

“Paying It Forward” Project Report



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Content

- 1.0 Introduction
 - 1.1 Identifying Issues
 - 1.2 Motives and Objectives
- 2.0 Initial Stage for Design Proposal
 - 2.1 Current Condition
 - 2.2 Furniture Inventory
 - 2.3 Timeline
- 3.0 Design Execution
 - 3.1 New Floor Plan Layout
 - 3.2 Bookshelf Designs
 - 3.2.1 Evaluation of Bookshelf Designs
 - 3.3 Partition Designs
 - 3.3.1 Evaluation of Partition Designs
 - 3.4 Design Solutions to Problems Faced
 - 3.5 Usage of Materials
 - 3.6 Expenditure
 - 3.7 Work In Progress
 - 3.7.1 Bookshelf Progress
 - 3.7.2 Partition Progress
- 4.0 Sustainable and Environmental Strategy
 - 4.1 Wood Pellet
 - 4.2 Cardboard
- 5.0 Conclusion
 - 5.1 Relation to Sustainability
 - 5.2 Experience with Community Involvement
- 6.0 Appendix
 - 6.1 Proposal
 - 6.2 Approval Letter
 - 6.3 Community Feedback
 - 6.4 Sponsorship List
 - 6.5 Appreciation Letter
- 7.0 Reference
 - 7.1 Research Relating to Material using Wood Pellet
 - 7.2 Research Relating to Material using Cardboard

1.0 INTRODUCTION

Sustainability and community involvement have never been a more enriching task to partake on. Based on our project outline, we were tasked to offer our services to a non-governmental organization which requires our services and assistance in creating a better environment for them to live in as well as enhance the way they lead their lives each day. In addition to improve the living conditions of the community, we also ensured that our actions and efforts are indeed sustainable in terms of the efforts and processes in which we take to implement our project.

Our target community is The United Nations High Commissioner for Refugees (Myanmar Refugee Centre).

Refugees are legally defined as people who are outside their countries because of a fear of persecution based on their race, nationality or membership in social group, and who cannot return home. As a humanitarian, non-political organization, UNHCR has two basic and closely related aims – to protect refugees and to seek ways to help them restart their lives in a normal environment.

As such, our efforts aim to provide aid to the refugees in the Myanmar Refugee Centre, especially to the children in the community by providing them a more conducive learning environment. Quality of education and environment can determine the future of these children. We hope that by doing so, these children will develop to be keen and enthusiastic learners in the future.

1.1 Identifying issues



Figure 1 Overview of UNHCR within the block.

After weighing out our options of non-profit organizations to offer our services to, we eventually agreed on providing assistance to UNHCR which is located at C-2-5 Jalan 3/93A Off Cheras, BT 2-1/2 Warisan City. Being located in a row house, they have been operating above a commercial store by having three floor levels of space above the ground floor.

Given the centre's cramped conditions, space is definitely an issue for their community. The centre is split into three floor levels. The third floor housed four open concept classrooms where there is barely any division between each classroom. As such, while all 5 classes are running concurrently, it may be distracting for the students. Having spoken to one of the teachers from the centre, we want to highlight a few issues that should be addressed.

- (1) Upon visiting the site, we noticed that the spatial arrangement of all 5 classrooms could be further improved to facilitate smooth circulation for the students and teachers.



Figure 2 Improper partitioning of spaces.



Figure 3 Messy cluster arrangement of furniture.

- (2) And also, the conditions of the furniture, especially bookshelves, suggest that quite a number of them should be replaced to ensure a conducive learning environment for the students.



Figure 4



Figure 5



Figure 6

- (3) In addition to that, one of the educators from the centre, Mr. Evan, voiced his concerns regarding the lack of stationary supplies and books for the students.



Figure 7 Lack of stationary supplies



Figure 8 Deficiency of books

1.2 Motives and Objectives

Having surveyed all three floors of the building, we have mutually agreed on working on the classrooms which were located at the top floor. Our project aims to provide a better and more conducive learning environment for the students. Having heard the sentiments of the teachers in the centre, we have also sought permission from them to rearrange the furniture in the classrooms as well as replace some of the furniture which were in such poor conditions such as the shelving units and cupboards. We propose to replace those furniture with our renditions of shelves and cupboards made out of wood pellets. Also, since there is little to almost no separation between each classroom, we thought of devising a partition between each classroom using recycled cardboards. Other than being environmentally friendly, these storage pieces made out of lightweight materials are not only strong but can also be easily transported from one place to another if there is a need to rearrange the classrooms in the future.

The following is a list of our objectives for this project.

- (1) Ensure that our designs and products create a better learning environment for the children.
- (2) Ensure that our efforts and designs are environmentally friendly and sustainable.
- (3) Stay within budget.

Since most of the design works and construction of the furniture can be done in the studio, we'll be going back to the centre itself once every two weeks to update the teachers on the project we're embarking on. Once we've done with the construction of the furniture, we will take a few days to assemble and rearrange the space of the classrooms, ensuring a better place for the students to study thus, instilling more enthusiasm in the classrooms.

We estimate about RM200-RM300 for the cost of our project that covers the purchase of cardboard materials and wooden pellets for the furniture and partitions. Given that cardboards and wooden pellets have high recyclable properties, this favours the project's aim of implementing sustainable and environmental strategies while improving the lives of the students and teachers of the refugee centre.

2.0 INITIAL STAGE FOR DESIGN PROPOSAL

2.1 Current Condition

To show the relations between spaces, measurements (as shown in figure 9) and photos (figure 10) of each respective classroom were taken to visualize the current condition so that we can design accordingly to fully utilize the space.

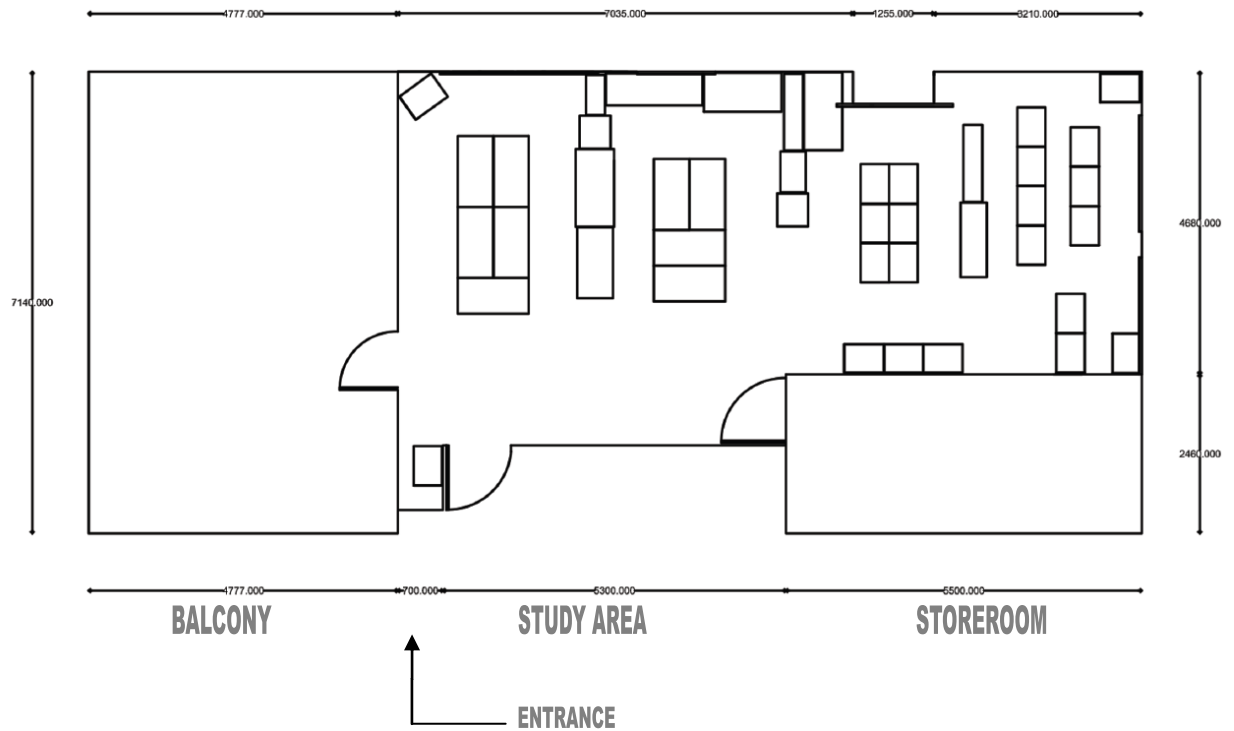


Figure 9 Measured drawing of existing furniture layout.

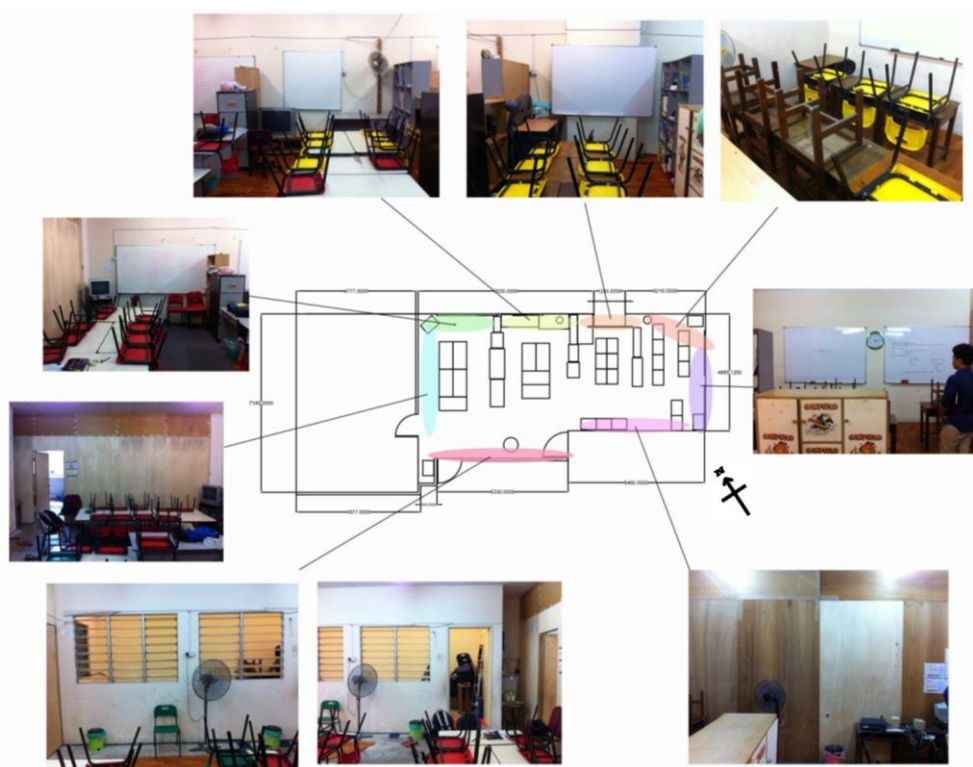
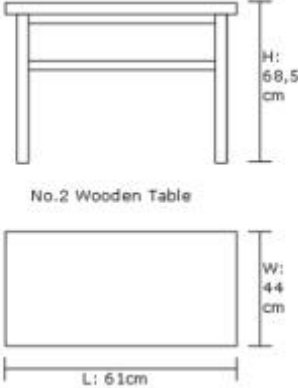
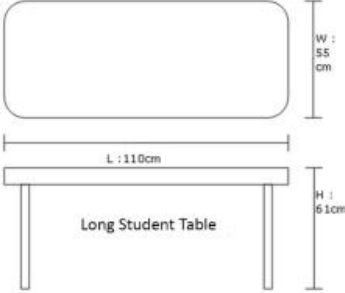
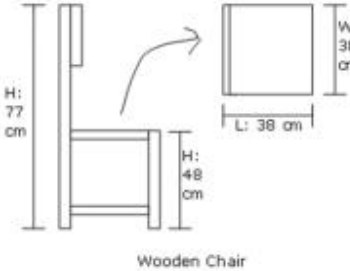
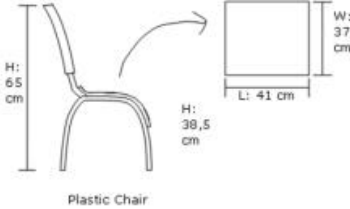


Figure 10 Pictorial labeling according to existing spatial arrangement.

2.2 Furniture inventory

No.	Name	Dimension	Quantity	Condition	Function
1.	Wooden Desk	 <p>No.2 Wooden Table</p>	23	Good	Used for smaller class
2.	Student Table	 <p>Long Student Table</p>	16	Good	Used for bigger class
3.	Wooden Chair	 <p>Wooden Chair</p>	5	Good	Kept in storeroom as the number of plastic chairs is more than enough
4.	Plastic Chair	 <p>Plastic Chair</p>	78	Good	Used for all classes

5.	Grey Book shelf		2	1 Good	Placed along the wooden wall
				1 Poor	The wood is reused in the new bookshelf design.
6.	TV Table		1	Good	Placed along the wooden wall
7.	Drawer		1	Good	
8.	Cupboard 1		1	Good	

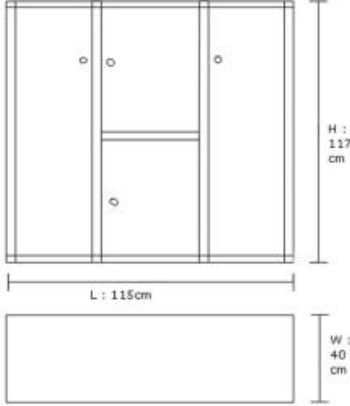
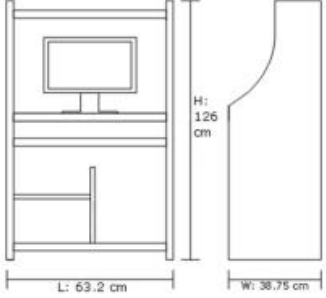
9.	Cupboard 2	 <p>Technical drawing of Cupboard 2. The front view shows a cabinet with three doors and a central shelf. Dimensions are L: 115cm and H: 117cm. The side view shows a depth of W: 40cm.</p>	1	Poor	Recycled after evaluating the condition and tolerance of the furnitures
10.	Computer Table	 <p>Technical drawing of Computer Table. The front view shows a desk with a monitor and a chair. Dimensions are L: 63.2 cm and H: 126 cm. The side view shows a depth of W: 38.75 cm.</p>	1	Poor	

Table 1 Inventory list of current furniture available and its condition.

2.3 Timeline

To complete this community work efficiently, we proposed a scheduled timeline (as shown in chart 1, enlarge timeline is included in) and decided to have weekly meetings to update on issues faced problem solving session. We took around 3 weeks' time to have site visiting and info collecting. Designs of partition and bookshelf were produced within this period of time. Then we gathered all the materials and started execution works. We have completed all the execution works within two weeks which is faster than what we proposed in the timeline. Video editing and documentation of the report were then finished in time. We completed this community work strictly according to the scheduled timeline with the spirit of teamwork.

ACTIVITIES	WEEK 1					WEEK 2					WEEK 3					WEEK 4					WEEK 5																	
	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			
Identification of Issue																																						
Meetings																																						
Site Visiting (Info Collection)																																						
Proposal																																						
Design Stage																																						
Inventory (Current & New Figure)																																						
Propose New Layout																																						
Materials Gathering																																						
Budget Allocation																																						
Sponsorships																																						
Execution Works (Partition)																																						
Execution Works (Bookshelf)																																						
Video Editing																																						
Documentation																																						

ACTIVITIES	WEEK 6					WEEK 7					WEEK 8					WEEK 9					WEEK 10					WEEK 11														
	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
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Chart 1 Scheduled timeline

3.0 DESIGN EXECUTION

3.1 Design layout

To create a better environment for the children, four partitions were placed to separate the cramped space into 5 different classrooms by taking the number of students in each class and the position of white board into consideration. Bookshelves were added along the wall beside classroom 5 to allocate the books.

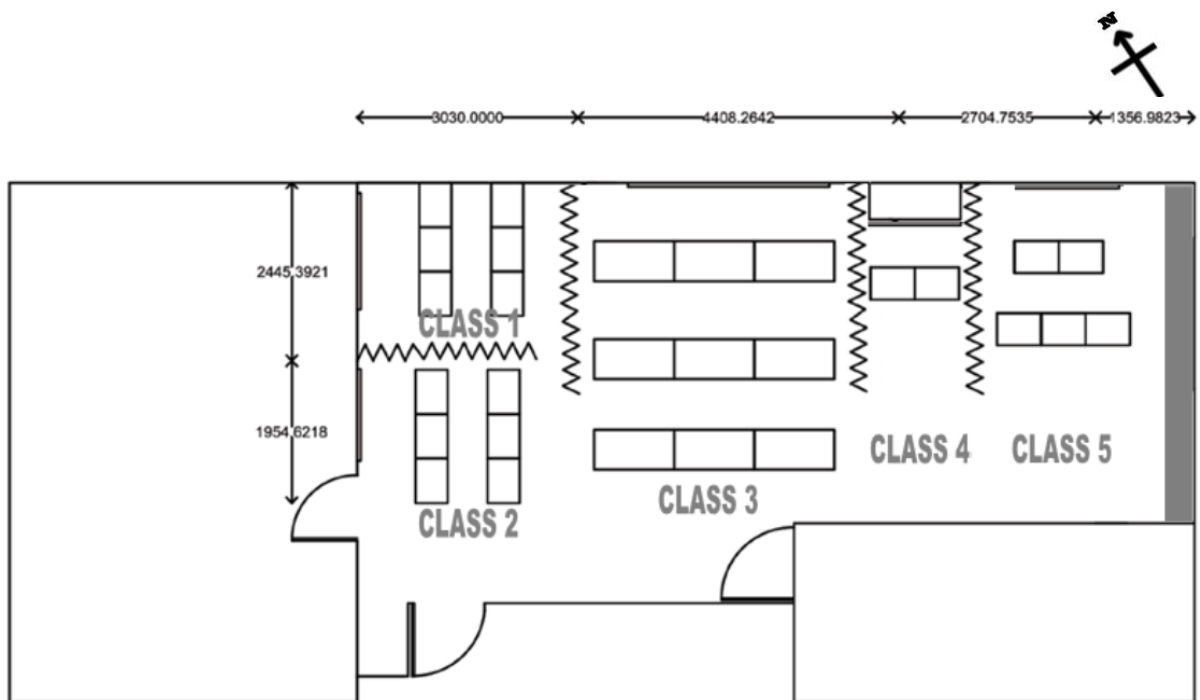


Figure 11 New spatial arrangement in complied with proposed partition design.

* New spatial arrangement to accommodate 5 different class sizes

- Class 1 (Primary 1) - 6 students
- Class 2 (Primary 2) - 6 students
- Class 3 (Kindergarten) - 22 students
- Class 4 (Primary 3) - 2 students
- Class 5 (Primary 4) - 5 students

 Partition

 Bookshelves

3.2 Bookshelf design

DESIGN 1

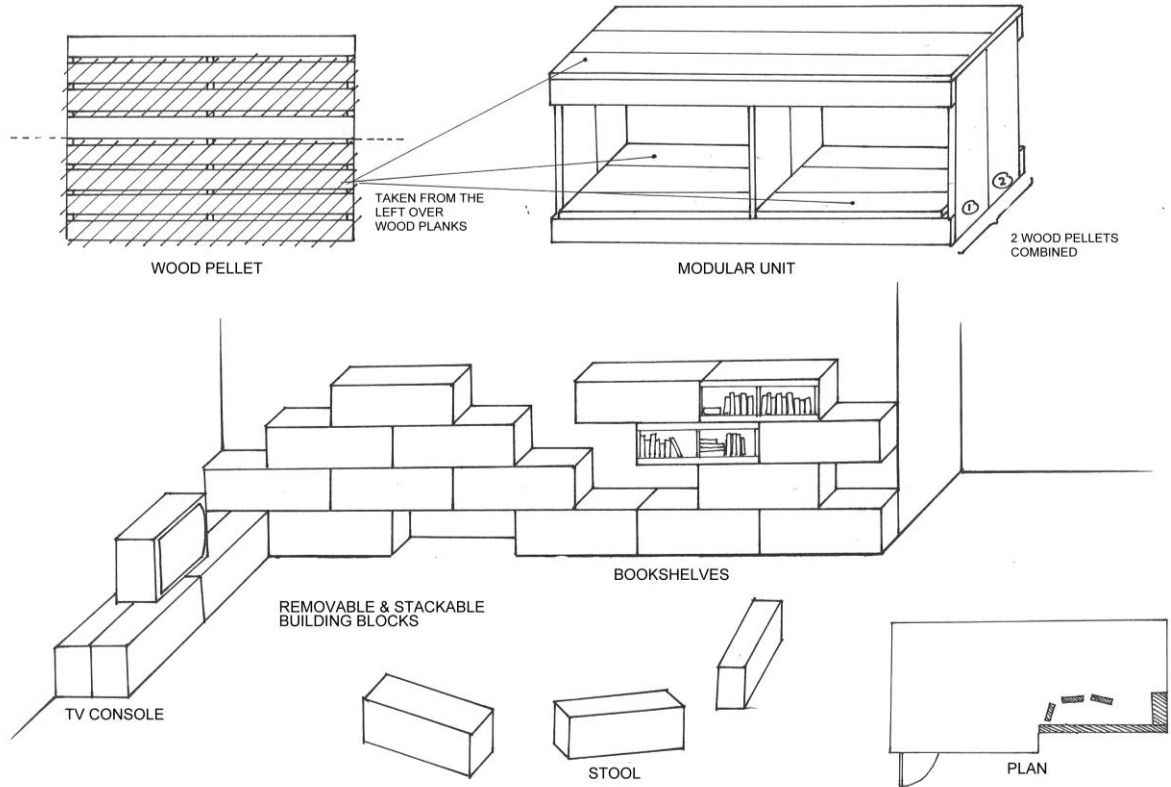


Figure 12 Illustration of multifunction bookshelves using recycled wood pallet.

This design is a combination of several modular units to form a multifunction furniture. Each unit is made using two wood pellets joined together back to back after being cut into same size. The design can be changed to suit the user's need and preference as the building blocks are movable and stackable to form various shapes and functions.

Advantage	Disadvantage
Fast and easy to construct	Each unit is relatively heavy
Changeable design	All wood pellets must be in the same size
Highly durable	Unstable structure due no joining between each unit and also between unit to the wall

Table 2 Comparison made to weigh its pros and cons before bringing it to ground.

DESIGN 2 (FINAL)

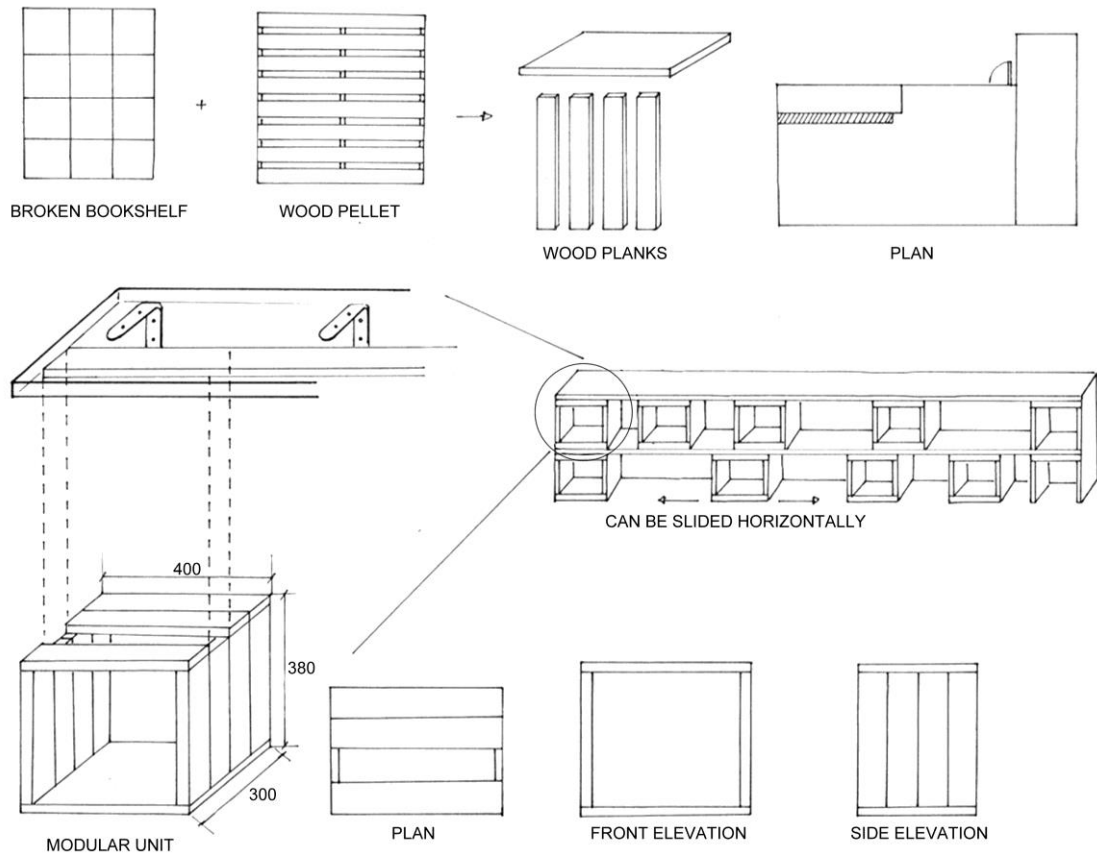


Figure 13 Illustration shows the modification done to suit in with resources available and time constraint factor.

Again designing with modular unit, the strategy used in this bookshelf solved the problems encountered in the previous design. This design requires relatively less materials as the interspace between each modular unit is functioning as a space for storage too. Moreover, the wood from the broken bookshelves were reused together with the wood planks taken from the collected wood pellets to construct this design that brings out the point of sustainability in term of recycling material.

Advantage	Disadvantage
Stable	Cannot be slide smoothly
Material saving	
Space saving	

Table 3 Comparison made to weigh its pros and cons before bringing it to ground.

3.2.1 EVALUATION OF BOOKSHELF DESIGNS

CRITERIA	DESIGN 1	DESIGN 2
Material	Wood pallets (some parts were taken off based on the design)	Wood pallets disassembled into wood planks
Dimension	<ul style="list-style-type: none"> - Design is restricted by the various dimensions of wood pallets - Does not correspond to the dimension of the books 	<ul style="list-style-type: none"> - Designed according to various dimension of wood pallet. - Design by considering the dimension of books
Stability	Unstable due to unfixed structure	Stable (connect to wall)
Cost (Nails, Screw, Paint)	Average	Low
Time	Shorter duration	Longer duration
Durability	Durable	Durable
Space	More space is occupied	Space saving with the same functionality as book shelf
Function	Flexible design	Spacing can be varied depends on different needs

Table 4 Comparison between design 1 and design 2 for bookshelf design.

There were numerous factors that have helped us in selecting our final design for our bookshelf. Despite the simplicity of the possibility of assembling the bookshelves for 'Design 1', we have actually overlooked various criteria such as the dimensions of the shelves cater to the size of the books in which the centre had. Also, we have overlooked the uncertainty of the acquisition of wooden pallets of varying sizes. As such, forming one 'perfect' bookshelf would seem a little farfetched. As such, we have devised a new design, though involving a longer time to produce, caters to the dimensions of the books. By dismantling the wooden planks individually from the wooden pallets, this enables us to alter the lengths and size of each plank, thus, easing the alteration of the dimensions of our bookshelves. Also, since the bookshelves for our second design will be adhered to the wall, hence, this proves to be a more stable structure than that of the first design. Eventually, after weighing out the advantages and benefits of 'Design 2', we mutually agreed on that design.

3.3 Partition design

DESIGN 1

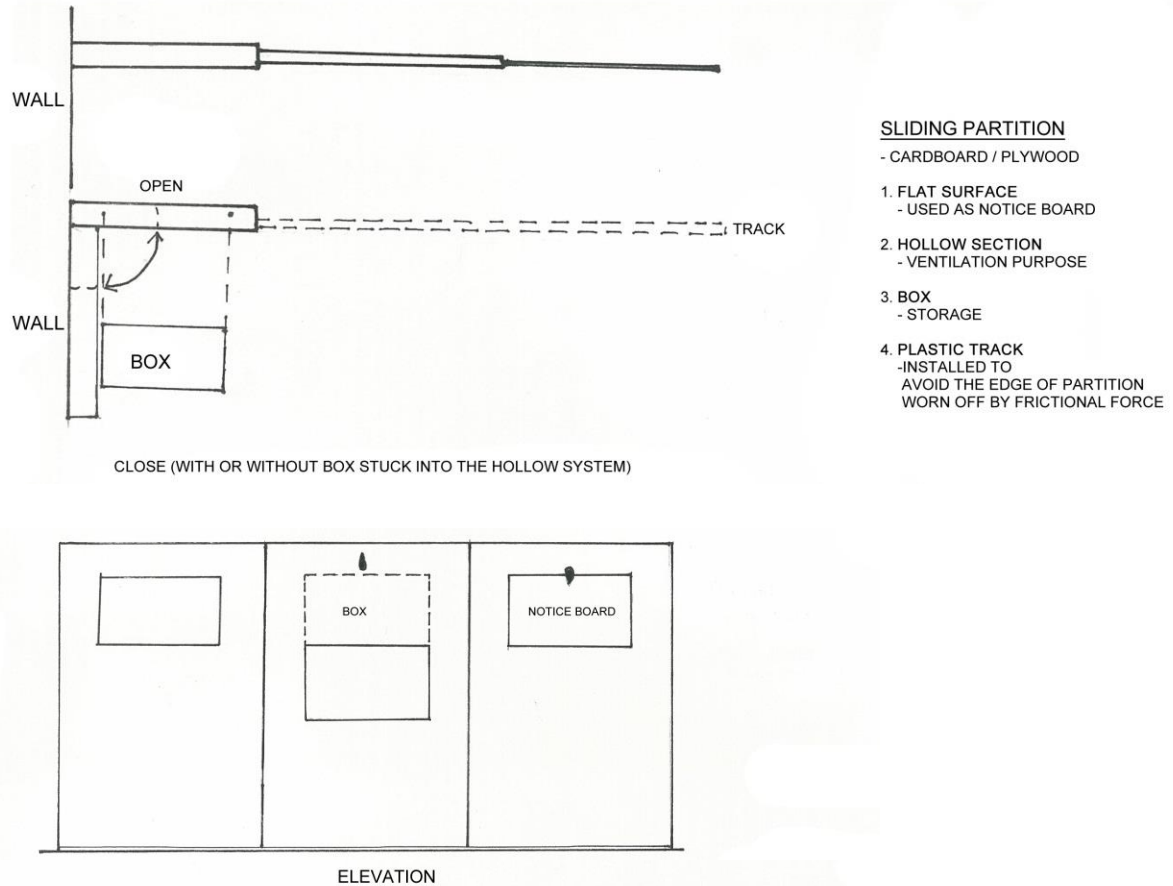


Figure 14 Illustration shows design of sliding pocket partition from plan and elevation views.

The sliding partition is made by different layers of cardboard that can be pull out when in use or keep it when not used. There is pivot connecting the edge of cardboard to the wall so that the partition can rotate 90 degree inwards or outwards to save space. Boxes will be insert into the hollow section of the partition as storages and the partition can be used as notice boards too.

Advantage	Disadvantage
Space saving	Tracks required for sliding might trip the children
Multipurpose (as partition/notice board/storage)	Not Stable
	Can be worn off in short period

Table 5 Comparison made to weigh its pros and cons before bringing it to ground.

DESIGN 2

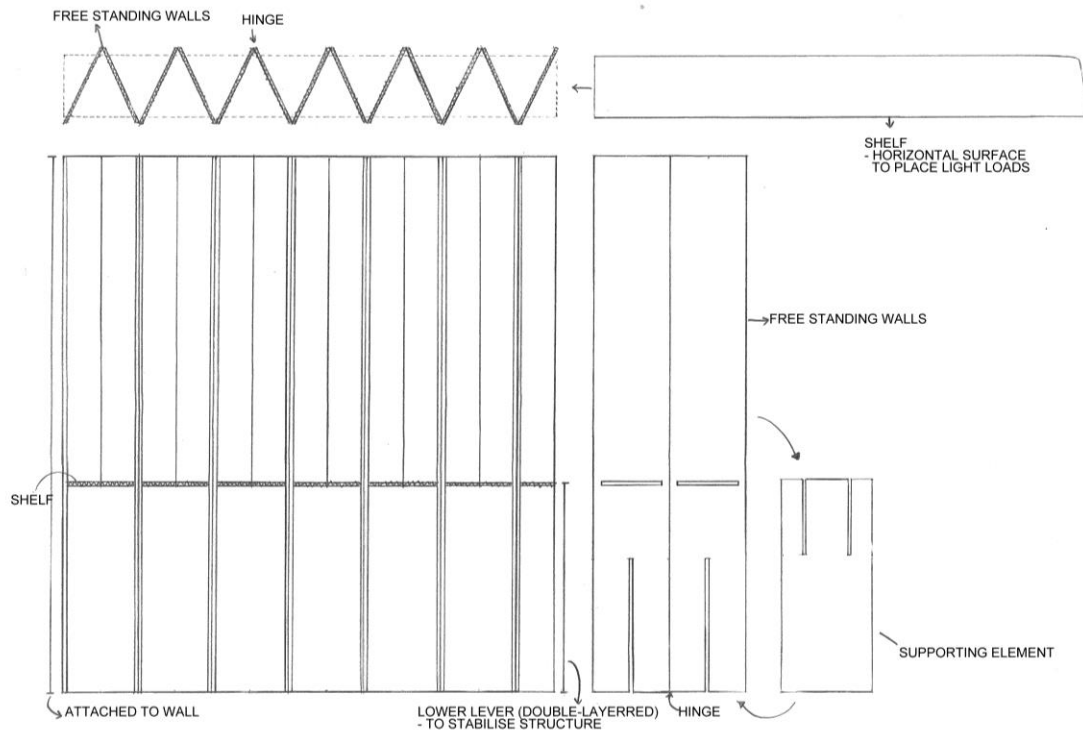


Figure 15 Illustration shows design of sliding partition from plan and elevation views.



Figure 16 A mock up model of design 2 for better understanding towards its mechanism.

The partition can be constructed by using different pieces of cardboard with slotting methods. It also function as a multi-purpose shelf and also a notice board. It is a free standing zigzag wall supported by a vertically slotted cardboard at the bottom and a piece of long horizontal cardboard lying on top of it functioning as the multipurpose shelf and also to stabilize the structure.

Advantage	Disadvantage
Multipurpose	No water resistance
Easy to construct	Can be easily damaged
	No heavy loads on the shelf
	Requires large space

Table 6 Comparison made to weigh its pros and cons before bringing it to ground.

DESIGN 3 (FINAL)

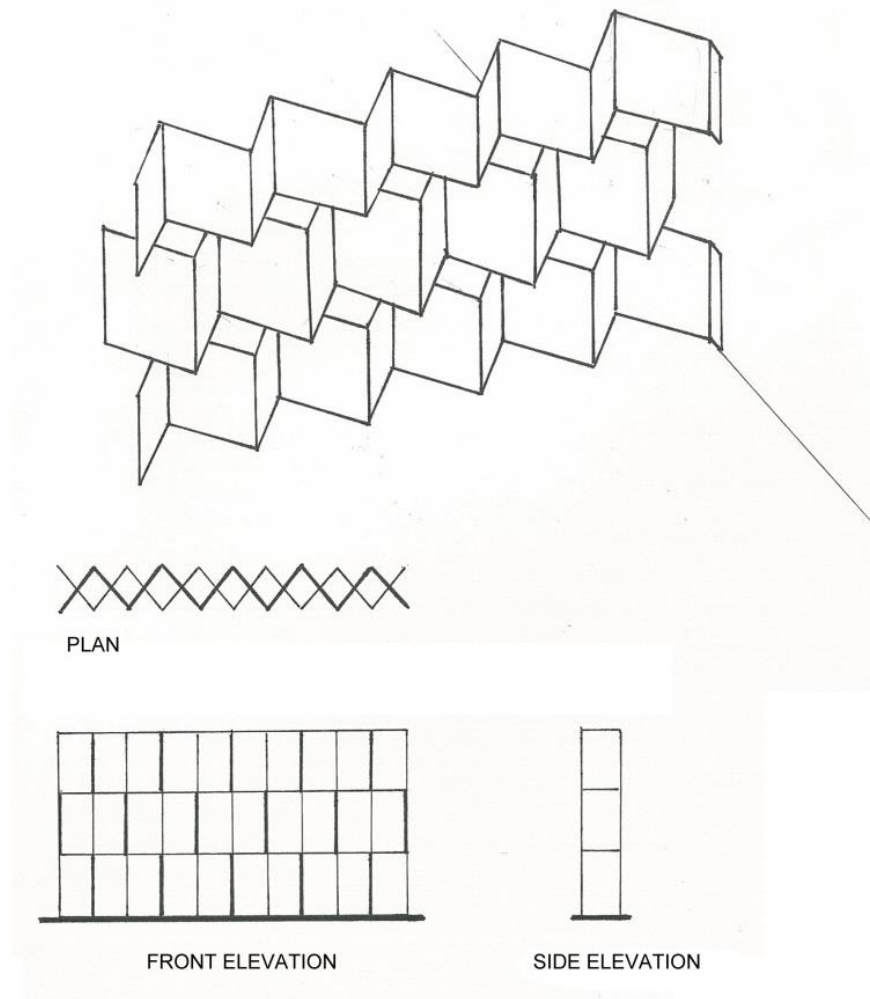


Figure 17 Illustration shows design of interlocking partition from plan, elevation and 3 dimensional views.

The compressive partition is a simple design that fulfils the need of the refugee center. To separate a small space into 5 classrooms, the saving of spaces becomes our ultimate goal while this design can save up to 70% of the spaces required by typical partition. It is time saving and easy to construct which the technique used is slotting the cardboards and gluing the cardboards together.

Advantage	Disadvantage
Space saving	Frictional force with the floor will wear down the bottom part of the partition
Easy to construct	The folding line will become weaker as time goes by
Time saving	
Durable due to impact	

Table 7 Comparison made to weigh its pros and cons before bringing it to ground.

3.3.1 EVALUATION OF PARTITION DESIGNS

Criteria	Design 1	Design 2	Design 3
Material	More cardboards are needed	More cardboards are needed	Fewer cardboards are needed
Stability	Not stable (because of its small base area)	Less stable (because of its height in one piece.)	Stable (due to the slotting of cardboards in a zigzag manner.)
Time	Long duration (complex mechanism)	Short	Short
Durability	Not durable	Durable	Durable
Space	Space saving	Occupy more space	Space saving (due to its compressive strength)
Function	Multipurpose (partition & notice board/storage)	Multipurpose (function as shelf)	Can be compressed (when not in use)

Table 5 Comparison between design 1, design 2 and design 3 for partition design.

Stability was definitely an issue for our partition since we decided to employ the use of cardboards. We had to ensure that the partition is not only stable but it also must not occupy too much space. The design of our partition had to be simple for ease of use. Initially, we have devised partitions which were multi-functional which either functioned as a notice board or storage area, as reflected in 'Design 1' and 'Design 2'. Even so, we have acknowledged the durability and tolerance of cardboards. As such, we have decided to only stick to a structure which only serves as a partition so as to prolong the partition's longevity. Also, the compressible trait of 'Design 3' indicates that the partitions can be easily stowed away when a big area is required to accommodate more people. As such, with the simplistic, compressible and non bulky nature of 'Design 3', that design was employed.

3.4 Design solutions to problems faced

3.4.1 Bookshelf

We faced a few issues regarding the design of the bookshelves. This was due to the difference in thickness and size of the wooden pallet which we have acquired. Based on our initial design, in order to construct each modular unit, every wooden pallet has to have an exact, equal dimension.

We then sought an alternative design to accommodate the different sized wood pallets which we have obtained. Instead using the entire wood pallet as a whole for each bookshelf, we decided to use wood planks from the wood pallets. This thus, eases the manipulation of length and thickness of each wood plank according to the specified dimensions of our design. Apart from this, we have also salvaged materials from a broken wooden bookshelf that was found at the refugee centre and incorporated these materials into our proposed design. Hence, with this new altered design, we are able to maximize the usage of materials that are available to us.



Figure 18 & 19 Wood pallets collected are of different dimensions.

3.4.2 Partition

Highlighting the issues faced in corroborating a new design for our partition, we managed to conjure up a final design that is desirable and practical in terms of stability and structural strength. One of the significant advantages of our design is the compressible mechanism that allows the partition to be closed up when not in use. The partitions can be fully compressed and tied close to the wall to create a spacious area for functions or events that require a large space have to accommodate a large number of people.

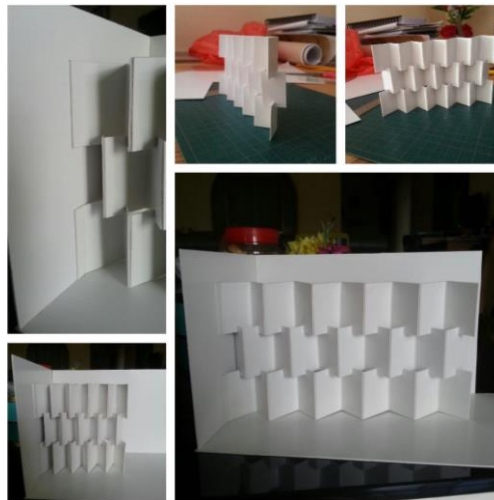


Figure 20 A mock up model of design 3 for better understanding towards its mechanism.

3.5 Usage of materials

We've weighed several options of materials and decided to use materials that are biodegradable, non-toxic & made from reused, recycled and rapidly renewable sources. It is also compulsory to achieve energy-performance and aesthetic goals. So we decided to use materials that are 100% post-industrial recycled, which are the construction material wastes: wood pallets and cardboards.



Figure 21 Wood pallets were left unattended after its initial usage.



3

Figure 22 Cardboards of electrical products in large amount.

3.6 Expenditure

Quantity	Description	Unit Price (RM)	Total (RM)
40	Wood pellet	5.00	150.00
4	Cardboard	-	-
	Miscellaneous expenses		100.00
Grand total			250.00

Table 9 Initial budget allocations before unattended wood pallets were found.

We planned to use wooden pallets and cardboards as our main materials. At first, we thought of purchasing the wooden pellets. The unit price of wooden pallet is comparatively cheap, bearing in mind that wood gives high quality in touch and is aesthetically pleasing. However, to make a bookshelf, we would have to use a lot of wood, so the total cost will be quite high if we were to buy the wood. As for the cardboards, we obtained more than enough used cardboard from a lighting company. The miscellaneous expense includes glue, nails, and other additional things we would have to use in our design.

Quantity	Description	Unit Price (RM)	Total (RM)
70	Cardboard	0.00	0.00
30	Wood Pallet	0.00	0.00
6	Hanger	0.50	3.00
1	Wood filler	4.00	4.00
1	Alien Key	4.00	4.00
1	Thinner	4.00	4.00
2	String	3.50	7.00
1	AVA glue	8.00	8.00
2	Paint brush	5.00	10.00
2	Duct tape	6.00	12.00
1	Hot glue gun	15.00	15.00
-	Screw	-	28.50
11	Metal L bracket (7")	3.50	28.50
2	Wooden paint	20.00	40.00
10	Metal L bracket (9")	5.00	50.00
Grand Total			214.00

Table 10 Detailed expenditure for task completion.

Our final expenditure is lower than estimated, as we were able to work with recycled materials instead of purchasing new ones. It would be quite pricey if we were to purchase new wood. And also, new wood would have to be treated before we can use it in the construction of our bookshelves.

We have collected and retrieved the used wooden pallets from the roadside and also construction sites. As the used wooden pallets are already cut out into workable pieces, we do not have to send them to the carpenter, hence, saving up on the preparation cost. We did all the removing of nails, sanding and painting by ourselves.

We spent most of our budget on the metal L bracket, which we used to secure the shelves to the wall. Most of the money is also spent on the paint, which is oil-based. Oil-based paint is more expensive than water-based paint, but gives a rather more appealing finish.

We tried to calculate the cost of each material we needed everytime we made a purchase so that there would be less or no leftovers. We got sponsors from a few sources, and it totaled up to RM300. We have RM 86 left, so we decided to purchase storybooks and stationeries for the children.

3.7 Work in progress

3.7.1 Bookshelf Progress

All figures below show the bookshelf building progress. We processed it from its raw and untreated condition to the finest possible condition.

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Figure 23 Wood pallet's condition at its collected condition.



Figure 24 Each unit of wood pallet is separated into individual wooden strip.



Figure 24 Removing all the nails on the wooden strip.



Figure 25 All the nail-free wooden strips.



Figure 26 Smoothen the wooden strips surface.



Figure 27 All the wooden strip is cut into respective length.

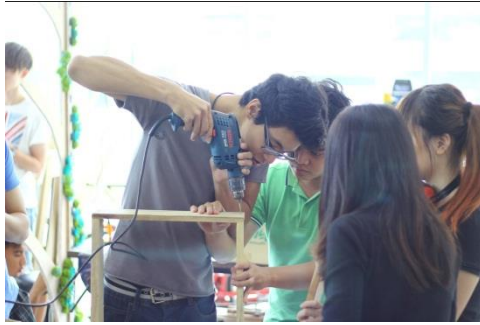


Figure 28 Joining the wooden strips to produce the frame of bookshelf.



Figure 29 Measuring the wooden strips in order to have accurate fittings.



Figure 30 Carefully marked the point of connection.



Figure 31 Completed modular unit of the bookshelf.



Figure 32 Painting the frame for batik drawings.



Figure 33 Painting the bookshelf's modular unit.

3.7.2 Partition Progress



Figure 34 Cut the cardboard into 2 pieces.



Figure 35 Remove the unwanted sides.



Figure 36 Folding the cardboard into half.



Figure 37 Folding the cardboard along the edge line.

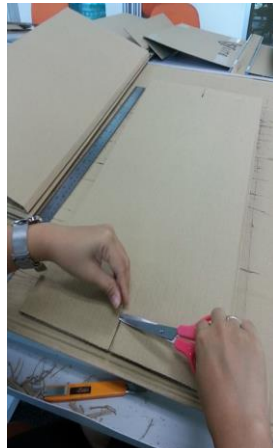


Figure 38 Create the slotting space.



Figure 39 Connecting piece by piece using hot glue gun.



Figure 40 Attach string to strengthen the partition.



Figure 41 Knot made to the partition.



Figure 42 Completed partition.

4.0 SUSTAINABLE & ENVIRONMENTAL STRATEGY

In order to minimize the amount of negative impact onto the environment, we have to adopt a sustainable strategy that does not only ensure that our products last but also ensure that the materials from our products are highly recyclable. We also embarked on an environmental friendly approach in terms of the usage of materials & man power.

We looked into common recycled materials such as cardboards and wooden pallets. By contacting various suppliers and sub-contractors, we have managed to acquire the required materials for our project. The table below indicates the construction and demolitions materials recovery.

Table 11 : Construction & Demolitions Material Recovery

Materials	Lbs./yd2	Tons/yd2	Yd2/Tons
Cardboard	100	0.05	20
Wood	300	0.15	6.7

With all the facilities available in Taylor's University, we decided to execute the processing of the materials ourselves. This does not only provide us with an experience in handling and the manufacturing of our own product, but also helps save on labouring cost. With the guidance of the workshop officer, we are now more informed of the proper procedures, appropriate devices and machines to be used.

4.1 Wood Pallet

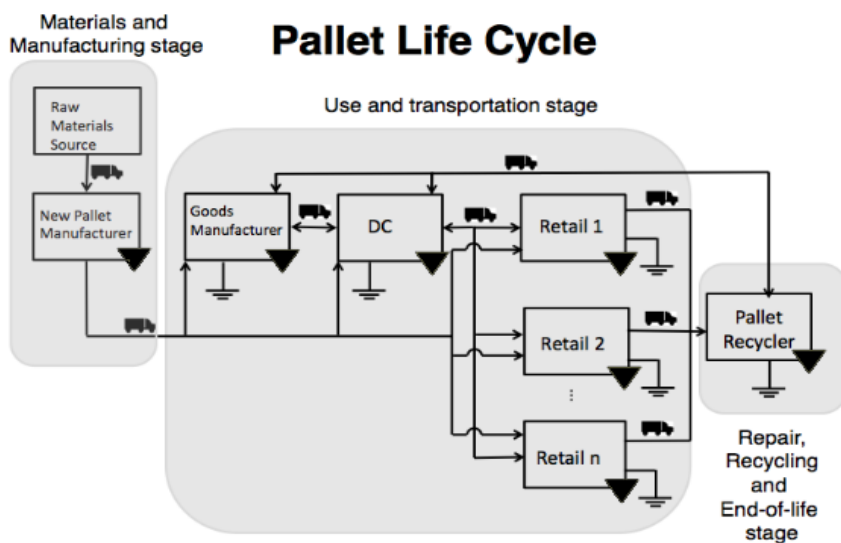


Figure 43 Life Cycle of Wood Pallet (Source : <http://cdn.promatshow.com>)

Trees are rarely cut down to produce wooden pallets. They are cut down for more valuable items such as building materials and furniture. Wooden pallets are built from the unattractive lumber that is left over from this process. It would likely be discarded if not made into pallets. So the process of recycling pallets does not reduce our natural foliage. Recycled pallets are built from existing pallets. If a pallet can no longer be repaired it is turned into useful, marketable products such as landscape mulch, animal bedding and woodstove pallets. One key characteristic that influences carbon emissions associated with the pallets used is weight. Lighter pallets require less fuel to transport, thereby reducing carbon emissions. The annual emissions created by moving each pallet type under our assumptions range from a high of 5 mmtCO₂e/yr for nailed pallets.

By using recycled wood pallets, we ensured the maintenance of an environmentally friendly strategy where the energy is conserved. The use of recycled wood pallets also ensures a cleaner atmosphere whereby if wood pallets were to be discarded, these pellets would end up being burnt, thus, releasing carbon monoxide and other harmful gases which may contaminate the atmosphere. During the manufacture of wood, a lot of energy was used for processes such as logging, drying, cutting and sanding. Hence, less energy would be used up in the recycling of wood instead of manufacturing new ones. Less energy consumption is always a desirable sustainable strategy. Besides that, used wood pallets are known to be more durable and stronger than virgin wood since its strength is already tested and proven in its previous usage.

The type of wood desired for the wood pallets are recycled from hard or soft wood which are kiln dried or a combination of new and recycled wood whereas the type of fasteners are staplers or nails. On the other hand, more time was used up to obtain the wood pallets. We managed to find a few abandoned wood pallets along districts of PJS 7. Those wood pallets were not in exceptionally good condition hence some modifications had to be done before it is being used. Given that we did not spend any money on these wood pellets, hence, we are indeed on par with our aim of adopting an environmental and sustainable approach to our project.

By conserving the material, we intend to design the bookshelf using the different sizes of wood planks from the pallets. We dismantled the wooden pallet at first. Then, we altered them into different dimensions according to the sizes and width of pallets we have obtained according to the design specifications of our product.

4.2 Cardboard

Cardboard is a very popular material and is most often used to make boxes for shipping. It comprises of corrugated fiber paper, sandwiched between sturdy sheets of cardboard. Once this cardboard has been deposited into the trash or recycling bin, it is referred to in the industry as old corrugated cardboard, or OCC.

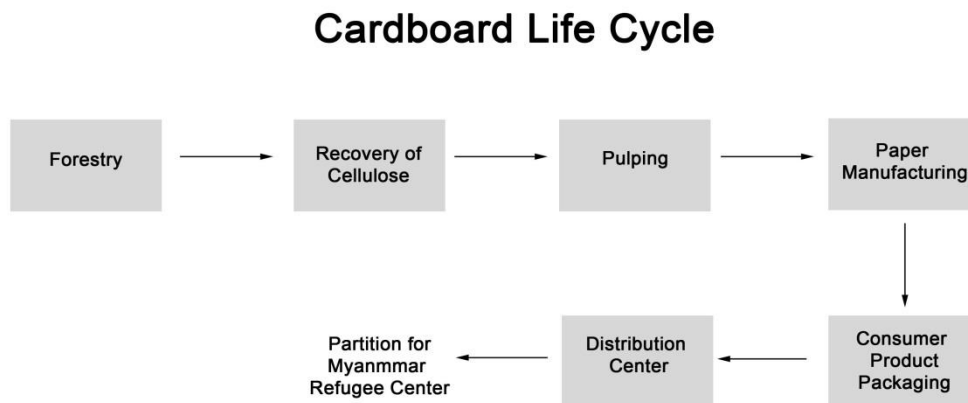


Figure 44 Life Cycle of Cardboard (Source:original)

According to figure 44, trees are cut down and taken to the paper mill. Pulp is extracted, dried and flattened to make 2 types of cardboard, that is paperboard and corrugated cardboard. After the cardboard is used, it is placed into recycling and sent back to the paper mill. Cardboards collected are then soaked in water and chemical bath in order to break them down into 'pulp'. Several stages of cleaning are then applied to remove contaminants like glue, plastic, staples and ink. After this, the pulp is mixed with virgin fibers and made into recycled cardboards. Every time a cardboard is recycled, the fibers become weaker, limiting the number of times it can be recycled, but still cardboard can be recycled up to 8 times.

When cardboard breaks down in a landfill, opposed to being recycled, it creates methane, a major greenhouse gas with a global warming capacity 21 times more powerful than carbon dioxide. Recycling 1 Ton of cardboard can save 9 cubic Yards of landfill space. The embodied energy produced by paper and cardboard saves 2.3t of CO₂ emissions per year. 240L bin of cardboard disposed fortnightly produce the amount of embodied energy equivalent to 11,414 hours use of an average LCD TV.

We decided on the use of cardboards for our partitions after understanding the amount of cardboards that were disposed off without being recycled. The discarding of cardboards would take up much space as cardboards are rather bulky and huge. Thus, recycling cardboards would delay the need to expand landfills. We managed to collect boxes of lighting products from sub-contractors and most of the cardboards were in very good condition. Under proper care, we believe that the lifespan of the cardboard will range from 3 to 5 years, that will fulfill the sustainability criteria we are looking for. Furthermore, usage of recycled cardboards can contribute to the conservation of natural resources like oil and fossil fuel.

All in all, sustainable building materials should be utilized appropriately and contextually in each neighborhood development. The use of sustainable building materials not only reduces transport costs, carbon emissions, and in most cases materials costs, but it also provides employment and skills development opportunities for community members.

Hence, we have established an effort in sustainability by involving the use of natural products and energy in a way that does not harm the environment. Concurrently, we ensure that our products are long lasting. We strongly believed that this small effort we had made would not only reduce the waste to our mother earth, but also a step to create a more caring society.

5.0 CONCLUSION

5.1 Relation To Sustainability

Whilst it was important to acknowledge the fact that we were to ensure an improved learning environment for the children, we also have to keep in mind that our efforts and actions were sustainable and environmentally favourable.

Apart from understanding the life cycle of the materials which we have chosen, we have also gained an in-depth understanding of the benefits of recycling the materials, which we have salvaged. Doing so, it has enabled us to weigh out the benefits of making use of these recyclable materials rather than purchasing brand new ones from authorized distributors or retailers.

By prolonging the lifespan of the wooden pellets and cardboards, we ensured that the amount of waste which may be otherwise generated, is greatly reduced and as such, decreases the negative impact on the environment through a reduction in the disposal of waste matter which would require a lot of energy.

And also, keeping our expenses low, we further emphasized our desire to maintain a self-sustained project where most of the manpower is provided by our own team members.

Despite the fact that we have only managed to salvage a few wooden pellets and cardboards whose figures may not seem significant to the amount of wastage that is occurring in the environment around us right now, it is through such miniscule efforts that sustainability will have a positive impact on the environment in the long run and we hope that our efforts to conserve serves as a springboard to inform others of the co-existing possibility of design and sustainability.

5.2 Experience With Community Involvement

This project has not only equipped us with the necessary skills for woodworking and experiencing the handling of different types of recycled materials, it has also given us an opportunity to interact with the refugee community. By integrating ourselves among the children and understanding their needs as well as the educators, we were able to acknowledge the needs of the community there and as such, build our project around what is to be catered to the community. It was a humble experience working with Mr. Evan where he occasionally shared with us the background of the children whom he taught as well as how different children have to be handled differently. As such, those insightful sharing sessions force us to reflect upon ourselves and thus, understand the plight faced by the children and educators of the refugee centre. Their cooperativeness and welcoming attitude are very valuable for us in the process of the project. All in all, working together and helping each other in the group throughout the whole course of brainstorming up till the point of installation was indeed an experience to remember. We kept up good teamwork with every contribution from all the members of the group. We have indeed bonded well among ourselves.

5.3 Reflection

After all, we would say that our project is a successful one. We were able to keep up with the timeline and finish everything in time. All our designs are able to be constructed successfully and meet with the objectives. As a group, we are very competent and efficient. The owner, teachers and students of Myanmar Refugee Centre were thrilled by our make over. Our expenditure is also below our budget, so we have extra money to be spent on stationeries. We had also achieved some of the TGC criteria, such as communication and interpersonal skills.

6.0 APPENDIX

6.1 Proposal

PROJECT STATEMENT

After weighing out our options of non-profit organizations to offer our services to, we eventually agreed on providing assistance to UNHCR which is located Off Cheras. Given the centre's cramped conditions, space is definitely an issue for their community. The centre is split into three floor levels. The third floor housed four open concept classrooms where there is barely any division between each classroom. As such, while all 5 classes are running concurrently, it may be distracting for the students. Having spoken to one of the teachers from the centre, we want to highlight a few issues that should be addressed.

1. Upon visiting the site, we noticed that the spatial arrangement of all 5 classrooms could be further improved to facilitate smooth circulation for the students and teachers.
2. Also, the condition of the furniture, especially bookshelves, suggests that quite a number of them should be replaced to ensure a conducive learning environment for the students.
3. In addition to that, one of the teachers in the centre known as Mr. Evan voiced his concerns regarding the lack of stationary supplies and books for the students.

PROJECT OBJECTIVES

Basically the objective of our project is to be able to increase the awareness of our current environmental issue around us. It can be seen every day, environmental issues along with community issues which are being ignored by most of the people in the community itself. Therefore, by doing this community service project increase our awareness of our surrounding and perhaps can help us in the future as we are also the part of the community that we work and we contribute to.

Our objective as a student is also, being able to creatively explore the circumstance of our environment and create the solution for the issue, either by creating environmental sustainable product or design, or by doing services to the community.

Last but not the least, is for the understanding of the principle of sustainability that we gain from doing the community service project from environmental and social aspect, as well as being able to explain the principle of the sustainability.

6.2 Approval letter



UNHCR

United Nations High Commissioner for Refugees

Haut Commissariat des Nations Unies pour les Réfugiés

13th May 2012

Mr. Evan

Educator of Myanmar Refugee Centre

C-2-5, Jalan 3/93A Off Cheras,

BT 2-1/2 Warisan City

To whom it may concern,

Having spoken to the students of Taylor's University regarding their intentions of creating a better learning environment for my students, I was informed of the changes that they intend to make to the classrooms. I am fully aware of these changes and I indeed welcome these keen students who seem deeply motivated to inculcate a positive learning environment. I have authorized these students to note down information that is relevant to their project where they have come down during two occasions to take down a furniture log of the classrooms and also measurements and dimensions of the area. I look forward to the commencement of this project.

Sincerely

Evan HauKhatMung

7.0 REFERENCE

7.1 Research Relating to Material using Wood Pellet

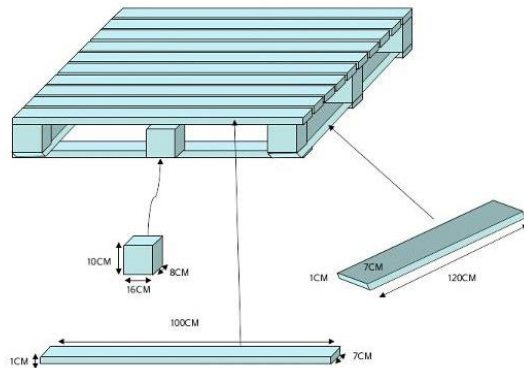


Figure 45 Standard dimension of wood pallet.
(Source: Chua Sor Hong)



Figure 46 Wood pallets as the fencing gate.
(Source: Mohammad Syarulnizam)



Figure 47 Wood pallets as divider.

(Source:<http://willowhavenoutdoor.com/featured-wilderness-survival-blog-entries/2-cool-recycled-pallet-projects/>)



Figure 48 Wood pallets as the design
for modern house

(Source:<http://shippingcontainerhomesaustralia.com.au/modern-container-home/>)



Figure 49 Wood pallets as the design
for modern house

(Source:http://www.plataformaarquitectura.cl/2013/03/03/pabellon-de-pallets-reciclados-avatar-architettura/51302a12b3fc4b895900014a_pabellon-de-pallets-reciclados-avatar-architettura-_05-jpg/)



Figure 50 Wood pallets as the design
for modern house

(Source:http://www.plataformaarquitectura.cl/2013/03/03/pabellon-de-pallets-reciclados-avatar-architettura/51302a12b3fc4b895900014a_pabellon-de-pallets-reciclados-avatar-architettura-_05-jpg/)

7.2 Research Relating to Material using Cardboard



Figure 51 Wavy bookshelf that need to be traced.



Figure 52 Zigzag partition along with book rack.

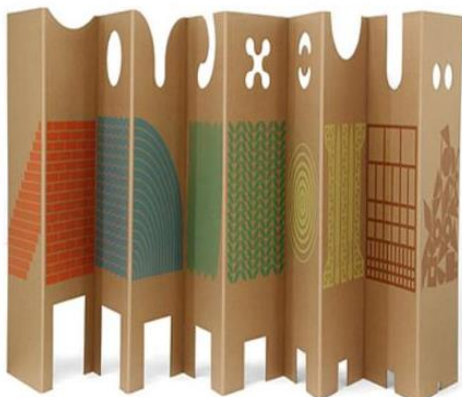


Figure 53 Partition look simple and nice.



Figure 54 Zigzag partition along with book store.



Figure 55 Bookshelf using the cardboard.



Figure 56 Cardboard can also be used as furniture.