



CLAS SLU

Concrete Layer Assistance & Survey

BREAKWATER SOLUTION™

1 BACKGROUND AND DEFINITION

Artificial concrete blocks are the most economical, reliable and strongest technology for the construction of breakwaters. The know-how is not widespread and the sellers of the licenses of the artificial blocks do not freely disseminate their knowledge. We speak of a “technological niche”. There is no school to train engineers and technicians in the implementation of these blocks.

The consequence is that sometimes projects experience difficulties with serious consequences:

- Financial failures for the construction company which loses money because its construction is slow and sometimes even refused.
- Technical failure when the blocks break and the structures deteriorate rapidly.

Indeed, certain risks are poorly controlled by license sellers who are not construction professionals and the support they provide under their license agreement is insufficient for some companies that need full-time assistance.

CLAS has developed a quality certification activity which includes full-time support for the company, monitoring compliance with the design of the works and the technology. But our know-how goes beyond that, because we have laid, inspected and appraised more than 1,000,000 armour blocks in over 20 years, in real situations and not just in the laboratory.

Our know-how integrates the notion of interlocking and intrinsic stability of each block, as well as the breakage of the blocks after installation, if certain rules are ignored or incorrectly applied.

On the other hand, most of these blocks are no longer protected by the patent and have fallen into the public domain, they can be used by anyone, subject to not infringing the registered trademarks, the lapse of which is not limited in time.

It is in this general context that CLAS created the concept and the brand **BREAKWATER SOLUTION™**

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BREAWATER SOLUTION™ is the formula whose application guarantees:

- Staff safety,
- The durability of the works,
- The speed of construction,
- The supply of a block without patent protection, without the risk of trademark infringement and without a license to pay.

2 SAFETY

CLAS is to date the only company independent of license sellers and maritime works companies, specializing in the construction of breakwaters with artificial blocks such as ACCROPODE™, ACCROPODE™II, CORELOC™, ECOPODE™, X-bloc ® and all blocks from the BREAWATER SOLUTION™ range called BS1, BS2, BS3 and BS4.

CLAS inspectors are all IMCA and HSE approved divers and CLAS is a company certified for Hyperbaric Work by BCS (COFRAC). We are construction specialists, control specialists and trainers. Unlike license vendors, CLAS provides safety training for personnel involved in the construction of breakwaters using these blocks. CLAS inspectors supervise the teams and adapt the safety procedures to the equipment and specificities of each site.



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3 SUSTAINABILITY OF STRUCTURES

The BREAWATER SOLUTION™ concept includes the full-time presence of a CLAS inspector on site or even a team responsible for placing the blocks. Thus, companies are no longer alone in facing the many problems that are bound to appear.

For more than twenty years of full-time presence on construction sites, we have been confronted with all situations and have always found the right solutions. It is this experience that we put at your service. Our technical reference and the assistance of our permanent inspectors, provide a reliable solution to avoid the accumulation of installation faults regardless of the block used.

Our inspectors check each construction area several times a day and this avoids having to rebuild part of the breakwater.

We control in real time:

- The underlayer and the granulometry of the materials actually put in place and not just the truck loading slips.
- The placement of the armour blocks several times a day,
- The perfect interlocking of the blocks to avoid any movement after installation in addition to the usual rules.

At the end of the construction of each section, we issue a certificate of conformity based on filmed evidence that the construction is sound and the durability of the breakwater guaranteed within the limits of the design criteria.

The project thus monitored receives CLASS A certification, which proves that the breakwater conforms to the design tested on the 2D and 3D models, conforms to the technology and above all, conforms to the sustainability objectives required by the client.

4 SPEED OF CONSTRUCTION

CLAS inspectors join the construction teams. Our inspectors are specialists in the construction of breakwaters and do only that. They know how to give advice that will avoid mistakes. If necessary, they can place the blocks themselves to help you overcome a difficult passage or give a boost to a project. We also provide you with a complete installation team which greatly increases the speed of construction.

The placing teams, supervised by a CLAS inspector, achieve unparalleled production because we have been doing it for more than twenty years.

It is now the norm to see 3 or 4 blocks placed per hour, part of which will then be dismantled because of

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their poor interlocking. The reality is very far from the productions indicated by the license merchants. This is due to the incorrect use of the installation tools, or unsuitable installation tools and the difficulty of understanding a DIT that is not very explanatory. It also comes from the poor training and lack of supervision of the teams, who do not know how to identify non-conformities in real time or do not understand them. The productions carried out with the full-time assistance of a CLAS inspector are more of the order of 6 to 15 blocks per hour, correctly placed and approved, depending on their size and the machines used. Production depends on the size of the blocks, the placing machines, the quality of the underlayer and the visibility in the water.

Throughout the duration of the work, at the request of the company and in partnership with it, the CLAS inspectors can lead training meetings and meetings with the project manager and the contracting authority, to present the progress work and answer all questions.

5 CONFIDENTIALITY

There is no confidentiality associated with the **BREAWATER SOLUTION™** concept, as there are no difficulties that should be hidden or that the company could not have overcome. A permanent follow-up of the construction makes it possible to avoid the difficulties or to solve them gradually as they appear.

An additional advantage of the **BREAWATER SOLUTION™** concept is that there is no conflict, neither during nor after the construction of the breakwater if our recommendations are applied. Any technical issues that arise are resolved immediately.

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6 LICENCE-FREE BLOCKS

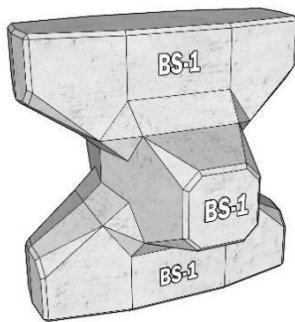
French regulations, but also international ones, in principle set the duration of protection granted by a patent at 20 years. There are exceptions for drugs. This is the general case which also applies to artificial blocks intended for the construction of breakwaters. But you have to be careful, the patent is not the only protection. There is also trademark protection that applies to these concrete blocks. We recognize that a name corresponds to a registered trademark by the application of the ™ or ® logos following the name. To have the right to use these names and the services offered by the license sellers, you must pay a fee per m³ of concrete used on the project. For a large project, this can represent a sum that greatly exceeds the fees of CLAS for full-time support by an accredited consultant. This is why we have decided to create the legal framework within which companies will be able to use our services, without paying a fee to a license seller, only our work which remain the same, license seller or not.

We called upon the services of an international law firm specializing in intellectual property, then on its recommendation, a technical and legal consulting firm to finalize the procedure.

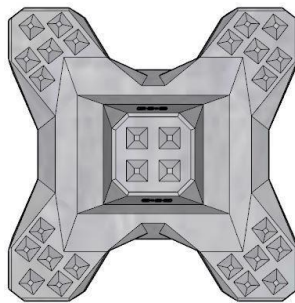
By adhering to the **BREAKWATER SOLUTION™** brand, we contractually guarantee that existing moulds can be used under certain conditions that we will specify.

We offer the three most popular blocks whose patent has fallen into the public domain:

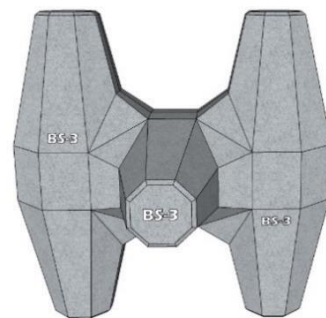
BS1



BS2



BS3



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7 TROIS OPTIONS DIFFÉRENTES

7-1 Full-time assistance with a CLAS inspector on site: cheaper but slower for construction

CLAS is committed to providing detailed technical assistance as follows:

- 3D plan Plans of the block for the realization of the formwork,
- Safety training,
- Draw up the theoretical placing drawings intended to calculate the placing density.
- Study of procedures, assistance with method statements and technical documents and advice.
- Full-time assistance for the placement of the artificial blocks, inspection and approval of the visual appearance and leveling of the underlayer and the toe mount protection included.
- BREAKWATER SOLUTION™ technical reference document.
- Complete quality certification file for a class A breakwater.

Numerous assistance and certification references on our site.



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7-2 Mixed placement team: The best solution internationally.

CLAS undertakes to provide detailed technical assistance as follows:

- 3D plan Plans of the block for the realization of the formwork,
- Safety training,
- Realization of the placing drawings intended to accompany the placement of the artificial blocks and to calculate the packing density of the placement.
- Support in the establishment of procedures, assistance in the drafting of procedures and methods and technical advice.
- Full-time assistance for the installation of the artificial blocks, inspection and approval of the visual appearance and roughness of the underlayment and the toe mat included.
- BREAKWATER SOLUTION™ technical reference document.
- Complete quality certification file for a class A breakwater.

+

Diving equipment dedicated to the construction of breakwaters in order to increase safety and speed of construction. 2 commercial divers from CLAS and 2 commercial divers from the local company for each



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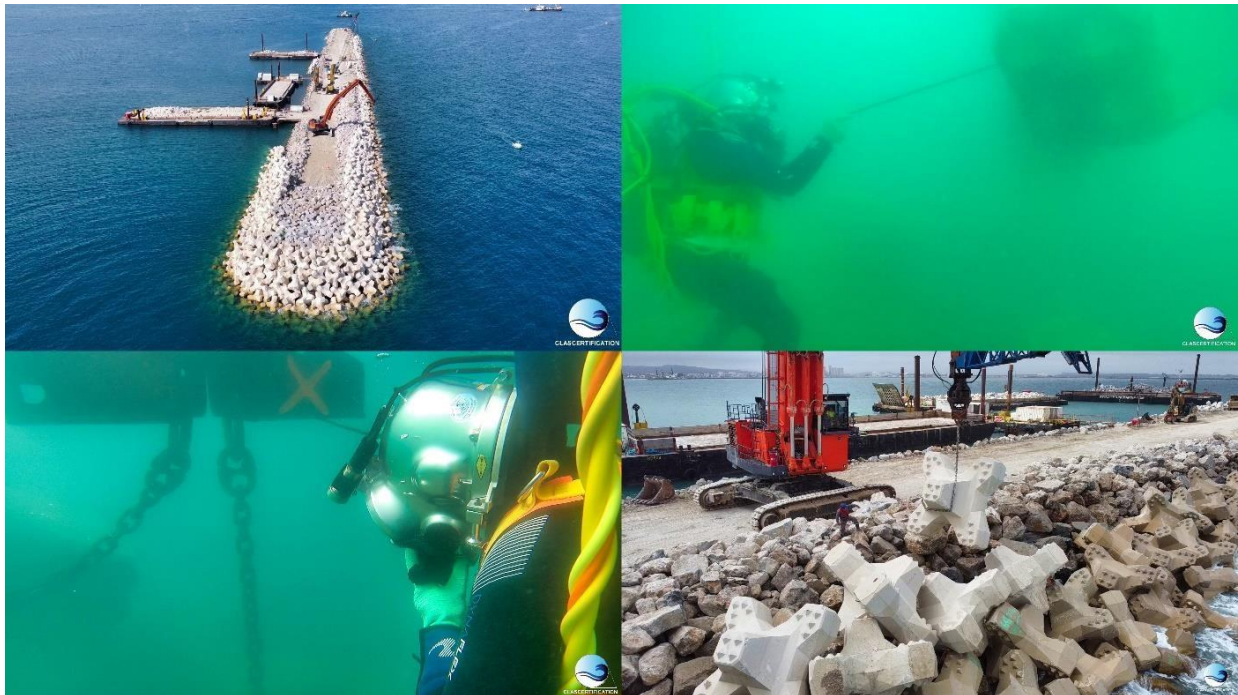
7-3 CLAS installation team: The fastest in case of emergency

CLAS is committed to providing detailed technical assistance as follows:

- 3D plan of the block for the realization of the formwork,
- Safety training,
- Realization of the placing drawings intended to accompany the placement of the artificial blocks and to calculate the packing density of the placement.
- Support in the establishment of procedures, assistance in the drafting of procedures and methods and technical advice.
- Full-time assistance for the installation of the artificial blocks, inspection and approval of the visual appearance and roughness of the underlayment and the toe mat included.
- BREAKWATER SOLUTION™ technical reference.
- Complete quality certification file for a class A breakwater.

+

Diving equipment dedicated to the construction of dyke shells to increase safety and speed of construction. 4 CLAS commercial divers for each installation team.



In 2022, two major clients adopted the **BREAKWATER SOLUTION™** concept with license-free blocks and the complete CLAS installation team: VINCI CONSTRUCTION and the BUESA-RAZEL-TDA group.

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8 ADDITIONAL SERVICES

CLAS offers the services of high-level partners for the following operations:

- High-level International Scientific Consultants for wave studies and validation of design studies.
- 2D and 3D modeling with the OCEANIDE laboratory in France.
- Design of breakwaters with BRL Ingénierie.
- Full project management with an experienced international partner.



Do not hesitate to let us know your needs.

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Recent recommendations following our work and expertise

Nouvelle Route du Littoral 2018-2023



4 breakwaters

24,000 ACCROPODE™II

2 years of conflict in court

Amicable settlement and repairs based on non-conformities highlighted by CLAS reports

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EGIS

9 Rue Sully Prud'homme
97420 Le Port

Destinataire :

CLAS SLU
Résidence Prat de Baix d'Envalira
Edifici F Porta 2 – Soldeu
AD100 Canillo
Andorre

ATTESTATION DE SERVICES RENDUS

Je soussigné Adrian MARTINEZ, Directeur de Projet de la Maîtrise d'Œuvre de la Nouvelle Route du Littoral de La Réunion (NRL), dont EGIS VILLE ET TRANSPORTS est Maître d'Œuvre, certifie par la présente que la société CLAS SLU a réalisé les missions qui lui ont été confiées en respectant les délais impartis grâce à sa technicité pointue et à sa grande rigueur professionnelle.

Ces prestations ont porté essentiellement sur une assistance technique à la Maîtrise d'Œuvre EGIS pour l'inspection des carapaces en blocs artificiels en béton des digues D1 à D4 de la NRL, suite à des constats de dommages.

La mission confiée à CLAS comportait notamment les points suivants :

- Inspection aérienne et subaquatique des digues D1, D2, D3 et D4;
- Expertise pour déterminer la conformité de la mise en œuvre ;
- Interprétation des causes des dommages constatés ;
- Actions à mener en présence de blocs cassés ;
- Recommandations pour la mise en œuvre de carapaces des digues non encore réalisées.

EGIS recommande CLAS pour des missions de ce type sur des digues mettant en œuvre des blocs artificiels de carapace en béton.

Le port le 05 Octobre 2020,


EGIS Villes & transports
5, rue Roland Hoareau
ZAC Belvédère - CS 9801
97829 Le Port Cedex
Tél. 0262 20 12 22
R.C.S. Lyon 493 334 429
TVA - FR 94 493 334 429 - APE 7112 B

This mission was renewed until 2023 and the complete realization of the project

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Prat de Baix d'Envalira, Edifici F Porta 2A
Soldeu Canillo AD100 Andorre

Le Port, le 16 Août 2023

MARCHE : Nouvelle Route du Littoral

OBJET : CERTIFICATE OF SERVICES RENDERED

The undersigned Solenne LESOURD, Project Manager of the New Coastal Road of Réunion (NRL), for which EGIS VILLE ET TRANSPORTS is Project Manager, hereby certifies that the company CLAS SLU has carried out the missions entrusted to him while respecting the deadlines thanks to his sharp technicality and his great professional rigor.

These services mainly related to technical assistance to the Project Management EGIS for the inspection of the armor layers in artificial blocks ACCROPODE™II and X-bloc®, of the D1 to D5 dikes of the NRL, within the framework of the monitoring of the works. recovery of the disorders identified during damage reports, carried out from 2018 to 2022.

The mission entrusted to CLAS included the following points in particular:

- Aerial and underwater inspections of dikes D1, D2, D3, D4 and D5;
- Analysis of risks related to non-compliance;
- Recommendation for corrective actions to be taken on non-conformities;
- Repair follow-up reports at the end of each mission.

CLAS interventions took place, as part of this mission, from 2021 to 2023.

This mission followed a previous mission that EGIS entrusted to CLAS from 2018 to 2020, for which a specific certificate was established.

EGIS recommends CLAS for missions of this type, on dikes using artificial concrete armor blocks.

Le Maître d'Œuvre
Solenne LESOURD



Annexe 1

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Port de La Turballe 2020-2022



1 Breakwater

4,000 X-bloc[®]

BREAKWATER SOLUTION™ implemented successfully

Project achieved in time and certified CLASS A

BREAKWATER

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Madame, Monsieur,

Je soussigné Antoine THAURY, Directeur du projet de Réaménagement du Port de la Turballe, certifie par la présente que la société CLAS est intervenue sur le projet du mois d'Avril 2021 au mois de Mai 2022. La mission confiée à la société CLAS était l'accompagnement de l'entreprise CHARIER pour la construction de la digue de protection du port.

La mission confiée à CLAS comportait notamment les points suivants :

- Formation des personnels à la technique Xbloc®.
- Formation des personnels à la sécurité.
- Supervision de la construction de la sous-couche, de la carapace et de la butée de pieds.
- Certification de la qualité pour un ouvrage de Classe A.

La société CLAS a mené à bien sa mission, montrant une technicité pointue et une grande rigueur professionnelle. Son expertise a permis de réduire drastiquement les délais de réalisation de l'ouvrage et de satisfaire les exigences de qualité attendues par le maître d'œuvre et le maître d'ouvrage.

L'entreprise CHARIER recommande la société CLAS pour des missions d'assistance à la construction et de certification de la qualité, mettant en œuvre des blocs artificiels de carapaces en béton.

Je vous prie d'agréer, Madame, Monsieur, mes respectueuses salutations distinguées.

Le 15/11/22. A. Thaurry

CHARIER
GÉNIE CIVIL
NANTES
2 Rue des Mauviers - BP 14 - 44220 COLÉRON - Tél. 02 40 85 44 77 - Fax 02 40 85 00 29
SIREN 320 651 706 - RCS NANTES - SIRET 320 651 706 00030 - CODE TVA : FR 19 320 651 706

www.charier.fr

CHARIER G.C.
2 Rue des Mauviers - La Barrière Noire - BP 14 - 44220 COLÉRON - Tél. 02 40 85 44 77 - Fax 02 40 85 00 29
SAS au capital de 200 000 €
SIREN 320 651 706 - RCS NANTES - SIRET 320 651 706 00030 - CODE TVA : FR 19 320 651 706



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Extension de Port La Nouvelle



Placement of ACCROPODE™II
CLAS experts and consultants

2 Breakwaters

Blocs ACCROPODE™II

Placement in emergency before the storms

CLAS provided a complete placing team



Placement of ACCROPODE™II
CLAS experts and consultants



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REFERENCE CLIENT

Je soussigné, Quentin YVARD, Directeur de Projet Adjoint du projet d'extension du port de Port-La-Nouvelle, certifie par la présente que la société CLAS, représentée par son gérant Monsieur SKIERNEWSKI Eric, a reçu la mission de poser les ACCROPODE™II de 12 m³ et de 14 m³ sur le musoir définitif de la digue foraine, avant la survenance des tempêtes hivernales. Cette mission a été étendue à la pose des ACCROPODE™II de 9m³ en partie sous-marine jusqu'à + 2,5 mètres, exposés directement aux fortes houles et non encore posés côté mer, sur ce même ouvrage, musoir provisoire inclus.

Je certifie par la présente que la société CLAS est intervenue du 02 Août au 7 Octobre 2021 et a correctement posé dans ce délai plus de 1000 ACCROPODE™II, qui n'ont nécessité aucune reprise ni démontage après leur contrôle.

BOUYGUES TP recommande sans hésitation, CLAS pour des missions liées à la construction de digues mettant en œuvre des blocs artificiels en béton.

Port La Nouvelle, le 20 10 2021

Quentin YVARD

BOUYGUES TRAVAUX PUBLICS
S.A.S. au capital de 41 002 785 €
Challenger - 1, avenue Eugène Freyssinet
78280 GUYANCOURT - FRANCE
Tél. : +33 (0)1 30 60 57 00
R.C.S. Versailles 407 985 308 - I.E. FR 42 407 985 308

Contract renewed in 2022 for the second breakwater

**More than 2000 ACCROPODE™II installed in two
months**

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