Houseboats and Floating Houses

Houseboats and floating houses are built elements that lie on top of the water surface, and therefore have there sensations depicted by the moving water below and views surround them. They are unique places to live due to these sensations. Houseboats and floating houses are very different. The major difference is in the fact that houseboats move themselves whilst floating houses are located in primarily the one spot. Living on the water can create a strong sense of community though floating houses, or it can provide privacy through houseboats, both however give the occupant a strong understanding and appreciation of the natural environment.

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Differences between houseboats and floating houses-

The major difference between houseboat and floating house design is the amount of manoeuvrability required. The typical houseboat for example has as hull that is submerged below the waves which allows the boat to move in the water with ease and direction. There are two major types of houseboats, the first has one hull that is curved to move through the water quickly, and it is designed for speed and to move though rough waters. The other has a pontoon base that is wider in the water and contains at least two hull extrusions into the water. This houseboat style is for slow cruising through waterways as it has less speed and manoeuvrability. The living area above or within the hull is therefore designed to maximise the space below and above the water level. In faster single hulled boats sleeping and living quarters are included in the hull of the boat, an example of which is a yacht. The pontoon base requires that the living space be above the water, as the two or more hulls are shallow, however this space can still be utilised as storage space. Many objects in a houseboat are more compacted compared to a normal house. An example of an equivalent land based habitat is the caravan, which also maximises minimal space whilst moving from place to place. [1]

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[1] Newcomb, D. The Wonderful World of Houseboating, Publish by Prentice-Hall of Canada Ltd, Toronto 1974, pages 130-135

Houseboat

Floating House

Floating house design on the other hand is possible due to a floatation base on which they sit. These bases are made out of varying materials, all of which require floating qualities. The podium sits and floats on the water, but is usually connected to a walkway that links it to land. Floating houses do not usually move on their own, as they have no device to manoeuvre in the water, but they are able to be taken to different sites by tug boat if required. The base is wider and more stable than a houseboat therefore allowing more regular construction above the floatation base. The base area of the floatation device can be as big as desired, and depending on its strength a floating home can rise up to four levels high. A floating house is therefore more permanent for the occupant compared to a houseboat, thus allowing the residents to live in it comfortably all year around. Floating houses are usually grouped in communities, therefore allowing more services to be located in the one area, and be accessible for more people.

Floating House

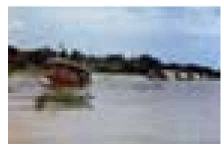
Single Hull Houseboat

Pontoon Houseboat

Locations for communities

Houseboats are found in most waterways around North America, Australia, Europe, and Asia. In most western countries houseboats are either privately owned for weekend and holiday use- or they are hired out to people for holiday use. Some houseboats are used for year round living, such as the cannels of European cities- Paris, London, Amsterdam to name a few. [2] In Asian communities, houseboats are commonly used as places of work, as well as residence, such as the transporting of goods or fishing, in these cases the family works together and live together. As houseboats are able to move through the water they are able to go anywhere that their engines ability and flotation ability is able to take them. For example supper-yachts are able to navigate around the globe in luxury, and can pull into any port or drop anchor in any shallow water, this is the advantage of a houseboat.

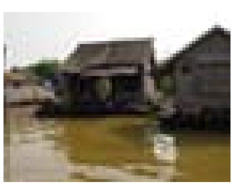
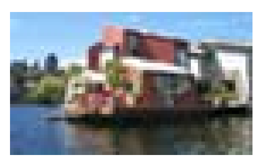





Houseboat in Paris

Asian Houseboats

Floating house communities are located in more specific areas. The largest in Canada is in Vancouver, whilst in the US the main floating house communities are located in Seattle, San Francisco, and Florida. Apart from North America the Netherlands have a very large and successful community of floating houses. This is due to the rising water levels in the country and the growing population, where people are forced to find alternatives to land habitation. The architects in the Netherlands seem to have taken a lead in sustainable and innovative floating house design due to the pressures just mentioned. [3] In Asian floating house communities, floating houses are also converted into community buildings such as schools and shops that are only a short paddle away from the family floating home. These communities are able to deal with the rising water levels and growing populations, but have few of the modern conveniences that western floating houses have, such as electricity and sanitation. [4]

Floating Houses

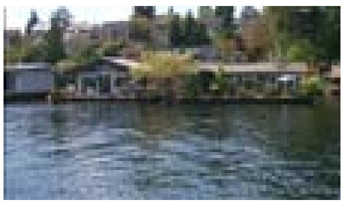
[2] Gabor, M. Houseboats from Floating Places to Humble Dwellings- a glowing tribute to a growing lifestyle. Published by Ballantine Books, Toronto 1979.

[3] http://archrecord.construction.com/inovation/1_TechBriefs/0310Watervilla.asp

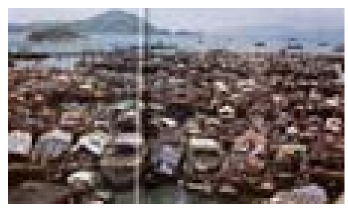
[4] Gabor, op.cit.

Requirements for a floating house community-

Floating house communities are very important to floating house owners. Floating house communities provide a sense of security and connection for the individual floating house owners, which is required when living on the water. A floating house community can be made up of half a dozen or more floating houses. Larger communities are a combination of smaller neighbourhoods, containing 4 to 6 floating houses all linked together by the same pier or boardwalk. These neighbourhoods may run off one larger boardwalk, or they may be directly linked to the land. Some older communities would run the length of the pier or the shoreline. Floating houses can be individually situated, on private waterfront properties, but most floating homes now are controlled by local planning and are required to be situated in only certain areas. [5]



Floating House Communities



The initial attraction to floating houses in North America was that there was no land tax for living on the water, which was a great benefit during the great depression, however as the numbers of communities increased local governments eventually caught up and took control of the planning in floating house communities. The number of floating house communities have since dwindled, as have the number of floating houses within the communities, and this is because of the tougher stance taken by the authorities, who believed them to be very unsanitary places. In some areas authorities have declared that there will be no more floating houses, and that if one sinks or moves none can take its place, which insures that the community will disappear. In other parts of the world however, floating house design is becoming much more important, and as such, so are the communities where they will be situated. An example of which is in the Netherlands. Communities there are being designed as whole suburbs, including family homes, student flats, offices and much more. This is becoming a priority, as there are fears of global warming and rising waters, which now are in the not so distant future.

There is a large range of people living in the floating home communities. At around the turn of the 20th century when floating houses started to develop in North America, many of the inhabitants of

[5] Paris, G. The Floating Home Channel Floating Home Community- The Deering Channel Floating Home Community Vancouver B.C. 59-672 Integrative Project R.R.Stoltz Supervisor- School of Landscape Architecture University of Guelph, Guelph Ontario. May 4, 1984.

floating homes were men who's work involved floating logs down river and it was easier for them to work and live on the water, especially as the logs that they floated down the river became the floating device which the floating house would sit[6]. Wealthier families were able to enjoy living on the river at these times as well. Recently there have been large ranges of people who enjoy living on floating houses. They range from professionals, such as school teachers, to retirees, majority of people according to Gregory Paris are couples, and only a few families with children live on floating houses in Vancouver. Floating house communities also attract artists, poets and other creative personalities, with a desire to be creatively influenced by living on a floating house and the water.[7] Groups of more than 2 people, such as families, or groups of couple's on the other hand occupy houseboats on weekends or holidays.

Wealthy and Poorer Floating Houses around the turn of the 20th Century

What makes up a floating house community is not just the floating home. In successful communities, services are provided for the direct use of the occupants. These services include laundry facilities, communal washroom facilities (including showers and toilets- for those floating homes that do not have their own shower), communal room/hall, park areas, car parking, and public transport access. These services are important to the occupants of floating homes in individual ways. Laundry facilities and communal washrooms for example are provided so that occupants with out a washing machine do not have to travel long distances into a town to clean their cloths, which would be a hassle and time consuming. The communal rooms or hall are required for community meetings, social gatherings and for organisational purposes. These places may also have some other features that would benefit certain generations of the floating home community, such as teenagers, who might require external activities with other members of the same age group. These rooms would be a safe place where they would be able to meet with friends and have a good time.[8]

Parks are very important to a floating house community, as there is no private land for the occupants of a floating home. According to a study called "The floating home channel, floating home community", in Vancouver B.C, an interactive project by Gregory Paris, 1984, parks in floating home communities require long walking tracks, open grass space for activities and BBQ's and outdoor eating space facilities. Car parking is required for all occupants that have vehicles so that they are able to access their floating home from other areas. For people that don't have cars

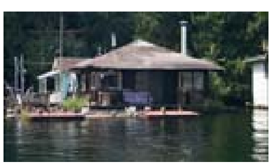
[6] Dennis, B, Case, B. Houseboat- Reflections of North America's Floating Homes… History, Architecture and Lifestyles. Smuggler's Cove Publishing 1977 Seattle.
[7] Paris, G . op.cit.
[8] Paris, G . op.cit.

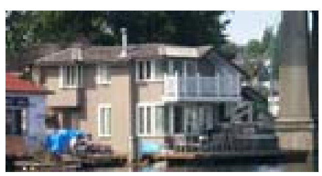
public transport may be necessary. The easiest forms of public transport that can be extended to a floating house community are the bus services. Most communities have no form of transportation between the car park, public transport drop off and the floating homes themselves, as some distances may be quite far and the occupant may have heavy bags or the like, this issue may be important in the future. [9]

Designs of floating houses and houseboats

The appearance of floating houses are different all around the world. In North America floating houses can be either designed by an architect, and look relatively like a land house, or they can be pieces of sculpture, where the builder has taken many objects, usually starting with a flotation device and creates a home out of the materials that they can find. As Mark Gabor puts it in his book Houseboats, Living on the Water Around the World, on page 6, floating houses in North America "can range dramatically from a one-room shingled cabin on wooden pontoons, to a mobile-home-type squatter's shack supported by metal oil drums, to a three-story suburban palace on a reinforced ferro-concrete barge base."[10] The main requirement for a craft to be labelled as a floating house is that it is a permanent residence, with homely belongings inside. These homes are able to contain all the creature comforts that a land house of the same nature may have. For example, fire places, kitchens, spa baths, staircases, normal beds, laundries etc. Floating houses are now linked up to the shore line so that fresh water can be brought straight into the house and sewage can be pumped back into town lines, thus avoiding the floating house communities from becoming unsanitary slums.

Floating Houses



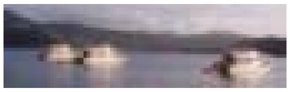


Houseboats are much more common on the worlds waterways, this is due to the fact that they are not restricted to the one spot. Hence they can be easily placed in the water at any place required and they can be off. Houseboats only have to stop in one place long enough to refuel the boat and its supplies and then it can travel around to explore different places up and down the river or coast. In fast moving houseboats with one hull, the hull shape can be squarer or rounder, depending on the smoothness of the ride. In square bottom hulls the water gets trapped underneath the bottom of the boat lifting it up high into the air, and when the next wave arrives the boat comes crashing down again, sitting high in the water also helps the boat to travel faster. The round bottom edge on the other hand lets the water underneath it to escape, thus allowing the boat to sit lower in the water and making the ride smoother. Most houseboats rely on the internal side of the hull for living quarters, such as bed space, living/ dinning areas, kitchen, bathroom and storage. The shape of

[9] Paris, G . op.cit.
[10] Gabor, op.cit.

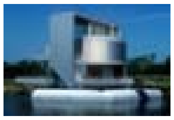
the hull therefore has a large impact on the feel of the boat, and the habitable space inside, as well as how it moves throughout the water. Pontoon houseboats on the other hand, have more similarities to floating houses as the living area is above the waterline, and can therefore take a less determined space to that of a hull. The pontoon houseboat only travels very slowly, but because of the movement and navigation requirements their size is not much bigger than that of a hull houseboat. They therefore have very tightly packed internal spaces, with the aim to maximise every corner in the home. [11]

Houseboats



Modern examples of floating houses

Floating house design has slowly developed through the years, however it has only been recently that designs have become more environmentally aware and have begun to challenge the boundaries. This is mainly due to new construction techniques and growing climate changes. Two example of floating houses that have employed environmental principles to create sustainable dwellings and innovative water house design are Hertzberger's "Watervilla" and Zema's "Jelly-fish 85".



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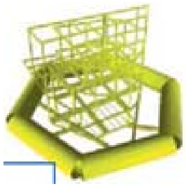
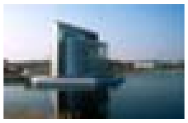


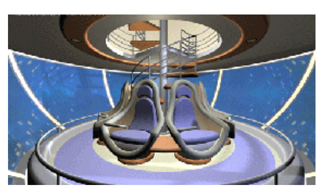


[11] Malo, J. The Complete Guide to Houseboating. MacMillian Publishing Co. Inc, New York 1974.

Watervilla has been designed by Dutch architect Herman Hertzberger as an innovative step towards solving Netherlands over crowding and rising water level problems. Watervilla's floatation system works on the same principle as an offshore floatation rig, and contains a steel frame in a hexagon shape, covered in industrial flotation pipes. This structure allows the floating home to be stable in the heavy seas and winds up to a force 14 storm. The pipes are in a D-formation and are over 2 meters high, making the structure almost un-tippable, due to the suction created, and also very strong, able to carry 135 tonnes in weight, enough to hold the live weight of a three-story house. The Watervilla is designed to be situated far enough away from the shoreline so it can rise and fall with the water level, and it is connected to the shore by steel hawser guy ropes so that in times of floods it does not get swept away. An advantage of the Watervilla is the small on board motor, which allows it to move to another place if required, and due to the shape of the base the floating house has good manoeuvrability. It is however designed for emergency use only, and if travel is required then there is room for a larger motor to be installed. The system, which can be operated manually or computerised through solar power, also controls the crafts ability to turn 90ɣ deg depending on the solar orientation of the season.[12] The Watervilla was designed to be competitive with the land housing market in the Netherlands, so it's cladding is as Barreneche describes "prefabricated, low-maintenance skin made of lightweight steel plates over the 60-centimerter deep steel frame with foam insulation." The Watervilla is three stories high and contains two bedrooms and a study, two entry points into the house and balcony areas on each level. The large floor to ceiling glass windows allow for cross ventilation and indoor temperature is controlled through heating and cooling systems. [13]

Zema's Jelly-fish 85 however is not aimed at the housing market. At a cost of 2 million dollars USD, the Jelly-fish 85 is a luxury home for the very rich. The Jelly-fish 85 is nonetheless designed to be self-sufficient and non-polluting, the first of its kind, and if it is ever to transpire then it would be a great step forward to a cleaner richer environment. The Jelly-fish 85 works in a very similar way to the Trilobis 65 through its solar electric panels, solar hot water panels and hydrogen power to move the Jelly-fish 85 through the water.[14] It also has the photovoltaic glass panels, which turn dark to block direct sunlight and reflected glare on the users command. The Jelly-fish 85 sleeps 6 people and like the Watervilla also contains three habitable levels above the water each containing balcony areas also. The Jelly-fish 85 also has an underwater observation bulb that is currently unique to Zema's designs. Zema's design allows for cross ventilation and internal climate control,

http://www.giancarlozema.co



[12] http://archrecord.construction.com/inovation/1_TechBriefs/0310Watervilla.asp

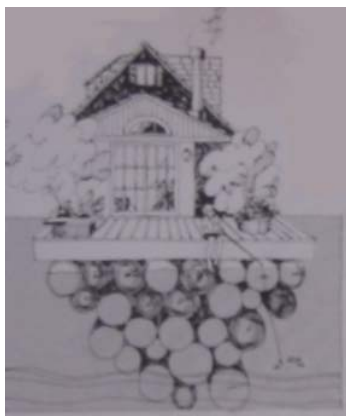
[13] http://uk.geocities.com/annemarieskjold/float.html

[14] http://www.giancarlozema.com

as well as highly insulated exterior cladding. [15]

Common materials

Floating houses are unique because they provide the occupant with all the comforts of a land home, and yet provides an extra uniqueness to the lives of people living in them due to the relationship the water they float on. The floating devise is the main difference between the floating home and a land home. Initially in North America floatation devises were simple rafts. As these rafts began to fill with water large cedar logs were rolled underneath the raft.[16] As these became water logged then another was rolled under eventually forming a triangle shape below the raft. Some floating houses could have as many logs underneath as to reach 4.6m deep. Recent more experimental floatation methods have been air filled drums that are tied together and placed under the base raft of the house, ferro cement hulls, concrete barges filled with styrofoam, steel tanks and old scows or barges.



Dennis, B, Case, B. Houseboat- Reflections of North America's Floating Homes… History, Architecture and Lifestyles. Smuggler's Cove Publishing 1977 Seattle

Common materials for houseboats are very similar, as they also have to be waterproof and be able to float on the water. Some examples of hull and pontoon materials are wood, ferro-cement, steel, aluminium and fibreglass. Some of the advantages of wood is that it has good strength and resilience, its less expensive and it doesn't easily transmit vibrations. Some disadvantages is that it requires yearly painting and is fire prone. Ferro-cement is used by troweling a mix of Portland cement, fine sand and pozzolana on framework of pipe rods and chicken wire. The advantages of ferro-cement are that its maintenance free, fire proof, rot proof and strong, they are however very heavy and therefore require a lot of fuel to move quickly in the water, and usually do not handle well in rough water and are not very stable at slow speeds. Steel is very tough and can be almost seamless, fibreglass is also very strong, durable, totally seamless and resilient, however it does cost more and is heavier. Aluminium is lightweight and therefore is better on fuel consumption, and requires less power to reach high speeds. Special coatings can protect it from corrosion and it is easier to manipulate than steel. [17]

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[15] http://popularmechanics.com/science/transportation/2002/11/living_underwater/index.phtml
[16] Dennis, B. op.cit.
[17] Newcomb, D. op.cit.

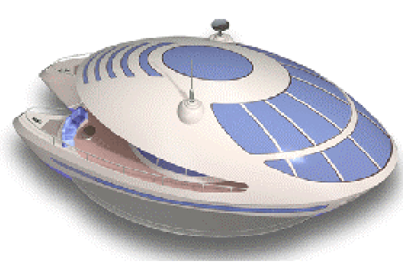
Advantages Disadvantages on living on the water

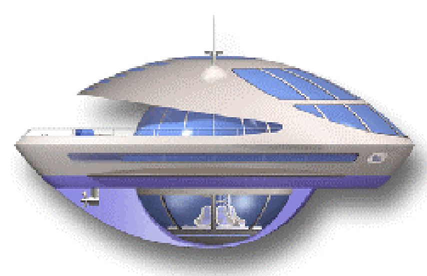
There are some advantages and disadvantages to living on the water, however if you ask almost anyone who lives on the water they will tell you that it is the only way to live. Some of the great aspects of living on a houseboat are the connections with the natural environment. This is achieved through the gently rocking of the wave and the soft wind on calm days and the more furious motion of the waves moving the floating house or houseboat along with the strong wind on wilder days. Other advantages are that residents would be more likely to take care of the water on which they are living on so that they can swim in it and not see and smell pollution coming from it, they will take more care to looking after where they live, and lobby to persuade others to do the same. Disadvantages are that they have no private out door space for which children can play safely, although many people are happy about not having to mow any lawns. There is also the threat of the floating house or houseboat sinking or catching on fire, and the occupants loosing all their possessions.

Leed analysis

My LEED analysis will focus on the work of an Italian Navel Architect Giancarlo Zema, who has clamed to have designed a floating house and houseboat that are "self-sufficient, (and) non-polluting". These buildings/vessels have not as yet been built- but are estimated to cost 2 million USD and 5 million USD respectively. They are proposed to be built at a private residents next to Lake Washington, by a wealthy US businessman along with a complex of other buildings. The floating house has been named the Jelly-fish 45 and the houseboat is called Trilobis 65. They are named in part after their shape but also in from their relation with the water. Both structures have a unique submersible polycarbonate sphere below the water line that allows the occupants to view the aquatic life below the craft, both during the day and with spotlights at night.

The analysis information is based on the Trilobis 65, the houseboat that sleeps 6 people, two single and two double bedrooms all with private bathrooms. It is 65ft or 19.5m from stem to stern and 42ft or 12.6m from port to starboard, and includes 4 levels that range from above to below the water line. The top level contains the helm, communications and navigational areas, whilst the level below holds the living area, kitchen and decking. The level that is in line with the water level is where the sleep and bathing areas are held. This level also holds the propulsion system and the two electric motors. The bottom level contains the viewing globe to the marine life.





http://www.submersiblesubmarines.com/pages/interview.htm

The LEED analysis is very unusual for this project, and there are aspects that are not applicable to the requirements, and there are some requirements that have to be adjusted to suite the project.

Sustainable Sites:

The site of the project is on an artificial lake, which would be considered a green-field, as it has yet to be built on. There would be a great amount of destruction on the site to create a lake the size proposed. This project could easily work on an exiting lake, but as the Trilobis 65 has such a high cost and there is an interested buyer/developer who is setting up the lake project too the architect has been commissioned with whole lake, and must follow the wishes of the client if he is to get a Trilobis 65 built.

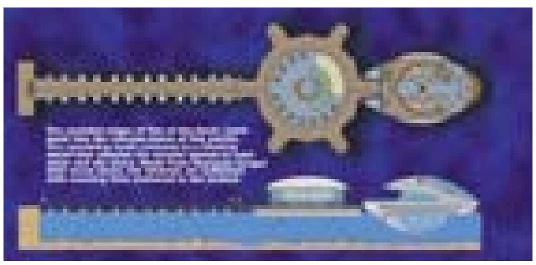
As it is a new development it would not obtain the development density point, which aims for greater development in one area, before people begin moving on to a new, green-field site. One advantage of the Trilobis 65 is that the docking system allows for up to five boats to be docked at one time, and many docks can be placed next to each other, allowing development and population to begin and grow in the one spot then move on to another when there is no room left, or the community has reached its desired density. The negative effects that the Trilobis may impact into the site may include disturbance of the lake floor due to propulsion if in shallow waters, and the possibility of leakage or spilling of waste into the water. If this was to happen- as is possible in all water crafts, then the impact on the water would be very great compared to that on land as it would be harder to clean and to contain the spillage.

The lakes location, as a new development has not been identified, therefore it is not know if there is any transport to or from the site. With the amount of facilities shown on the site map however, (such as the shopping area, information point, welcome area, docking area, lake museum, submarine docking, submerged restaurant and Trilobis 65 docking area), it is clear that the whole project would be more successful if there was public transport and lots of room for vehicles. There has also been no identified transport to move around the site other than the craft itself, which is an alternative fuel vehicle that can move up and down coastlines as well as around a lake. The Trilobis 65 is able to dock at special stations that are linked to land by platforms, where there would be car parking- however there is no evidence of an alternative fuel vehicle to transport a number of people from the car park to the Trilobis 65. There is room on board the Trilobis 65 for bikes and other smaller forms of transport.

http://www.submersiblesubmarines.com/pages/interview.htm

The location of the Trilobis 65 is good as it has a small footprint in comparison to its total habitual area- therefore affecting less of the possible site, this also allows for easier handling in busy

waterways. However, the size of the Trilobis 65 is quite large in comparison to a normal house or a floating house, an example of which is Hertzberger's Watervilla which has three storeys and a total floor area of 156m^2, as the Trilobis 65 has four storeys high, which only 2 storeys are habitual, and there being a possibility of 6 people living on it at one time, with the largest footprint being 19.5 x 12.6m, thus the total habitual floor area is about 500m^2. Some of this area however is outdoor space, which is not included in the calculation of land housing or the Watervilla. The site disturbance from the new artificial lake would initially be great but the surrounding area has been planned with grasslands and planted areas, which would stop erosion and improve the site.
The storm water management issue is a very unique one as the water would just run straight into the lake, the only problem with this may be that it washes what has collected on the external surface of the Trilobis 65 into the water- which may be polluting. For the site storm water management, the solution would be easy as the water would be able to run straight into the lake- thus replenishing the evaporated water. There is little external heat island effect for the surrounding areas; however the glare that hits the water from the sun may be disturbing for the occupants. The advantage of being a houseboat however allows it to move and turn and face away from the glare. There would be heat build up on the roof/external surface of the building because of the dark tinted glass, solar eclectic and hot water panels and the large curved area that faces the sun at one time.



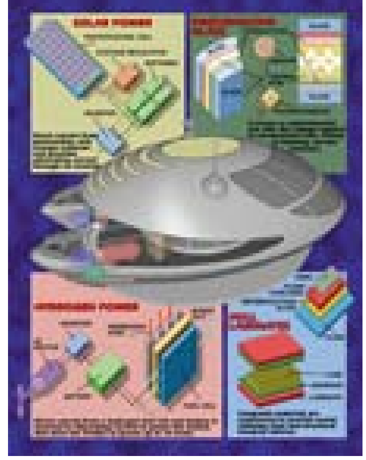
http:// popularmechanics.com

Water Efficiency:

There is not much need for water efficient landscaping as the storm water runs straight into the water, however if plants were to be utilised on a boat then the storm water run off would be a good way to look after the plants. It would be also important to catch rain water that may be able to be stored for drinking or grey water use when the Trilobite is away from land for long times, however there is none on the Trilobite at present. Wastewater is to be dealt with as it is in super-yachts, typically this is where the solids are separated from the wastewater, and stored, while the wastewater is reused, until it is then stored. It is finally removed at marinas, during docking. This process would also count as water use reduction. There is no mention of water use reduction, however simple reduction techniques, such as water efficient shower rose, and taps could be easily employed in the design of the Trilobite 65.

Energy and Atmosphere:

I believe that the Trilobis 65 would have a commission team to overview the project before it is to be built- however as it has not yet been built I can only theorise. The CFC reduction is possible due to the reverse cycle air-conditioning system, which is powered the solar panels, this point is however easy to obtain as it relates to larger HVAC systems, that are not need in the Trilobis 65. The Trilobis 65 is run totally on renewable energy both with its solar power for electricity; solar hot water and the hydrogen power for its movement though the water, therefore it is 100% renewable energy. There is no mention of control systems on the Trilobis 65 for lighting and cooling loads, http:// popularmechanics.com



however the control room on the top level which holds all the navigation equipment would have many controls on it that could easily contain the controls for lighting, cooling and heating.

Materials and Resources:

As the Trilobis 65 project is still in its infancy, I doubt that issues such as collections for recyclables has come up; however there is enough space onboard that would allow storage facilities. This waste would probably be removed from the vessel when docked at the marina or other docking space, along with other forms of waste.

The Trilobis 65 would be a totally new construction; the major structural materials are the foam reinforced fibreglass skin, which includes laminates on the exterior, the foam core, and vinyl internal finish. The glass on the Trilobis 65 is photovoltaic glass that is controlled by sensors and is made from “two layers of tempered glass with an electrolyte” in between which changes the glass from clear to totally blacked out depending on the occupants requirements and the external weather conditions. The last major product is the either thick glass or polycarbonate (reports differ) that surrounds the observation bulb which is at the same technical standards as tourist submarines. There is a possibility for using recycled content in some of these materials- but it is unknown if is has been specified for construction or not. The materials don’t meet the requirements for local or regional materials, and are nor rapidly renewable materials, however they have long lives, which require little maintenance, except possibly cleaning of the glass bulb from algae’s and other sea creatures that attach them selves to vessels.

The construction waste management is not yet known as none have been made yet; however as it is a unique product then it would have pieces that are made specifically for the Trilobis 65 there for they would be more likely to be made for direct installation within the final built structure. This fabrication would reduce the amount of waste during its construction.

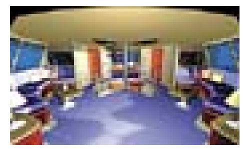
Indoor Environmental Quality:

The Trilobis 65 complies with the minimum indoor air quality requirements as it contains a reverse cycle air conditioner that runs throughout the building. There has been no statement about tobacco smoke control with in the Trilobis 65- however there is a decking in front of the lounge area that allows people wishing to smoke to move outside.

Air quality management during construction would be very important as it will probably be built inside a factory and the builders will be working with toxic fibreglass odours, as well as other

materials. I assume that there would be some sort of plan in place to deal with those problems, as they would not be able to work in that environment. There is no evidence yet of what internal finishes and adhesives Trilobis 65 will have so it is not known yet where it will have low emitting materials, however as it is a totally new construction there is the opportunity for all internal materials to be low in VOC emissions. There is no record yet of an indoor air management plan for the pre-occupancy stage, however as the Trilobis 65 would need to be transported to it’s initial docking area from the factory where it was constructed there should be enough time for the air quality inside the Trilobis 65 to be at the level required for occupancy.

Most of the windows on the Trilobis 65 are operable, therefore allowing the clean, fresh sea or lake air to circulate through the vessel, and providing cross ventilation. The lounge area that faces the Trilobis 65's decking has large doors that allows the internal space to be directly influenced by the outdoor space, therefore the occupant has full control over their connection with the external



environment. The thermal comfort of a building is related to the reverse cycle air conditioning system and the photovoltaic windows to block out heat and light. These systems are controlled by the occupant, which allows maximum comfort. The Trilobis 65 has a good source of daylight and view into the living and other spaces. The unique underwater viewing platform extends the view to the unknown on the lake or sea floor.

Carbon dioxide could be monitored in the control room on the top floor of the Trilobis 65, however the only place that it would be required for would be the observation bulb, which is below water level, and therefore has no operable windows. The access of fresh air in the bulb is supplied through the air conditioning and the entry stairs that open up to the above levels.

Innovation and Design Process:

Three points have been given for innovation and design. First to the hydrogen power created to move the Trilobis 65. This avoids accidental spilling of fuels into the water, and it is a renewable resource, which has no adverse effect on the environment. The second point is given to the photovoltaic cells that darken the glass to help the thermal and visual comfort of the occupant. Thus allowing maximum views onto the Coastline/ Lake or marine park without the discomfort of glare or overheating, which saves money and energy on conditioning the internal space. The third point is given to the underwater bulb as it provides an unusual place for relaxation, contemplation and gives the occupant a direct connection with the marine life around them- that they will be less likely to destroy as they can see the consequences. [18]

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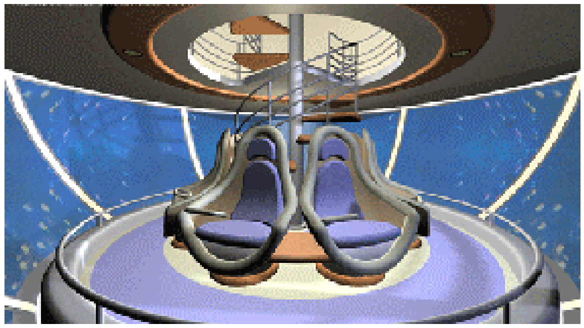
[18] All leed analysis was based on references:
http://popularmechanics.com/science/transportation/2002/11/living_underwater/index.phtml



http:// popularmechanics.com

Design Brief

Brief:

To design a floating home community with facilities for houseboat docking and anchorage. Also to design a prototype houseboat for up to 6 people and a prototype floating house for 3 people, both of which are self sufficient and environmentally friendly.

Floating home community:

-Layout for 50 floating homes.
-Docking area for 10 houseboats at one time with room for another 10 to anchor.
-Connecting boardwalks, including weather covering, and street furniture.
-Community facilities to include; general store, communal laundry, communal wash area, meeting hall with 2 smaller meeting rooms and outdoor eating facilities, that are partly covered.
-Parks to include walking track, grassy areas for ball games, lookouts, vegetation, paved areas for ball games, children's playground, vegetable plots and garden area for floating house residences.
-Car parking for 65 cars.
-Public transport stop/station, and extension of existing public transport in the area.
-Green-power transportation for occupants between entry and floating home.

Houseboat:

-Navigational area
-Room for 6 people to sleep
-Two bathrooms
-One kitchen/galley
-One living area/dinning area
-External decking
-Green power and perpulsion
-Contain ESD principles
-Design to support smooth movement through water with reasonable speeds and manoeuvrability in high seas.

Floating house:

-Room for a couple
-One bathroom
-Kitchen
-Living area

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http://www.giancarlozema.com
http://www.submersiblesubmarines.com/pages/interview.htm
Email conversations with navel architect Giancarlo Zema

-Dinning area
-Study/bedroom
-External decking
-Green power
-Contain ESD principles
-Laundry area
-Designed to react to the movement and angle of the sun

Both the houseboat and floating house to have the possibility for underwater exploration, such as the observation bulb on the Trilobis 65 and Jelly-fish 85.

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