for containment and cleaning up:**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Use neutralising agent.
Dispose contaminated material as waste according to item 13.

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Ensure adequate ventilation.
- **6.4 Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

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SECTION 7: Handling and storage

- **7.1 Precautions for safe handling**
Ensure good ventilation/exhaustion at the workplace.
Prevent formation of aerosols.
- **Information about fire - and explosion protection:** No special measures required.

- **7.2 Conditions for safe storage, including any incompatibilities**
- **Storage:**
- **Requirements to be met by storerooms and receptacles:** Store only in the original receptacle.
- **Information about storage in one common storage facility:** Not required.
- **Further information about storage conditions:** Keep container tightly sealed.
- **7.3 Specific end use(s)** No further relevant information available.

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SECTION 8: Exposure controls/personal protection

- **Additional information about design of technical facilities:** No further data; see item 7.

- **8.1 Control parameters**
- **Ingredients with limit values that require monitoring at the workplace:**
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.
- **Additional information:** The lists valid during the making were used as basis.

- **8.2 Exposure controls**
- **Personal protective equipment:**
- **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing
Wash hands before breaks and at the end of work.
Avoid contact with the eyes and skin.
- **Respiratory protection:**
Filter P1
In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use self-contained respiratory protective device.
- **Protection of hands:**

Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation
- **Material of gloves**
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

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- **Penetration time of glove material**
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
- **Eye protection:**

Tightly sealed goggles

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SECTION 9: Physical and chemical properties

- **9.1 Information on basic physical and chemical properties**
- **General Information**
- **Appearance:**
Form: Fluid
Colour: Colourless
- **Odour:** Characteristic
- **Odour threshold:** Not determined.
- **pH-value at 20 °C:** 11-13
- **Change in condition**
Melting point/freezing point: Undetermined.
Initial boiling point and boiling range: Undetermined.
- **Flash point:** Not applicable.
- **Flammability (solid, gas):** Not applicable.
- **Decomposition temperature:** Not determined.
- **Explosive properties:** Product does not present an explosion hazard.
- **Explosion limits:**
Lower: Not determined.
Upper: Not determined.
- **Vapour pressure:** Not determined.
- **Density at 20 °C:** 1.13-1.19 g/cm³
- **Vapour density** Not determined.
- **Evaporation rate** Not determined.
- **Solubility in / Miscibility with water:** Partly miscible.
- **Partition coefficient: n-octanol/water:** Not determined.
- **Viscosity:**
Dynamic: Not determined.
Kinematic: Not determined.
- **9.2 Other information** No further relevant information available.

SECTION 10: Stability and reactivity

- **10.1 Reactivity** No further relevant information available.
- **10.2 Chemical stability**
- **Thermal decomposition / conditions to be avoided:**
No decomposition if used according to specifications.
- **10.3 Possibility of hazardous reactions** No dangerous reactions known.
- **10.4 Conditions to avoid** No further relevant information available.

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- **10.5 Incompatible materials:** No further relevant information available.
- **10.6 Hazardous decomposition products:** Possible in traces.

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SECTION 11: Toxicological information

- **11.1 Information on toxicological effects**
- **Acute toxicity** Based on available data, the classification criteria are not met.

- **LD/LC50 values relevant for classification:**		
584-08-7 potassium carbonate		
Oral	LD50	1,870 mg/kg (rat)

- **Primary irritant effect:**
- **Skin corrosion/irritation**
Causes skin irritation.
- **Serious eye damage/irritation**
Causes serious eye irritation.
- **Respiratory or skin sensitisation** Based on available data, the classification criteria are not met.
- **CMR effects (carcinogenity, mutagenicity and toxicity for reproduction)**
- **Germ cell mutagenicity** Based on available data, the classification criteria are not met.
- **Carcinogenicity** Based on available data, the classification criteria are not met.
- **Reproductive toxicity** Based on available data, the classification criteria are not met.
- **STOT-single exposure** Based on available data, the classification criteria are not met.
- **STOT-repeated exposure** Based on available data, the classification criteria are not met.
- **Aspiration hazard** Based on available data, the classification criteria are not met.

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SECTION 12: Ecological information

- **12.1 Toxicity**
- **Aquatic toxicity:** LC50 (96h) = 2,6 mg/L (Oncorhynchus mykiss) (ECHA)
- **12.2 Persistence and degradability** No further relevant information available.
- **12.3 Bioaccumulative potential** No further relevant information available.
- **12.4 Mobility in soil** No further relevant information available.
- **Additional ecological information:**
- **General notes:**
Water hazard class 1 (German Regulation) (Self-assessment): slightly hazardous for water
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
Must not reach sewage water or drainage ditch undiluted or unneutralised.
Rinse off of bigger amounts into drains or the aquatic environment may lead to increased pH-values. A high pH-value harms aquatic organisms. In the dilution of the use-level the pH-value is considerably reduced, so that after the use of the product the aqueous waste, emptied into drains, is only low water-dangerous.
- **12.5 Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.
- **12.6 Other adverse effects** No further relevant information available.

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SECTION 13: Disposal considerations

- **13.1 Waste treatment methods**
- **Recommendation**
Must not be disposed together with household garbage. Do not allow product to reach sewage system.
- **Uncleaned packaging:**
- **Recommendation:** Disposal must be made according to official regulations.

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Trade name: DURAHIT Crystal Ad 3000

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- **Recommended cleansing agents:** Water, if necessary together with cleaning agents.

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SECTION 14: Transport information

- **14.1 UN-Number**
- **ADR, ADN, IMDG, IATA** Void
- **14.2 UN proper shipping name**
- **ADR, ADN, IMDG, IATA** Void
- **14.3 Transport hazard class(es)**
- **ADR, ADN, IMDG, IATA**
- **Class** Void
- **14.4 Packing group**
- **ADR, IMDG, IATA** Void
- **14.5 Environmental hazards:**
- **Marine pollutant:** No
- **14.6 Special precautions for user** Not applicable.
- **14.7 Transport in bulk according to Annex II of Marpol and the IBC Code** Not applicable.
- **Transport/Additional information:** Not dangerous according to the above specifications.
- **UN "Model Regulation":** Void

SECTION 15: Regulatory information

- **15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**
- **Directive 2012/18/EU**
- **Named dangerous substances - ANNEX I** None of the ingredients is listed.
- **REGULATION (EC) No 1907/2006 ANNEX XVII** Conditions of restriction: 3
- **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

SECTION 16: Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.
The above information describes exclusively the safety requirements of the product(s) and is based on our present-day knowledge. It does not represent a guarantee for the properties of the product(s) described in terms of the legal warranty regulations. Properties of the product are to be found in the respective product leaflet.

- **Relevant phrases**
H302 Harmful if swallowed.
H319 Causes serious eye irritation.
- **Abbreviations and acronyms:**
Acute Tox. 4: Acute toxicity - oral – Category 4
Skin Irrit. 2: Skin corrosion/irritation – Category 2
Eye Irrit. 2: Serious eye damage/eye irritation – Category 2

נספח ב'

גיליון בטיחות של החומר Potassium carbonate

המעיין 4, ליגד סנטר 2, מודיעין 71724/ טל. 08-3730057 / פקס. 08-3730055
info@amirim-he.co.il / www.amirim-he.co.il

SAFETY DATA SHEET

Creation Date 12-May-2011 **Revision Date** 24-Dec-2021 **Revision Number** 7

1. Identification

Product Name **Potassium Carbonate Anhydrous (Certified ACS)**

Cat No. : **P208-3; P208-250LB; P208-500**

CAS No 584-08-7
Synonyms Potash; Pearl ash; Dipotassium salt of carbonic acid

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Warning

Hazard Statements
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Storage
Store in a well-ventilated place. Keep container tightly closed
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Potassium carbonate	584-08-7	>95

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention if symptoms occur.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Get medical attention if symptoms occur.

Inhalation Remove to fresh air. If symptoms arise, call a physician. If not breathing, give artificial respiration.

Ingestion Do NOT induce vomiting. Get medical attention if symptoms occur.

Most important symptoms and effects No information available.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.
Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.

Hazardous Combustion Products
Carbon monoxide (CO). Carbon dioxide (CO_2). Potassium oxides.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	0	1	N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation. Avoid dust formation. Avoid contact with skin, eyes or clothing.
Environmental Precautions	Avoid release to the environment. See Section 12 for additional Ecological Information.
Methods for Containment and Clean Up	Sweep up and shovel into suitable containers for disposal. Avoid dust formation.

7. Handling and storage

Handling	Wear personal protective equipment/face protection. Ensure adequate ventilation. Avoid dust formation. Avoid contact with skin and eyes. Do not breathe dust. Do not ingest. If swallowed then seek immediate medical assistance.
Storage.	Keep containers tightly closed in a dry, cool and well-ventilated place. Incompatible Materials. Acids. Strong oxidizing agents. Halogens.

8. Exposure controls / personal protection

Exposure Guidelines	This product does not contain any hazardous materials with occupational exposure limitsestablished by the region specific regulatory bodies.
Engineering Measures	Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	White
Odor	Odorless
Odor Threshold	No information available
pH	11.5-12 50 g/l aq.sol
Melting Point/Range	891 °C / 1635.8 °F
Boiling Point/Range	No information available
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	No information available
Solubility	1120 g/L water (20°C)
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	C K2 O3
Molecular Weight	138.21

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under recommended storage conditions. Hygroscopic.

Conditions to Avoid Avoid dust formation. Incompatible products. Exposure to moisture.

Incompatible Materials Acids, Strong oxidizing agents, Halogens

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2), Potassium oxides

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Potassium carbonate	> 2000 mg/kg (Rat)	LD50 > 2000 mg/kg (Rabbit)	LC50 > 4.96 mg/L (Rat) 4.5 h

Toxicologically Synergistic No information available

Products

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Potassium carbonate	584-08-7	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects Not mutagenic in AMES Test

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains. .

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Potassium carbonate	Not listed	LC50 <510 mg/L/96h (Pimephales promelas)	Not listed	LC50: = 630 mg/L, 48h (Ceriodaphnia dubia)

Persistence and Degradability Soluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT Not regulated
TDG Not regulated
IATA Not regulated
IMDG/IMO Not regulated

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Potassium carbonate	584-08-7	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Potassium carbonate	584-08-7	X	-	209-529-3	X	X	X	X	X	KE-29083

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA Not applicable

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations Not applicable

U.S. Department of Transportation
Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Potassium carbonate	584-08-7	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Potassium carbonate	584-08-7	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 12-May-2011
Revision Date 24-Dec-2021
Print Date 24-Dec-2021
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

נספח ג'

אישור FDA לחומר Potassium carbonate

המעיין 4, ליגד סנטר 2, מודיעין 71724/ טל. 08-3730057 / פקס. 08-3730055
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[Code of Federal Regulations]
[Title 21, Volume 3]
[CITE: 21CFR184.1619]

TITLE 21--FOOD AND DRUGS
CHAPTER I--FOOD AND DRUG ADMINISTRATION
DEPARTMENT OF HEALTH AND HUMAN SERVICES
SUBCHAPTER B - FOOD FOR HUMAN CONSUMPTION (CONTINUED)

PART 184 -- DIRECT FOOD SUBSTANCES AFFIRMED AS GENERALLY RECOGNIZED AS SAFE

Subpart B - Listing of Specific Substances Affirmed as GRAS

Sec. 184.1619 Potassium carbonate.

(a) **potassium carbonate** (K_2CO_3, CAS Reg. No. 584-08-7) is produced by the following methods of manufacture:

(1) By electrolysis of potassium chloride followed by exposing the resultant potassium to carbon dioxide;

(2) By treating a solution of potassium hydroxide with excess carbon dioxide to produce **potassium carbonate** ;

(3) By treating a solution of potassium hydroxide with carbon dioxide to produce potassium bicarbonate, which is then heated to yield **potassium carbonate** .

(b) The ingredient meets the specifications of the Food Chemicals Codex, 3d Ed. (1981), p. 240, which is incorporated by reference. Copies are available from the National Academy Press, 2101 Constitution Ave. NW., Washington, D.C. 20418, or available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: *http://www.archives.gov /federal_register/code_of_federal_regulations/ibr_locations.html.*

(c) In accordance with § 184.1(b)(1), the ingredient is used in food with no limitation other than current good manufacturing practice. the affirmation of this ingredient as generally recognized as safe (GRAS) as a direct human food ingredient is based upon the following current good manufacturing practice conditions of use:

(1) The ingredient is used in food as a flavoring agent and adjuvant as defined in § 170.3(o)(12) of this chapter; nutrient supplement as defined in § 170.3(o)(20) of this chapter; pH control agent as defined in § 170.3(o)(23) of this chapter; and processing aid as defined in § 170.3(o)(24) of this chapter.

(2) The ingredient is used in food at levels not to exceed current good manufacturing practice.

(d) Prior sanctions for this ingredient different from the uses established in this section do not exist or have been waived.

[48 FR 52442, Nov. 18, 1983]

(מתוך אתר ה- FDA, www.accessdata.fda.gov, עודכן לאחרונה ב- 17 לאוקטובר 2023).

נספח ד'

אנליזות MPA לחומר DURHAIT

Crystal Ad 3000

המעיין 4, ליגד סנטר 2, מודיעין 71724/ טל. 08-3730057 / פקס. 08-3730055
info@amirim-he.co.il / www.amirim-he.co.il

Materialprüfanstalt Hannover
Bauwesen und Produktionstechnik

Test report no. 203472

1st copy of 30 October 2020

Ordering party:	Ha-Be Betonchemie GmbH Stüvestraße 39 31785 Hameln
Date of commission:	10.08.2020 / Mr Husmann
Subject of commission:	Tests regarding the efficiency of water resisting admixture for concrete Product: DURAHIT® Crystal Ad 3000 (DM)

The test report contains 17 pages.

The testing material is used up.

Materialprüfanstalt für das Bauwesen und Produktionstechnik
Nienburger Straße 3 · 30167 Hannover, GERMANY
Contact Dipl.-Ing. A. Giese
Direct dial +49 511 762-5815
E-mail a.giese@mpa-hannover.de
Internet www.mpa-hannover.de

1. General

The ordering party has assigned MPA HANNOVER to perform tests regarding the efficiency of water resisting admixture for concrete in comparison to a reference concrete. The scope of the tests to be carried out has been determined by the ordering party and is set out in section 3. This test report states the results of the tests.

2. Delivery of samples

On 26.06.20, 01.07.2020 and 15.07.20 were delivered by an employee of the ordering party:

9 pcs.	Concrete cubes, L x B x H = 150 x 150 x 150 mm³	
2 pcs.	Concrete plates, L x B x H = 200 x 200 x 120 mm³	
3 pcs.	Concrete cylinders, D x H = 100 x 150 mm²	
5 pcs.	Concrete plates, L x B x H = 150 x 150 x 70 mm³	
1 pcs.	Concrete plate, L x B x H = 400 x 400 x 120 mm³	
	with following information:	
	Date of production	24.06.2020
	Mixture no.	Reference

And on 19.08.20 and 24.08.20:

12 pcs.	Concrete cubes, L x B x H = 150 x 150 x 150 mm³	
2 pcs.	Concrete plates, L x B x H = 200 x 200 x 120 mm³	
3 pcs.	Concrete cylinders, D x H = 100 x 150 mm²	
5 pcs.	Concrete plates, L x B x H = 150 x 150 x 70 mm³	
	with following information:	
	Date of production	18.08.2020
	Mixture no.	Ad 3000

3. Scope

The scope of performed tests listed in Table 1. The tests were performed each at the Reference concrete and at the concrete produced with the water resisting admixture DURAHIT® Crystal Ad 3000 (DM).

Table 1: Scope of testing

Test ID	Type of test	Age of sample	No. of samples
1	Flow table test DIN EN 12350-5:2019-09	5 min, 30 min	1 each
2	Bulk density DIN EN 12350-6:2019-09	20 min	1
3	Air content DIN EN 12350-7:2019-09	20 min	1
4	Compressive strength and bulk density DIN EN 12390-3:2019-10	2, 7 and 28 d	3
5	Depth of penetration of water under pressure DIN EN 12390-8:2019-10	28 d	2
6	Determination of capillary adsorption DIN EN 13057:2002	> 28 d	3
7	Freeze-thaw-salt resistance BAW-Merkblatt „Frostprüfung von Beton“, 2012	28 d	5
8	Chloride migration resistance BAW-Merkblatt „Chlorideindringwiderstand von Beton (MCL)“, 2004	56 d	3

4. Results

4.1 Manufacture of samples

The samples were produced according to DIN EN 12390-2:2019-08 in the laboratory of Ha-Be Betonchemie GmbH, Hameln by witness of a representative of MPA HANNOVER. A forced mixer Zyklos ZK 50 was used for the mixing. The mixing time was 2 min after water addition. The water resisting admixture and the superplasticizer were added separately. The compositions of mixtures are listed in Table 2. All test specimens as well as the fresh grout tests were prepared from three mixtures each.

Table 2: Composition of mixtures

		Reference		Ad 3000	
Raw material		Quantity	Mass kg/m³	Quantity	Mass kg/m³
Cement	-	-	350	-	350
Water	-	-	175	-	167
w/c-ratio	-	-	0.50	-	0.48
Sand 0-2 mm	M.-% of aggregate	35	679	35	679
Gravel 2-8 mm		30	566	30	566
Gravel 8-16 mm		35	673	35	673
DURAHIT® Crystal Ad 3000 (DM)	M.-% of water	-	-	5.20	8.30
PANTARHIT® RC683 (FM)	M.-% of cement	0.30	1.05	0.70	2.45

4.2 Bulk density of fresh concrete, air content and flow table test

The properties of fresh concrete were determined according to DIN EN 12350-5 (flow table test), DIN EN 12350-6 (bulk density) and 12350-7 (air content). The results are listed in Table 3.

Table 3: Results of test on fresh concrete

		Reference	Ad 3000
Air temperature	°C	20	20
Flow table test A after water addition in mm	5 min	520	520
	30 min	420	450
Fresh concrete temperature	°C	24	24
Bulk density of fresh concrete	kg/dm³	2.30	2.33
Air content	Vol.- %	2.9	2.6

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4.3 Compressive strength and bulk density

The determination of compressive strength was carried out 2, 7 days and 28 days after casting according to DIN EN 12390-3 at 3 cubes each with 150 mm edge length. The means values of the results are shown in Table 4. Details of the tests are listed in Appendix A1.

Table 4: Results of test of compressive strength according to DIN EN 12390-3, mean values

		Reference		Ad 3000	
Samples no.	Age d	Bulk density kg/m³	Compressive strength $f_{c,cube}$ MPa	Bulk density kg/m³	Compressive strength $f_{c,cube}$ MPa
1-3	2	2330	42.4	2330	45.7
4-6	7	2330	51.9	2350	54.3
7-9	28	2320	57.5	2340	62.7

4.4 Depth of penetration of water under pressure

The depth of penetration of water under pressure was carried out according to DIN EN 12390-8 at 2 plates each with the dimensions of 200 x 200 x 120 mm. The age of samples was 30 days at the begin of testing. The results of the tests are shown in Table 5. The spread of water at the cracking surfaces is shown in Appendix A2.

Table 5: Results of depth of penetration of water according to DIN EN 12390-8

	Reference	Ad 3000
Sample no.	maximal depth of penetration mm	maximal depth of penetration mm
1	17	12
2	12	14
Mean	**15**	**13**

4.5 Capillary adsorption

The resistance of capillary absorption was determined according to DIN EN 13057 on three samples each with a height of 50 mm and a diameter of 104 mm. The results are listed in Table 6. Details of the tests are listed in Appendix A3.

Table 6: Test results of resistance of capillary absorption, mean values

		Reference	Ad 3000
Water uptake after 24 h	kg/m²	3.03	2.02
Absorption coefficient S_{24h}	kg/m²*h$^{0.5}$	0.62	0.41
Resistance coefficient R_{2h}	h/m²	1800	12000

4.6 Freeze-thaw-salt resistance

4.6.1 Preparation for testing

The test of the freeze-thaw resistance was carried out according to BAW-Merkblatt „Frostprüfung von Beton", version 2012. The samples were sawn, measured and prepared for testing, approximately 7 days before the start of the test. The lateral faces were glued with an aluminium foil with butyl bonding. The specimens were stored in a climate chamber at a temperature of 20 °C and a relative humidity of 65 % until testing. The weights of the specimens were determined before and after sealing of the lateral faces.

4.6.2 Capillary suction

After preparing of the specimens and the pre-storage described above, the specimens were place into the test containers on spacers with a height of 10 mm with the test surface facing the bottom. Then a test solution consisting of 3-percent sodium chloride solution was filled into the containers up to a height of 15 mm so that the specimens were immersed 5 mm depth into the test solution. The increase in weight of the test specimens was measured after two, five and seven days of storage in the test solution.

4.6.3 Freeze-thaw testing

The test specimens together with the test containers and the present test liquid were placed into a temperature-controlled chest with liquid cooling bath and subjected to freeze-thaw testing according to the test specification mentioned in section 1. One freeze-thaw cycle lasts 12 hours. Beginning at + 20 °C, the temperature was lowered in 4 hours with a constant cooling rate to –20 °C. Then it was left to cool for 3 hours at this temperature and within 4 hours increased to +20 °C again and subsequently held for one hour. The specimens were taken from the chest in specific intervals and the water uptake, the surface scaling and the dynamic E-modulus were determined according to test specification. The results of the freeze-thaw test are compiled in Table 7 as mean values. Details of the tests are listed in Appendix A4.

Table 7: Results of the test of Freeze-thaw-salt resistance, mean values

		Surface scaling in g/m²		rel. dyn. E-modulus in %	
		Reference	Ad 3000	Reference	Ad 3000
Frost-thaw cycle	0	0	0	100	100
	4	88	153	99	98
	10	660	1020	98	97
	14	1185	1807	98	94
	18	1691	2563	97	92
	24	2370	3563	97	87
	28	2790	4425	97	84

4.7 Chloride migration resistance

The determination of the chloride migration resistance was performed according to BAW-Merkblatt „Chlorideindringwiderstand von Beton“, version 2012. The cubes were continuously stored under water after manufacturing. Cylinders with a diameter of 100 mm were drilled out from the samples approx. 7 days before testing. A layer of 10 mm was removed from the upper edge by sawing. A test area parallel saw cut was made at a height of approx. 50 ± 5 mm measured from the test surface. The test specimens were stored in a water bath at 20 °C until testing and were installed and tested in migration cells at the start of the test. The chloride migration coefficients calculated from the test results are shown in Appendix A4 and Table 8.

Table 8: Chloride migration coefficients

Sample no.	Chloride migration coefficient x 10^{-12} [m²/s]	
	Reference	Ad 3000
1	13.5	8.5
2	14.5	9.0
3	12.3	8.4
Mean value D_{CL}	**13.5**	**8.6**
Max. individual value $D_{CL.max}$	14.5	9.0

Depending on the given exposure class, the mean values and maximum individual values of migration coefficients given in Table 9 must be complied in accordance with BAW-Merkblatt "Chlorideindringwiderstand von Beton“, version 2012.

Table 9: Mean values to be complied with and the maximum permissible individual values of the migration coefficients as a function of the exposure class

Given exposure class acc. DIN EN 206-1 /DIN 1045-2	Migration coefficient	
	Mean value	*Max. individual value*
-	x 10^{-12} [m²/s]	x 10^{-12} [m²/s]
XS 1, XD 1	≤ 10.0	≤ 12.0
XS 2, XD 2		
XS 3, XD 3	≤ 5.0	≤ 7.0

Hanover, 30 October 2020

Head of Testing Institute

(ORR Dr.-Ing. H. Höveling)

Contact

(Dipl.-Ing. A. Giese)

Materialprüfanstalt Hannover MPA HANNOVER Bauwesen und Produktionstechnik

APPENDIX

Appendix A1: Test of compressive strength

Appendix A1-1: Results of test of compressive strength according to DIN EN 12390-3, Reference

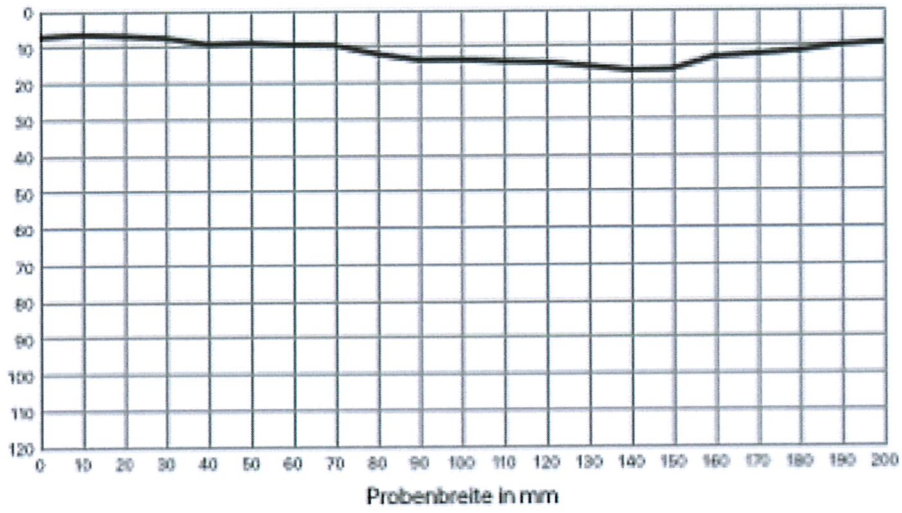
Date of casting:									24.06.2020
Sample	Dimensions			Age	Mass	Bulk density	max. load F	Compressive strength	
	Length	Width	Height					$f_{c,dry}$	$f_{c,cube}$
no.	mm	mm	mm	d	kg	kg/m³	kN	N/mm²	
1	150	151	150		7.95	2330	965	-	42.5
2	150	151	150	2	7.94	2320	956	-	41.9
3	150	151	150		7.93	2340	966	-	42.7
Mean:						**2330**	**-**	**-**	**42.4**
4	150	151	150		7.90	2330	1199	-	53.0
5	150	152	150	7	7.95	2330	1198	-	52.7
6	150	151	150		7.85	2330	1125	-	49.9
Mean:						**2330**	**-**	**-**	**51.9**
7	150	151	150		7.85	2320	1416	62.6	57.6
8	150	152	150	28	7.93	2320	1407	61.7	56.8
9	150	151	150		7.94	2320	1437	63.2	58.1
Mean:						**2320**	**-**	**62.5**	**57.5**

Appendix A1-2: Results of test of compressive strength according to DIN EN 12390-3, AD 3000

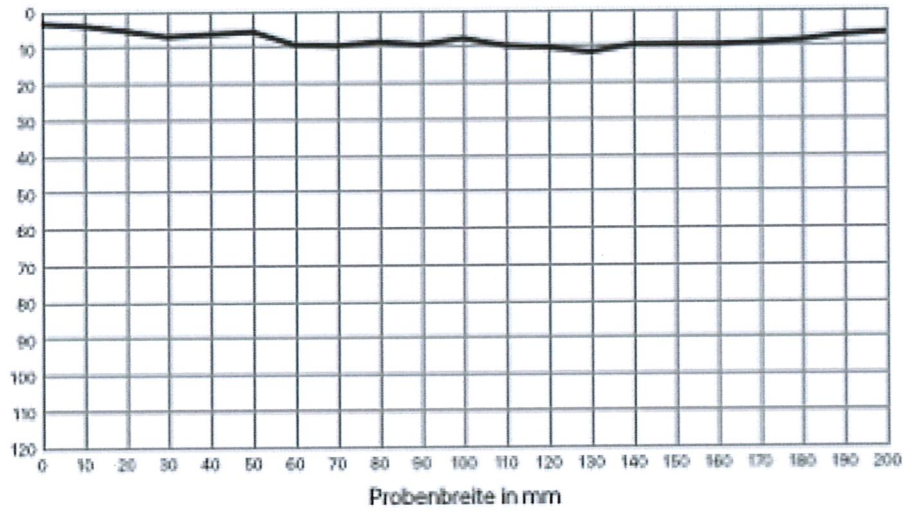
Date of casting:									18.08.2020
Sample	Dimensions			Age	Mass	Bulk density	max. load F	Compressive strength	
	Length	Width	Height					$f_{c,dry}$	$f_{c,cube}$
no.	mm	mm	mm	d	kg	kg/m³	kN	N/mm²	
1	150	150	150		7.89	2340	1031	-	45.8
2	150	152	150	2	7.91	2320	1032	-	45.4
3	151	152	150		8.03	2330	1049		45.8
Mean:						**2330**	**-**	**-**	**45.7**
4	150	151	150		7.99	2350	1244	-	54.8
5	150	151	150	7	7.94	2350	1222	-	54.0
6	150	150	150		7.94	2360	1213	-	53.9
Mean:						**2350**	**-**	**-**	**54.3**
7	150	152	150		8.00	2340	1538	67.5	62.1
8	150	151	150	28	7.94	2340	1533	67.7	62.3
9	150	152	150		8.02	2340	1582	69.3	63.8
Mean:						**2340**	**-**	**68.2**	**62.7**

Appendix A2: Depth of penetration of water

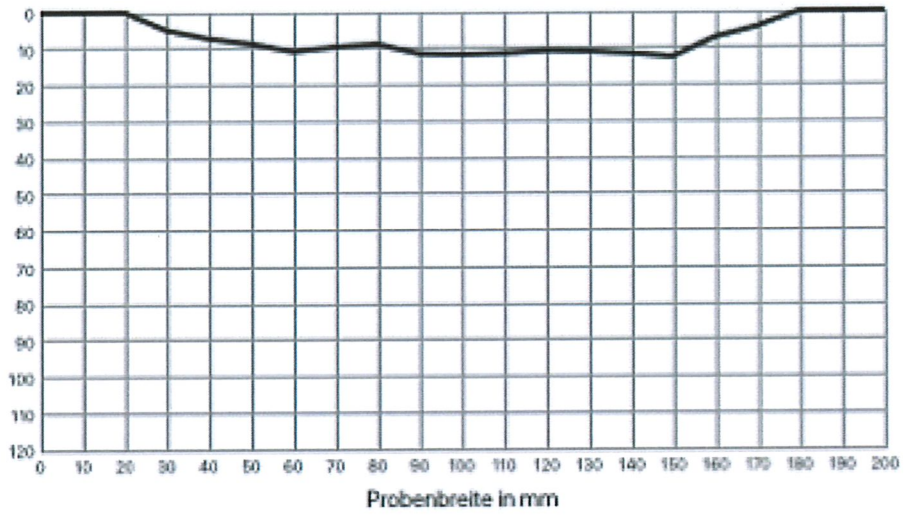
Appendix A2-1: Depth of penetration of water, Reference: 1, max. depth of penetration t = 17 mm



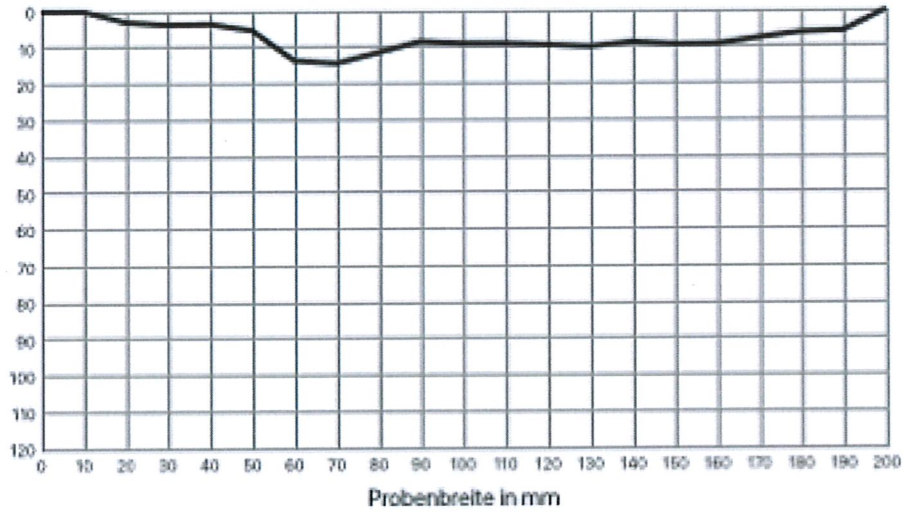
Appendix A2-2: Depth of penetration of water, Reference: 2, max. depth of penetration t = 12 mm



Appendix A2-3: Depth of penetration of water, AD 3000: 1, max. depth of penetration t = 12 mm



Appendix A2-4: Depth of penetration of water, AD 3000: 2, max. depth of penetration t = 14 mm

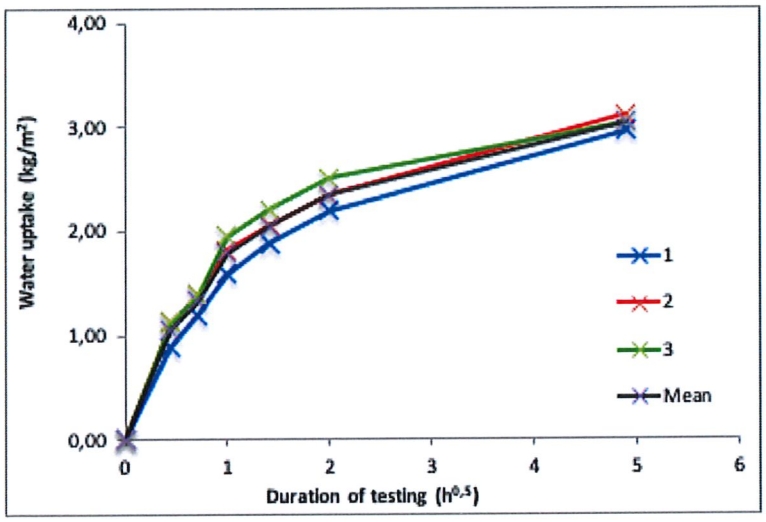


Appendix A3: Capillary adsorption

Appendix A3-1: Test results of capillary absorption, Reference
Production of samples: 24.06.2020
Time of testing: 19.08.2020 - 20.08.2020

Sample no.	Duration of testing (h)							absorption coefficient	resistance coefficient
	0	0.2	0.5	1	2	4	24	S_{24h}	R_{2h}
	Water uptake (kg/m²)							kg/m²*h$^{0.5}$	h/m²
1	0.00	0.90	1.20	1.59	1.88	2.19	2.96	0.60	1800
2	0.00	1.13	1.39	1.83	2.05	2.34	3.11	0.63	1900
3	0.00	1.13	1.39	1.96	2.20	2.51	3.04	0.62	1700
Mean	**0.00**	**1.05**	**1.33**	**1.79**	**2.05**	**2.35**	**3.03**	**0.62**	**1800**

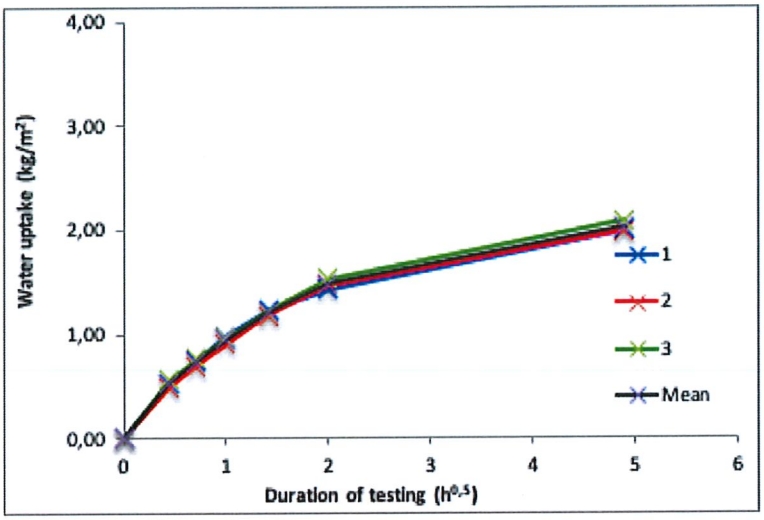
Appendix A3-2: Graph of the capillary absorption, Reference



Appendix A3-3: Test results of capillary absorption, Ad 3000
Production of samples: 18.08.2020
Time of testing: 01.10.2020 - 02.10.2020

Sample no.	Duration of testing (h)							absorption coefficient	resistance coefficient
	0	0.2	0.5	1	2	4	24	S_{24h}	R_{2h}
	Water uptake (kg/m²)							kg/m²*h$^{0.5}$	h/m²
1	0.00	0.53	0.74	0.98	1.22	1.43	1.99	0.41	11000
2	0.00	0.49	0.69	0.91	1.18	1.47	1.98	0.40	13000
3	0.00	0.57	0.77	0.97	1.21	1.53	2.08	0.43	12000
Mean	**0.00**	**0.53**	**0.73**	**0.95**	**1.21**	**1.48**	**2.02**	**0.41**	**12000**

Appendix A3-4: Graph of the capillary absorption, Ad 3000



Appendix A4: Freeze-thaw-salt testing

Appendix A4-1: Dimensions and mass for specimen preparation. Reference

Specimen			1	2	3	4	5
Weight	without belt	g	2892	2837	2838	2879	2926
	with belt		2952	2896	2898	2938	2985
Dimensions w/o sealing	Length	mm	151	151	150	151	150
	Width		114	114	113	113	113
	Height		73	71	71	73	74

Appendix A4-2: Water uptake. Reference

Begin of test:									22.07.2020
Probe	after d		1	2	3	4	5	**Mean**	Standard deviation
Capillary suction in d	-7	M.- %	-0.22	-0.22	-0.24	-0.24	-0.21	**-0.23**	0.02
	-5		-0.06	-0.05	-0.06	-0.05	-0.04	**-0.05**	0.01
	-2		-0.01	-0.01	-0.02	-0.01	-0.01	**-0.01**	0.00
	0		0.00	0.00	0.00	0.00	0.00	**0.00**	0.00
Frost-thaw cycle	4		0.13	0.15	0.10	0.14	0.11	**0.13**	0.02
	10		0.23	0.27	0.20	0.27	0.22	**0.24**	0.03
	14		0.25	0.32	0.23	0.31	0.24	**0.27**	0.03
	18		0.30	0.33	0.27	0.37	0.29	**0.31**	0.03
	24		0.36	0.39	0.39	0.43	0.35	**0.38**	0.03
	28		0.40	0.42	0.41	0.48	0.38	**0.42**	0.03

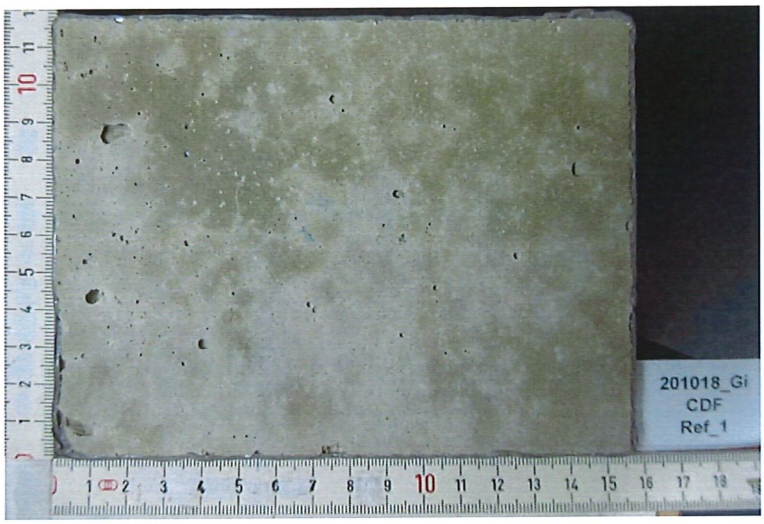
Appendix A4-3: Relative dynamic E-modulus of the specimens, Reference

Frost-thaw cycle	Relative dynamic E-modulus in %						
	1	2	3	4	5	**Mean**	Standard deviation
0	100	100	100	100	100	**100**	0.0
4	99	99	99	100	98	**99**	0.6
10	98	98	99	99	98	**98**	0.8
14	98	98	98	99	97	**98**	0.6
18	97	97	98	98	97	**97**	0.7
24	96	96	98	98	96	**97**	1.0
28	95	96	97	98	96	**97**	1.2

Appendix A4-4: Surface scaling of the specimens by weathering, Reference

Frost-thaw cycle	Surface scaling in g/m²						
	1	2	3	4	5	**Mean**	Standard deviation
0	0	0	0	0	0	**0**	0
4	61	109	139	83	50	**88**	36
10	459	782	959	650	450	**660**	217
14	919	1323	1520	1208	956	**1185**	253
18	1395	1800	2041	1752	1464	**1691**	263
24	2110	2420	2727	2488	2102	**2370**	266
28	2511	2823	3135	2974	2504	**2790**	280
95 % - quantile after 28 frost-thaw cycles						**3386**	---

Appendix A4-5: Sample before testing, Reference



Appendix A4-6: Sample after testing, Reference

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Appendix A4-7: Dimensions and mass for specimen preparation, Ad 3000

Specimen			1	2	3	4	5
Weight	without belt	g	2697	2782	2730	2708	2712
	with belt		2758	2843	2790	2770	2773
Dimensions w/o sealing	Length	mm	151	150	151	150	150
	Width		108	109	108	109	108
	Height		71	73	72	71	72

Appendix A4-8: Water uptake. Ad 3000

Begin of test:									16.09.2020
Probe	after d		1	2	3	4	5	**Mean**	Standard deviation
Capillary suction in d	-7	M.- %	-0.30	-0.32	-0.32	-0.37	-0.38	**-0.34**	-0.03
	-5		-0.05	-0.06	-0.07	-0.07	-0.07	**-0.07**	-0.01
	-2		0.00	-0.02	-0.03	-0.01	-0.01	**-0.01**	0.00
	0		0.00	0.00	0.00	0.00	0.00	**0.00**	0.00
Frost-thaw cycle	4		0.22	0.22	0.19	0.22	0.23	**0.22**	0.01
	10		0.41	0.43	0.33	0.39	0.38	**0.39**	0.01
	14		0.64	0.66	0.46	0.60	0.57	**0.58**	0.05
	18		0.76	0.56	0.41	0.67	0.57	**0.59**	0.10
	24		0.98	0.75	0.56	0.94	0.81	**0.81**	0.14
	28		1.35	1.02	0.93	1.20	1.03	**1.10**	0.13

Appendix A4-9: Relative dynamic E-modulus of the specimens, Ad 3000

Frost-thaw cycle	Relative dynamic E-modulus in %						
	1	2	3	4	5	**Mean**	Standard deviation
0	100	100	100	100	100	**100**	0.0
4	98	98	98	98	99	**98**	0.3
10	97	95	98	96	97	**97**	1.2
14	93	93	96	93	94	**94**	1.3
18	88	93	96	91	93	**92**	2.9
24	81	90	93	85	88	**87**	4.6
28	79	88	90	78	86	**84**	5.4

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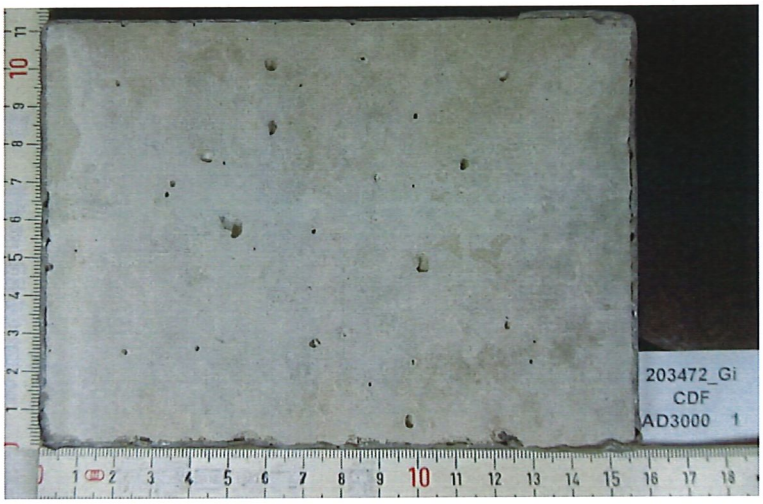
Appendix A4-10: Surface scaling of the specimens by weathering, Ad 3000

Frost-thaw cycle	Surface scaling in g/m²						
	1	2	3	4	5	**Mean**	Standard deviation
0	0	0	0	0	0	**0**	0
4	194	102	166	152	153	**153**	33
10	1183	779	1145	1051	942	**1020**	164
14	1939	1616	1934	1841	1702	**1807**	143
18	2871	2096	2788	2625	2436	**2563**	310
24	3830	3070	3824	3630	3460	**3563**	315
28	4578	3940	4669	4600	4338	**4425**	299
95 % - quantile after 28 frost-thaw cycles						**5062**	---

Appendix A4-11: Sample before testing, Ad 3000



Appendix A4-12: Sample after testing, AD 3000

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Appendix A5: Chloride migration

Appendix A5-1: Measured values of the test, Reference

Sample no.	Test start		Test end		Amperage start	Amperage end	Duration of test
	Date	Time	Date	Time	mA	mA	h
1	19.08.20	19:00	20.08.20	06:00	79.8	76.7	11.00
2	19.08.20	19:00	20.08.20	06:00	79.1	74.5	11.00
3	19.08.20	19:00	20.08.20	06:00	74.7	70.5	11.00

Sample no.	Test liquid		Test sample				
	Temperature		Height	Diameter	Mass after		Bulk density Water storage
	Start	End			Water storage	Testing	
	°C	°C	mm	mm	g	g	[kg/m³]
1	25.3	25.7	51.8	99.6	933.00	934.80	-
2	25.3	25.7	51.5	99.6	932.57	934.13	-
3	25.3	25.7	52.8	99.6	929.64	931.47	-

Penetration depths:

[mm]	Sample 1 half 1	Sample 1 half 2	Sample 2 half 1	Sample 2 half 2	Sample 3 half 1	Sample 3 half 2
Point 1	22.9	21.6	18.3	19.9	17.9	16.1
Point 2	18.0	15.9	17.0	13.3	12.0	11.0
Point 3	13.2	11.8	17.1	13.3	14.0	11.0
Point 4	14.8	9.8	14.2	16.9	12.8	14.2
Point 5	15.2	14.8	18.8	14.8	12.8	14.8
Point 6	12.1	14.9	17.1	12.5	10.0	13.1
Point 7	13.5	13.0	14.3	11.9	11.8	11.4
Point 8	12.0	13.1	12.5	13.5	12.7	13.5
Point 9	15.1	13.6	16.7	16.5	12.0	12.9
Point 10	15.1	18.0	13.1	15.2	15.9	12.9
Point 11	16.8	17.1	14.8	15.7	12.8	13.3
Mean value x_d	**14.2**	**13.9**	**15.9**	**14.3**	**12.6**	**12.8**
Max. value x_{max}	16.8	15.9	18.8	16.9	14.0	14.8

Remark: Blue values were not included in the evaluation!

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Appendix A5-2: Measured values of the test. AD 3000

Sample no.	Test start		Test end		Amperage start	Amperage end	Duration of test
	Date	Time	Date	Time	mA	mA	h
1	13.10.20	07:45	13.10.20	16:20	67.9	60.7	8.58
2	13.10.20	07:45	13.10.20	16:20	72.6	65.4	8.58
3	13.10.20	07:45	13.10.20	16:20	81.1	76.8	8.58

Sample no.	Test liquid		Test sample				
	Temperature		Height	Diameter	Mass after		Bulk density Water storage
	Start	End			Water storage	Testing	
	°C	°C	mm	mm	g	g	[kg/m³]
1	20.5	20.9	48.0	100.0	867.82	866.23	-
2	20.5	20.7	48.0	100.0	856.91	855.67	-
3	20.5	21.2	48.0	100.0	853.82	851.45	-

Penetration depths:

[mm]	Sample 1 half 1	Sample 1 half 2	Sample 2 half 1	Sample 2 half 2	Sample 3 half 1	Sample 3 half 2
Point 1	14.9	15.9	12.9	16.1	22.5	23.1
Point 2	9.5	11.9	9.2	8.2	5.6	7.3
Point 3	11.4	10.5	8.1	10.2	5.5	5.9
Point 4	8.4	9.0	8.5	6.4	6.3	6.7
Point 5	5.6	8.3	2.6	2.5	6.6	6.5
Point 6	7.3	6.2	5.9	6.6	7.2	7.0
Point 7	7.4	6.7	7.2	7.9	11.5	7.9
Point 8	5.0	4.9	7.9	9.0	11.4	11.9
Point 9	6.1	2.9	7.9	8.9	9.6	9.6
Point 10	2.1	3.8	11.9	9.9	7.4	7.4
Point 11	10.7	11.8	17.8	13.4	21.7	32.9
Mean value x_d	**7.6**	**8.2**	**8.3**	**8.4**	**7.9**	**7.8**
Max. value x_{max}	11.4	11.9	9.2	10.2	11.5	11.9

Remark: Blue values were not included in the evaluation!

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