

# A BIM APPROACH FOR THE DESIGN OF A 5D MODEL OF INDUSTRIAL WAREHOUSES IN MARINE ENVIRONMENT

*Rassidatou Abbo<sup>1</sup>, Okpwe Mbarga Richard<sup>2</sup>, Lezin Seba Minsili<sup>3</sup>, Mbondo Jean Marc<sup>4</sup>*

<sup>1</sup> Graduate student, Department of Civil Engineering, National Advanced School of Engineering of Yaounde, Cameroon

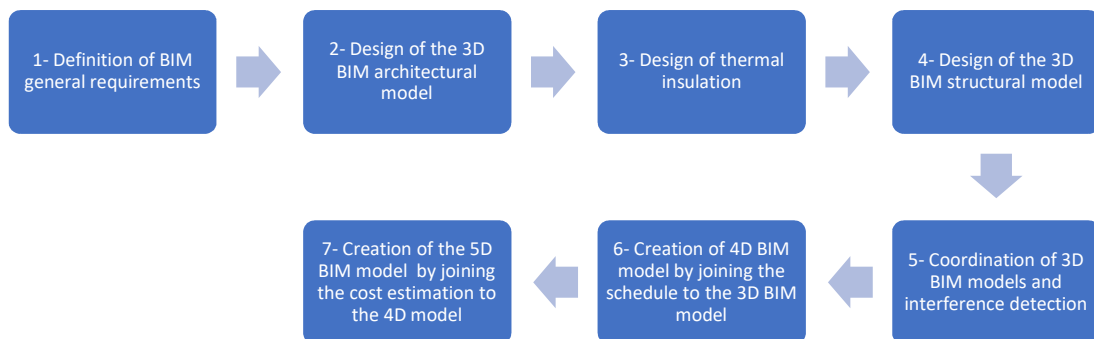
<sup>2</sup> Lecturer, Department of Civil Engineering, National Advanced School of Engineering of Yaounde, Cameroon

<sup>3</sup> Associate Professor, Department of Civil Engineering, National Advanced School of Engineering of Yaounde, Cameroon

<sup>4</sup> Senior Architect, Department Head, Port Asset Management, DAME, the Port Authority of Kribi, Cameroon

## Abstract

The BIM (Building Information Modelling) is transforming the architecture, engineering and construction (AEC) industry everywhere in the world. In Sub-Saharan Countries, its spreading is just in an earlier stage while academics are working hand in hand with the local industry for its smooth implementation. In this context, the aim of this research is to provide an approach for designing industrial warehouses subjected to marine conditions using BIM. For this purpose, and considering our context, we make use of a methodology in seven steps:



More precisely:

- Definition of BIM general requirements for this type of construction project. Here we define the units, the language, the open standard for exchanging data, the BIM deliverables, the quality control process and how data sharing will be done and adopt a Level of Development 300;

- Design of the 3D BIM architectural model. Parametric objects (footings, walls, windows, beam, column...) are used to create the model, and the software used is Autodesk Revit Architecture 2018;
- Design of thermal insulation making use of CSTB (1975), Microsoft Excel 2010 Software and the previous BIM architectural model;
- Design of the 3D BIM structural model using Revit 2018 Platform, Robot Structural Analysis 2018 and IFC format;
- Coordination of 3D BIM models and interference detection with the software Autodesk Navisworks Manage; All possible clashes between the different models are corrected in order to get a consistent 3D BIM model;
- Creation of 4D BIM model by combining schedule (created with the software Ms. Project) of the project to each BIM objects of the 3D BIM model ;
- Creation of the 5D model that gives us the cost estimation of the elements built onsite and the element to be built at every step of the project (this calculation is done using Navisworks manage or intelligent BIM objects).

This methodology is applied for the design of a warehouse, dedicated to contain cocoa or coffee products requiring homogeneous thermo-hydroscopic setting in a marine environment of the industrial area of the deep sea port of Kribi (Cameroon), with a surface of 2000 m<sup>2</sup> and 11.2 m height. Preliminary results show that the proposed methodology can be easily implemented with available BIM software commonly used by engineers in Cameroon. This approach makes it possible to get quickly a consistent 5D BIM model of the industrial building, namely a comprehensive model which integrates data related to: architecture, structure, thermal insulation and planning of the industrial building.

Our research studies are moving forward in order to automatically generate costs related to the project using state of art approaches related to higher Degree BIM models and based on intelligent BIM objects.

**Keywords:** Design, Warehouses, Construction, BIM model, marine environment.