



# GENERAL CONDITIONS FOR USING THE CLI SINGLE-LAYER ARMOURING SYSTEMS



"Sharing skills and experience  
to achieve successful projects"

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CLI and its partners worldwide, have gained, over many years, extensive knowledge and experience in the field of river, ports and harbours, coastal defences and development from use of SINGLE-LAYER high interlocking units for protection of such structures against tidal and wave action.

CLI assistance is available at initial development stages of a scheme and throughout the design phases and is mandatory during all stages of construction to ensure that the implementation of these techniques complies with the most updated CLI QA/QC standards and recommendations.

The use of CLI units on specific projects is subject to a fee per m<sup>3</sup> of fabricated armour concrete. Provision is made for tailored technical assistance provided during the various stages of construction.

CLI is committed to fully supporting and assisting both design and construction professionals to achieve consistent quality and reliability for each and every project however large or small.

## 1. ASSISTANCE BY CLI AT DESIGN STAGE

### 1.1. INFORMATION

Basic information for all CLI single-layer systems is freely available on request, or from [www.concretelayer.com](http://www.concretelayer.com). The documentation material ranges from general to specific information from projects, generic model tests, construction methods and field experience from a great number of projects completed worldwide.

### 1.2. DESK-STUDY

At project appraisal stage CLI offers to assist in mutual confidentiality, Owners, Designers and marine Contractors with the preparation of an engineered specific solution of their project. In order to carry out this desk-study, the following basic project data is required:

- PROJECT LOCATION MAP,
- LAYOUT OF THE PROJECT, INCLUDING SEABED CONTOURS,
- DESIGN WAVE CRITERION (OFFSHORE WAVE,  $H_s$ ,  $T_p$ , RETURN PERIOD, DIRECTIONS),
- SEA LEVEL VARIATIONS (MSL, TIDAL RANGE, SURGE),
- OTHER DESIGN CRITERIA (WATER LEVELS and OVERTOPPING),
- SPECIFIC GRAVITY OF ARMOUR CONCRETE AND ROCK,
- SOILS DATA, NATURE OF SEABED,
- CROSS-SECTIONS OF ORIGINAL SOLUTION IF AVAILABLE,
- WATER VISIBILITY and CURRENTS,
- CONSTRUCTION METHODS (IF ALREADY KNOWN),
- ANY OTHER RELEVANT INFORMATION AFFECTING THE PRIMARY ARMOUR DESIGN.

This preliminary study consists of a technical memorandum, quantity estimate and typical cross-sections and deals with hydraulic conditions only. It provides the opportunity for a fair appraisal of the advantages by interested professionals.

However, solutions can also directly be studied by engineers and designers for specific projects. In such cases, CLI offers to confidentially review their design, and will make recommendations, as applicable, at that stage.

*When a CLI system is specified as the basic solution, tender documents shall indicate that bidders must contact CLI for obtaining the conditions of use of the selected CLI Technology.*

### 1.3. HYDRAULIC MODEL TESTS

Physical modelling is recommended for optimization purpose.

Physical model tests can be carried out at any qualified hydraulic laboratory. Model units can be rented from CLI for this purpose after review of the cross-sections to be tested, receipt of the test program and agreement on CLI terms. Unless the proposed testing laboratory has sufficient experience in the placement of the model units, a specialist will be dispatched to the laboratory to help perform the initial placement and train the laboratory staff to repeat this task.



## 2. AT TENDER STAGE

Standard specifications and advice on construction methods can be supplied for tendering purposes.

When one of the CLI armour units is selected as an alternative solution, CLI is ready to confidentially assist interested Contractors in supplying the relevant design information to document their alternative design, and provide the financial conditions to allow them to prepare their bid.

The CLI financial terms and sub-licence conditions may be obtained for pricing purpose by contacting CLI:

CLI (Concrete Layer Innovations) - CS 30218 - 6, rue de Lorraine - 38432 Echirolles - FRANCE

Tel.: +33 (0)4 76 04 47 74 - Fax: +33 (0)4 76 04 47 75 - E-mail: [cli@concretelayer.com](mailto:cli@concretelayer.com) - Web site: [www.concretelayer.com](http://www.concretelayer.com)

## 3. TECHNICAL SUPPORT AND ASSISTANCE BY CLI DURING CONSTRUCTION

When a sub-licence contract is effective, a package of technical services will be provided by CLI to the Contractor who has been awarded the works.

The technical support provided by CLI is to enable and to assist the Contractor in the manufacture and placement of the units in cost-effective, rapid and safe manner. This support and recommendations are based on the experience CLI have gained from the construction and completion of many contracts and the placement in excess of 12 million tons on projects worldwide together with improved unit geometry resulting from ongoing research and development and post contract project analysis.

Each contract is treated confidentially. The recommendations provided by CLI take into account the project location and the Contractors intended construction methods, sequence of working and plant and equipment.

The support provided by CLI is carried out by fully experienced personnel dedicated to each project throughout the construction duration.

The technical assistance provided by CLI includes the following items:

- Provision of drawings for manufacturing the moulds.
- Technical specifications for the use of the selected system. When required and if technically possible, specifications can be adapted to suit special project conditions.
- Drawings for placing the units on the structure (outline drawings for running sections, detailed drawings for curved sections of breakwaters), along with the required CAD files indicating the exact position of each unit and armour concrete quantities.
- Follow-up during implementation by a specialist involving site visits, scheduled at the most important moments of the construction (start of casting, start of placement, during placement of the units especially on roundheads and at transitions areas). The CLI specialist will visit the construction site and casting yard, at times agreed with the Contractor.

## 4. USEFUL REMINDER

Experience gained from many projects indicates that the Contractors' interests are best served when CLI contribute and become involved as early as practical from and including the initial tender stage or even better at the conceptual stage and model testing where applicable.

It has also been recognised that early involvement of CLI at the actual project site is preferred: i.e.: well thought casting and placement operations can benefit the Contractor as the CLI specialist can discuss and suggest where improvements can be made.

CLI experience in single-layer over the past years has proved that if the following items are met:

- The design wave conditions are correctly determined,
- The geotechnical and scouring risks are controlled,
- CLI recommendations are followed,
- Minimum concrete strength specifications are obtained,
- The minimum as-built packing density and placing rules are respected,

then, the CLI single-layer system should perform as expected.

**This is the reason why the CLI "Single-layer team is at your service from early design through construction to completion of the works".**





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