

Eco bricks Project -Design and Build Sculpture Structure.

Our brief for this project consisted of designing a homeless shelter made from eco bricks and other recycled/renewable materials and building a full-size sculpture as a larger group, for the Waterfront Museum. Our key aims for this project involved developing better understanding of sustainable materials and concepts and creating a structure that embodies our developing understanding of architectural forms using such materials.

Sustainability Aims and Objectives.

With building operations and building materials and construction producing just shy of 40% of our global CO2 emissions (Architecture2030.org, 2019) it is clear to me that we as architects must make a huge effort to find sustainable ways of construction. We also need to be proactive in the way we design buildings to be as close to carbon neutral as possible, if not carbon positive. With that in mind our shelter and sculpture had to be constructed from sustainable or recycled material. For this project, Eco bricks were our focus and we were challenged to incorporate these into our design. Eco bricks are essentially recycled plastic bottles stuffed with recycled materials such as crisp packets and other materials that would, if not used, end up in our oceans and find their way into our food chain and water ways as micro plastics. The Eco bricks provide us with a structurally strong object to work with, and if airtight a component that can act as an insulant for the shelter/structure.

Materials.

As mentioned above, the challenge of building with Eco bricks was the focus of this project. And therefore, we needed to carefully select a selection of materials that would be both structurally and aesthetically appropriate, and sustainable having no negative effect on the environment. Early in the design phase, after deciding on our 'wave' concept we began to explore the use of cardboard as a sort of skeletal structure to support the Eco bricks. These concepts were inspired by work from the likes of Buckminster Fuller and Shigeru Ban. Our intention was to create a wave-like structure as a reminder of the plastic pollution in the oceans. We began to model these conceptual forms to assess their function and ease of use. We found that performance and effectiveness varied hugely depending on the type of cardboard used. It was at this point we decided the need to introduce carpet tube uprights into our design. We understood the need to transfer the loads equally into the base and the properties of the carpet tubes allowed us to do so. This would mean we would lose the integrity of the wave shape slightly, but it was a decision that had to be made for structural purposes.

Environment.

Throughout this project with both shelter design and structure construction I feel as if my understanding of how architecture can affect the environment both positively and negatively has improved greatly. I now understand the concept of embodied carbon and how we should

strive to design, and construct using materials with low embodied carbon such as locally sourced timber and create energy efficient buildings using materials such as locally sourced sheep's wool for insulation. I have also learnt that drastic actions must be made in the construction industry within the next 10-12 years to reduce the amount of carbon emitted during construction, and to increase the efficiency of existing buildings via retrofit. It is vital that architects are at the forefront of these issues.

Construction.

In terms of construction, the sculpture for the Waterfront Museum has provided me with a great insight into how a design and construction process can work effectively. It has also allowed me to understand new technologies and how they can be used effectively to create architectural structures. The construction of the sculpture gave me the opportunity to work on the structural spine of the sculpture which took 4 carpet tubes into a point to create internal support for the outer layers. This gave me the opportunity to see first-hand whether the tubes would be appropriate for our shelter design and behave in the way I had anticipated. Another issue faced throughout the shelter design and sculpture construction was the fact that the Eco bricks must remain untouched. This meant that both designs had to adapt a cassette system to hold the bottles in place. Of course, the use of glue or commonly used types of mortar would be inappropriate because they are not sustainable and emit carbon during production. Natural types of mortar such as bee's wax were explored but not used in final designs or construction.

Structural Methodology.

During the project my understanding of how architectural structures are constructed, whether that's small Eco brick structures or full-size housing schemes has improved greatly. I have learnt that the foundations play the most important role in any structure. As a group we decided that our homeless shelter would be best placed upon a recycled wooden pallet foundation. This would provide the occupant with a raised, dry living area that has a cavity for insulation if need be. The wooden pallet also provides a strong, level foundation upon which we can fix the load bearing carpet tubes. Wooden pallets were also the foundation of choice for our museum sculpture. Both designs incorporate similar methods of framed construction where the exterior walls/cladding would be fixed later.

Envelope/Skin.

The outer envelope placed on the sculpture was intended for aesthetic appeal. In terms of function this Eco brick shell didn't need to withstand rain or cold temperatures. This ringed effect created by plywood cassettes holding the Eco bricks has effectively created a shape that appropriately resembles that of a Christmas tree. Contrary to this when considering cladding for our homeless shelter we understood the need for weather proofing. We decided that a recycled tin exterior would be appropriate, overlapping to ensure water drainage. The cavity between the external tin cladding and Eco brick structure would provide an

opportunity to insulate the shelter. Sheep's wool or recycled paper would be appropriate. A recycled damp-proof membrane may also be useful should the tin exterior not be watertight.

Lessons Learned.

On reflection this project has been hugely beneficial, allowing me to develop my understanding of basic architectural structures using sustainable materials. As mentioned earlier in this essay this project has also allowed me to better understand systems used by professionals striving to achieve sustainable construction and carbon neutral dwellings. As a student I understand the importance of how we as architects can lower global carbon emissions by adapting our designs with sustainable technologies. This is something that must happen, sooner rather than later.

1079 words.

Reference list.

Architecture2030.org. (2019). New Buildings: Embodied Carbon- Architecture 2010. [online]
Available at: <https://architecture2030.org/new-buildings-embodied/> [Accessed 4 Dec. 2019].