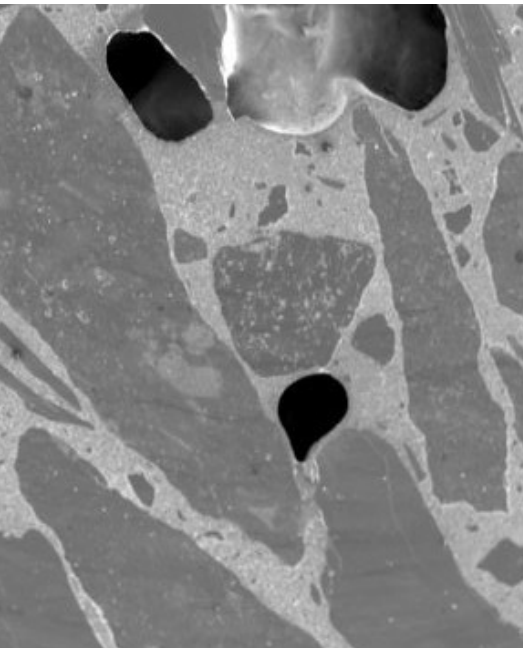


# BUILDING MATERIALS



**Multi-scale approach**



**Bio-based materials**



**Sustainable management of  
resources**

# Applied research with high scientific impact

The Research Laboratory of ESITC Caen develops applied research in the field of building materials based on a scientific approach. The Research team designs and tests new materials and supports industrials and organizations in the construction sector in their research and development on building materials.

## OUR EXPERTISE

- **CHARACTERIZATION** of building and construction materials (mechanical, geotechnical, and microstructure): mortars, concrete, soils, wood, steel ...
- **OPTIMIZATION** of soil and sediment treatment: methodology and adaptation of treatment to the end use
- **FUNCTIONAL DESIGN** of concrete and cementitious materials, concrete design
- **REUSE AND RECYCLING** of industrial and natural by-products in new sustainable construction materials: natural fibres (flax, hemp, wood), shellfish by-products, earth, equestrian surfaces ...
- **LARGE-SCALE PROTOTYPING** and study of construction systems in a controlled atmosphere
- **ENVIRONMENTAL IMPACT ASSESSMENT** of building materials using Life Cycle Analyses
- **ASSESSMENT** of the durability of materials from accelerated aging tests and numerical modeling

## OUR RESOURCES

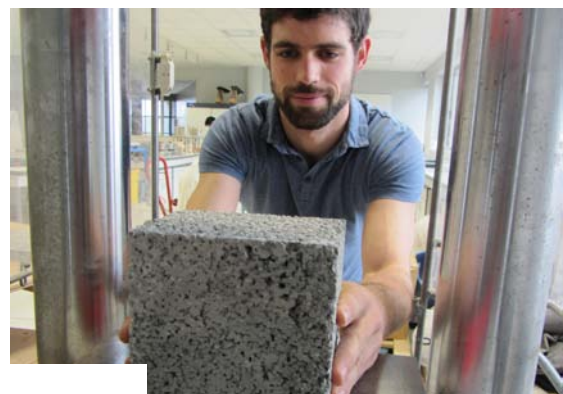
### OUR TEAM:

The research team is composed of a Laboratory Director accredited to supervise research (HDR), Teachers-Researchers (6), PhD students, technicians and a coordination unit of collaborative research projects (one R&D project manager and one R&D Engineer).

### OUR FACILITIES:

Located in the heart of the school, the 2000 m<sup>2</sup> laboratory consists of:

- 4 research rooms
- 1 hall dedicated to prototyping and scale 1 tests
- 3 practical work rooms for students



## OUR EQUIPMENTS

In addition to equipments for students practical works, the laboratory has high performance facilities to develop building materials.

### IDENTIFICATION, FORMULATION AND MANUFACTURING OF SOILS AND SEDIMENTS:

Earthworks Road Guide soil classification: particle size distribution, compaction parameters, CBR press, methylene blue value, Los Angeles, Micro-Deval, density, Atterberg limit, carbonate content, lime reactivity. Laboratory and field vane tester, compaction meter, soil permeability. Shearing frame and mixer, cutterhead mixer, 40L and 150L mixers, suitability test equipment, dynamic vapour sorption analysis ...

### CHARACTERIZATION, FORMULATION AND MANUFACTURE OF CEMENTITIOUS MATERIALS:

Mortar mixer, impact compactor, 65L concrete mixer, concrete rectification grinder, laboratory crusher, Abram's cone, workability apparatus, splitting test, Cembureau gaz permeability, Blaine permeameter, rheometer, carbonation chamber, calorimeter, conductivimeter, laser particule analyser, scanning electron microscope, optical microscope ...

# RESEARCH TOPICS



## MATERIALS FOR SUSTAINABLE BUILDING

Design and characterization of eco-materials from agricultural and industrial by-products such as natural fibres (e.g. flax, hemp), marine by-products (e.g. shellfishes, algae) or waste mainly resulting from the construction sector (e.g. demolition aggregates).



## MATERIALS FOR ENVIRONMENTAL GEOTECHNICS

Treatment and reuse of soils related to land operations (e.g. earthworks, retaining, foundations) and unusable sediment (e.g. dredged sediments) for the field of building and civil engineering.



## MATERIALS FOR BUILDING ENERGY EFFICIENCY

Development and implementation of materials and eco-materials to improve energy consumption of buildings by both flow optimization (e.g. thermal, humidity) and reduction of carbon emissions related to their construction.



## MATERIALS FOR MARINE INFRASTRUCTURES

Development and characterization of eco-materials (e.g. concrete shell) suitable for marine applications (e.g. dikes, docks, artificial reefs) and the specific conditions of the sea (e.g. sea water, bio-deterioration, waves).

### MECHANICAL AND GEOTECHNICAL CHARACTERIZATION OF CEMENTITIOUS MATERIALS AND SOILS:

Compression machine (Schenck 300T), bending/compression gantry (Controlab 160kN), tensile testing machine (Lloyd LR 30K and Instron 50kN/10N), oedometers, Proctor and CBR compactor, triaxial and CBR presses ...

### CHEMICAL ANALYSIS:

TGA/TDA, GC-MS, UV-visible spectrophotometer, polarographie, centrifuge, leaching and vacuum filtration devices ...

### PROTOTYPING AND REAL CONDITION TESTS:

4000kN press, 2x300kN and 9m long bending test bench for beams and slabs, bridge crane and forklift, conical mixer 150L, precision saw, equipments for manufacturing pavers, concrete blocks and earth bricks, ovens, dryers and climate chambers with controlled temperature and humidity ...

# EXAMPLES OF PROJECTS / REFERENCES



## BTONLIN

Collaborative project on reuse of flax fibres into eco-materials for the building sector. The project is co-funded by the ERDF programme and the Normandy Region and is labelled by the French cluster of metallic assemblies and complex composites (EMC2).  
Partners: ESITC Caen, CMEG company



## RECIF

European project on shellfish by-products reuse in artificial reefs selected under the Cross-border Cooperation Programme Interreg IV A France (Channel) / England, co-funded by the ERDF and the Normandy Region. Website: [www.recif-project.eu](http://www.recif-project.eu)  
Partners: ESITC Caen, Univ. of Caen-BOREA, Univ. of Caen-M2C, Univ. of Caen-LUSAC, TPC and EMCC companies (VINCI Group), Plymouth Laboratory Marine, MNHN, Univ. of Southampton, Univ. of Exeter



## SETARMS

European project aiming to the reuse of marine sediments in road construction techniques selected under the Interreg IV A France (Channel) / England Programme, co-funded by the ERDF and the Normandy Region. Website: [www.setarms.org](http://www.setarms.org)  
Partners: APLM, ESITC Caen, EMDouai, GPMH, LASEM, Univ. of Caen-ABTE, Univ. of Exeter, Univ. of Brighton, CG29, PNA, Eurovia BN (VINCI Group)

## VECOP & VECOP-EXP

Collaborative project on shellfish by-products reuse in pervious eco-pavers for urban use and the sustainable management of rainwater. The project is co-funded by the ERDF programme and the Normandy Region and is labelled by the French cluster Pôle Mer Bretagne Atlantique.  
Partners: ESITC Caen, Univ. of Caen-ABTE, Granvilmer, Slipper Limpet Processing, Veolia Propreté, Point P, MARC SA, TECAM

## OURS PARTNERS

### INSTITUTIONS

Academy of Caen  
CCI Seine-Estuaire  
Fédération Française du Bâtiment  
Fédération Nationale des Travaux Publics  
PNR des Marais du Cotentin et du Bessin  
Normandy Region

### LABORATORIES

University of Caen Normandy: M2C, BOREA, LUSAC, ABTE  
LGCE (Douai School of Mines)  
CRISMAT  
Ecole Centrale de Lille  
ESITPA  
INSA Rouen

ISPA  
University of Nantes-  
Centrale Nantes : GeM

### UNIVERSITIES

Bath (UK)  
Brighton (UK)  
Caen Normandy (FR)  
Cantabria (ESP)  
Exeter (UK)  
Kyoto (JP)

Manitoba (CN)  
Plymouth (UK)  
Red River College (CN)  
Southampton (UK)

### INDUSTRIALS

Cargill  
CMEG  
EMCC (Vinci Group)  
Eurovia (Vinci) Group  
Groupe Depestele  
Mastellotto

Point P Sonen (Saint Gobain Group)  
Ports Normands Associés  
SATO HOIG  
TPC (Vinci Group)  
Veolia Propreté



ESITC Caen  
1 rue Pierre et Marie Curie  
14610 EPRON - FRANCE

[www.esitc-caen.fr](http://www.esitc-caen.fr)  
+33 2 31 46 23 06  
[laboratoire@esitc-caen.fr](mailto:laboratoire@esitc-caen.fr)

