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The 24-Hour House: Assembled in 24 Hours Using Revit, Navisworks, and BIM 360 Field

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quattroD

Learning Objectives

- Know that it is possible and how to actually work in a multi-discipline project, on a Collaborative way, using the most of Autodesk technology;
- How to apply Autodesk technology in almost all the uses of BIM along a building cycle life;

Description

Encouraged by Autodesk University Las Vegas 2017's motto to do "More, Better, With Less," and knowing the alarming numbers of people around the world who still don't have homes to live in—especially in countries such as Brazil, which unfortunately still struggles with social problems and poverty—this real Brazilian case will show how we can use technology to change the future. This project used Autodesk products such as Revit software (to design and to extract information), Navisworks software (to plan the 4D construction sequence), and BIM 360 Field software (to monitor building processes). With a high-level multidisciplinary team, we were able to assemble a house live at the biggest construction fair in Brazil in a total of 23 work hours. With the spare hour, our team decided to have a classic Brazilian BBQ. The house was assembled—not built—in 24 hours, because most of the components had been prebuilt by the industry, much like how a car is assembled.

About the Speaker

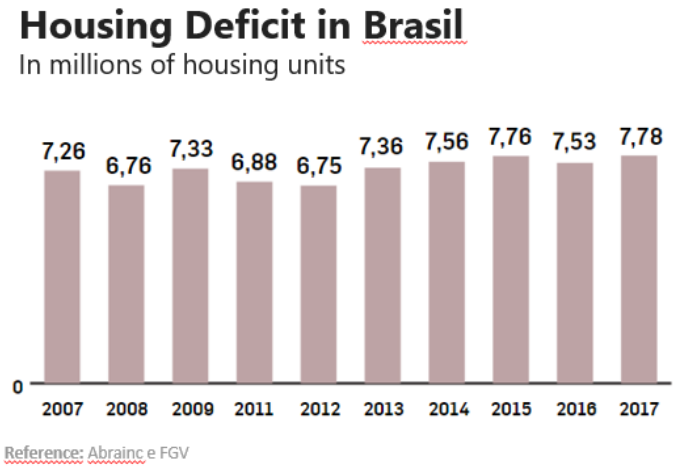
Fernanda Cruz has graduated as an Architect and Urbanist, on 2010 at UNICAMP, one of the best Universities at Latin America, where she had the first contact with Autodesk Revit. After graduated she started her career on an Engineering company called L&M, where on 2012 they began the use of BIM to design Data Centers using Autodesk Revit. L&M was responsible for Architecture, Plumbing, Electrical and Mechanical projects, and they all started the use of Revit on the new mission that was given for the office. Fernanda acted as the BIM Manager of this project and the company, and after the first project ended she realize that what she really liked was to help people discover how to use this new technology, and therefore she decided to change job to quattroD, a new and pioneer BIM company, where she works since November of 2012 and recently has become owner/ partner. On this new company she is responsible for Autodesk AEC Softwares trainings and consultings, family production (as a specialist on this skill, she was responsible for creating more than 2000 families for FDE – a Brazilian government company that is responsible for all public schools design on São Paulo State). Nowadays she´s not only owner/ partner at quattroD, but also a professor at a post-grad program in BIM called “BIM Master Specialist” at ISITEC.

The context and motivations for this project

Encouraged by the housing deficit and the inefficiency of Brazilian Civil Industry, this project was born with the motivation to help solve both problems just as Autodesk motto of AU2017 which was to encourage us to do “more, better, with less”.

The Housing Deficit

All over the world millions of people are still struggling with lack of proper habitation. And in Brazil this is still a huge problem, studies show that on 2007 there was a lack of 7,26 million houses, a number that has being growing to 7,78 million on 2017 (a 7% of increasing).
And based on this indicator it would be necessary to build around 1,2 million of houses for a year on the next decade to supply the demand for houses.



The Inefficiency of Civil Industry

Civil construction industry still is one of the most inefficient industry, at least in Brazil where we still use old and very handcrafted methods, which results on low productivity, wasting of materials and time.

About the Project

This project was based on some goals and concepts that helped to achieve the main purposes.

Project main information

The hole project was developed around those 4 concepts:

A “Popular” House

Planned for an average Brazilian family, with 45m², 2 bedrooms, a kitchen, a living/dining room and a bathroom, this house could be produced in large scale to help reducing Brazilian housing deficit faster.

Flexible and adaptable

With the interior walls made of Drywalls, this house has a flexible layout, allowing the owners to either build it with a bigger living/ dining room or change it latter.

In accordance with current regulations

Another important concept it was to design and build a house respecting all current regulations, such as “NBR 15575”- that sets standards for minimal performance of building components and the “Blue seal da Caixa” – a socioenvironmental mark of a bank responsible for financing habitations in Brazil.

Build in 24 hours

The main challenge of this project was to build a house in only 24 hours of labor, and to do so we get the inspiration of automobile industry, so instead of traditionally build a house we assemble it just a car, who’s parts are already manufactured while before, and that’s what the “off-site construction concept” is all about.

How was it done

The success of this case was only achieved, thanks to another 4 ingredients:

A multi-discipline team

With 16 companies, including designers, builders and consulters, each one specialized in a specific area worked together on a collaborative way to make this possible.

The pre-cast concrete walls as a construction main system

In order to follow the “off-site construction concept” the main obstacle was the walls, because in Brazil, light constructions like steel framing are not well accepted and most constructions are made with masonry and concrete.
So, to “industrialize” the walls, we opted to using pre-cast concrete walls a very efficient system that also brought the conduit pipes and their junction boxes already installed inside the walls.

Planning and Testing

As the first experience was going to happen on a fair, with a live audience, we couldn’t afford mistakes, so to avoid 3 pre-tests were made to not only help the team to know how to act, but also to improve the original planning.
All the planning process was based on the lean concept to assurance the best use of the staff need to complete each task in a very orchestrated and efficient way.

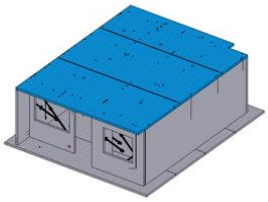
Technology

As the main ingredient, technology was essential to guarantee the success of this project.
It was not only applied on construction technics like the pre-cast concrete walls and the waterbox cistern, but also by the use of BIM.

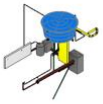
The Uses of BIM on the 24h house project

Design and Modeling
Architecture, Structure, Plumbing and Electric design were all based on modeling, using Autodesk Revit for most of them and IFC file for structure (which was made with Tekla)

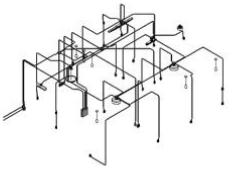
Architecture



Structure



Plumbing



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Design Review
During all process of modeling, 3D was crucial to avoid conflicts and helping designers to make a better choices.

Cost Estimation (5D)
Once all building components were on the models, estimation cost was easy to get by the quantities taken from the models.

Analysis
Thermic, lighting and sustainability analysis were made with the models or the information provided from them.

4D Planning
In order to not only the staff, but also the public of the fair be able to understand when the planned tasks would happen, a 4D video with the building sequence was also made on Navisworks and showed during all the 4 days of the fair.

Construction Monitoring
During the 3 days of work all tasks were registered on Autodesk BIM 360 Field, with pictures, status and time, as they were finished.

Results and conclusions

With a hard-collaborative team of great specialists, using technology it is possible to produce more housing, in a better way with less resources and time.