University of Victoria

PFE / Master 2022

COMPANY or LABORATORY

University of Victoria, 3800 Finnerty Rd, Victoria, BC V8P 5C2, Canada

In collaboration with:

Department of Physics and Mechanics of Materials, Pprime Institute, 1 avenue Clément Ader, BP 40109, F86961 Futuroscope-Chasseneuil cedex, France.

SCIENTIFIC SUPERVISORS

First name: Carole Name: Nadot-Martin

Service/Laboratory: Department of Physics and Mechanics of Materials, Pprime Institute.

First name: Sardar Name: Malekmohammadi

Service/Laboratory: Department of Civil Engineering, University of Victoria (UVic)

DURATION **6 mois** DATES **April to September 2021**

MISCELLANEOUS INFORMATION

Financial allowance: UVic (2,000 CAD) for 6 months.

NATURE OF THE PROJECT

R&D theoretical and numerical modelling

TITLE OF THE PROJECT

Micromechanical modelling of thermal conductivity in Cross-Laminated Timber

PROJECT DESCRIPTION

The proposed research constitutes a part of a program performed in the context of a collaboration between Pprime (contact Prof. C. Nadot-Martin) and UVic (Dr S. Malekmohammadi). This program involves analytical and numerical modelling works using

commercial software packages such as ANSYS Workbench, ABAQUS, Mathematica, MatLab, etc., to help with the design of insulated sandwich panels for energy-efficient buildings

The objective is here to develop analytical and numerical models to predict the coefficients of thermal conductivity in Cross-Laminated Timber (CLT), a novel sustainable composite product used in multi-storey modular buildings in North America and Europe. Defects (voids) within the glue lines (resin) as well as resin and wood thermoelastic properties are considered for this purpose. A “Morphological Approach”, initially designed at Pprime for solid propellants, will be employed in the analytical part of this work. Additionally, a recently developed multi-scale full-field model at UVic will be extended to provide numerical reference solutions. Results will be compared with available experimental data to validate both models. The final objective is to progress in the analysis and prediction of the long-term behaviour of composite materials and structures under cyclic moisture and temperature changes.

The potential candidates will have the opportunity to interact with experts in the field of green composite materials and engage with academics and engineers while working in the greenest civil engineering department in Canada. Please visit https://www.uvic.ca/engineering/civil/green/index.php for more details.

UVic is committed to upholding the values of equity, diversity, and inclusion in our living, learning and work environments. In pursuit of our values, we seek members who will work respectfully and constructively with differences and across levels of power. We actively encourage applications from members of groups experiencing barriers to equity. Read our full equity statement here:

https://www.uvic.ca/equity/employment-equity/statement/ .

The candidate is expected to be a good communicator and be able to document his/her research findings on a regular basis in the form of reports and presentation slides.

SKILLS PROVIDED BY THE PROJECT

The project will provide important skills and expertise in the following fields:

- Multiscale modelling and corresponding coding with Mathematica, MatLab, Python;
- Full-field microstructures simulations (with ANSYS and ABAQUS);
- Green composite materials.

For more details, please contact Carole Nadot-Martin (carole.nadot@ensma.fr).

For application, please send your letter and CV to Carole Nadot-Martin (carole.nadot@ensma.fr).