ABOUT US

Proposal: E-0189-Golspie Flood Action
Date: 17/06/2026
Reference: E-0189-0288-PRP-0002-A









ARC marine is a nature tech company specialising in the design and installation of Nature-Inclusive Design for marine infrastructure.

For 10+ years, ARC marine has supported clients across offshore energy, coastal defence, fisheries and habitat restoration, integrating ecological function directly into essential marine assets. Our work transforms conventional marine infrastructure into stable, biodiverse systems that enhance ecosystem resilience whilst meeting demanding engineering, commercial and regulatory requirements.

ARC marine operates as a full turnkey delivery partner. We provide integrated services spanning ecological assessment, Nature-Inclusive Design development, advanced engineering and modelling, manufacturing, offshore deployment guidance and long-term monitoring. This allows clients to engage with a single partner across the full project lifecycle, from early feasibility through to construction, operation and long-term performance.

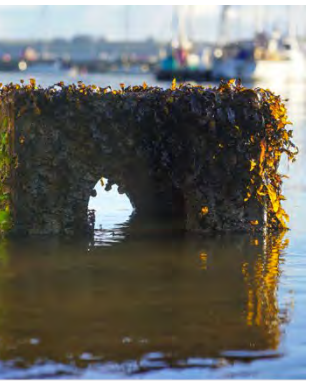
Our capability is underpinned by substantial in-house capability, including dedicated ecology and testing facilities, hydrodynamic and structural modelling, OrcaFlex/CFD simulation, offshore survey equipment, proprietary deployment frames and advanced digital design and prototyping tools. This depth of technical control enables rapid iteration, high levels of assurance and consistent delivery across complex marine projects.

ARC marine's work is independently validated through peer-reviewed research, recognised quality and environmental management systems and internationally respected certification, including multiple ISO standards and B Corp status.

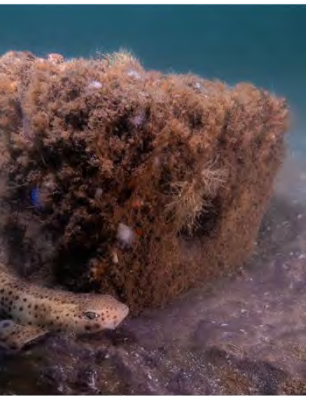
Beyond project delivery, ARC marine plays an active role in shaping industry best practice. We co-authored PAS 1401:2025, the UK's first code of practice for Nature-Inclusive marine structures, helping embed ecological value from the earliest stages of marine infrastructure design.

WHY CHOOSE ARC?

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Proven leadership in Nature-Inclusive Design
ARC marine has over 10 years of experience delivering Nature-Inclusive Design across a wide range of marine projects, from sensitive habitat restoration and fisheries enhancement to large-scale coastal and infrastructure schemes.
We are trusted by clients, delivery partners and regulators to integrate ecological function into marine assets while maintaining high standards of engineering performance, safety and compliance. Our role is to translate environmental ambition into practical, deliverable solutions that perform in real-world marine conditions.

Designed for diverse project environments
ARC marine works across highly varied operating contexts, from remote conservation sites to complex, regulated infrastructure projects.
We collaborate closely with designers, contractors, communities and stakeholders to ensure Nature-Inclusive Design solutions align with local conditions, programme constraints, construction methodologies and operational requirements. This flexibility allows projects with very different objectives and sensitivities to achieve strong environmental outcomes without introducing unnecessary risk, disruption or complexity.

Reducing consenting and stakeholder risk
By embedding Nature-Inclusive Design directly into project delivery, ARC marine helps strengthen regulatory confidence, simplify consenting pathways and build durable support with stakeholders and local communities.
This approach reduces reliance on secondary mitigation and creates a clearer, more defensible environmental narrative across the project lifecycle.

Whole-life value and long-term confidence
ARC marine supports projects in delivering lasting environmental performance alongside core functional and engineering outcomes.
In appropriate conditions and subject to approvals, Nature-Inclusive structures may remain in situ beyond operational life, helping reduce decommissioning scope, future cost exposure and environmental disturbance. This whole-life perspective provides asset owners and project partners with greater certainty around long-term environmental and commercial performance.

Science-led assurance
ARC marine provides scientific and technical assurance through in-house expertise, specialist monitoring equipment and long-term data collection. This evidence base supports internal decision-making, regulatory engagement and long-term asset stewardship across diverse project types.

MADE FROM 98% RECYCLED MATERIALS

100% PLASTIC FREE

LOW CARBON - CONTAINS NO PORTLAND CEMENT

CERTIFIED AS NON-TOXIC TO THE MARINE ENVIRONMENT

ENCOURAGES MARINE GROWTH / BIODIVERSITY

MARINE CRETE MIX: AC30
MASS IN AIR: 5,900kg (APPROX)
VOLUME OF MARINE CRETE: 2.56m^3

PORT HOLES AND INTERNAL CHAMBER FOR MULTIPLE HABITAT ENHANCEMENT BENEFITS

COLOUR
LIGHT-GREY, CAN BE CUSTOMISED WITH ECO-FRIENDLY ADDITIVES

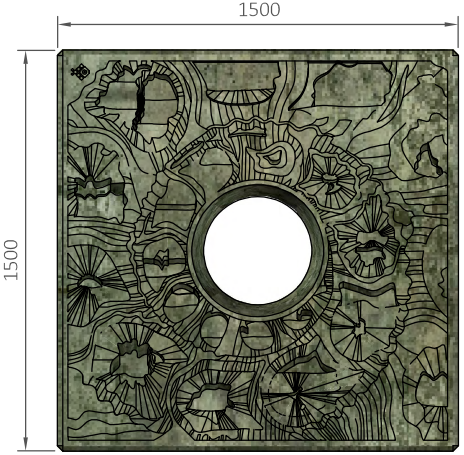
MACRO-TEXTURED FEATURES
CREATES HABITAT AND ENCOURAGES REEF CREATION
DIFFERENT COMBINATIONS OF FEATURES AVAILABLE TO SUIT THE TARGET SPECIES

KRIB KARN MACRO TEXTURE SHOWN
KRIB KARN SURFACE AREA INCREASE FACTOR = 1.38





PLAN VIEW



SIDE VIEW

ECOLOGICAL FEATURES

- 4-OFF EXPOSED UPPER ROCK POOLS
- SIDE PANELS WITH ROUGHENED TEXTURES INCLUDING:
  - CREVICES
  - CRACKS
  - UNDERCUTS CREATING "MICROPOOLS"
  - OVERHANGS
  - PASSAGES
  - HOLES
  - PITS
  - MICROTEXTURE
- 1-OFF LARGE SHADED INTERNAL POOL

CUSTOMISATIONS

CUSTOM VARIATIONS AVAILABLE ON REQUEST:

- CUSTOM OVERALL, CHAMBER AND PORT SIZES
- LIFTING INSERTS CAN BE INCLUDED
- CHANGE OF SURFACE TEXTURE
- HIGHER DENSITY MARINE CRETE MIXES
- SCALLOP/OYSTER SHELL VENEER



MICRO-TEXTURED SURFACES
INCREASES SURFACE AREA FURTHER
PROMOTES GROWTH ON SUBSTRATE



RC1500	1060	490	0.71	0.32	10	16.903	23.270	14.086	19.392	2.56	5883	2622	3261	[NOTE 3 - 7]
Reef cube® SIZE [mm]	CHAMBER DIAMETER, A [mm]	OUTER PORT DIAMETER, B [mm]	CHAMBER / SIZE RATIO, ζ	PORT / SIZE RATIO, ξ	PORT DRAFT ANGLE, θ [°]	SURFACE AREA - NO TEXTURE [m^2]	SURFACE AREA - KRIB KARN TEXTURE [m^2]	ON SEABED SURFACE AREA - NO TEXTURE [m^2]	ON SEABED SURFACE AREA - KRIB KARN TEXTURE [m^2]	VOLUME MARINE CRETE [m^3]	MASS IN AIR [kg]	BUOYANCY [kgf]	SUBMERGED WEIGHT [kgf]	NOTES

reef cube® PROPERTIES

NOTES
1. FOR BULK ORDERS ARC MANUFACTURES LOCALLY HENCE PRODUCT DENSITIES ARE SUBJECT TO LOCAL VARIATION OF THE SUSTAINABLY SOURCED AGGREGATE.
2. CARBON FOOTPRINT VARIES WHEN LOCALLY SOURCED MATERIALS ARE APPLIED.
3. ALL SIZES SPECIFIED AS +/- 5 MM.
4. reef cube® SIZES MAY VARY DEPENDING ON THE SELECTED TEXTURE.
5. MASSES ARE CALCULATED BASED ON UNTEXTURED reef cubes®.
6. MASSES IN THE TABLE ARE APPROXIMATE AND SUBJECT TO VARIATION BASED ON DENSITY AND LOCAL MATERIALS USED DURING PRODUCTION
7. ON SEABED SURFACE AREAS ASSUME 1-SIDE OF THE CUBE SURFACE AND PORT HOLE IS SMOTHERED AND THEREFORE NOT AVAILABLE FOR HABITAT DEVELOPMENT.

INTELLECTUAL PROPERTY

1. PCT/GB2017/053678 - Artificial reef method- UK Patent granted reference GB2557321. Filed in national phase in the E.U, Australia, USA, Mexico, Brazil, India, China, Japan, South Korea and Saudi Arabia (including new city NEOM).

2. Divisional of Application 1620752.4 - Manufacturing method for reef cubes®. UK stage on file, currently filing for PCT.

REVISION HISTORY

REV.	DESCRIPTION OF REVISION	DATE	DRAWN	ENG'D	NID'D	APP'D
A	ISSUED FOR ARC PRODUCT VAULT	APR 2024	HS	HS	SH	JM
B	UPDATED WITH NEW TEXTURES	OCT 2025	KD	HS	SH	JM

REFERENCE DRAWINGS

DRAWING No.	TITLE
V-0004-0000-DWG-0002	Reef cube® handling - single
V-0013-0000-SPD-0001	AC30 Mix Testing Results

ARC marine®

"Every marine project can now leave a positive sustainable legacy that enhances marine habitat"

CLIENT:

DEFAULT TOLERANCES U.N.O:
FABRICATION
0-100mm = ±2.0mm
OVER 100mm = ±5mm
ANGULAR = ± 0.5°
MACHINING

SURFACE FINISH ROUGH TEXTURE AGGREGATE FINISH UNLESS SPECIFIED OTHERWISE

ALL DIMENSIONS IN MM

THIRD ANGLE PROJECTION

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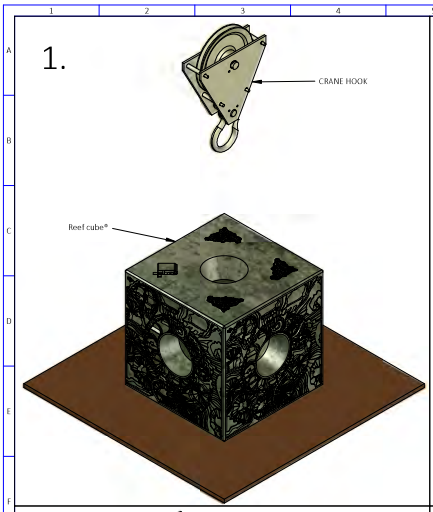
SCALE A1
-

ASSET: -
PROJECT: ARC STANDARD
TITLE: INTERTIDAL Reef cube®

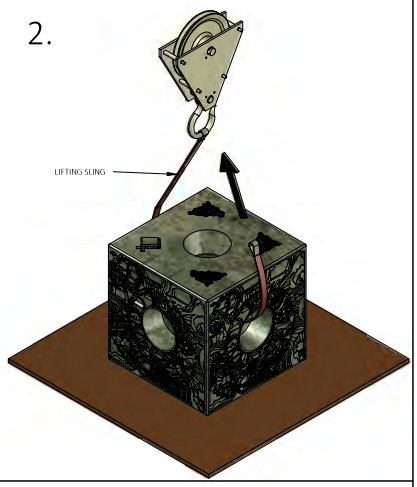
CLIENT DWG No: -
REVISION -

ARC MARINE DWG No: V-0004-0000-DWG-0003
REVISION B

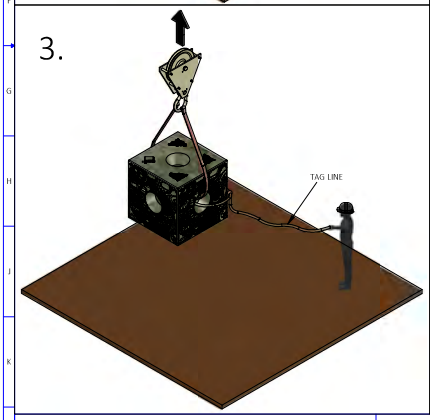
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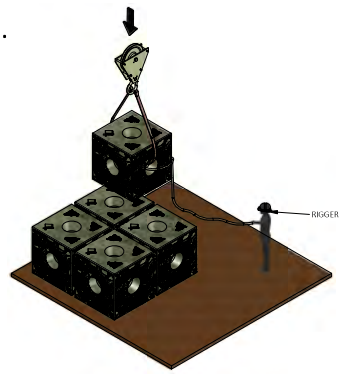
2.



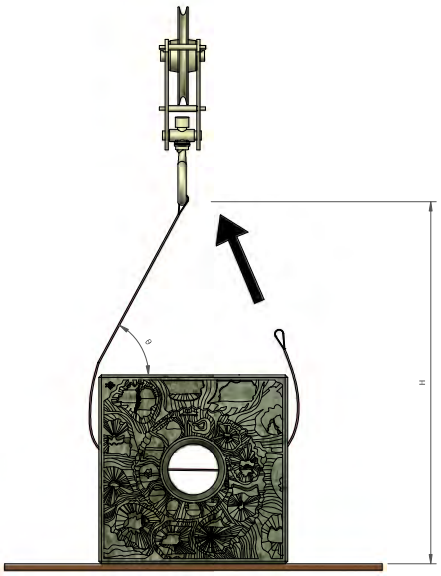
3.



4.



5.



1. Reef cube® READY TO BE LIFTED
2. LIFTING EQUIPMENT FED THROUGH Reef cube® PORT HOLES
3. Reef cube® LIFTED WITH TAG LINE TO CONTROL LOAD
4. Reef cube® POSITIONED AND LOWERED
5. MINIMUM DIMENSIONS ACCORDING TO RIGGING TABLE

RIGGING TABLE

Reef cube® SIZE [mm]	Reef cube® WEIGHT IN AIR [kgf]	RECOMMENDED LIFTING ANGLE, θ [°]	MINIMUM RECOMMENDED RIGGING HEIGHT, H [mm]	MINIMUM RECOMMENDED SLING LENGTH, L [mm]	MINIMUM SLING SAFE WORKING LOAD [kgf]	RECOMMENDED SLING
RC1500, 5 PORT	5884	60	2799	5518	10000	10te SWL soft sling with 6m EWL
RC1500, 6 PORT	5306	60	2799	5518	10000	10te SWL soft sling with 6m EWL
RC1000	1541	60	1866	3520	4000	4te SWL soft sling with 4m EWL
RC750	471	60	1400	2635	2000	2te SWL soft sling with 3m EWL
RC500	150	60	933	1790	1000	1te SWL soft sling with 2m EWL

NOTES

1. LIFTING EQUIPMENT AND RIGGING AT CLIENTS DISCRETION TO BE ASSESSED BY COMPETENT PERSON AND NOT SPECIFIED BY ARC MARINE®.
2. CHECK ALL UNITS AND EQUIPMENT BEFORE USE TO ENSURE NO DEFECTS PRESENT.
3. ENSURE LIFT PLAN IN PLACE PRIOR TO LIFTING.
4. RECOMMEND THE USE OF SLING WEAR SLEEVES OR PADDING WHERE SLING IS IN CONTACT WITH CONCRETE TO PROTECT RIGGING.
5. STORAGE OF REEF CUBES® IS RECOMMENDED NOT TO EXCEED TWO UNITS HIGH. UNITS STACKED ON TOP OF EACH OTHER SHOULD BE FULLY SUPPORTED AND NOT OVERHANG. SUFFICIENT ACCESS TO BE ENSURED TO ENABLE SAFE STORAGE AND HANDLING.

REVISION HISTORY

REV.	DESCRIPTION OF REVISION	DATE	DRAWN	ENG'D	MID'D	APP'D
A	INITIAL DRAWING	09/04/24	KD	HS	XXX	JM
B	UPDATED DRAWING	23/07/24	KD	DR	XXX	HS
C	UPDATED DRAWING	JAN-26	KA	DR	-	HS

REFERENCE DRAWINGS

DRAWING No.	TITLE
V-0004-0000-DWG-0003	Intertidal Reef cube®
V-0006-0000-DWG-0002-A	Subtidal Reef cube®

ARC marine®
ACCELERATING REEF CREATION

CLIENT:

ALL DIMENSIONS IN MM

THIRD ANGLE PROJECTION

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ASSET: -

PROJECT: ARC STANDARD

TITLE: Reef cube® HANDLING - SINGLE

CLIENT DWG No: - REVISION -

SCALE A1 -

ARC MARINE DWG No: V-0004-0000-DWG-0002 REVISION C



WORLD'S LEADING ULTRA LOW-CARBON NATURE INCLUSIVE DESIGN REEF SOLUTION

Reef cubes® - A new era for nature inclusive design and marine habitat creation for subtidal and intertidal environments. Featuring unique ultra low-carbon and plastic-free properties for habitat rejuvenation, subsea scour protection, fisheries enhancement and coastal defence solutions.

Designed and produced by ARC marine® using its proprietary Marine crete construction, 98% recycled materials, zero plastics and developed using targeted Nature Inclusive Design (NID) principles. Reef cubes® can reduce CO_2 levels by 50-100kg p.tonne and are designed to increase specific marine life populations and local biodiversity levels.







ARC marine®
ACCELERATING REEF CREATION

arcmarine.co.uk

MANAGEMENT SYSTEM CERTIFICATION DNV ISO 9001 • ISO 14001 ISO 45001

Certified B Corporation

Reef cubes®

THE MOST ECOLOGICAL AND TECHNOLOGICALLY ADVANCED REEF AVAILABLE



SCIENTIFICALLY BACKED AND LOCATION SPECIFIC NATURE-INCLUSIVE DESIGN (NID) TEXTURED FINISH

ULTRA LOW-CARBON

98% RECYCLED MATERIALS AND ZERO PLASTICS

STRENGTHS OF 15-60 MPa WITH A DENSITY OF 2,350kg/m^3

AN INTRODUCTION

ARC stands for Accelerating Reef Creation – a principle brought to life through the innovative design of the Reef cubes®, developed through continuous research and development since 2015.

With a unique 3D textured finish, each Reef cube® is engineered with nature-inclusive design at its core. The design is fully customisable based on deployment location, target species, and sea state conditions.

Passageway diameters can also be tailored to suit specific species requirements.

Beyond its ecological benefits, the Reef cube® serves as an effective and environmentally friendly solution for scour protection around offshore wind turbines, cables, CPS, jacket legs, pipelines and any other subsea infrastructure exposed to impact or scour.

Localised manufacturing near deployment sites minimises both timeframes and the CO_2 footprint typically associated with traditional rock transport.

Our in-house team of engineering and marine scientists collaborate closely with clients to ensure the design meets project-specific requirements, always with a strong focus on biodiversity net gain - creating thriving habitats and supporting marine life across global waters.

Reef cubes® – the most advanced, multi-purpose, and effective reef solution available.

FEATURES AND BENEFITS

Nature Inclusive Design -
Fully customised textured finish to target growth of local marine species and increase biodiversity levels. Designed in accordance with PAS1401:2025

Eco-engineering -
Ultra low-carbon and plastic free

Global application -
Available in a variety of sizes and all made in country using locally sourced raw materials to keep carbon footprint to a minimum

Lifespan -
Due to its Marine crete construction, Reef cubes® are more impermeable and resistant to salt water and chemical erosion than standard Ordinary Portland Cement - thus increasing lifespan and durability over competitors concrete products

Multi use -
Reef rejuvenation, habitat creation, scour protection, mooring blocks, Eco-tourism - with no decommissioning requried

Peer reviewed -
Currently peer reviewed by 3 x external sources, with a further 2 more yet to be published

Intertidal and subtidal uses -
Reef cubes® from the RC1500 upwards feature an intricate rock pool features in both the top and sides of the cube design. This makes them an ideal solution in intertidal regions which allows pools of water to remain on the cube to host and shelter small marine life, even when the tide has gone out and the cube is fully exposed

REEF CUBES® SPECIFICATIONS

Available in multiple sizes:
From 15cm side - 2m side
For specific product sizes see table below

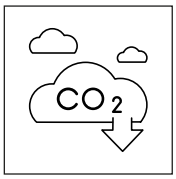
Top surfaces:
Nature Inclusive Design /
Optional subtidal rock pools

Strength:
15-60 MPa

Density:
2,350 kg/m^3

Emissions:
Ultra low-carbon

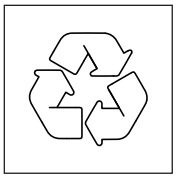
Materials:
98% Recycled and meets
EU leachate testing standards



ULTRA LOW-CARBON - Manufactured using ARC marine's patented materials, an ultra low-carbon alternative to Ordinary Portland Cement, significantly reducing embodied carbon compared to conventional concrete.



PLASTIC FREE - Containing absolutely zero plastics to make it as pollutant free as possible.



98% RECYCLED MATERIALS - Produced using locally sourced recycled materials we are able to provide a minimum 91% carbon saving before adding our further carbon reducing Marine crete solution.

REEF CUBES® WEIGHTS & DIMENSIONS - Length/Width/Height (mm)

	RC150	RC350	RC500	RC750	RC1000	RC1500	RC2000
Size (mm)	155 x 155 x 160	350 x 350 x 350	468 x 468 x 500	720 x 720 x 750	1,000 x 1,000 x 1,000	1,500 x 1,500 x 1,520	2,000 x 2,000 x 2,220 est.
Weight (kg)	8kg	79kg	150kg	470kg	1090kg	5306kg	11500kg

TRUSTED BY

bp · RWE · EDF · Boskalis · The Crown Estate · sse · TotalEnergies · wsp · Cefas · Natural England



10+ YEARS OF ACCELERATING REEF CREATION THROUGH NATURE-INCLUSIVE DESIGN.

FEATURED IN

BBC · World Economic Forum · ITV

AWARDS

Offshore Achievement Awards Winner 2022

RWE Ecology Award 2022

Subsea Expo Awards Technology Development 2025

ARC marine — Accelerating Reef Creation

arcmarine.co.uk

DNV ISO 9001 · ISO 14001 · ISO 45001

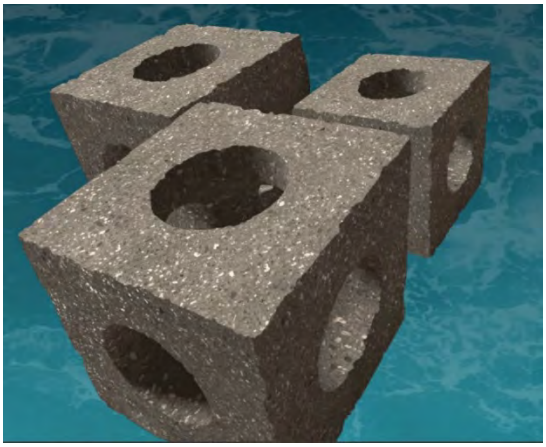
Certified B Corporation

SGS INTRON B.V.

December, 2020

Letter of confirmation

Environmental quality of concrete Reef Cubes®



ARC Marine produces concrete products (Reef Cubes®) to be used in marine environment.
All the aggregates used in the concrete mix are of 100% recycled origin as a by-product from the quarrying industry.

In order to prove that the environmental quality of the (Reef Cubes®) concrete products meets high standards, SGS INTRON tested the organic content and the release of heavy metals and salts. For the assessment of the environmental quality of the Reef Cubes® the legislation in the Netherlands is used.

The Dutch Soil Quality Decree ensures the protection of the environment (soil and water). An assessment is made with the test results (leaching and organic content) of this concrete type on the maximum limits set in the Dutch Soil Quality Decree (SQD). The performed leaching tests, column test (EN 16637-3) and dynamic surface leaching test (tank test EN 16637-2) show very low release and comply to the limits of the SQD for the shaped product.
Since the Reef Cubes® are used in a marine environment the leaching test was performed in seawater. In this salt environment the concrete was assessed to be durable according to the SQD limit for shaped products.

The release of heavy metals and salts from crushed concrete products (Reef Cubes®) also complies to the SQD for aggregates in unbound application. Based on this aspect:

- There is no environmental risk due to wearing of the Reef Cubes® concrete in the seawater construction
- the Reef Cubes® concrete can be reused in a second life cycle as aggregates in civil engineering works without environmental risks.

The test results are documented in SGS INTRON report A116090-R20201244.