The 1st Annual Advanced Architecture

SELF SUFFICIENT (SUSTAINABLE) HOUSING DESIGN COMPETITION

The Institute for Advanced Architecture of Catalonia

Submission Deadline
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The first annual Advanced Architecture Contest for Self Sufficient (Sustainable) Housing calls for students, designers and practitioners from around the world to address the issues surrounding sustainable design and its relation to the world's current sustaining issues. With no restriction on site, style or program the competition was open for interpretation to each participant, hoping for an encompassing discussion about sustainability - equal if not greater than the design competition itself.

Departing from the *World Commission on Environment & Development's* definition of sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet heir own needs," initially ignited ideas about recycled materials, renewable energies, efficient building envelopes and eco-village planning. All of which are becoming present in many projects around the world, with some combining many of these concepts together to amplify the degree of sustainable building. Although much of these recent developments in sustainable architecture are effective and progressive thinking, one should not forget many vernacular and past ideas about design and engineering which have just as much validity to offer the discussion – as they are time tested methods, having proven themselves over their many years of use.

Similarly, addressing sustainability can not exclusively be articulated in architectural design terms, and must also be expressed through social and cultural mediums. To fully address this discussion the design process must reach beyond architectural design to embark upon the act of sustainability. The cultural reality pertaining to sustainability is currently quite weak, and it is where the next big area of growth needs to be realized. Initially by developing new and ground-breaking ideas about the role of sustainability within our culture, and then continuing to implement them within our social values. One such cultural medium already implemented in small portions around the world are cooperative communities, whether it be housing co-ops, agricultural co-ops or financial co-ops. By complimenting architectural expression and past and current innovation with the culture of community and cooperative thinking, the goals of sustainability became intertwined to holistically tackle the act of sustaining.

As a result, throughout the conception and design of this competition, three areas of inspiration emerged; those which are recent examples similar in essence and conception, those which offer past and time tested insight and inspiration, and lastly those which embodied a cultural action based in the responsibility of sustainability. Together these ideas lead to the fruition of the 'The Galt Centre Coop'.

Holistic Examples of Sustainable Design

Although there are many approaches to adding sustainability to the architecture produced these days, many examples still tend to focus only on one or two key aspects with which are sustainable. Whether their focus is reusing materials, reducing imbedded energies in construction, high efficiency design, or integrated renewable energies, it is less common to find a project which chooses to tackle as many qualities as possible – bringing into question the extent of sustainability and the tendency for sensational design. To best address the design question posed by the IAAC (The Institute for Advanced Architecture of Catalonia), one must find examples that try to take as many aspects into consideration. Such examples that do address the many angles of sustainability tend to produce buildings that are not only efficient, low impact and intelligent design, but also find that the architecture relates or even influences the culture with which it is in – ultimately leading into the third aspect of this discussion.

BedZed Housing Development

A recent and ambitious sustainable design completed in the UK just outside of London, the BedZED Housing Development in the Borough of Sutton is an ideal urban context precedent. This urban system reconciles high-density three-storey city blocks with high residential and workspace amenity. Workspace is placed in the shaded zones of south facing housing terraces, with sky gardens created on the workspace roofs, enabling all flats to have outdoor garden areas with good access to sunlight, at the same time as providing well day lit workspace without problematic summer overheating. (*see section*)

The combination of many systems throughout the BedZED development offer a reduced need for both electricity and heat to the point where a 135 kW wood fuelled combined heat and power plant (CHP) can meet the energy requirements for a community of around 240 residents and 200 workers. An intergraded photovoltaic panel within the structure of south-facing facades and terrace roofs is the source for much of the renewable energy supplied to the development. Across the scheme PV panels collect enough power to run 40 electric vehicles for 10,000 annual miles each. In addition, the buildings make use of the sun by being orientated for passive solar gain and employ high levels of thermal mass and super insulation to prevent overheating in summer and store warmth in winter. To help maintain this heat in winter months, heat recovery systems are incorporated in the distinctive rotating wind cowls which use wind power to passively naturally ventilate the units – ultimately minimizing heat loss. The combined heat and power plant fuelled by tree surgery waste from the Boroughs of Sutton and Croydon, is intended to provide the bulk of BedZED's heat and electricity that is needed in addition to the renewable sources in use.[1]

To alleviate the water usage and waste output the community treats all its black and grey water on site, and collects rainwater to minimize mains water consumption. It is predicted that 18% of BedZED's water consumption will be met by

1 BedZED, http://www.zedfactory.com/bedzed/bedzed.html

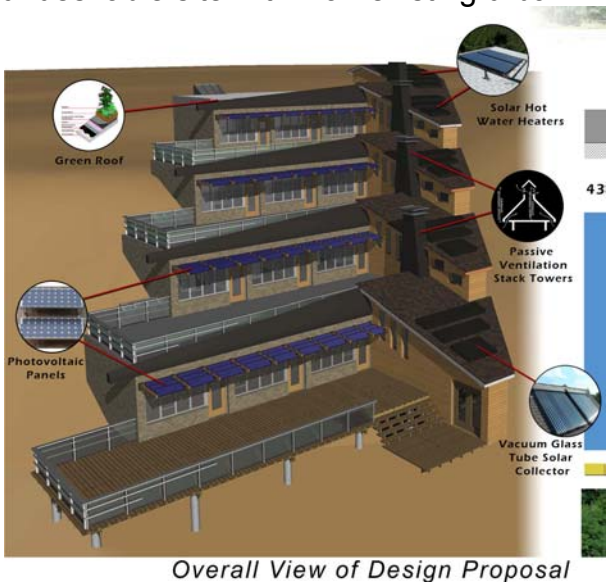
collected rainwater, which is stored in underground tanks and filtered before use in WC flushing and garden irrigation.[2]

In addition to the systems in place as part of the buildings, a green transport plan is also an integral part of the BedZED development. It aims to supplement excellent public transport links with a proposed car pool, bulk home deliveries and links to an existing cycle network. To encourage cyclists, secure cycle storage and repair facilities are provided on site. The community has the capability to lead a carbon neutral lifestyle - with all energy for buildings and local transport being supplied by renewable energy sources.[3]

The sustainability of BedZED is not only a final product but was intended to be incorporated within the fabrication and construction process. During the development and construction the intent was to use the BioRegional principles of local material and labour sourcing to stimulate the local economy, maximize urban / rural links and minimize pollution from transportation. Adopting the 35 mile radius limit for local sourcing of bulk materials ensured that the BedZED project respected local market conditions and upheld the existing townscape, ensuring that all bulky materials have a reduced embodied energy.[4]

The BedZED project began by finding a brownfield site that had been disregarded and/or undervalued for design. This precedent for procuring and using sites within the urban fabric which are otherwise seen as useless, rather than searching for new land yet to be developed from the peripheral of the city is a key direction for the future sustainability of new developments. This beginning is a very relevant and congruent thought in the discussion for 'The Galt Centre Coop' which also began by choosing an undesirable site within an existing urban context.

Likewise, much of the integrated systems and innovations seen in the completion of the BedZED project are also inspirational and precedent on how systems can be implemented to better sustain



Overall View of Design Proposal

2 BedZED, http://www.zedfactory.com/bedzed/bedzed.html

3 BedZED, http://www.zedfactory.com/bedzed/bedzed.html

4 BedZED, http://www.bedzed.org.uk/

residential projects. Although the example is located in a slightly different climate as the proposed design, much of the orientation and design strategies can be extrapolated to be used and adapted for a site in Cambridge, Ontario, Canada. Moreover the BedZED development has a tendency to influence the lifestyle of the patrons living in its community – as it is a community based development with much of its success coming through the collective use of amenities and resources to ensure the most productivity from the least amount of work and capital. This arrangement not only affects the overall sustainability of the project but also reveals a case for economical savings from the same innovations and collective usage. Both of which prove to be evidence of the practicality of such endeavors and the need for further developments to follow this example.

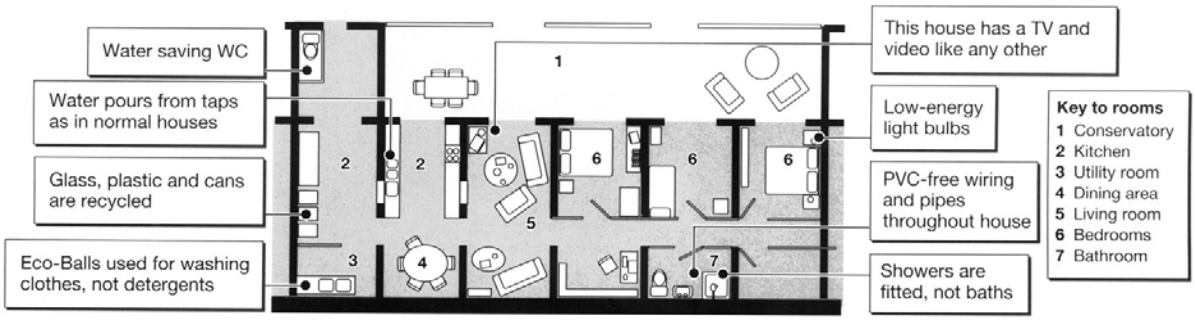
Hockerton Housing Project

What started off as a desire of a small group of people to develop a lifestyle more in touch with the natural environment and its cycles, the Hockerton Housing Project (HHP) is an innovative residential sustainable development in the village of Hockerton near Southwell, Nottinghamshire, England. The architects were Professor Brenda Vale and Dr Robert Vale, whose own ground-breaking home in Southwell, England provided much of the inspiration and know-how for this project. It was completed in September 1998 after three years of planning and 18 months of construction. It has been designed as one of the first zero energy residential systems in the UK, reducing life cycle energy to a minimum and is amongst the most energy efficient dwellings in Europe. Maximum use of organic and recycled materials has been utilized in the

construction as the project is designed to be, to a large extent, self-sufficient. The houses are earth covered and have passive solar heating with no use of a space heating system.[5]

The homes are made up of a terrace of five single storey dwellings which are earth-sheltered at the rear (North), such that the ground surface slopes and blends smoothly into the field at the back. Each house is 6 m deep with a 19 m south-facing conservatory running the full width of each dwelling. A repeated modular bay system of 3.2m in width was used for ease of construction. Most of the internal rooms have 3 m high French windows that open to the conservatory. The homes are designed to maximize light penetration in the winter, when it is most desired. The sloping roof, high at the front and loss of leaves from the nearby trees allows the low winter sun to penetrate to the back of the buildings. In the summer the homes self-shade themselves from the high sun, helping to keep them cool. Those rooms that are not so dependent on natural light, such as utility and bathing areas are located towards the rear of the homes.[6]

The interior

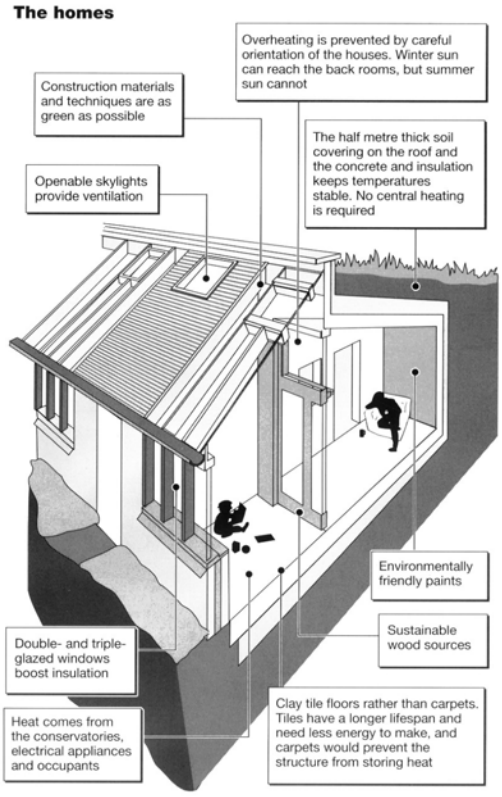


The building itself is built to high environmental standards, including meeting the zero heating and zero CO2 standards. A combination of factors heat the houses – the sun, body warmth, and heat given off from appliances – but no central heating. Where the grass roof runs up to join the conservatory is a parapet on which sit solar panels. These are set facing southwards at an angle to maximize the generation of electricity via the sun. In combination with the wind turbine they are responsible for supplying much of the energy needs of the

5 Hockerton Housing Project, http://www.hockerton.demon.co.uk/

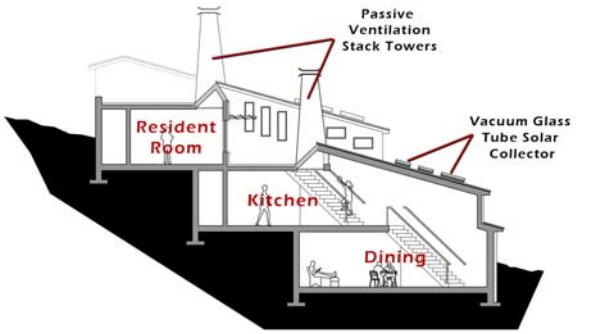
6 Hockerton Housing Project, http://www.hockerton.demon.co.uk/

homes. The homes are fitted with water-saving WCs, PVC-free wiring and pipes and low energy light bulbs. Even the bricks have been fired using methane gas from landfill sites.[7]



The project is self-sufficient in water, both in terms of collecting, use of and waste disposal. Water for drinking is collected from the large conservatory roofs and stored in underground chambers. Before being pumped to the homes the water is filtered and treated to ensure it meets drinking water standards. Water for all other uses, including washing, toilet flushing and bathing, is collected from the surrounding fields and from the earth roof. This is stored in a reservoir and treated via a 'slow sand filter' before being used by the homes. A reed bed cleans up the outflow from septic tanks by supporting a highly active eco-system. Their roots supply oxygen to bacteria in the water, which digest the pathogens in the sewage. [8]

The windows on the roof of the conservatory allow adequate natural ventilation during the summer months. Mechanical ventilation heat recovery is used to supply fresh air to the living room and to the bedroom and supplies fresh air to the kitchen and bathroom areas.[9]



Design Section

Again seen through the example of the Hockerton Housing Project are precedent for the many systems and approaches to making residential living sustainable – all of which are valuable arguments towards the discussion of this end.

7 BBC – Nottingham 360 Images – Tour the Hockerton Housing Project, http://www.bbc.co.uk/nottingham/360/where_to_go/hockerton_housing_project/tour_01.shtml

8 BBC – Tour the Hockerton Housing Project, http://www.bbc.co.uk

9 BBC – Tour the Hockerton Housing Project, http://www.bbc.co.uk

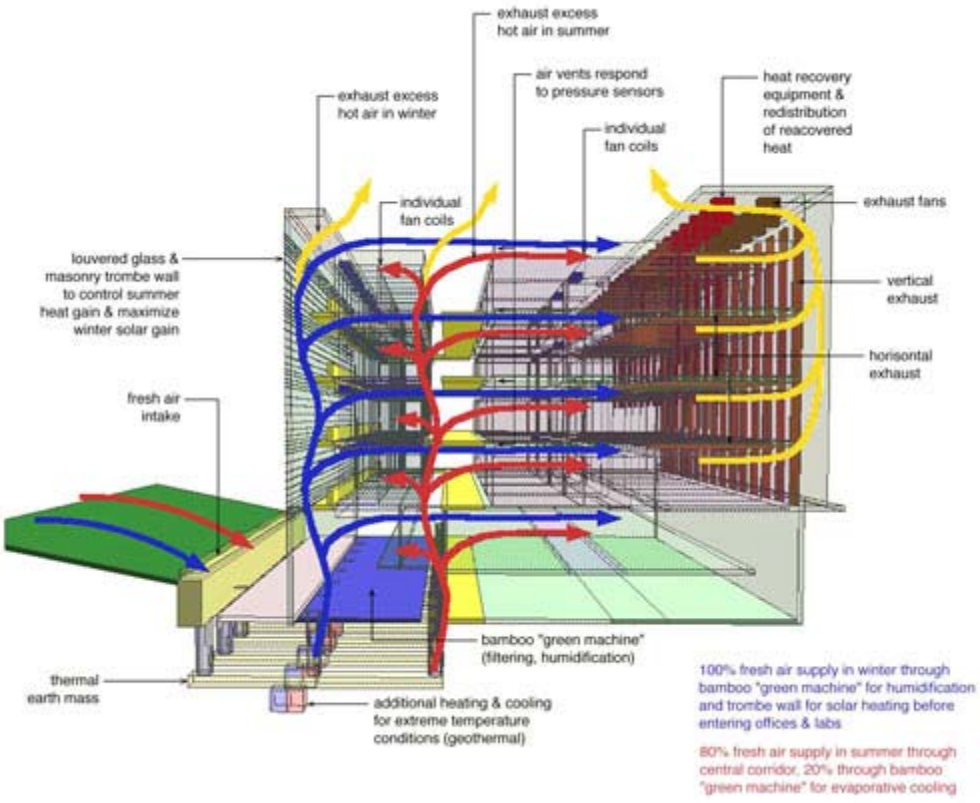
More notable with the case of the Hockerton Housing Project is its incorporation of earth sheltering into the design and success of the development. This design attribute is testament to the usefulness of using the earth as insulation, while still demonstrating the ability of light to penetrate such an arrangement. As the competition proposal began to deal with a similar type of development and design this precedent proved very encouraging and informative for the completed design. This illustration of a sustainable project and corresponding community again goes to support the cause of 'The Galt Centre Coop' and its surrounding design discussion.

Closer to Home – Canadian Examples

Some current examples of the most progressive and holistic sustainable design in Canada continually come from the office of L'OEUF out of Montréal, Quebec. Under the leadership of Daniel Pearl and Mark Poddubiuk, the office has developed a considerable reputation in environmental and sustainable architecture – with many of their works reflecting their understanding of the environmental impact of a project. Their projects range in scale of sustainability, with some addressing more than others.

A significant proposal which relates to the competition submission is the Loyola Science Complex at Concordia University. What drives the ecological design philosophy for the Science Pavilion is the 'transparent integration of low-technology natural phenomena with a sophisticated degree of user control.' [10] Much of this philosophy was used in the design submission of 'The Galt Centre Coop', where simple moves in the plan and section were made in an attempt to utilize the naturally occurring forces of the site. The aspect of the science building's section has been carefully crafted to draw in daylight and provide natural ventilation; drawing optimum benefit from the natural displacement of air through the building literally taping into the existing energy potential found on-site. *(see image)*

10 L'O.E.U.F., http://www.loeuf.com/



Furthermore with a great deal of their experience working with the sustainability of residential projects, they have been fruitful in both small scale, such as St. Ambrose Residences and large scale projects, like the Ecolodge design. But none have been as grand or as all encompassing as their Benny Farm renovation project.

Green Energy Benny Farm

Although still ongoing and yet to yield its true success, one of the most holistically ambitious sustainable projects taken on within Canada is the greening of the infrastructure for Benny Farm in Montreal, Quebec. The Benny Farm property was originally developed in 1947 to provide housing for WWII veterans and their families. The recent redevelopment plan which has been mainly headed up by L'OEUF is designed to respect the socio-cultural past of the site while bringing about a revitalized housing development rooted in self sustaining values and infrastructure. This project, which is a combination of urban, landscape and architectural responses, proposes an unprecedented integration of buildings, infrastructure and community-driven housing development – eventually intended

to have the infrastructure directed by the new tenants of Benny Farm. Designed to be implemented in phases, the project provides a holistic sustainable protocol, beginning with construction that reduces greenhouse gas emissions, potable water use, the production of waste water, and the production of solid waste through retrofitting, reuse and waste diversion. This new model for collectively driven sustainable construction was developed with the intent to have this be the complement to the green system initiatives taken in the retrofit of the Benny Farm Development.[11]

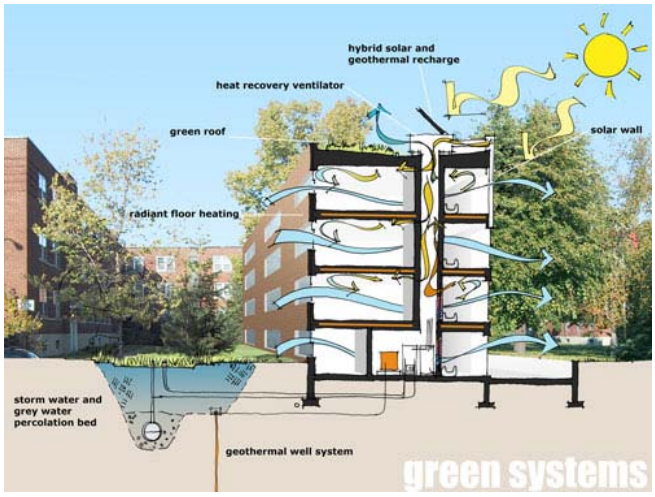
The project integrates a series of systems, both existing and new, which run between and within all buildings involved. Building initiatives focus on reuse, heightened air quality, durable construction, and energy efficient envelopes. Most energy will come from renewable sources, as these systems will include geothermal heat exchange, hybrid glycol/electric solar power, radiant heating, and both air- and water-based heat recovery. Likewise, water use will be reduced by more than half, with upgraded efficiency and new water systems involving grey-water and storm-water reuse, wetland treatment and percolation, and sub-grade water-table recharge. As it is a holistic approach these systems are interconnected; and through this interdependency they contribute to the sustainability of the community. This success is not just limited to the environmental value but also offers economical returns created by reduced energy and water use through collective amenities.[12]

Unlike the previous examples, this project renovates an existing condition to upgrade its ability to sustain. The reusing of the existing buildings rather than demolition and new construction exemplify the sustaining qualities sought after in the IAAC competition discussion, even if they do not necessarily apply to the design proposal. The most important aspect the Benny Farm redevelopment

11 Benny Farm, http://www.bennyfarm.org/

12 L'O.E.U.F., http://www.loeuf.com/

offers this discussion is that it shows the implementation of sustainable systems can be used in the harsher climates of Canada, rather than those of the climates of the pervious examples. It gives the proposal a climatic relevance, and assurance that sustainability is not limited to the more moderate climates of the UK. Yet again, it also begins to illustrate that in order for residential projects to truly become sustainable there is a required mass or size that helps to make the project viable. Ultimately this leads to the formation of a community and in turn becomes socially and culturally intertwined – adding to the later half of this discussion.



Time Tested Ideas and Innovations

Dealing with the Slope

Given that this design proposal has made use of a sloping site, addressing the landform and usability required some complementary thinking to deal with it. We can look to agriculture, which around the world has used the method of terracing to shed some light on the adaptability we can have on sloped sites. A terrace is a leveled section of a hilly cultivated area, designed to slow or prevent the rapid run-off of irrigation water. This arrangement also stops the rain from washing away the soil. Often such land is formed into multiple terraces, giving a stepped appearance and making it easier for both mechanical and

manual sowing and harvesting than a steep slope would be.[13] The human landscapes of rice cultivation often follow the natural contours of the escarpments, like contour plowing; it is a classic feature of the Cordilleras in the Philippines. There are many more rice terraces in Asia, but those in the Philippine Cordilleras are outstanding because of their altitude (up to 1500 meters) and steep slopes (maximum of 70 degrees). This ancient and time-proven engineering skill of the Ifugao and Bontoc, who built and maintained the Cordillera terraces made use of otherwise unusable slopes by dry walling to create terraces. It has been identified that even to this day these indigenous rice terracing technologies, maintain an importance in the sustainable development of the area.[14]

As a result these indigenous innovations offer knowledge about different types of rocks and their properties, the breakage, the transportation, and the piling to form stable retaining walls. Likewise, earth works knowledge of different types of soils, the leveling, digging and transportation are needed to build the terraces. Combined, these skills maximize the design of terrace area and how they are built to follow the natural contours of the mountains; as well as how to maintain the terracing and related soil erosion/ cohesion.[15]

From its origins in agriculture, the practice of formally terracing a sloping site evolved in gardening – a more common example. Responding to the land formation, elevation change is accounted for by stepping down the side of the hill to better allow usability, and is done so in a controlled manner by a series of stepped platforms, all separated by retaining walls. Depending on the step size and desired esthetic, many different system of retaining the earth have been devised. When constructed out of wood, the retaining wall can be built using horizontal timbers, vertical poles or a system of post and boards. Using concrete or masonry, methods such as concrete gravity wall, semi gravity wall, reinforced wall, cantilever wall, counterfort wall or even be built from designer modular concrete units.[16] (*see image of retaining walls*)

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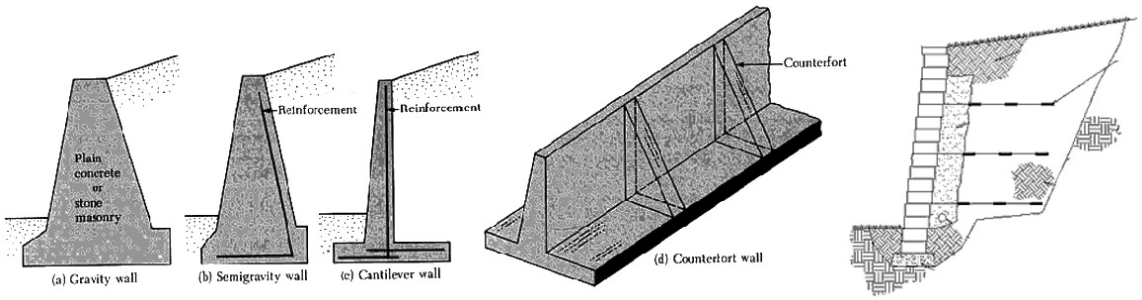
13 Agricultural Terracing, http://en.wikipedia.org/wiki/Terrace_(agriculture)

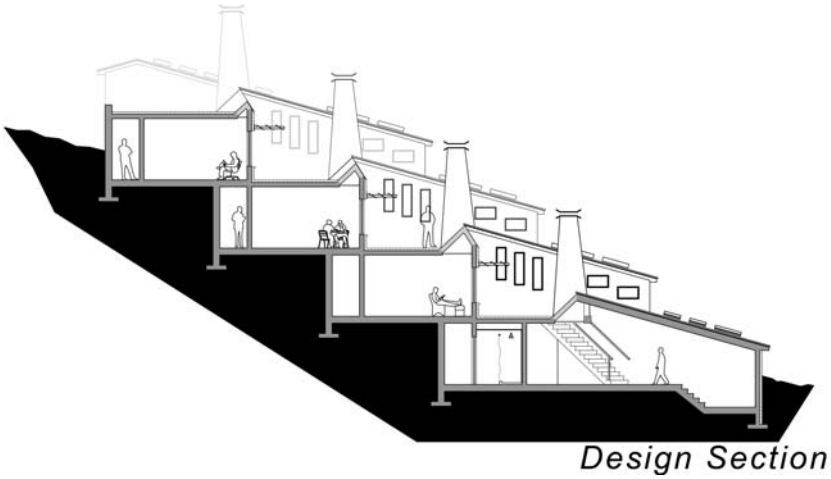
14 Rice Terraces of the Philippine Cordilleras, http://www.theculturedtraveler.com/Heritage/Archives/Rice_Terraces.htm

15 Rice Terraces of the Philippine Cordilleras, http://www.theculturedtraveler.com/Heritage/Archives/Rice_Terraces.htm

16 Hoke, John R., ed. Architectural Graphic Standards: Student Edition. 8th ed. New York: John Wiley &Sons, Inc., 1994.



As in the case with the proposed design, the actual building does the retaining of the earth, and it is the actual structure that would have to account for the retaining. Nevertheless the understanding of retaining walls and the system of stepped platforms advises the flow of the building whose influence can be observed in the section of the proposed building. (*see section*)

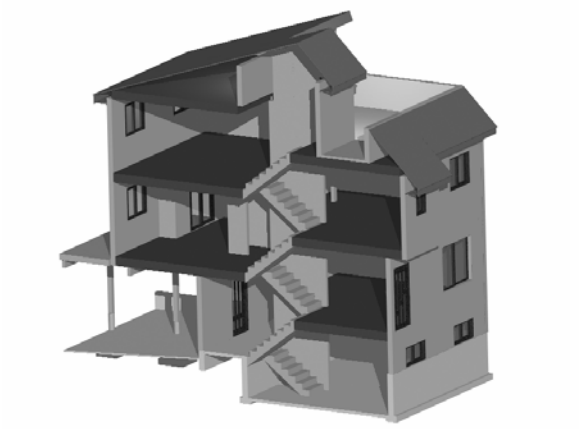


Design Section

Stacked Housing

As the design proposal developed vertically as much as horizontally, the notion of stacked architecture was employed. One residential typology of housing that makes use of this approach is townhouses. Although contemporary thinking about stacked townhouses is not initially thought of as sustainable, they are built for their economical aspects – but that which saves money also saves material and in turn is more sustainable, not to mention that the typology itself creates higher density which is also indicative of sustainability.

In a stacked townhouse, living units are layered vertically over each other while maintaining a street entrance for each unit. Generally speaking they usually have three full storeys and a basement and there are a range of dwelling unit sizes that can be accommodated– from 46.5 m2 (500 ft2) bachelor units, to 115 m2 (1,200 ft2) two or three bedroom dwelling units. Often an approach to this housing form is for two family units on top of each other or a smaller bachelor unit placed over or below the family townhouse. Studies have shown that stacked townhouses have a 50% saving in foundation and roof areas, a 33% saving in lot area and curb length, and a 70% saving in exterior wall perimeter.[17]



Another version of this is the walk up apartment. With this style of housing, dwelling units are either stacked one above another, positioned side-by-side, or front-to-back with one shared central entrance and staircase. Similarly a variety of dwelling units can be accommodated: bachelor, one-bedroom, two-bedroom and three-bedroom units. In place of private yards for each unit, walkup apartments typically have a common amenity area with each dwelling unit having a balcony or terrace. Since walk-up apartments are generally 3 stories and do not have an elevator, they are less expensive to build per square meter than a high-rise apartment, and as a result have similar savings to stacked townhouses.[18]

To exemplify this typology, one can look at the Hydro Block project in Toronto by AJ Diamond and Associates. Done in the early 70's the hydro block was an interesting development which used this typology to combine different unit types and sizes all in one building by stacking them on top of one another. Two-storey units designed for larger households occupy the first two floors. Each unit has its own front door and porch opening to the street, with an individual street number. Smaller apartments geared towards singles or couples occupy the upper levels. Access to these upstairs apartments is provided by a glazed porch-like corridor which overlooks the street. The ground floor units

17 Planning Communities, Building Sustainability, http://www.sgog.bc.ca/uplo/Sq1Housing.pdf

18 Planning Communities, Building Sustainability, http://www.sgog.bc.ca/uplo/Sq1Housing.pdf

have their own private yards and a playground area at the center of the complex is available to all residents.[19]

This setup allowed an innovative high-density, lowrise design. In effect, the highrise form was turned on its side and laid along the street, achieving a density of 80 units per acre.[20] It became an example of how high density housing could be achieved with architecture on a human scale.

Many attributes of stacked townhouses are pertinent to the arrangement of the design proposal. As the site requires that the building be working vertical, this technique is an optimal solution. Not to mention that the stacking also reduces the amount of materials in comparison to accommodating the same number of people in single dwelling homes. Further, on a pragmatic level, this layout allows the building to have multiple entrances which exit at different levels, accessing both Ainslie Street and Roseview Ave.

Earth Berm Building

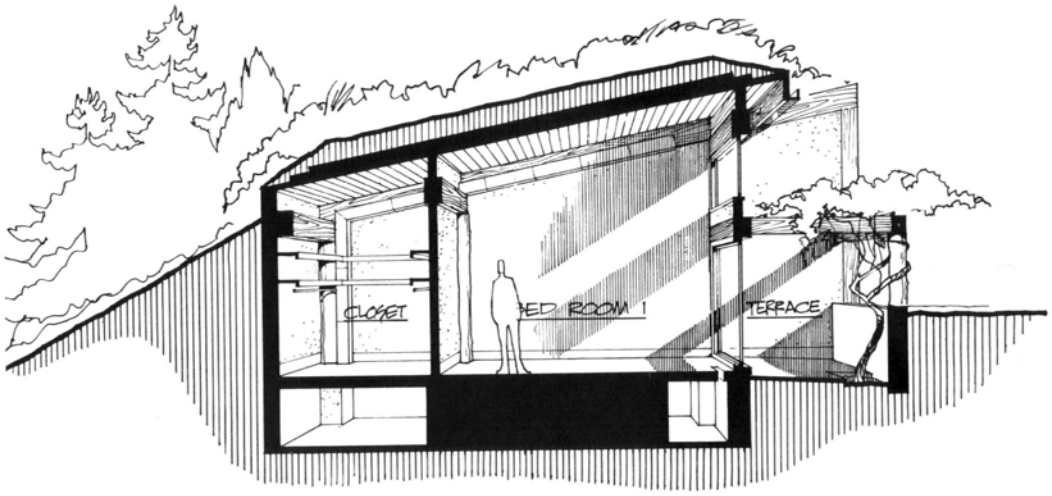
As a result of the design layout stretching down the hillside of the site, the sustainable characteristics of earth building are used towards the design's advantage. Earth sheltered, or underground houses lie mostly beneath the ground surface. The surrounding soil provides natural insulation, making these houses inexpensive to heat and cool. This technique is used both for passive cooling as well as heating of buildings, a feat which is made possible by the earth

19 Carter, Brian, ed. Works: The Architecture of A.J. Diamond, Donald Schmitt and Company, 1968-1995. Halifax, Nova Scotia: TUNS P, 1996. pg. 21

20 Carter, Brian, ed. Works: The Architecture of A.J. Diamond, Donald Schmitt and Company, 1968-1995. Halifax, Nova Scotia: TUNS P, 1996. pg. 21

acting as a massive heat sink. Summer as well as winter variations die out rapidly with increasing depth from the earth's surface. This temperature at a depth of a few meters remains almost stable throughout the year. Thus, the underground or partially sunk buildings would provide both cooling (in the summer) and heating (in the winter) to the living space. As well, load fluctuations are reduced by the addition of earth mass to the thermal mass of the building.[21]

The best location for an earth sheltered house is on a well-drained hillside, with windows facing south or an overhead skylight to fill the interior with sunshine. Both of which best describe the site condition and design of the proposed building – ideally linking this strategy. The earth sheltered structure has to be heavier and stronger to withstand the load of the earth and the vegetation above and therefore are typically made of concrete. Further, it should be suitably waterproofed and insulated to avoid ground moisture.[22]



Designers of underground homes have developed several methods for regulating the interior temperature. Some underground homes depend entirely on the natural insulation provided by the walls and floors. Sometimes tubes are channeled through the earth to bring in air. And, sometimes a heat pump is used to regulate temperatures. Additional heating, if required, can be provided by means of direct gain through windows near the roof projecting above the ground.[23]

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21 Klodt, Gerald. Earth Sheltered Housing. Reston, Virgina: Reston Company, 1985.

22 Earth Sheltered Homes, http://architecture.about.com/library/bl-earth.htm

23 Earth Sheltered Definitions, http://www.greenbuilder.com/sourcebook/EarthSheltered.html#Define

Sloping terrain that may otherwise be destroyed or unsuitable for conventional construction is easily utilized for an earth-sheltered home, and is the key factor relating to the design of 'The Galt Centre Coop'. Although the very nature of building on a slope requires a firm construction into the ground, earth berm design is very successful in complimenting many useful sustainable characteristics.

By examining these innovations which are not always directly related to sustainable design it is clear to see that they can offer knowledge and experience to the design discussion for the 'Galt Centre Coop'. Ultimately it is their combined attributes which have helped address a difficult site seen as unusable, and find a new use for it – providing a more sustainable solution to be produced in light of its difficultness.

Cultural and Social Medium

Cooperative Mentality and Involvement

As sustainability is not solely an expression of architectural requisites, and inadvertently must be expressed through social and cultural mediums – these methods became a large factor in the discussion and development of this design submission. Therefore, even though not an architectural precedent, nor directly related to architectural design, cooperative mentality and involvement is a precedent in social and cultural significance, which plays a key role in the success of the design.

In an attempt to address the sustainability of humanity, the involvement of cooperative arrangements can be very useful for reducing the burden of humanity on the environment. The basic attitude of sharing rather than each individual owning and possessing their own item, immensely changes the quantity of products, possessions and infrastructure. Although not all the principles of cooperative arrangements can be clearly seen in the architecture, the success of the project can not be achieved without the implementation of them. As a result many of the programmatic decisions were conceived in light of this cultural and social infrastructure.

A coop defines itself as “an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically- controlled enterprise.” Yet to best get a glimpse into the overall coop mentality and culture, a brief synopsis of their principles would be useful. The co-operative principles are not rules but guidelines by which co-operatives put their values into practice. Each organization determines which are most appropriate and significant to their particular cooperative.[24]

First Principle: Voluntary and Open Membership

Co-operatives are voluntary organizations, open to all persons able to use their services and willing to accept the responsibilities of membership, without gender, social, racial, political, or religious discrimination.

Second Principle: Democratic Member Control

Co-operatives are democratic organizations controlled by their members, who actively participate in setting their policies and making decisions. Men and women serving as elected representatives are accountable to the membership. In primary co-operatives members have equal voting rights (one member, one vote) and co-operatives at other levels are organized in a democratic manner.

Third Principle: Member Economic Participation

Members contribute equitably to, and democratically control, the capital of their co-operative. At least part of that capital is usually the common property of the co-operative. They usually receive limited compensation, if any, on capital subscribed as a condition of membership. Members allocate surpluses for any or all of the following purposes: developing the co-operative, possibly by setting up reserves, part of which at least would be indivisible; benefiting members in proportion to their transactions with the co-operative; and supporting other activities approved by the membership.

24 Ontario Co-operative Association, http://www.ontario.coop/

Fourth Principle: Autonomy and Independence

Co-operatives are autonomous, self-help organizations controlled by their members. If they enter into agreements with other organizations, including governments, or raise capital from external sources, they do so on terms that ensure democratic control by their members and maintain their co-operative autonomy.

Fifth Principle: Education, Training, and Information

Co-operatives provide education and training for their members, elected representatives, managers, and employees so they can contribute effectively to the development of their co-operatives. They inform the general public -- particularly young people and opinion leaders -- about the nature and benefits of co-operation.

Sixth Principle: Cooperation Among Co-operatives

Co-operatives serve their members most effectively and strengthen the co-operative movement by working together through local, national, regional, and international structures.

Seventh Principle: Concern for Community

While focusing on member needs, co-operatives work for the sustainable development of their communities through policies accepted by their members.[25]

From these principles it can be extrapolated to say that co-operatives are based on the values of self-help, self- responsibility, democracy, equality, equity, and solidarity. But it is the self-responsibility which best suits the goal of sustainability, and is the connection for incorporating cooperative thinking into this design discussion.

By patronizing and becoming an active member of a co-op, you invest yourself with the power to shape that collective. You control the politics and economics of what is truly your organization. This localized member control

25 Ontario Co-operative Association, http://www.ontario.coop/

allows co-ops to be as varied as the people they serve. Thus, there are different types of co-ops including: food co-ops, housing co-ops, arts and crafts co-ops, book co-ops, bakery co-ops, bike co-ops, farm co-ops, rural electric co-ops, financial co-ops (credit unions), and insurance co-ops. And each of these has a flavor of its own, reflective of the desires of its individual memberships. Despite the diversity in type and tradition of co-ops, most have several things in common – that which was mentioned above, the ideals and principles from which they emerge.[26]

The diverse application and implementation of cooperative arrangements is also a valuable characteristic. Because their very nature is very fluid they can be developed to address each individual situation, allowing this to be used in many locations among different cultures, in other words it is easily transferable to most places and situation around the globe – to both different cultures as well as different environments.

In the case of a housing co-operative, it is defined as a legal association formed for the purpose of providing housing to its members on a continuing basis.[27] As with all co-operatives it is owned and controlled by its members. A co-operative is distinguished from other housing associations by its ownership structure and its commitment to co-operative principles. By involving the inhabitants of the building with the ownership, the accountability and responsibility of the inhabitant allows for both a sense of control as well as a connection to its worth and upkeep. This connection among multiple owners is what begins to lead to community, especially in the event of mutual inhabitants being part of a mutual building or set of housing developments. This connection of community is what was illustrated in the previous examples of sustainable architecture, and ultimately offers a similar cultural and social infrastructure.

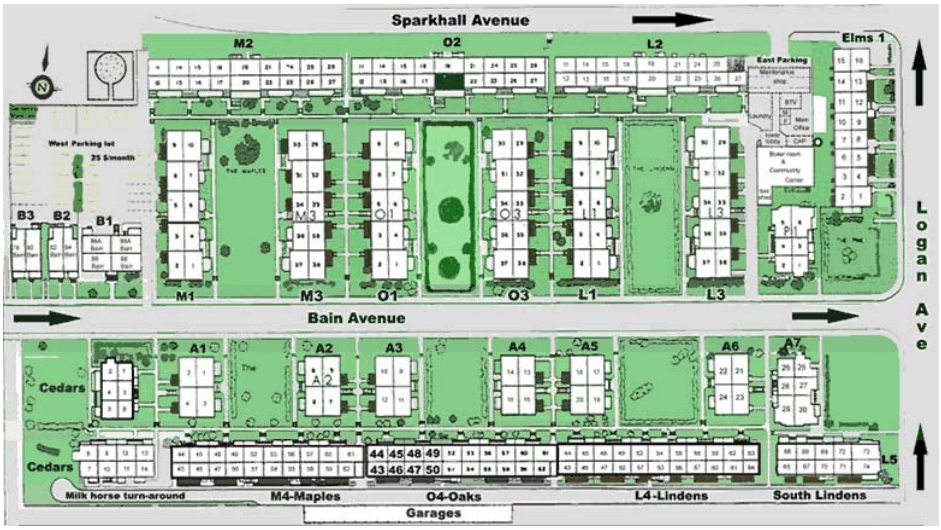
Simply by looking locally for examples of cooperative housing organizations, it can be found that in Toronto alone there are more than 180 housing co-operatives with approximately 45,000 members. In addition to being an individual co-op, most are members of the local organization of the Co-operative Housing Federation of Toronto (CHFT), or also belong to the national umbrella organization of housing co-operatives, the Co-operative Housing Federation of Canada (CHFC) located in Ottawa.[28] Either way there already exists an infrastructure to support and develop cooperative housing in Southern

26 Ontario Co-operative Association, http://www.ontario.coop/

27 Ontario Co-operative Association, http://www.ontario.coop/

28 Bain Coop, http://www.100bain.com/

Ontario and./or Canada, which would be much needed to help the Galt Centre Coop begin and prosper over the years.

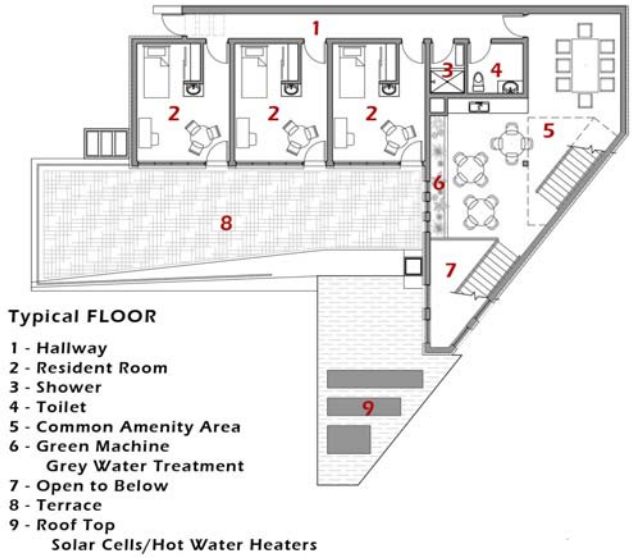


To get an idea of what already exists, the Bain Co-op in Toronto, which came into legal existence on October 30, 1977, was one of the first housing cooperatives in Ontario. Containing 260 units, which range from a series of different one bedroom units to as large as four-bedroom units, this coop is comprised of multiple buildings which are spread out in a composition of buildings and garden spaces.[29] (*see image*) The Bain Apartments Co-operative Housing Inc. provides affordable housing to low and middle income people in the Riverdale neighbourhood of Toronto. Although this housing co-op does not make any claims of sustainability, especially not in any environmental capacity, it does run itself as a not-for-profit organization and collectively they own the property and are responsible for the overall management. It is truly a self-sustaining community that exemplifies the power in numbers that co-ops pride themselves on.

As for 'The Galt Centre Coop', the set up of the building is even more communal than any previous sustainable housing examples –it exemplifies a more in depth cooperative lifestyle, similar to the Bain Co-op in Toronto. The intention of this level of cooperative living is intended to bring about a further degree of shared living and in turn a further level of sustainable living. By incorporating shared eating and household amenities the overall building will reduce its energy load and require minimal appliances, fixtures and materials –

29 Bain Coop, http://www.100bain.com/

thereby further reducing the resources needed to create and maintain the building. This lifestyle presents a culture of cooperative living and although not necessarily intend for all forms of sustainable living, this design intent hopes to add to the IAAC competition discussion.



The Design Discussion

'The Galt Centre Coop' proposal required an array of models; architectural precedent – residential projects and their governing communities as well as many concepts and past experiences. Yet not confining ourselves to just architectural expression, this design solution straddles many existing and developing cultural ideas which inevitably must partner with the concepts and innovations of architectural work. In the end, the discussion encompassed many technical advances with which to draw upon as seen through the examples of the BedZED, Hockerton and Benny Farm Communities. Further as these examples were examined it was seen that their already evolving sustainable design is including cultural elements, which offer connection to the later part of the discussion. In conjuncture with techniques already in place in many applications such as the terraced construction, stacked living apartments and earth berm buildings, the discussion for 'The Galt Centre Coop' is well rounded. By continuing the design to include social development into its function it further produced an active device to address the competition – and hopefully offers a further layer of depth to the dialogue.

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http://www.100bain.com/

BBC – Nottingham 360 Images – Tour the Hockerton Housing Project
http://www.bbc.co.uk/nottingham/360/where_to_go/hockerton_housing_project/tour_01.shtml

BedZED
http://www.bedzed.org.uk/

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Benny Farm
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Earth Sheltered Definitions
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