Habidite: innovative precast technology for housing

The first prototype of concrete modular dwellings

On the 4th of June, Habidite presented its first prototype of a modular dwelling made of steel-reinforced concrete. It is a unit comprised of three independent modules of 6.6 x 3.3 m which, together with the 2-part balcony, make for a total surface area of 65 m². The prototype consists of a living room, kitchen, two bedrooms and a complete bathroom, and it is equipped with the most advanced domestic implements and a high degree of technological application.

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In CPI 5/07, a detailed description and explanation of the modular philosophy of the product was provided. Habidite is a construction system that has emerged to meet one of the main concerns in the building sector: the optimization of production processes through implementation of the latest technologies. The system developed involves the manufacture of precast elements for a housing block in a controlled and stable environment like an industrial plant by means of serial production. Once they are complete, these finished components are transported to the destination site and the final assembly of the building is initiated.

In December 2007, production began of the first Habidite prototype in the company's Trápaga workshop, and the process ended in May 2008. The finished parts were transported to the central facilities of the Afer Group in Ortuella for final assembly and public display.

Modul mit integrierter Fußbodenheizung vor dem Glätten

Production process

The execution of each of the modules was performed in a number of fully distinct phases: the concreting of the structure, the placement of interior partition walls, the screeding of the floors and the assembly of the rest of the facilities and finishes of the housing unit. The structure, made mostly of SCLC (self-compacting light-weight concrete) with a density of 1,900 kg/m³, was made mainly in two phases. First, the base of the module was concreted in a specially made metal mould. This floor was composed of a cross-linked frame of beams solidified monolithically by a thin upper slab. After the base was cured and set, the vertical sections were built (pillars, beams and perimeter walls, as necessary) in which all the conduits for utilities were embedded (electricity, plumbing, domestic appliances, etc). To do this, use was made of another modular mould with a special filling system to prevent the formation of air bubbles within the concrete. Further, in each one of the four pillars, poly-purpose parts (PPP) were embedded to elevate, approximate, embed, level and bind the modules.

The interior partitions, also made of SCLC, were made in separate tables, horizontally, and the rest of the facilities were embedded within it, as well as the anchoring necessary for their subsequent installation. Once they were finished, they were hoisted up and placed in their final position in the module, with all the mechanical connections necessary and the facilities envisaged. This building procedure allows the owner of the dwelling to remove the internal panels in order to reform the internal distribution of the home. This can be achieved easily, as the partitions have no load-bearing task in

Construction of the concrete base, using self compacting concrete

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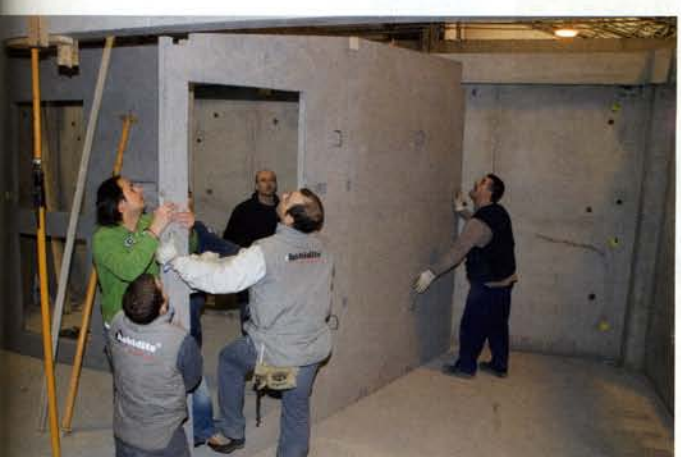
the structure of the building. Once the main structure of the module has been erected, the remaining phases of assembly were undertaken. First, the radiating ground was laid down, with its own insulation and pipe system, then the screeding was done with a self-levelling mortar, and the sub-floor was completed with the laying of ceramic and marble tiling chosen by the customer.

Simultaneously with these processes, both balconies and façades were being made. The former are self-carrying steel-reinforced concrete structures that are later hung, after going through the same phases of positioning of utilities and finishes, by means of anchors designed in the R+D department, with poly-purpose parts (PPP) included in the pillars of the module. The same process was performed on the façade panels, which, for this first prototype, were lined with facing tiles, but, in the future, any other material could be used: stone siding, concrete facing, ceramics, metal, etc.

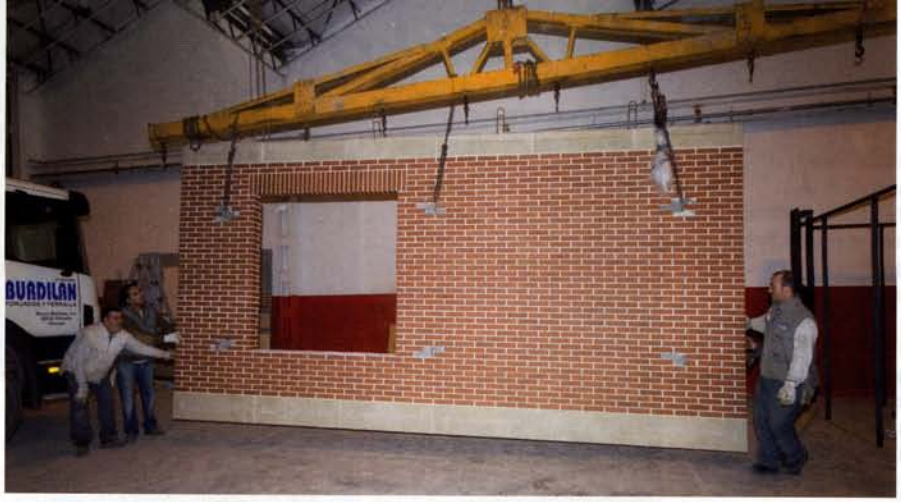
After painting and finishing of the interior of the module, the connection boxes for utilities were installed, along with toilets, home appliances, kitchen and bathroom furniture, embedded closets, etc. Then, the links and connections were made for the comprehensive control of basic functions of the dwelling, including a touch-screen control panel. The system can control ambience aspects (such as light, temperature, background music, etc.), increase security (with presence simulation, surveillance cameras, intruder alarms), climate control and energy savings (with heating and refrigeration with radiating ground, as well as managing of Venetian blinds automatically), remote control of the dwelling by mobile telephone, PDA or computer, etc.

Transport

As previously mentioned, most of these processes were undertaken in an industrial facility many kilometres away from the final location



Module with installed underfloor heating system, prior to screeding



Installation of partition walls

of the dwelling prototype. The reason for this was to enable study of the effects and possible imperfections caused by the transport of the modules in an ordinary truck. In addition, it was also seen that the impact caused by this transport on surrounding traffic was minimal, as the width of the lorry never surpassed 3.5 m, and the speeds were more than acceptable.
The modules, balconies and panels were wrapped in specially prepared packaging to ensure water and air-tightness, and to ensure that handling, packing and unpakking times would be as short as possible.

Final assembly

Once the modules were unloaded in the Ortuella show-room, the work of placement and assembly of the three modules with their respective balconies was quite delicate. Given the limitations of height and carry capacity of the available bridge crane, a specialized team from Habidite Technologies ensured exact synchronization of the movements of the modules, which were hoisted up with hydraulic equipment, moved with pneumatic load-modules and levelled with the poly-purpose parts (PPP), a patent for which is forthcoming. Each of the modules - weighing roughly 24 T, which is the same as three city buses - was carried solely by the four corner points, with the balconies overhanging, thus simulating the support system the modules will have in a finished building.

When the three dwelling units were placed adjacent to each other, the necessary mechanical connections were made with high-resistance anchors, and the quick connections were made in the conduits built in for them, including plumbing, radiate heating, electricity, audio, video, control units for electronic appliances, etc. At that moment, the dwelling became a single, perfectly integrated and solidified whole. Nevertheless, and prior to the transport of the modules, all these elements had been checked in the production plant where they had been manufactured, to ensure that the tolerances and dimensions were fully precise so that an exact synchronization could be achieved in assembly.
The final tasks consisted of the placement of joint sealing between the modules, which were completed with light finishing touches and details of decoration.

Conclusion

In sum, the construction of this prototype is another milestone in the work of Habidite to show that the construction of modular dwellings is not only possible, but even advisable to ensure that the dwellings of the future have the highest levels of quality possible in a controlled environment. In the future, when execution of all these processes is performed industrially, these levels of quality will be supplemented by the undeniable values of safety, efficiency, savings of energy, water, shortening of construction times and more. ■

FURTHER INFORMATION

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