

Innovation and quality are central priorities in Tipee's approach to better meet the requirements of its customers.

As part of our development, we propose an internship for the hygrothermal characterization of an insulated roof-terrace system at real-scale: Numerical simulation and experimental campaign

Candidate Profile: Master degree, Engineering school (3rd year's student) ...

The Company

Tipee is a technological platform of expertise specialized in sustainable building born in 2012. The company is located in La Rochelle, France, within the building Lab In'Tech on a "low-carbon" park which can represent energy and environmental efficiency activities in urban areas. The platform is notably labelled by the Sustainable Building Plan and is a partner of the Scientific and Technical Building Center (CSTB). Its role is to provide concrete solutions to all stakeholders in the building and housing sector: builders, developers, manufacturers, craftsmen ...

The platform is composed of three areas of activity: a multi-scale testing laboratory, the training centre and the engineering & research centre. More information on www.platforme-tipee.com.



The Tipee building on the Atlantech low-carbon park in Lagord - Photo credits: Frédéric LE LAN / CDA La Rochelle

Context

Tipee seeks to characterize, theoretically and experimentally, the risk of interstitial condensation on an insulated roofing system in outdoor climate and at real-scale. The initial lightweight roofing complex consists of a combination of bio-sourced insulation layers, a water-vapor barrier and a waterproofing membrane, all placed on a supporting wooden cradle. The objective is to evaluate the possible damage of the complex such as material decay and mould growth over a significant time period. The complex must therefore be instrumented by sensors measuring the temporal evolution of temperatures and water contents in its vertical and horizontal profile sections.

Outdoor test-facility

This experiment will be conducted on a real-scale test facility exposed to oceanic climate developed at the Tipee Platform. The test complex will be designed to fit into a wood cradle, the exposed surface of the complex is 400 x 300 cm.

The advantages of experimentation led on a real-scale test-cell exposed to real weather conditions are:

- ✓ The complexity and the interaction of climatic conditions that create thermal and hygric solicitations at different time scales, difficult to reproduce in a laboratory. Their stochastic nature often entails difficulties disregarded in the design-stage assumptions to characterize the in-situ behaviour of a technology;
- ✓ The study of singular points and constructive details of the envelope (thermal bridges, connections, protruding parts exposed to rain infiltration, protruding parts on the interior side hindering the implementation of insulation, etc.).

Figure 1 shows Tipee's real-scale test-facility. The cell that will host the roof testing complex is circled in orange. With a floor area of 4 m by 3 m for a ceiling height of at least 3.6 m, the volume cell in temperature controlled.

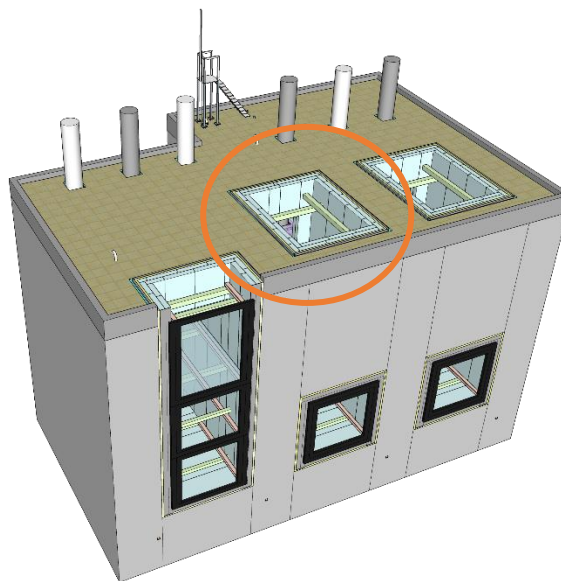


Figure 1 : 3D scheme of Tipee's test facility




Assignment

The protocol for implementation and integration of the sensors will be the subject of a preliminary study in which the trainee will participate. , the candidate will first use a numerical software (WUFI) to identify beforehand the trend of coupled heat and moisture transfers (Hygrothermics) in the test configuration. Highlights and conclusions of this initial study will feed the definition of an appropriate instrumentation protocol. These numerical pre-studies will also serve as a basis for comparison with the experimental results and will confirm the optimal position of the sensors for this comparison.

Depending on the sensitivity of the candidate, the programming work of the data acquisition environment (LabView) for relative humidity and volumetric water content sensors will be required. It will also have to develop tools for processing and analysing the recorded data (Python).

The cross-examination of numerical and experimental results will highlight the ability of the software and the choice of calculation assumptions to reproduce realistic temporal / spatial trends of expected drying process and moisture storage. The analysis of the experimental results should also help to evaluate the risks of degradation of insulators as a function of the observed moisture levels.

Supporting team

Maxime Doya	Cécile Jolas	David Gaillard
		
Project leader Referring-staff for Tipee's real-scale facility	Project leader Referring-staff for Heat and Moisture calculation	Laboratory technician Referring-staff for experimental development

Required skills and abilities

Your application will be appreciated regarding the following characteristics:

- ✓ Methodical approach in the analysis of the specifications;
- ✓ Previous experience in experimental study (development of acquisition system, hardware choices, LabView development) would be highly appreciated;
- ✓ Knowledge of a programming language for the post-processing of experimental data (preferably Python);
- ✓ Knowledge of coupled heat and moisture transfers in buildings;
- ✓ Use of numerical modelling software for building energy and thermal envelope calculation (multi-zonal code, finite-element code).

The internship can begin as soon as February 14th, for a minimum period of 5 months and a half. The work planning defined within the service is relatively flexible, please indicate precisely your training periods dedicated to the internship in the cover letter. The position is based in La Rochelle within the premises of the Platform. The internship salary will be discussed with the candidates selected for interview.

Candidates should send a short cover letter, the name of one reference, CV:

contact@plateforme-tipee.com / +33(0)5 17 81 07 77

Indicate the email subject as [Application Training TT]

Contact for technical information:

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