

THE ECO_WALL CHALLENGES IN THE PURSUE OF LEED PLATINUM

Joseph Cory

Geotectura Studio, 17 Kiryat Seffer, Haifa 34676, Israel, geotectura@gmail.com

Summary

Advanced case studies and complex sustainable building projects are hard to find in Israel; therefore the burden that is laid upon the shoulders of the Porter School of Environmental Studies is very heavy.

The Eco_Wall project (designed by Geotectura, NCArchitects and Axelrod-Grobman Architects) won the competition that aimed to erect the first LEED Platinum building in Israel.

This paper will reveal the environmental aspects that were derived from the site conditions after analyzing various local conditions such as the wind direction, the orientation of the sun and the acoustic problem from the nearby highway.

The project is designed to perform as a living lab of ecological and social values for the community and the environment. It tells the story of the complex sustainability term and simplifies it to the public by strolling along the Eco_Wall, the ground floor and the green roof that present current research of energy, water, soil, vegetation, materials that they can see, touch and learn.

The Eco_Wall is an iconic ever-changing display window for the other universities and visitors and serves as a constant social-educational contributor.

The paper will get into the details and the dilemmas of the design team and will show different strategies and conclusions for this important mile stone in the sustainable architecture in Israel.

Keywords: Sustainable Architecture, LEED Platinum, Porter School of Environmental Studies, Geotectura, BIM

1 The Client

Great architecture can be made more easily when we have great clients with a vision. Dame Shirley Porter founded the Porter School of Environmental Studies in 2000. It has since become the leading school of environmental studies in Israel under the direction of Dr. Arie Neshet. The school brings educational opportunities in many fields including architecture, renewable energy, wastewater treatment, ecology and much more. TAU's Porter School of Environmental Studies is offering interdisciplinary degrees in environmental studies and unites researchers from different fields under one sustainable canopy. The school was established in response to the pressing need for greater academic knowledge in Israel on environmental issues. It promotes new areas of interdisciplinary environmental research, introduces novel environmental teaching programs and places environmental issues on the academic and public agenda [1].

The vision of Dame Shirley Porter included right from the first moment the need for a sustainable building to host all of the research activities. A competition was held with the target to design the most ecologic building for the school. In 2008, PSES embarked on the process of constructing its own building to house the school's growing activities. The selection process for the design team was comprised of two stages. In the first stage, the selection committee chose a shortlist of 7 teams from the 39 leading Israeli firms who submitted their candidacy. By November 2008 the architecture team was informed that it has been chosen by the selection committee to design the Porter School of Environmental Studies building. Our winning team included the author of this paper office (Dr. Joseph Cory is the founder of Geotectura) that is specializing in sustainable design [2] together with NCA office and Axelrod-Grobman Architects that are specialized in educational and retail buildings. We felt shared from the beginning the passion to follow the vision of designing the most green building in Israel. Vision is essential for a pioneering project like a faculty for environmental studies. In her vision for the Porter School of Environmental Studies Dame Shirley Porter wrote:

"Climate change is one of the world's greatest and most pressing challenges facing the planet today. It is a challenge that crosses all boundaries of race, creed and religion and it is only by working together that we will find solutions that are so vital to our survival. Israel must play its part and I am determined that the new building for PSES will demonstrate this commitment by providing real and practical applications of green technologies that may be held as a benchmark for sustainable development not only in Israel but across the whole region." [3]

The role of people like Dame Shirley Porter on the University is important because it challenge universities to be updated and to improve all the time. Here is what the TAU president, Professor Zvi Galil said following the vision of Dame Porter:

"The construction of the PSES green building at Tel Aviv University emphasizes the great importance TAU places on environment in general and green building in particular, as a leader in these fields. The establishment of the building is another important step towards developing TAU as a green campus, the largest green campus in Israel" [3]

We felt during the design process since we won the competition that the question marks and the uncertainties that were imposed by the University administration soon were replaced by the notion that this is the appropriate way for present and future design. Striving for the design of a LEED Platinum project is very challenging in Israeli architecture, where there are only two other LEED green buildings and none of them is Platinum. The lack of case studies in this scale in Israel emphasize how deeply we need a place to hold not just a location for learning sustainability but also a place for demonstrating it to the entire public.

Another aspect is the fact that the building will be like a living lab for sustainable ideas, meaning that all the design process and the results are open to the public. In many green buildings the access of the public is limited and therefore they have lesser impact on others. In our case because the client is a school of environmental studies the whole process is dealing with future educational values of the building itself. This paper as well as books and exhibitions that we plan to make will share our experience with other architects, engineers, researchers, more clients and the public in general.



Fig. 1 Porter School entrance view



Fig. 2 Porter School - Competition Entry

2 The Site

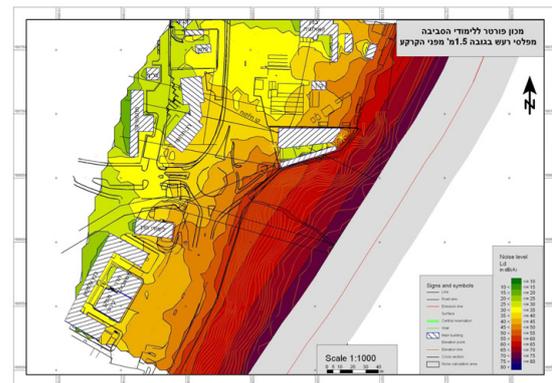
Climatic analysis of the site that dictates the design process helped us to design the first mass concept. Environmental solutions to acoustic problems, wind and sun exposure, meteorological data, soil categories, passive energy saving positioning of the building and so on were analyzed over and over during the work flow.

The site had many disadvantages that we tried to turn into advantages. A soil survey was conducted by Luda Environmental Technologies Ltd. [4] that determined that underneath the site that is a parking lot today one can find pollutants in the soil as a result of the disposal of construction waste the site, prior to the future construction work. Turning a site with construction waste disposal into a healthier environment is one of the building goals as well.

The nearby highway is causing acoustic problems and air pollution and the building mass was born from the need to address this issues. Understanding that we can make the building more iconic because of the fact that it can be seen from the highway and that it will be easier to reach it by public transportation that is nearby (Train station, Bus stations and bicycle roads) is reassuring us that we are in the right direction in spite of the un ideal conditions. The fact that the building is located in a dense urban location will give us LEED points and the project is actually contributing to existing electric, water and transportation infrastructure.



Fig. 3 Porter School - Soil Survey



The ECO_WALL as a sound Barrier

Fig. 4 Porter School - Acoustic Analysis

We still have some thoughts on some aspects that we are not sure if we know what the best strategy is. It is easy for example to aim for minimal parking within the building site parameter while using the existing parking spaces around the campus, but in a regular project outside of a university campus this easy LEED point will be harder to obtain because the municipality might not allow it. Other contradiction we might encounter relates to the L.E.D. lighting presentation on the skin of the capsule inside the Eco_Wall (the beating heart) that gives the public information about the energy production/consumption level or the amount of air pollution on the highway below. We want to keep light pollution to its minimum but in this case the greater good is to share the knowledge with the public.

In order to design the optimal building form we took into consideration the climatic conditions around the site that included wind velocities and directions, acoustic matters and weather conditions. But it is not easy to access accurate weather data. Although Israel is a small country the climatic conditions vary greatly from one location to another. It is very hard for planners to receive the accurate database about the climatic conditions in different places. In the Porter school case it was simpler because the architects received all the needed data from the client who did the homework need to be done before starting to plan. This is not the case in most of the projects in Israel where the client is not even aware of the need to obtain this data or he does not have time nor money for this detailed approach.

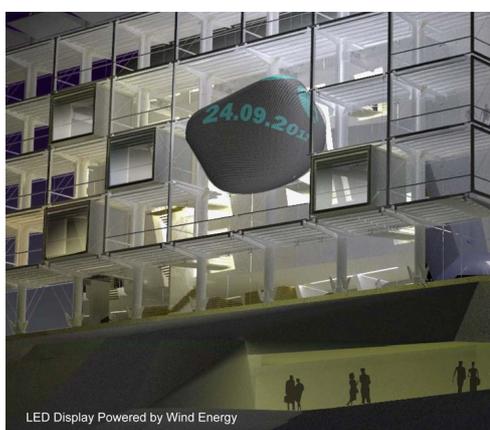


Fig. 5 Porter School - LED Capsule

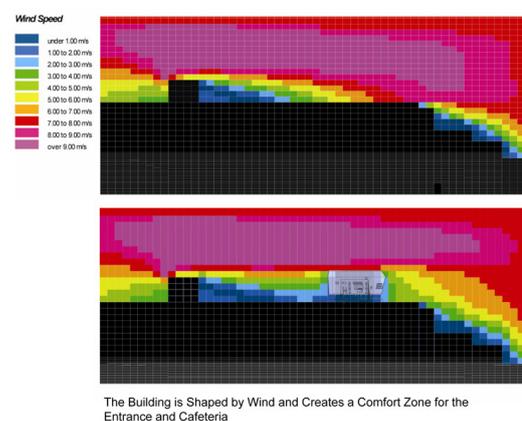


Fig. 6 Porter School - Wind Analysis

To build green means to look beyond just the building. We asked ourselves what is the broader connection between the building and the landscape, the building and the campus, and even the building and the city. We needed new data requirements that the university was never asked before to provide included total energy consumption, water consumption and waste production of the campus buildings and landscape. The data that will be gathered will serve other design teams to design better future buildings in the campus.

The connectivity of the campus is getting better because the building is a generator for a green belt around the University that will connect it to the city. The landscape architects Braudo-Maoz [5] are developing functions such as a pedestrian connection between the train station and the University, that can even reach the sea-shore as part of a promenade for strolling, biking and recreation. The surroundings the building should function as a demonstration garden of ecological design according to the landscape architects and it is all part of the dialog between the University, the architects and the municipality of Tel Aviv.



Fig. 7 Porter School - Green Belt



Fig. 8 Porter School - Promenade

3 The Team

Architects should lead and be involved in wider aspects of the design in order to be able to meet with the complicated challenges of sustainable design. In the architecture team we share strong connections between the academy and the practical world. We teach sustainability as well as build in a sustainable manner so it was the most fitting project for us to win and share our knowledge. This is why it was so important for us, the architects, to design from the first place a building that will meet the goals of Dame Shirley Porter and Dr. Arie Neshet - to represent the first green building for Tel Aviv University and also be a new benchmark in sustainable development in Israel. As an architect I had wrote our team vision in a tribute to Martin Luther King famous words while changing his 'I' with 'We' in order to emphasize the need for team work:

"We have a dream
Not just as individuals but as a group
A dream about a better future for the next generation
A dream about increasing the awareness and the responsibility notion
We have a dream today
That future generation will be able to dream for the reason that we dared to dream
Because of our positive action and deep research
Because we decreased the mistakes and defeated the indifference
We have a dream today"

The architecture team in sustainable design is not enough even if they are highly professional and motivated. We put together a multi-disciplinary team of experts including advisors for specific ecological issues. Our energetic approach was conceived by Assa Aharoni Consulting Engineering who set the energy concepts early on in the design process as I will mention in the next chapter. We have a LEED expert in that office that is responsible of collecting and explaining all the paperwork we need to submit for the LEED procedure.

Mr. Guy Battle, from Battle McCarthy Consulting Engineers and Landscape Architects was appointed to be the green consultant to the team and gave us new perspectives and thoughts on how to improve the design even more after we have won the competition. One aspect that was dominated by him was to point out how to translate the project targets into the BREEAM, LEED and the Israel Standard SI 5281. These base targets shortly became our design requirements. Another direction was to incorporate more passive solutions into the design and not to rely on technology in most of the cases.

The other members will be mentioned in the next chapter but it is important to understand that from all the list of the gifted consultants only few had a prior knowledge of green design. Because we do not have a lot of case studies in Israel it is no wonder that this is the case, but we are sure that more and more professional will join the circle of green experts and we are training them to be ready for their next project in the future with other clients or teams. What is now a niche in Israeli architecture will gradually become a standard for all designers in a way that we need more and more professionals to supply this growing need of the market. Education is not just for future students, the design process is educating the entire team all the time and it turned us all back into students.

One aspect that we hope will improve in the team work process is that in the future all the team members will be working with Building Information Modeling process (BIM) [6] meaning that they all share the same 3D model of the building with access and total synchronization to all the data. This integration and streamlined process is an important tool for sustainable design. In the meanwhile only the architecture team and the HVAC consultant are using BIM methods. In Israel only few offices are using BIM software for handling in a better way ecological design so the efficient experiment this project demonstrated for the client will hopefully be part of the demands that the University will ask from any design team.

We usually do not consider in the design team the local manufactures of green products but in this case the enthusiasm of the team and the inspiration that this building provokes in Israel is causing many industries that can provide local and green products with non-toxic and low emitting materials for a healthier working environment (thermal blocks, paint and stucco with green certification and many more) together with technological startups that are dealing with sustainable innovation to want to be part of this

adventure. We are holding many meetings with different suppliers that are being challenged by this project.

4 The Method

Even though the School employees knew in general of what they need in the new building the architects made a much more detailed brief of every aspect of the school requirements in order to meet the green building goals. The purpose of the detailed program was to provide a guiding document for the detailed architectural specifications and it set an example of how to document the key issues for all the team members as well [7].

In the beginning many meetings dealt with the discussion on what is the best method to compile with green standards. From the list of BREEAM, LEED and the Israel Standard SI 5281 we chose the LEED mainly because it is more popular and familiar in Israel in compare with the BREEAM and is much more detailed than the local standard.

The ecological consultant proposed a natural ventilation strategy plan that aided the energy efficiency concepts set by Assa Aharoni engineers. Thorough coordination between the architects and the client produced the reduction of energy losses as well as the efficient generation and utilization of energy. Eventually, the project will incorporate passive solar building design (maintaining interior thermal comfort while reducing the requirements for active mechanical heating and cooling systems), high performance envelope with optimized insulation techniques and building energy performance simulations such as CFD (Computational Fluid Dynamics) that helped us evaluate different scenarios and make the right decisions.

We did several CFD sessions until we were satisfied with the results. The Atrium was being analyzed over and over in order to enhance thermal comfort in all the floors open to it and to ensure air displacement and convenient temperatures. For example without any cooling or openings atria gets very hot in the Israeli climate exceeding 28c 70% of occupied time. This is why it is so important to check these things in order to improve the design. The CFD process was calculated by a UK firm (K8T8) because in Israel we did not find firms with that knowledge. One of the things to learn from it is the need to implement CFD studies in the academy and have local experts for future projects.

In order to increase the energy savings potential the engineers recommended to use active chilled beam cooling (chilled beam cooling utilizes a finned cooling coil and an integral air supplied system that decreases energy consumption from baseline conventional systems like fan coil units). This system is energy efficient and provides many temperature control zones. An absorption chiller system with dedicated solar heat collectors will eliminate the high incremental cost of electricity and the solar heat source will provide the energy needed to drive the cooling system. The absorption process has no moving parts and is powered only by heat. It has other benefits such as low noise level, low operating and maintenance costs and long product life. Good options such as using thermo-active slab or geothermal heat pumps were neglected along the way once we have decided to aim for LEED Platinum in order to get the optimal solution. But all of these options had the potential to save energy as well.

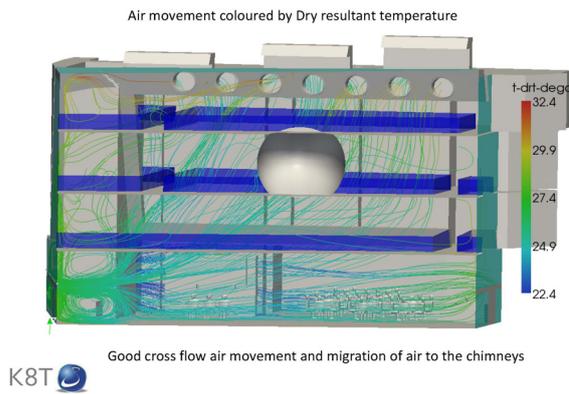


Fig. 9 Porter School - CFD



Fig. 10 Porter School - Atrium

A 50 KW photovoltaic system will be installed next to the building in order to produce energy and sell it to the electric company. Two years ago without proper regulations on that matter the PV business in Israel was almost zero. After the government understood the potential of green energy it helped open up the market for new actors. It is an important reminder that sustainability is saving us money in the long run and we need some help in order to make it available to as many sectors as we can in our society. The electrical report for the Porter School by Semo Ltd. [9] presented the green principles of electrical, lighting and communication design. Their objective was to reduce the energy consumption of the building according to LEED standards, which was their first encounter with the process. The lighting design in this project is based on advanced lighting fixture using lamps with high level of light output throughout their longer life which mean higher energy efficiency, photocells that will measure lighting level inside the rooms and dim according to specified lighting level (used on daytime), motion detectors and so on. Daylight simulations and glare control for all windows were examined and influenced the design (room area, furniture organization and so on). This is an important aspect that helps the active approach with good passive design that is usually better for the working and learning environment and saves a lot of money simple by thinking about what we are doing during the design method.

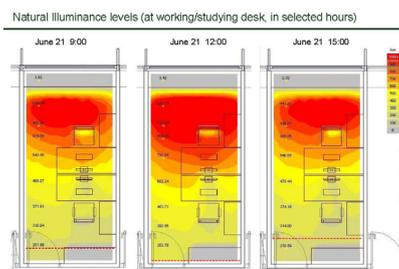


Fig. 11 Porter School - Daylight Simulation

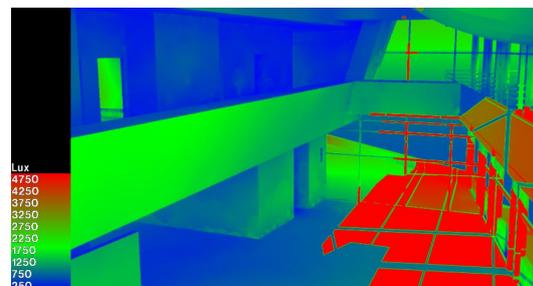


Fig. 12 Porter School - Atrium

The landscape architects examined different water scheme options with green roofs and constructed wetlands, gray water treatment and vertical green walls, all together aim to meet the LEED standards and to reduce heat island effect and to improve water efficient landscaping. The landscape architects objectives [5] included the use of captured rain water and gray water for irrigation, stormwater management, paving from recycled materials, choosing low water consumption plants, shade, purification of the air and much more.



Fig. 13 Porter School

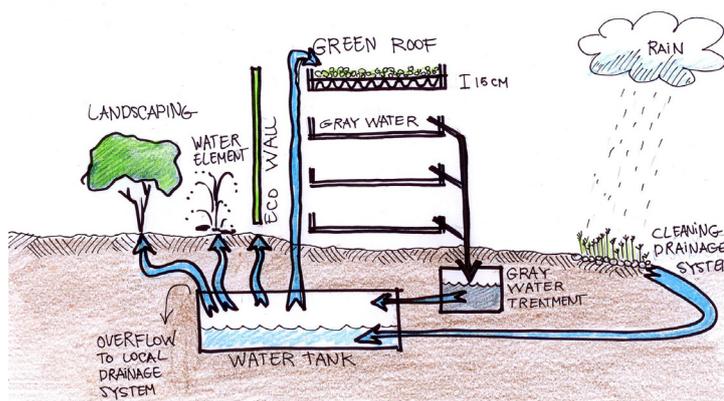


Fig. 14 Porter School - Landscape scheme

The goals of the plumbing systems consultants [10] was to save water and energy through the use of sanitary fixtures with saving devices, two separate sewage systems (drain water system known as gray water) and sewage water system (black water) and more. The gray water system that is going to be treated in biological pools and will be reused by the irrigation system was subject to the approval of the Health Ministry who is against gray water in general. In our project we have succeeded to convince the Health Ministry for the first time of the legitimacy of the gray water system and it will be a helpful reference for future ecological buildings in our region. This is a great example how even the phase of design can act as an educational one and influential one in the process of raising the awareness and updating our design principles. The acoustic objectives were being considered from the first sketch till the final design [11]. And the list is long and includes design for people with disabilities and much more.

The fact that in Israel we do not find many green buildings does not mean that we do not hear about "Green" buildings in the marketing department of many projects. Although greenwash is all over the only way to fight it back is to work with green regulations that will cause the design team and the client to use the proper method of sustainable design. Once you are obliged to work with green methods it is guaranteed that your project will not only have the right title but will also have the deeper notion behind the green points – a better environment for its inhabitants and a better return of investment in years to come.

5 Conclusion

In this paper we saw how a green building aiming to receive a LEED Platinum score is getting along. We discussed the crucial role of a client with a strong vision (in our case the

donator Dame Shirley Porter and the Tel Aviv University); we talked about the need for a team of experts and motivated designers and engineers and the importance of building according to green regulations. But to build only according to the green regulations is not enough! We must not neglect the values of good architecture that goes way beyond check lists. Our building has a deeper meaning besides being green - it is aiming to be a lighthouse in Israel for green design and to make people believe in what they will see and touch and to fight skepticism and ignorance on that matter. Using green regulations gave the project a solid platform to make architecture with meaning.

The building will serve as a platform for ongoing experiments. The Eco_Wall is a unique concept allowing researchers to conduct several experiments in the eco-pods. The Eco_Wall is a window display for the rest of the students and the outside visitors (from different universities in Israel around the world, schools, kindergartens and so on). The innovative idea is the ability of the wall to absorb changing technologies overtime and not becoming a static monument of sustainable architecture. The kinetic wall represents the technological frontier of the faculty and the generation as well. I believe that architects should think in topologic terms rather than typologic ones if they want to make the most out of the sustainable design process [12].

Even though we aim for LEED Platinum for the Porter School it does not mean we cannot improve our designs even further in future projects. In the near future we need our buildings to produce all of their energy and we might need a strong government to ask for it and finance it for several fragile sectors in the society. We need to aim towards zero carbon design as well. We will have to keep track on the performance and try to improve our design bit by bit. The cost and return of investment of the Porter school was less of an issue because the building need to educate first and be efficient second, but in regular projects efficiency might be more appropriate. We should ask ourselves how we can make green buildings with minimal budgets, how we can reduce bureaucracy, consider the urban and natural fabrics and so on.

We competed against many talented architects that included sustainable elements in their proposals but we were able to make the integration between the ecological values and the aesthetic values in an educational way. We are well aware of the opposition against any change such as in green building design especially in our country. Traditional way of thinking in a time for a change is causing paralyzed situations that we cannot retain in our era. This is why the Porter School will be first of all an educational model for a sustainable design. Education is the starting point for sustainability.

References

- [1] www.environment.tau.ac.il (15.03.2010)
- [2] www.geotectura.com (15.03.2010)
- [3] Sustainability Vision, The Porter School of Environmental Studies, prepared by Battle McCarthy Consulting Engineers & Landscape Architects, June 22, 2009.
- [4] PSES Soil Survey, prepared by Ludan Environmental Technologies Ltd., August 2009.
- [5] PSES Landscape Design Report, prepared by Braudo-Maoz Landscape Architecture Ltd., November, 2009.
- [6] KRYGIEL, E., NIES, B. Green BIM, Wiley Publishing: Indianapolis 2008.

- [7] PSES Design Brief, prepared by Axelrod-Grobmn Architects, Geotectura, NCArchitects, May, 2009.
- [8] PSES Green Building preliminary conceptual design report, pTMprepared by Assa Aharoni Consulting Engineers Ltd, May 25, 2009.
- [9] PSES Electrical Design Report, prepared by Semo Ltd., October, 2009.
- [10] PSES Water Supply, Rainwater run-off, Sewage and Drain Water Report, prepared by Nash Engineering Ltd., October, 2009.
- [11] PSES Acoustical Design Report, prepared by Aharon Viks Acoustical Consultant, October, 2009.
- [12] Cory, Joseph. Sustainable Topologies: Qualitative Properties of Geometric Forms in Ecological Buildings, SB Madrid Conference Proceedings, 2010.