



ACCROPODE™ I or II
ECOPODE™
ACCROBERM™ I or II
CORE-LOC™



COMPLIANCE CERTIFICATE
GENERAL DESCRIPTION

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“THE GUARANTEE FROM THE ARMOUR UNIT DEVELOPER”

1. WHAT IS THE COMPLIANCE CERTIFICATE?

The **COMPLIANCE CERTIFICATE** issuing procedure is implemented by the technique holder and ends up with the issuance of the COMPLIANCE CERTIFICATE which states that the ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ armour layer has been built according to the ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ technology in terms of unit position, orientation, and interlocking. This activity may be engaged only when the ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ sub-license contract is in force between CLI and the CONTRACTOR.

This certificate ensures the CLIENT (Owner of the breakwater to be built), the ENGINEER, the CONTRACTOR and all stakeholders that the CONTRACTOR has fulfilled its obligations in regard to the ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ technology. This additional service gives to the Contractor and its Client an essential guarantee supported and ensured by the ARTELIA GROUP.

Additionally, the COMPLIANCE CERTIFICATE allows to precisely define the condition of the armour layer at the structure handover and constitutes the base for future inspections and monitoring throughout the lifespan of the structure. Therefore, it allows the assets to be fully managed on behalf of the OPERATOR as well as the CLIENT.

1.1. THE COMPLIANCE CERTIFICATE: HOW DOES IT WORK?

During the construction period, ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ block laying will be undertaken by the CONTRACTOR according to a specific framework issued by CLI and agreed upon before starting to lay ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ units on the armour layer.

Throughout the construction activities, the ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ armour layer will be inspected, on a daily basis, by the CONTRACTOR. The armour layer shall be inspected and evidence shall be collected to check the armour layer condition at that time (dense cloud of georeferenced points collected above and below sea level, photos, videos). These evidences will be gathered in the form of reports along with the associated documentation. The results of these inspections will be provided by the CONTRACTOR to CLI on a regular basis for analysis and issuance of the relevant Reports and certificates.

CLI will regularly audit the process with the CONTRACTOR in order to improve this process and check that the survey procedures are correctly applied.

Based on collected information and on onsite audit visits performed by its experts, CLI will be able to state that the works have been built in compliance with the ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ technology. Contributions from both of these sources (collected information and audit visits) are compulsory to allow CLI to correctly assess construction phases of the ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ armour layer.

These audit visits will include 2 or 3 days at the jobsite, to work together with the CONTRACTOR staff, and their number will be adjusted according to the project size.

1.2. COMPLIANCE CERTIFICATE GENERAL PROCEDURE

The COMPLIANCE CERTIFICATE issuing procedure includes the following key stages:

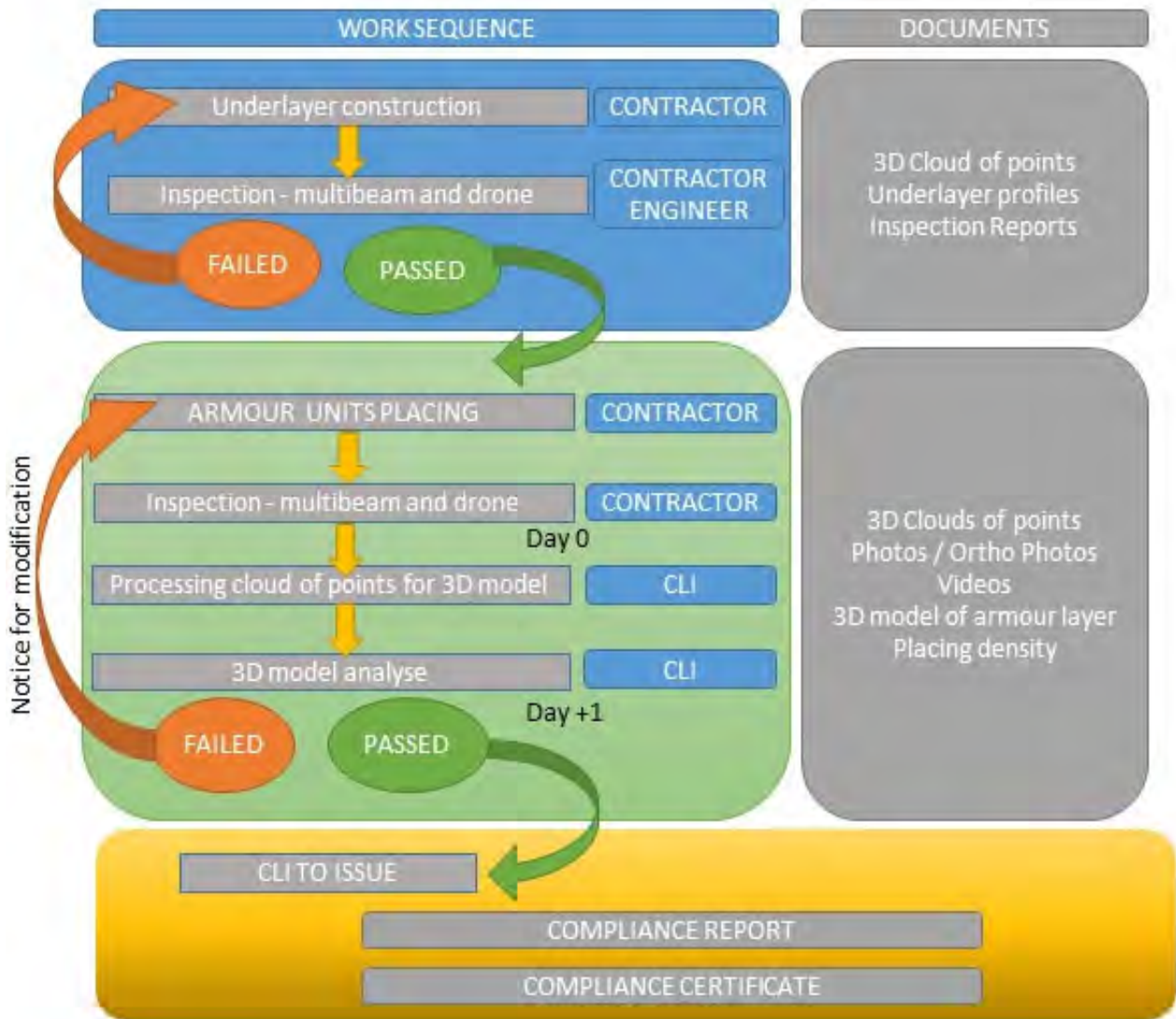
- CLI hands over INSPECTION GUIDELINES to the CONTRACTOR: these guidelines will be used by the CONTRACTOR to correctly inspect the works
- The CONTRACTOR performs the inspection according to the framework indicated in the INSPECTION GUIDELINES and gathers the INSPECTION REPORTS as well as the corresponding documentation such as a surveyed cloud of points and associated reports
- CLI will be in charge of producing a 3D digital twin of the armour layer. The software used by CLI allows 3D virtual blocks to be fitted on a surveyed cloud of points through the block shape recognition. These data will be produced daily following ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ placement activity
- INSPECTION REPORTS will be issued and uploaded by the CONTRACTOR on a specific CLI website (www.clicertificationtool.com) devoted to the COMPLIANCE CERTIFICATE procedure put in place for the project
- CLI will assess the documents and the information provided by the CONTRACTOR and will deliver a temporary compliance certificate for each section of the armour layer of the breakwater
- Should the STRUCTURE be non-compliant, CLI will issue a comment notice and instructions on how to dismantle/modify non-compliant STRUCTURE parts, and rebuild them in a proper way to set them out in compliance with the ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ technology; once rebuilt STRUCTURE areas comply with the ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ technology, the relevant COMPLIANCE CERTIFICATE will be issued
- Should the rebuilt works not comply with the ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ technology, the COMPLIANCE CERTIFICATE cannot be issued, and a notice of exclusion will be issued and delivered to the CONTRACTOR and ENGINEER
- CLI will perform audit visits at the jobsite, when necessary, to check inspection procedures, and to assist the CONTRACTOR if required
- CLI will issue the COMPLIANCE REPORT on basis of the documentation received from the CONTRACTOR
- CLI will issue the COMPLIANCE CERTIFICATE with or without comments and possible exclusions.

2. PROPOSED SURVEY EQUIPMENT

The inspections will be carried out on a daily basis by the CONTRACTOR, but CLI can also assist in sourcing equipment or sub-contractors having the full capabilities to carry out these tasks.

2.1. SURVEY OF THE EMERGED PART OF THE ARMOUR LAYER

For the emerged part of the armour layer, a full dry scan survey using a drone equipped with a photogrammetric system will be performed by the CONTRACTOR to obtain a detailed georeferenced (x, y, z) cloud of points.



Example of a methodology to be adapted for the projects

All the permits needed to execute drone surveys will fall under the CONTRACTOR responsibility, and their cost will also be incurred by the CONTRACTOR.

2.2. SURVEY OF THE SUBMERGED PART OF THE ARMOUR LAYER

The daily/weekly inspections must be carried out with a high performance multibeam sonar (Seabath Reson 7125 model or equivalent with an angle of 0.5° and minimum of 512 beams).

A typical solution would consist in using a multibeam sonar mounted on a vessel. This solution is most suitable on large sites with one or several zones where the placement is carried out simultaneously.



Example of a drone scanning the breakwater



Wet and dry digital model of Cannes breakwater in France



Dry digital model of Bormes Les Mimosas breakwater (France) – photogrammetric drone survey.

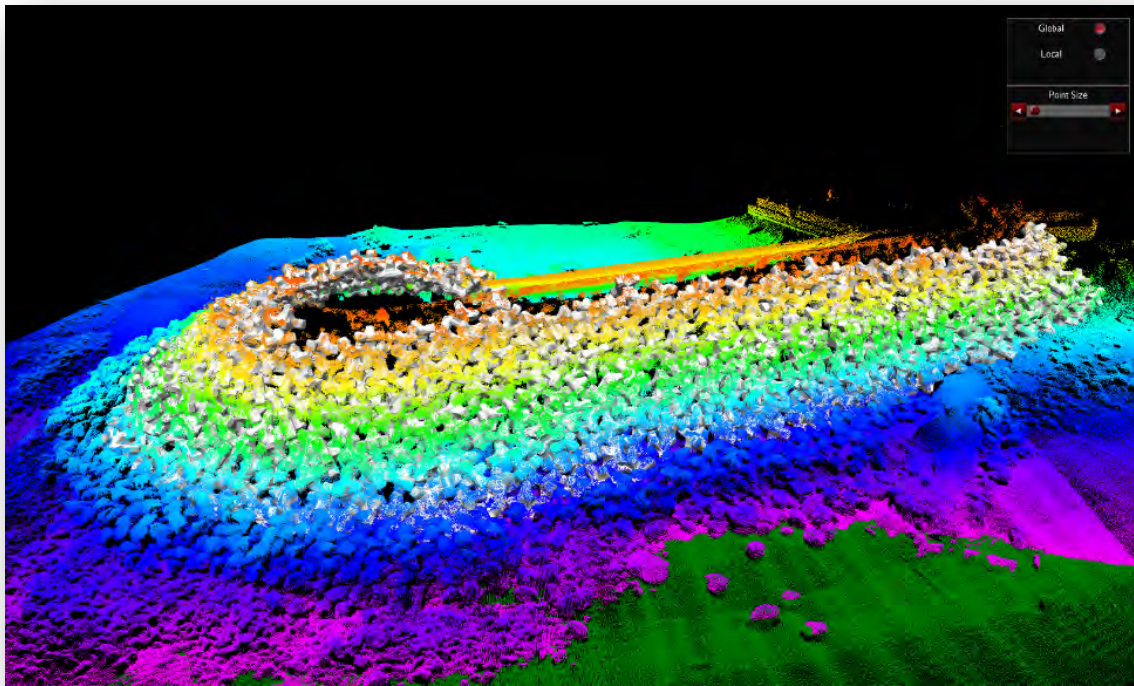
An alternative solution could consist of the same type of multibeam sonar but installed on a crane / excavator; this solution can be provided by MESURIS, a specialized company for this kind of survey. It requires a crane or excavator to perform the inspections, and this kind of equipment is usually available at the jobsite.

The advantage of this solution is that it can be used closer to the ACCROPODE™ II, ECOPODE™, ACCROBERM™ or CORE-LOC™ blocks. In both cases, this is not a real time tool and post-processing of data is required.

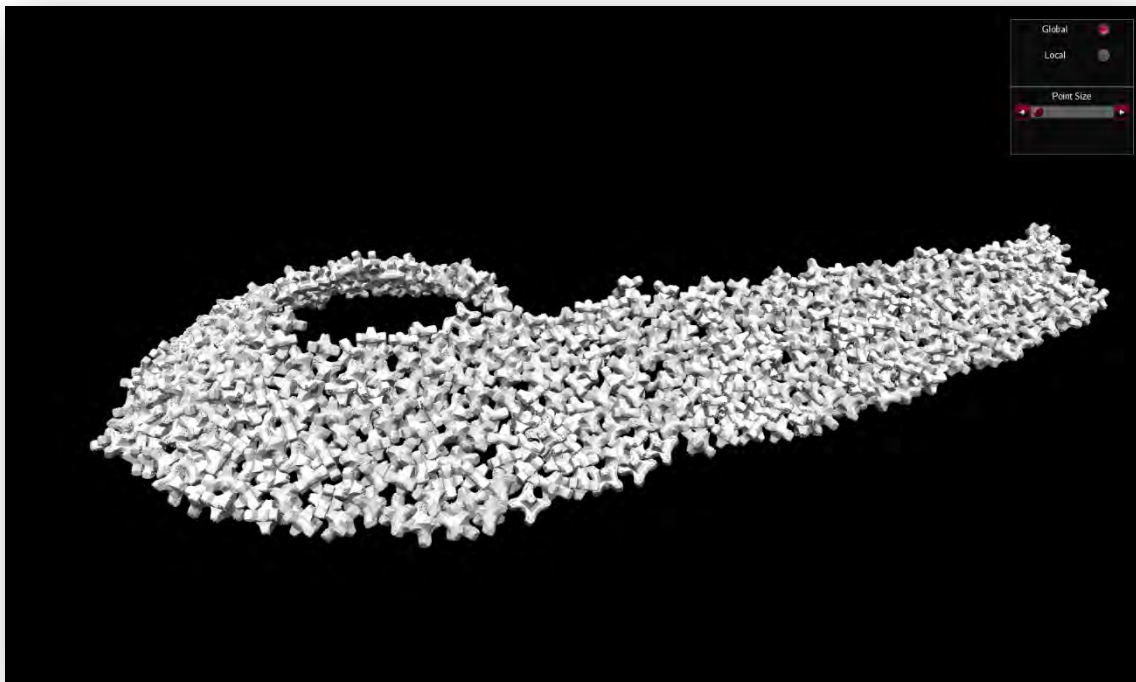
The cloud of points will allow the 3D model of the armour layer to be generated, which will then be used by CLI to assess and state the compliance of the ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ armour layer itself. For this reason, a good quality survey is mandatory otherwise CLI will not be able to state the compliance with the relevant technology.

Using the 3D digital model of the armour layer, CLI experts will be able to state if every single ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ block has been correctly installed in terms of position (center of gravity), orientation and interlocking, to assure that the CONTRACTOR has built the ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ armour layer strictly following the relevant technology.

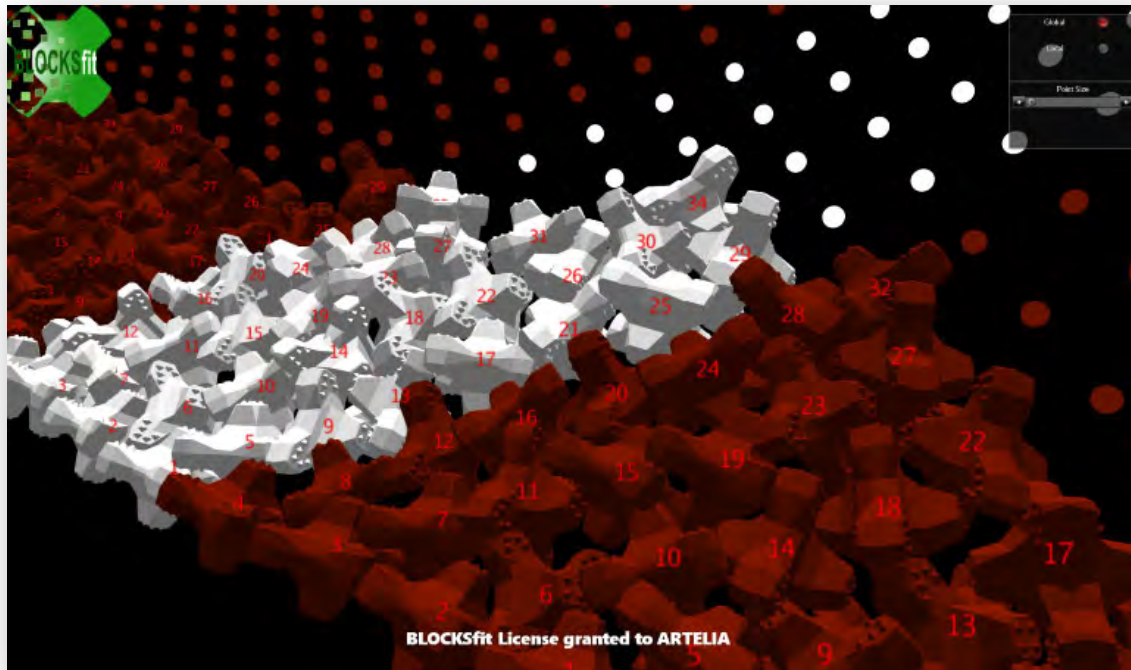
Diver inspections are no longer required when the survey has been conducted correctly in accordance with CLI guidelines; if the multibeam sonar survey cannot achieve the expected quality or if it is not able to inspect specific areas of the armour layer, survey data can be integrated on the basis of videos and photos taken manually.



Multibeam sonar recently performed on a site using 14 m³ ACCROPODE™, ECOPODE™, ACCROBERM™ or CORE-LOC™ units. The two first rows of ACCROPODE™ at the bottom and the underlayer are visible on this picture.



Post processing using the multibeam sonar and the 3D virtual blocks represented by BLOCKSfit



The 3D model can therefore be interpreted by CLI's experts on a daily basis in view of determining its compliance with the standards

3. INSPECTION AND CONSTRUCTION SEQUENCE

The inspection will be carried out by the CONTRACTOR or by a third party hired by the CONTRACTOR. Usually, the data must be provided with a centre distance of 10 m along the breakwater axis, and the CONTRACTOR needs to perform the inspection according to the following schedule:

Location	Item	Inspection / term	Proposed means
Toe / Under water	Under layer placement	Inspection when blocks are placed underwater and above water	Multi-beams
Under water	Placement of the first row of concrete blocks	Inspection after placement and corrections if necessary	Multi-beams
Under water	Placement of 3 rows of concrete blocks on top	Inspection after placement and corrections if necessary	Multi-beams
Under water	Placement of 5 rows of concrete blocks on top	Inspection after block placement and corrections if necessary	Multi-beams
Around water line	Placement of 3 rows of concrete blocks up to low water level	Inspection after block placement and corrections if necessary	Inspections with a drone at low water level
Above water	Placement of the block rows up to the top	Inspection after block placement and corrections if necessary	Inspections with a drone at low water level
Crest	Placement of the block rows up to the top	Inspection after placement and corrections if necessary	Inspections with a drone

4. DATA EXCHANGE

The collected data will be uploaded for each inspected section (10 m long) but a different length can be agreed with the CONTRACTOR according to the specific construction plan. The following table indicates the DATA that will be collected and uploaded on the web site.

Item	Provided and uploaded	Reviewed	Approved
Inspection guidelines	CLI	CLI	CLI
CLI Audit Reports	CLI	CLI	CLI
Underlayer profiles	CONTRACTOR	-	ENGINEER
Underlayer 3D cloud of points	CONTRACTOR	-	-
Underlayer inspection Report	CONTRACTOR	-	CLI
Underlayer photos and videos below and above sea level	CONTRACTOR	-	-
Concrete blocks placing densities	CONTRACTOR	CONTRACTOR	CLI
3D cloud of points for the armour layer section	CONTRACTOR	CLI	CLI
Concrete block photos and videos	CONTRACTOR	CLI	CLI
Compliance Report	CONTRACTOR	CLI	CLI
Compliance Certificate	CLI	CLI	CLI

4.1. DELIVERABLES

The following documents will be delivered by CLI:

- Inspection guidelines
- Audit reports
- Compliance Report
- Compliance Certificate

CLI shall deliver all documentation in hard and soft copy (except for photographs, videos and daily inspection reports, which will be sent in soft copy only or made available in the database set up by CLI).

4.2. MEETINGS AND AUDIT VISITS

During the project, several meetings and interactions with the CONTRACTOR will take place and are included in our offer:

- Kick-off meeting to be held at the beginning of the project to present the methodologies that will be used. CLI will give a presentation of the scope of work, methodologies, responsibilities, timing, and final objectives to be achieved. To make the meeting more efficient, the CONTRACTOR will provide CLI with a list of the main items to be discussed a week before the meeting itself. This will enable better coordination and more detailed answers. For the kick-off meeting, the Project Director as well as the Project Manager will be present at the jobsite with CONTRACTOR staff, unless it is prohibited by the sanitary rules (such as COVID-19 pandemic); in this situation the kick-off meeting will be replaced by a duly organized video conference.
- Depending on the project size CLI will perform the planned audit visits, which aim to perform random checks on the data collection process.

4.3. CLI'S SPECIFIC WEBTOOL

The collected data should be uploaded in the CLI platform called "CLICertificationtool". This tool has been developed by CLI and shall be used to store and exchange all data for each structure section throughout the COMPLIANCE CERTIFICATE process. The platform is accessible online by the stakeholders of the project with a login and password via a standard browser such as GOOGLE CHROME.

Only one login and password will be given to each party (CLIENT, ENGINEER, CONTRACTOR, CLI). The CONTRACTOR and CLI have the possibility to upload / download / comment on documents on the web-tool, whereas other parties have the possibility to download and comment only. The data will be stored in a "Windows cloud" and the server where the data is stored is based in France. Other storage options can be evaluated at the CONTRACTOR's request.