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

Analytical closed-form equations for reliability analysis of structural wood composites.

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 ABAQUS, Mathematica, MatLab, etc., to help with the multi-scale modelling of different types of composites.

The project aims to develop analytical closed-form equations for predicting the orthotropic elastic constants of strand- and veneer-based composite products used in the construction of modular multi-storey buildings. Such equations will be derived based on a “Morphological Approach” that has been proposed at Pprime for a large class of highly-filled composites. Although MA has been implemented numerically by the supervisors, simple closed-form equations are still required for reliability purposes and demonstrating the effect of various microstructural parameters on the composite mechanical properties. The developed equations will enable engineers to develop more robust standards for composite products. In the particular case of strand- and veneer-based composites, the developed equations will be compared with existing equations to highlight the ability of the MA to account for e.g. resin thickness, resin modulus, strand dimensions, etc and their variability on the overall behaviour. Furthermore, these equations will be incorporated into reliability software at UVic to improve the reliability of strand- and veneer-based composite products for designing mass timber structures.

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;
- Composite materials standard.

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).