La Maison Tropicale

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From the Congo to CAD

3D modelling software helps recreate history on screen

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Greg Benson
Manager, The CAD Studio

Pre-fabrication in construction is currently a hot topic, with many believing it holds the key to providing high quality homes at an affordable price. This however, is a pre-fabrication story with a twist — a big twist.

It features a building that was manufactured thousands of miles from where it was first assembled nearly six decades ago. The first flat-pack home, in fact — long before Ikea came up with the idea.

Over the years it has survived blistering temperatures, tropical rainstorms and even gun battles. Not to mention being deconstructed, packed away in containers and shipped across the Atlantic several times.

The building is, of course, one of the three Maisons Tropicales created by the renowned designer and engineer Jean Prouvé in 1951 and transported to the most remote parts of West Africa — namely to Brazzaville in the Congo and to Niger — to house French colonials.

It's a story steeped in history. However, the tale has suddenly been brought bang up-to-date by the intervention of the latest design technology. When the house was constructed recently outside the Tate Modern on the River Thames, London for a temporary exhibition, every component, fitting and assembly was recorded, measured and later modelled in Autodesk Inventor, creating an entire digital model of the building.

This will provide visual instruction to builders in any location who need to construct the modular building, as well as a permanent audit of components and record of how the design works. The move has implications for all historic buildings, whether pre-fabricated or not. But it also shows how 3D modelling will be used in the future — whether using Inventor or architectural solutions such as Revit Architecture to create a building information model — to keep a log of a building, exactly what has been used in its construction and procedures for maintenance.

Ahead of their time

The multi-talented Frenchman Jean Prouvé dedicated his work, until his death in the early 1980s, to producing buildings and furniture in his factory and workshops as efficiently and as economically as possible. As a result, he became a leader in utilitarian design and known for his sparse modernist style, perhaps influenced by his very practical early training as an apprentice to several blacksmiths. A friend and contemporary of La Corbusier, Prouvé also contributed to the trend for curtain wall building and skyscrapers with glass facades.

Designed for West African temperatures, Les Maisons Tropicales were not only ahead of their time in their flat, lightweight aluminium and steel structure, they also included what today would be labelled as "eco-design" features. They used the heat on the roof to draw in fresh air through openings in the walls and up into the ceiling, there were adjustable sunshades around the veranda and double-skinned insulated walls.

However, despite the functional, industrial nature of the design, they also featured beautiful, modernist lines and aesthetic details such as little circular portholes of blue glass.

The two houses in the Congo were constructed side by side and for a while became the property of the Aluminium Français company. However, the industrial design didn't really appeal to conservative tastes of the French bureaucrats and they were soon abandoned — until they were rediscovered in 2000 in a state of dilapidation and riddled with bullet holes. They were subsequently dismantled and shipped

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back to France and one of the houses was eventually bought for an undisclosed amount, estimated to be between $4 – 6 million at Christies in New York by the hotel magnate André Balazs.

Detailed audit

We now switch from what sounds like something from a Graham Greene novel, to the very different world of CAD — and the scene changes from the tropics to the banks of the River Thames in London on a cold morning in January. Working on behalf of his client, Tekne Shopfitting Limited, based in Poole Dorset who were commissioned by Andre Balazs to produce the Drawings, Greg Benson manager of The CAD Studio found himself in the grounds of The Tate Modern museum, kitted out in hard hats and high viability safety clothing, examining a shipment from New York in excessive detail.

The CAD Studio, a division of Adris Compting Concepts Ltd based in Southampton, since 1982, are one of the most well-established resellers of Autodesk's design software in the UK, offers both draughting and modelling services including animation and CGI development. Greg takes up the story: "We find ourselves involved in some very unusual projects, but this really was out of the ordinary.

"Before the team of French builders began constructing the house we had to record and measure in accurate detail every part of the building manually. In fact, as soon as any beam, panel and other component was taken out of the transport container we were their taking notes. We then recorded every assembly and watched how the whole house fitted together, taking detailed photographs along the way to help us in our task.

"The builders were eager to get the house up and ready for the exhibition so we had to work swiftly and efficiently to avoid holding up their schedules. However, it needed to be done at this stage as once the building was up, a lot of the structural detail would be hidden."

Maison Tropicale Re-Invented

After three weeks of intricate note taking on-site, Greg and his team took the details back to The CAD Studio in Southampton and the work of recreating the building on screen began. Using Autodesk Inventor, Greg's team were able to create precise 3D models of every individual item before assembling them to create a complete digital record of the building.

"There were some extremely interesting aspects," Greg explains. "These days steel structures tend to be constructed from standard parts and designers and CAD specialists can go to catalogues that give the dimensions of standard steels. However, probably because of the blacksmith influence, apart from a few new support structures, nothing was regular or standard about this structure and we had to model everything from scratch."

The result was a substantial 3D model of the entire 100 square metre structure. "We got a real sense of achievement when we completed the whole virtual model of the building — and it all fitted together as Prouvé intended." says Greg.

He explains that as the building was designed to be a modular one, with parts that were designed and manufactured to be constructed and dismantled, Inventor was the natural choice as a modelling tool for this project.

From the 3D model, The CAD Studio developed a complete instruction manual for the flat pack building providing an inventory of all the parts and pictorial details on how to assemble them. "We produced two manuals — a book of over 100 parts so that any construction team will be able to recognise and identify each piece, plus a 40-page document showing how to put it all together, Meccano style.

"The Inventor drawings are full of detail and well presented. As a result, we've produced manuals that are both accurate and attractive to look; so much so that Director of Business Affairs at André Balazs Properties, Sarah Carter, commented, "It is truly beautiful, and it is such a wonderful thing to see a job

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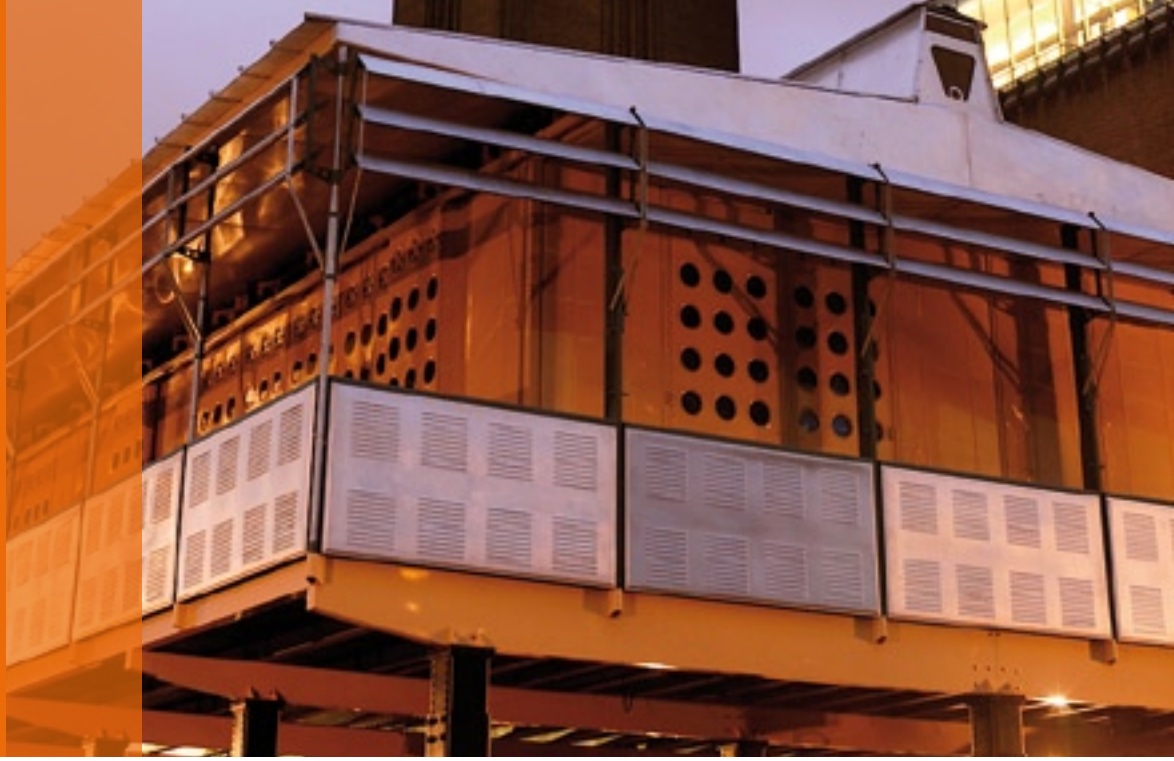

done with care and attention to detail." — "Ultimately these manuals will make it easy for construction teams anywhere in the world, whatever language they speak, to construct the building to their inevitably tight deadlines."

From the way Greg talks about the project, it's clear he found the task a fascinating and enjoyable challenge. Does he think it has implications for other architectural gems? "Most definitely however our job was made all the more possible because the Maison Tropicale was designed to be broken down, using parts, just the way same way Inventor works.

"Digital modelling enables us to hold all kinds of intelligence about a building and gain insight into its architecture and structure. It certainly has the potential to help record, maintain and even recreate our history in a way that was never even imaginable before," he says.

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