

# Building Prefabricated Elements for the UK's Subsidized Housing Market

an interview with  
**Michael Hardiman**

The term "prefabricated building element" generally refers to any size component of parts assembled in a factory, thus transforming a conventional construction site into a place of building with components. "For example," explains Michael Hardiman, "instead of floor joists, x-bracing, and sub flooring being delivered to the site as "building materials", these are pre-assembled into "cassettes" which fit into precise locations." By working with prefabricated elements, construction sites are able to reduce the waste of materials and time, while increasing accuracy and safety.

Michael Hardiman spent the last 5 years in London using **form-Z** to design prefabricated building elements for The Forge Company, which were then built full size and made into housing for the UK subsidized housing market.

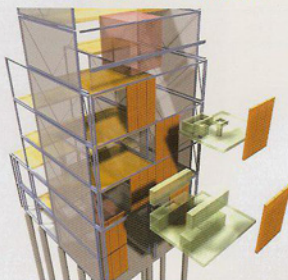
The project which Hardiman calls "the biggest success with **form-Z**" was the Beaufort House Project for the Peabody Trust (the UK's most adventurous Housing Association). "The Forge Company won the contract on the strength of our concept for a hybrid solution. In this, we would fabricate the high value and heavy items (bathrooms) as 3D modules and allow the larger, lower value spaces (living rooms, bedrooms) to be delivered as wall panels and floor cassettes." But I like to think that we also won because we could show them (virtually at least) a completed building beforehand and a clear idea of how it would be built.

Development of the steel fabrication drawings for the wall panels, floor cassettes and hot-rolled steel elements took place parallel to the prototype development of the bathroom pods. **form-Z** was used to illustrate the pods at different stages of their assembly and to show the refinement of the building's structural design. At the same time, testing was undertaken on prefab Terracotta wall panels at a testing facility using old WW2 bomber engines to simulate 50 year storms.

Fabrication of the bathroom pod steel cages took place at Ayrshire Metal Products in Scotland. These were then shipped by lorry (truck) to a shed in Milton Keynes, where they were fitted out with plumbing, electric, fixtures, gypboard, tiling and the works. Meanwhile, wall panels and floor cassettes were made at Ayrshire, while large scale hot-rolled steel elements were welded at Littlehampton Welding. This last included balconies, hollow section columns, and 3 story lift shaft sections and prefab steel stair runs.

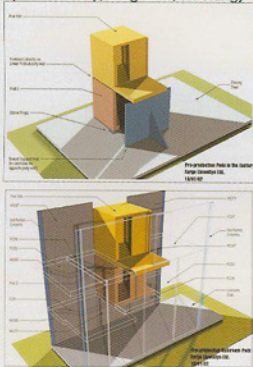
Delivery of the off-site fabricated structural elements to the site was carefully orchestrated bearing in mind minimum site storage space and the complex erection sequence. The 16 bay building was erected vertically in three bay lifts. This enabled first fix crews to keep moving while second fix crews were able to follow behind in parallel. The building was then finished off with normal site construction.

The project was brought in ahead of time and under the established budget. It won an RIBA Housing Design Award in 2001."



**A-Early Lillie Road**  
(what we did to get the project)

**B-Bathroom Pods**  
(steel factory, diagrams, stacking)



**C-Developmental Color Version of Lillie Model**

In addition to the success of the construction and the recognition from the RIBA, one of the images used to visualize the project was chosen as the cover image to a building magazine supplement on Offsite Fabrication became iconic in the UK Offsite housing industry. "Lots of renderings look terrific but fail to show what a building is made of. In order to focus on what was really important, we decided to model only two bays of the building. We also showed it in a halfway assembled state. This enabled us to present at least one of each major component very clearly. Its prefabricated nature was readable with a casual glance. Beyond the actual project, it became, for a while, symbolic of progressive construction thinking."

Hardiman notes how the powers of previsualization, and its ability to communicate design intentions clearly, have played an important role in the development of new building techniques. "It's hard, from where we are now, to imagine engaging in the process of design without the benefit of 3D modeling. Prefabrication requires that everybody in the supply chain clearly understands the components and the process of putting them together. You can attempt this with plans and sections but it's such an expenditure of energy for so little gained."

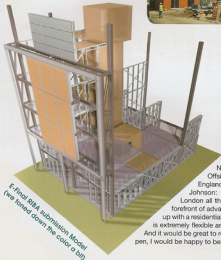
While Hardiman sees benefits in a number of terrific modeling programs out there, he recognizes **form-Z** as a step above the rest when it comes to architecture. In particular, he names the ability to precisely control dimensions, the object and grouping controls, the architectural shape tools, and the ability to export into many different file formats as elements comprising his affinity for **form-Z**.



Old and New Peabody comparison



Photos of the project On Site



E-Final RIBA submission Model  
(we toned down the color a bit)

As for the future of 3D modeling within the field of Offsite Fabrication, he envisions software developments that integrate more detail-oriented information along with continued growth of modeling and rendering capabilities. "I think the moment will come soon when the representation of time and how things actually go together is expected to be represented in virtual form before going on-site. Any problem you can resolve before getting to the site (or to the factory for that matter) is going to help save money in the building process and dynamic movies of components going together can help this tremendously. So I think that the ability to animate individual components is very important. It would be very useful if each component could be linked to a database, showing everything about that component (part number, whereabouts, cost, manufacturer), as they have been doing in the airplane and automotive industries for years."

Now living in Boston, Hardiman continues to use **form-Z** to explore Offsite fabrication systems for the US residential housing market in New England. He looks back favorably on his time in the UK, quoting Samuel Johnson: "When a man is tired of London, he is tired of life; for there is in London all that life can afford", but he welcomes the future and being at the forefront of advancements within his field of work. "It would be fantastic to come up with a residential building system that is truly exciting, that is very sustainable, that is extremely flexible and that can really make a leap in the 'easy-to-build' department. And it would be great to reap the economic benefits of this. Of course, if this doesn't happen, I would be happy to be an architect who just feels really good about his work."

— Bill Jordan