GNG 1103: Deliverable C

Dr. Muslim Majeed

Owen Cummings
300074121

Leena Tran
300088057

William Hayes
300077212

Justin Power
300083066

Shivam Syal
300065225

Teye Adekeye
7142255

Date of Submission: 02/03/2019

1.0 Objective

The objective of this deliverable is to perform several tasks such as defining a list of prioritized design criteria, benchmarking, list of metrics and target range specification related to the project.

2.0 Introduction

This deliverable describes the specific design criteria that are required for every aspect of our solution.

As mentioned in the above section, the objective of this deliverable is to perform several tasks such as defining a list of prioritized design criteria, benchmarking, list of metrics and target range specification related to the project. In order to achieve this, several tasks would have to be accomplished.

The evaluation of the potential solution ideas was done by the team after gathering information gotten from the client and subsequently exploring possibilities for solution.
The potential solution ideas would employ similar mechanisms to accomplish the task and each solution will be compared with the project metrics, analyzed for design criteria and innovation to aid in the design decision process.

3.0 Design Criteria

1. The weight of the bed frame should be capable of supporting 250 lbs adult.

   Max strength requirement: one of our design criteria is that the bed frame must support one adult. The weight of an average adult is 65Kg, however it is not uncommon for the weight of an individual to reach 100 - 115Kg. For this reason we aim for our bed to be capable of supporting at least 120Kg.

2. The solution must be able to fit a single adult.

   Size requirements: our client requires the final bed frame to fit a single adult. A standard twin/single size bed is 92cm x 187cm, and our bed frame must support the mattress 60cm above the floor.

3. The solution should not cost above 100$

4. Stability: for our bed to function effectively it will need to be very stable and resist rocking when in use. We would also like to incorporate walls around the edges of the top of the bed to keep the mattress secured.

5. Resistance to water absorption: In order to improve the longevity of the bed frame, the client wants the frame to be resistant to moisture. The final solution should be capable

of surviving small splashes and puddles of standing water—without being structurally compromised.

6. Foldability: For the bed to stay with the theme of being very moveable, ideally the bed is to be folded and or taken apart and packed up into one unit to be easily carried and transported. The goal is have the entire bed compacted to about 50% smaller in volume. This is a reasonable amount as the bed has to be transportable, and if the bed is compact enough, and pact into 1 unit, this seems like a very reasonable amount. However, if this cannot be done, the bed can be compacted into multiple units or pieces, the volume will not be as reduced as much as the 50% smaller 1 unit, but ideally the final solution should be compacted into 1 unit.

7. Height: The bed after being built should be at least 60 cm off the ground, this is do with the resistance to water, and will make the design less expensive, since the only part of the bed that will require this water resistance is the legs. This is also to provide comfortability as people do not want to sleep right on the floor, so this 60 cm is a perfect buffer.

4.0 Project Constraints

Budget / Cost
The client has mentioned that our design cost must not exceed this maximum value of approximately $100. The project will be constrained by this maximum budget.

Materials
The main constraint on our design is the material requirements, it must be made entirely of cardboard.

Time
The time for the project to be completed must be considered. Our project must be finalized with a full-scale prototype by march 25th.

Lifespan
From research, a house made entirely from cardboard is expected to last about 10-15 years. A bed frame would be expected to have a significantly shorter usable lifespan. We estimate a good piece of cardboard furniture would last half this amount of time (5 - 7 years). Solutions will be rated for how closely they meet or surpass this time period.

"The expected lifespan of a cardboard house (10 - 15 years)" - AYAM, ÖZLEM. CARDBOARD IN ARCHITECTURAL TECHNOLOGY AND STRUCTURAL ENGINEERING :
A CONCEPTUAL APPROACH TO CARDBOARD BUILDINGS IN ARCHITECTURE. Pg.93

Constructability
An important metric to consider in this project. This metric measures how easily a given solution can be repeatedly recreated and implemented. A solution that can be done repeatedly without having to modify any components or the methodology used will be ranked as excellent.

Order Specifications

Weight (Kg)
– Size when deployed (LxWxH m)
– Size when disassembled/assembled (cubic metres)

5.0 List of Metrics
The list of metrics based on the research made from benchmarking competitive products in terms of the client's perceptions and technical performance of the product to be designed are listed below:

Metrics Units	Units	Client's Perception/ Technical Performance
Weight of Bedframe	Kilograms	Any sized person should be able to sleep on the bed.
Longevity of product	Years	The product needs to be durable
Time taken for bed to be assembled/Disassembled	Seconds/Minutes	Design has to be time efficient
Dimensions of the Bedroom	Centimeters	Design needs to fit the given space for the bedroom.
Easy-to-Assemble/Disassemble	Seconds/ Minutes	The design should be relatively light weight and not burden the client to move/transport the bed
Stability to transmit various loadings safely to the ground.	Newton	The bedframe should be able to resist the loads for which its designed for

Cost	$CAD	The product needs to be cost effective

6.0 Target Specifications

Metrics	Marginally Acceptable	Ideal	Reason
1	65kg/150lbs	120Kg/250lbs	Its needs to be able to support a 250 pound full grown adult without issue
2	5 years	7 years	These are estimated lifespan of a cardboard house(project)
3	(time it takes to assemble)	(time it takes to disassemble)	It has be quick enough to avoid frustration of the client
4	92cm x 187cm	92cm x 187cm	The estimated dimensions for the bed
5	120 kg	60 kg	It has be light enough to be foldable or broken down for easy transport
6			It has to be stable enough to not rock or fall apart when in use
7	130$ if extra budget is approved	100$	We want to fall within the budget.
8	Slightly unpleasant	Neat and simple	Product needs to be presentable.

7.0 Reflection on Client meeting

The client meeting helped us rank our needs by stressing how important different aspects of the creation process are. Through the information that we gathered from this meeting the most

important aspect the bed would have to be the strength of it, as it will need to be able to have to hold a minimum of 120kg, followed by the structure and how stable this bed is, since it will need to be able to back up the 120kg. Since this is a portable house that can be disassembled and reassembled, it would make sense for the bed to be easily disassembled as well, even ideally folded up into one unit to be easily transported. This bed is made from pure cardboard, and since cardboard does not have great resistance to water, it would make sense to cover this weakness by applying some sort of water resistance coating onto the legs of this bed, and for that purpose and for being a comfortable distance from the ground 60cm should be an ideal distance to completely cover in a water resistant coating.

8.0 Conclusion

Through the assistance of a client and group research, a list of design criteria, target specification, metrics, and benchmarks were planned to build a budgeted bed frame. After working with the client, our group has prioritized the client's needs in the form of a ranked list. The bed frame must be able to support up to 120kg, be water resistant, stable, easily compactable, and transportable. With these traits in mind, our group went further to discuss the constraints that the bed frame must be built under. The bed is designed for the working class population, and it aims to appeal to comfort while on a budget. Therefore, cost, materials, time, lifespan, and constructability were considered and constraints were made to keep in check with client’s needs. Following our plan and constructing the bed frame, we hope to make some lives more mobile, more comfortable and more accessible.