

*Fiberglass Housing Prototyping*

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### *The Competition Brief and a short critique of the brief*

City of Portland is sponsoring a housing competition which calls for ideas for development of a narrow and deep urban infill lot. The dimension of the lot is 25x100ft. while the proposed structure is to be 15x50ft. with a 30ft. height limit. The scale of the house is unlike a typical detached downtown Toronto house, except in Portland, this dimension is very uncommon (typical dimension for a plot of land is 50ft wide by 100 ft. deep). Also, the required spacing between houses is 10ft. and most houses have a car garage facing the street. The photographs and description point out a condition that would better describe a Mississauga neighborhood than a Toronto one.



At the same time, Portland is dedicated to the idea of urban environment. Transportation and pedestrian friendliness of the streets is highly emphasized. The existing fabric does not support the idealized version of the city. The contradiction in the competition brief is that it asks for a house half the size of a typical one; they ask of it to incorporate all of the urban elements yet provide all of the suburban conveniences. A 15ft. wide house with an 8ft. wide front garage does not leave much room for urban interaction. A garage is not required, but is highly desirable based on the brief. Thus the solution to the problem requires a carefully articulated solution with not one, but a series of ideas that are all innovative and redefine the basic concept of the house. Unfortunately, the design proposal must fit on one panel just slightly bigger than two 11x17s. The required plans and sections take up most

of the space on the board, leaving little room to explain more complex architectural ideas.



### *The Project*

This project is an exercise in creative space planning based on non traditional building techniques. The structure is a simple three storey building constructed out of the most economical means available. It could be of light wood frame, steel, or a combination of materials; the execution of the structure is insignificant as long as one condition is satisfied- the short ends of the structure need to be able to support cantilevered building skin.

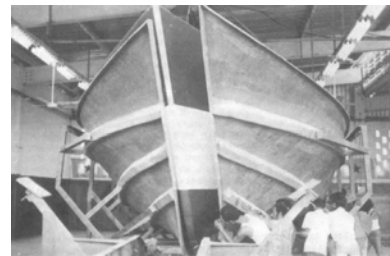
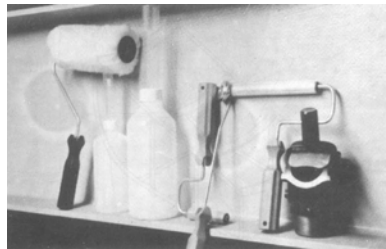
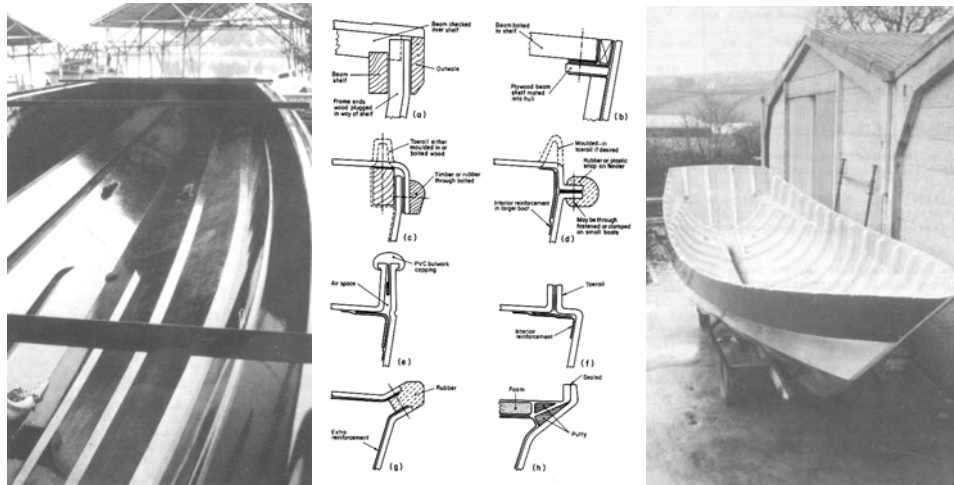
All of the mechanical elements required in a modern house such as electricity, heating, cooling, gas, phone and cable are incorporated into the skin of the building, which is itself constructed out of modular fiberglass and vacuum formed acrylic vision panels.

The idea for materiality of the skin comes from my 5<sup>th</sup> year thesis project, which dealt with high rise residential buildings. Each module represents a specific dwelling function, such as the kitchen, washrooms, balconies, doors and stairs. Each one of these elements is constructed out of a single continuous fiberglass shell for the exterior, and a series of fiberglass elements that come together and form the interior. The interior elements are meant to serve the specific function of the module, meaning the interior of the kitchen will be made up of fiberglass kitchen elements and the leftover space will be used for glazing. The exterior aesthetic of each module thus becomes the function of the interior, negating the necessity for incorporation of any outdated domestic architectural symbolisms.

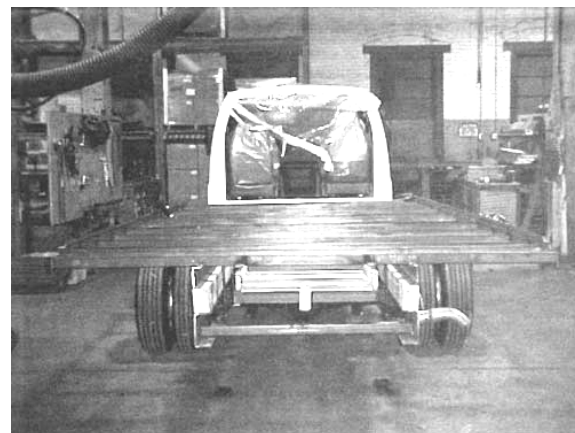
### *The Skin*

The skin borrows its ideas from fiberglass boat building and fiberglass truck design. A point of reference was a Fiberglass Boat Building Manual for Developing Countries issued by United Nations. The manual explains the materiality, process and skill required for building a mould that can then be used to make thousands of identical boats.

In simple terms, the process involves: making a prototype vessel, out of wood typically; forming a negative mould of it by using fiberglass or plaster or concrete; using the negative (female) mould to make a fiberglass replica of the original wooden boat. This process yields a waterproof, outside shell of the vessel; and depending on complexity of the boat design, a series of smaller fiberglass elements are fitted on the inside of the boat to provide structural cross bracing as well as to satisfy functional needs such as a place to sit, flat walking surface, roofs, etc..... This makes up the general idea for the proposed skin.



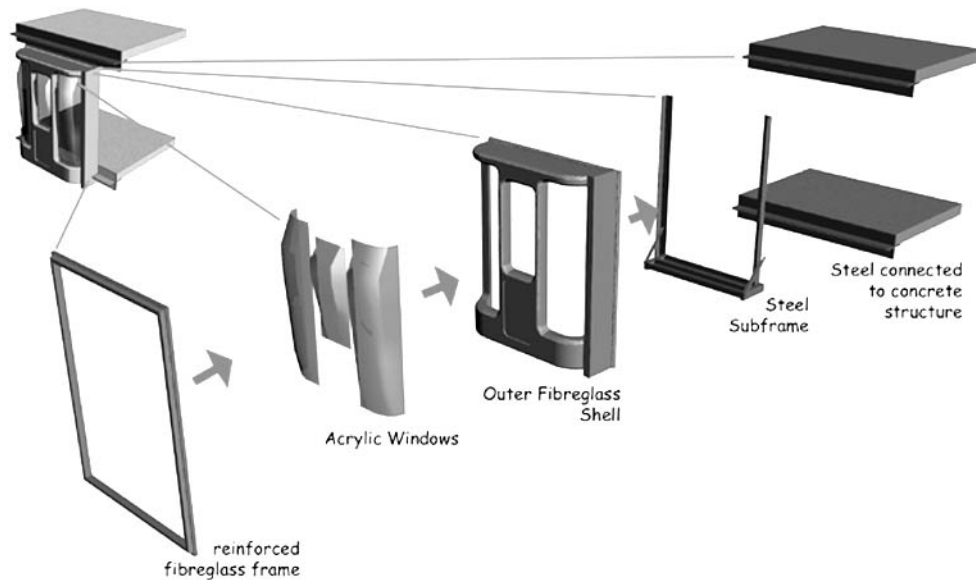
The second referenced technology is the fiberglass truck technology, which gives simple, easy solutions on how to achieve structural rigidity on land, and explains how fiberglass can be incorporated with other materials such as steel and aluminum, and how connections work between such materials.





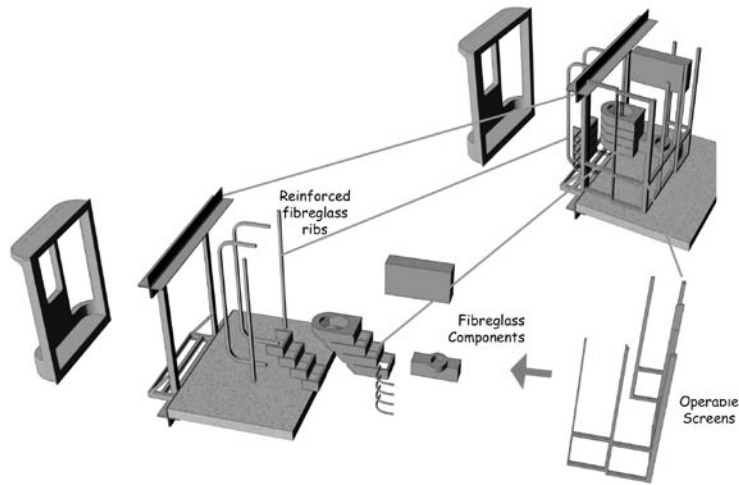
A fiberglass truck shell is a single continuous shell. The bed of the truck is made of steel channels which act as: a) transition between the shell and the truck chassis; b) structural bracing for the shell, as fiberglass is a strong material in the terms of volume to strength ratio, but is weak in resisting twisting forces. Similar approach is used in the

proposed skin, as the steel frame acts as a mediator between the fiberglass shell and the simple three storey structure. Since the steel frame solves the bracing issues of the fiberglass construction, various depths of cantilever can be achieved (different modules can have deeper profiles versus the simple three storey structure), thus allowing for more visually complex relationships between modules, and creation of hierarchy between elements.



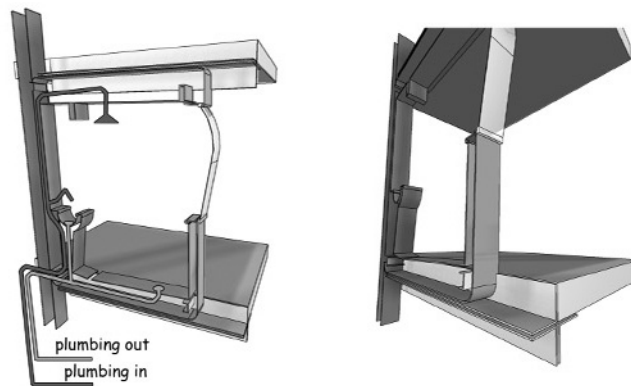
There are three strong reason for selection of fiberglass as the main cladding material; a) the ability to compose a façade out of a small number of modular elements that make up the whole, that can also be compiled in different ways thus allowing for variation and ultimate customization of the house based on the tenants preferences; b) the economy of construction, fiberglass is a low pressure laminate technology that does not require heat or pressure for formation, and also the glass fibers are end of the line for recycled glass life cycle; c) elimination of cavity wall cladding concept, which is unnecessary and wasteful.

Insulation fits between the outside shell and the inside composite shell. Also all of the services (plumbing, electricity, gas, phone, cable) also run between the two cavities. The concept will be further described in the next chapter.

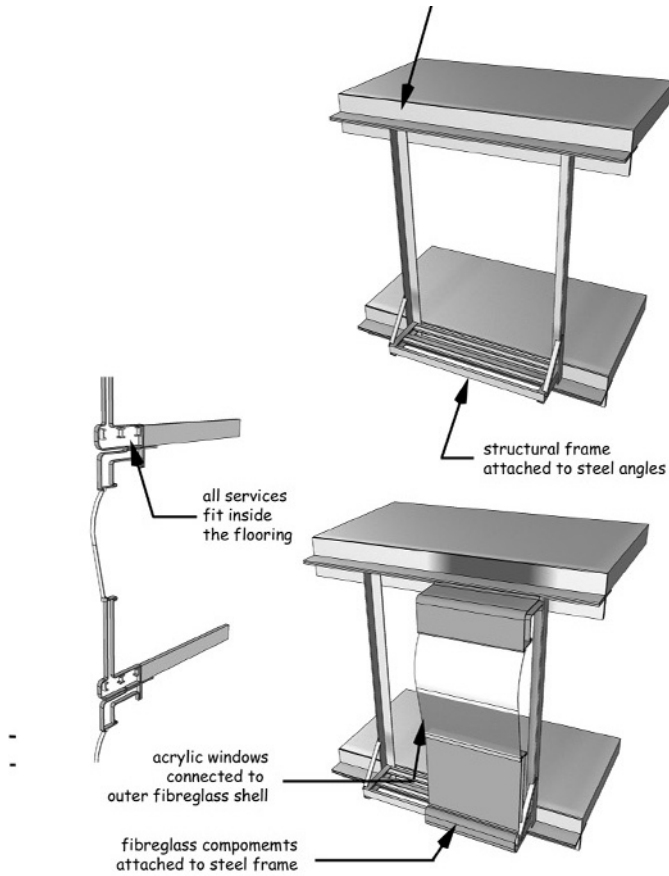


All of the glazing is made out of a non standard architectural material. Vacuum formed acrylic panels are typically used for skylights and as basement light well covers. They are used in this instance because of great

compatibility with fibreglass shells. The strength in acrylic panels is that the nature of their construction allows for elimination of the window sub frame. The glazing thickens at its edges thus creating a self supporting frame. Since all standard glass windows require a sub frame in order for them to be operable, thus adding to the cost of the assembly, all acrylic windows can therefore be operable with a minimal cost being added to the overall cost. This creates a unique situation; a house with all of its glazing fully operable, allowing for a great possibility for cross ventilation.

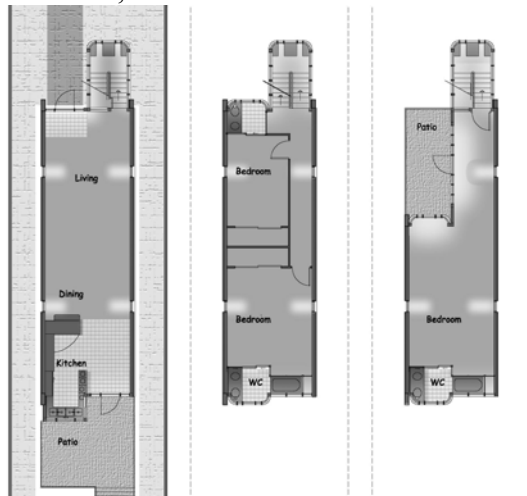


outer fibreglass layer (one piece)  
inner fibreglass layer (a composite)

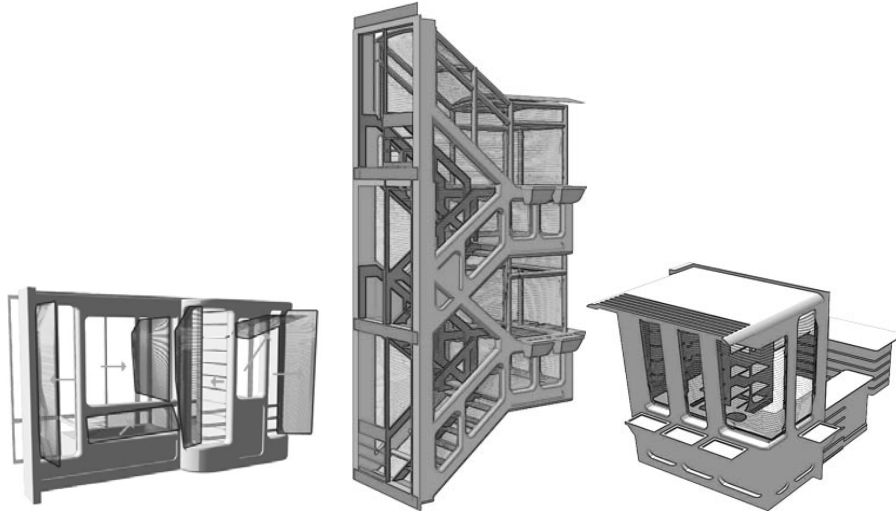


The Space planning

The kitchen, washrooms and vertical circulation are pushed to the outside and thus make up the new hierarchy for composing a façade. By pushing all of these services to the outside, a) the aesthetic of the building becomes the function of the interior, thus; b) the narrow nature of the lot is minimized by allowing the greatest interior flexibility and size possible within the 15''x 50'' dimensional constraints;

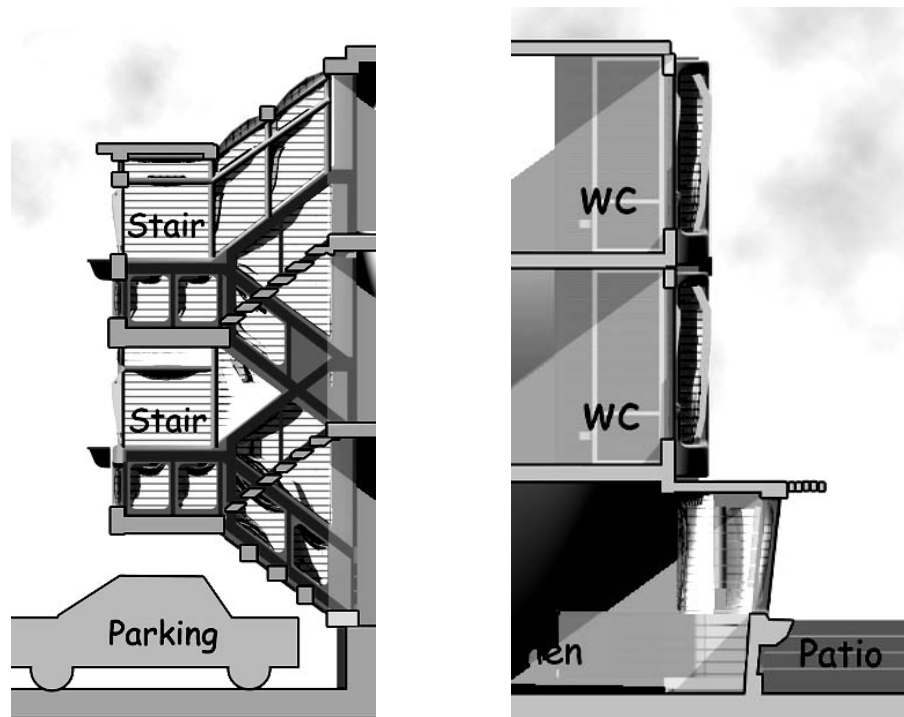


c) since the function of the interior is expressed on the outside, the scale will read as warm and appropriate to the existing fabric. Since the heart of the building is the skin, the proposed infill structure is truly extraverted and will read as welcoming from the outside.



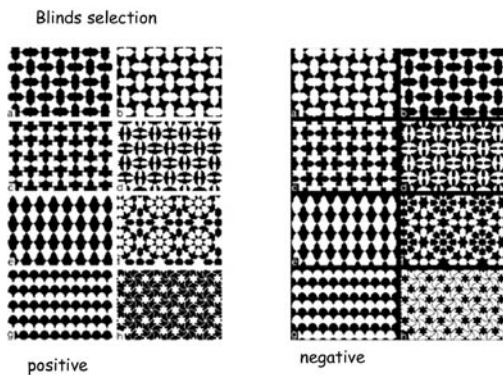
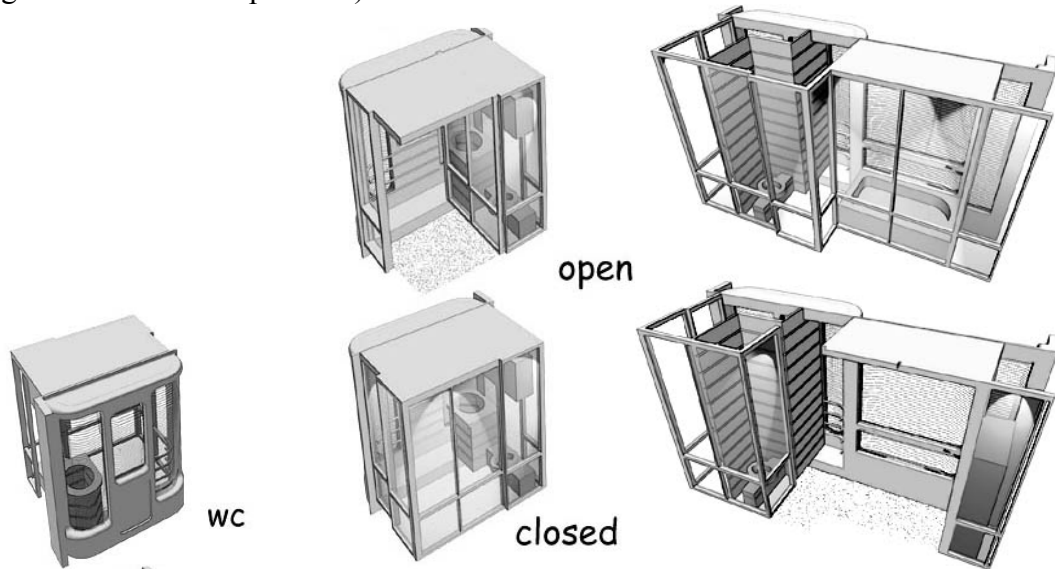
All of the mechanical services are embedded in the skin, leaving the interior spaces to be as flexible as possible. They run up the house in vertical shafts (two in the back and two at the front) feeding the services which are located in the unoccupied basement.

The front façade consists of vertical circulation, a cantilevered stair that hangs over the street, creating moments of interaction between the street at the stair landings, which are the furthest spaces away from the building. The space underneath the stair becomes a parking space for a single vehicle, which is meant not to look like a parking spot, yet provides full shelter from the elements.



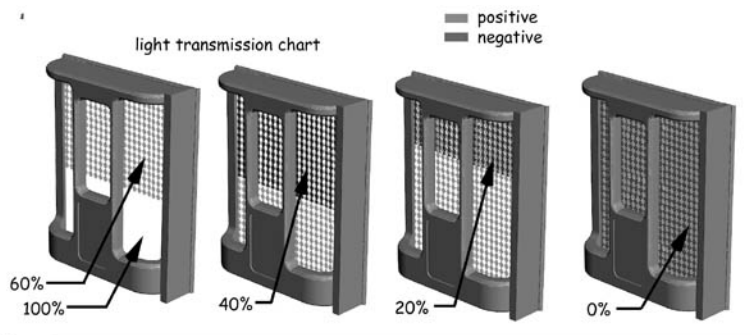


The two washrooms also face the front of the street, and they are designed in such a way so as to allow for transformation from a bedroom window to a full washroom. Important aspect of such a proposal is light control. A system of a patterned blind (built into the module), and the negative image of it, allow for a large degree of light permeability control (100%, 80%, 60%, 40%, 20% and 0% light transmission is possible).



The competition panel shows the proposed house in a definite shape and format. This is because the competition format did not allow for more information to be shown. The true idea behind this house is that just by shuffling proposed elements of the house, multiple schemes are possible. Elevation elements can be arranged in different ways, and new elements (not shown) could be added to the existing palette.

The competition brief asks of the participants to show a sample of a definite answer to the problem proposed. My entry goes one step further by introducing new ideas of materiality, space



planning and assembly, which are not definite answers onto themselves, but work meant to promote further discussion.

*Bibliography:*

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