

Waterproof Minimalist Coffee Table

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Abstract: Floods are becoming more severe in Malaysia, and the number of floods is increasing year after year. The flood events will cause harm to the human as well as the furnishings. Direct contact with water may change the structure and exterior appearance of a product, especially if it is constructed of a non-water-resistant material like MDF or plywood. Therefore, the goal of this study is to determine design criteria, design and fabricate a minimalist coffee table that is waterproof. The questionnaire was completed by Selangor citizens aged 21 and above in order to determine the coffee table's design criteria. Following that, the coffee table design process began with visual research, progressed through thumbnail and ideation sketches, idea development, final design selection, mock-up development, and concluded with prototype fabrication. The coffee table prototype in the present study was built of rubber wood and stainless steel. Sealer and lacquer are the finishes used on coffee tables parts made of rubber wood. Three criteria influence the design of the coffee table, which is a rectangle coffee table, a natural color coffee table, and a combination of wood and metal criteria. As a solution to the aforementioned challenge, this study successfully designed a minimalist coffee table with waterproof ability that fulfills market demand.

Keywords: Coffee Table, Floods, Minimalist Style, Farmhouse

1. Introduction

Since the birth of civilization, natural materials such as tree stumps, stones, and moss have been utilized as furniture. Archaeological evidence reveals that around 30,000 years ago, individuals began to make and carve their own furniture out of wood, stone, and animal bones. Thrones and klinai, multipurpose sofa used for sitting, eating, and sleeping, were common in ancient Greece and Rome. Furniture and household items can be made from a number of materials, including wood, metal, plastics, marble, glass, or fabrics, and can serve a range of purposes. The word furniture comes from the French word *meuble*, which means "equipment". The term "furniture" refers to the collection of materials used to furnish a space to enable human activity. Different types of furniture are used for different purposes

such as working, relaxing, and eating. There are seats, tables, bookcases, counters, armchairs, and other types of furniture featured.

There are various aspects to consider while making furniture. In Malaysia, for example, at least 3.5 million people are expected to live in flood plains and be vulnerable to floods of varying severity (Noar & Kamal, 2018). Flash floods have wreaked havoc on Malaysian cities such as Kuala Lumpur and Kajang (Bari *et al.*, 2021). As of December 20, 2021, rivers in Pahang, Selangor, and Kelantan were over the danger level in nearly 30 locations (Sulaiman, 2021).

In Malaysia, floods are categorised into two types: flash floods and monsoon floods. Flash floods return to normal water levels in a matter of hours, whereas monsoon floods might linger for a month (Buslima *et al.*, 2018). According to Moatty and Vinet (2016) and Tun *et al.* (2017), flood victims face repair costs, and some small businesses do not reopen following the disaster.

Floodwater may ruin wood furniture in a variety of ways. Direct engagement can change the structure and appearance of an object. When the joints relax, the wood may bend or crack. The finish may become cloudy, and stains are likely. This is due to the capability of modern materials used to make furniture to absorb water, particularly furniture made of non-solid wood components. Solid wood, on the other hand, may continue to absorb water after being soaked or immersed for a lengthy period of time.

The current trend is to raise furniture to higher elevation during the flood event which somehow quite challenges for individual or senior citizen. Place concrete blocks beneath sofas and other furniture to lift them off the floor and away from rising floodwaters (Lipford, 2019). The present furniture is enormous and heavy, making it difficult to shift him to a higher position. If the user is somewhat weak and lives alone, he will be unable to walk away from the furniture to a higher level on his own. To answer this issue, the present study will design a waterproof coffee table. Because of the waterproof material, this table will not be damaged if it is flooded.

2. Research Methodology

In the present study, the methods described by Lim and Selimin (2023) and Kor and Selimin (2023) was utilized. The questionnaire was distributed to 60 Selangor citizens aged 21 and above who live in low-lying geographical areas. The responder received the questionnaire through Google Form. From the design criteria obtained, four visual research were produced using the predefined elements of visual research. All of the acquired data and visual research were utilized to generate 30 thumbnail sketches, 5 ideations, and 5 idea developments prior to a final design selection. Only three out of five idea developments were chosen as pre-final designs and advanced to the final design selection survey. To choose the final design of the waterproof minimalist coffee table, a simple final design survey was performed using Google Form. Subsequently after deciding the final design, the mock-up was developed in a 1:5 ratio to the prototype of a minimalist coffee table. In this study, MDF, a ruler, pencil, scissors, an eraser, and glue were used to construct a mock-up. Next, a technical drawing of a minimalist coffee table with complete proportions was generated using AutoCAD. The materials for the minimalist design coffee table were determined based on the survey findings. The assembly and packing of the minimalist design coffee table are the final steps once the prototype fabrication is done. A bill of materials (BOM) was included in this investigation. BOM is an outline of all the raw materials, assemblies, subassemblies, parts, and components required to manufacture a product, as well as their quantities. Cutting, sanding, welding, finishing, and assembling were all part of the fabrication process.

3. Results and Discussion

3.1 Questionnaire Analysis

In this study, 60 respondents were chosen to answer the questionnaire, with the scope of the respondents being residents of the lowlands aged 21 and above in Selangor. The researcher used Google Forms to analyze the data after obtaining it. The questionnaire is given in order to establish the design criteria of the waterproof minimalist coffee table to meet the end consumer desire. Section A (demographic information), Section B (design criteria), and Section C (minimalist coffee table) comprise the questionnaire. The results suggest that the majority of respondents wanted a simple coffee table with waterproofing protection. The waterproof minimalist coffee table design criteria include storage, a combination of wood and metal, and a light color as additional elements. The majority of responders comprehend the notion of waterproof as well as a minimalist style. Table 1 displays the questionnaire results.

Table 1: Summary of the questionnaire result

Element	Percentage	Description
Demographic information	61.7	Female
	33.3	26 - 30 years old
	56.7	Chinese
	38.3	Single
	85.0	Employee
	55.0	RM2001 - RM4000
	65.0	Terrace
Design criteria of minimalist coffee table	51.7	Rectangular Coffee Table
	73.3	With storage
	48.3	Light colour
	60.0	Combination of wood and metal
Minimalist Coffee Table	85.0	Owning a coffee table
	85.0	Know the concept of waterproof
	71.7	Know the concept of minimalist coffee table

3.2 Visual Research

The following is visual research. The visual research in this study was based on the farmhouse design of coffee table, coffee table with storage, coffee table with light color, and coffee table with combination material. As shown in Figure 1, four visual research were made to aid the researcher in determining the best suited design direction. This visual research output gave a crucial insight into the design process's direction.

3.3 Thumbnail and Ideation Sketches

Thumbnail sketches are rapid, simple drawings that are frequently finished quickly and without changes. On any piece of paper, a soft 4B - 6B pencil was used to generate stunning black marks. In this research, 30 thumbnail sketches were generated, and suggestions for minimalist coffee tables were sketched on A3 paper in 2D form using just a pencil. Figure 2 depicts a total of 30 minimalist coffee table thumbnail sketches.

Next, five of the thumbnail ideas (marked with red boxes in Figure 2) were chosen as the base for designing a minimalist coffee table. These five chosen ideas have clean shapes and intriguing aesthetics that are seldom seen in coffee table designs; therefore, they were utilized as inspiration when constructing a minimalist coffee table. The farmhouse theme is central to the concept. A farmhouse pattern was employed to build a simple coffee table in this study.



Figure 1: Visual research

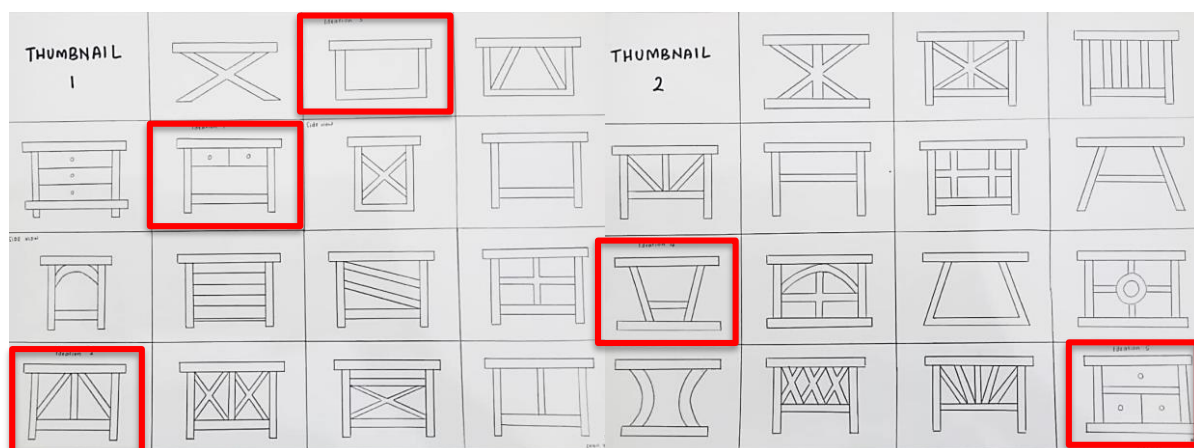


Figure 2: Thumbnail sketches

In this study, six ideas were created from the thumbnail that was marked with a red box (Figure 2), as shown in Figure 3. The concept was drawn in 3D view. This sketch was created for ideation 1 based on the Chinese design of the Haidilao hotpot. The stainless-steel coffee table foundation for ideation 1 has a square design, a glass surface, and open storage. Following that, the ideation 2 was based on current forms of coffee table. The ideation 2 coffee table base is composed of stainless steel, has a square form, a glass surface, and two triangular open storage. Meanwhile, an ideation 3 was developed using a blend of modern coffee table and the soup bases of the Haidilao hotpot design. The coffee table foundation for Ideation 3 is composed of stainless steel, has a square form, a glass surface, and four sections of open storage.

In addition, an ideation 4 emerged based on the modern coffee table unambiguous design. The coffee table base for ideation 4 is composed of stainless steel and has two-cylinder table legs, two L-shaped legs, a square form, a glass surface, and open storage. Furthermore, an ideation 5 was made based on the four soup bases Haidilao hotpot design. The coffee table foundation for ideation 5 is composed of stainless steel, has a square form, a glass surface, and four pieces of open storage. Finally,

an ideation 6 was created based on the four soup bases Haidilao hotpot design. The stainless-steel coffee table foundation for ideation 6 has a square design, a glass surface, and open storage separated into eight pieces that are up-down four sections. Ideation 2, 3, and 4 were chosen as a viable design for further development because they met the design needs and were more distinctive than the other ideas.

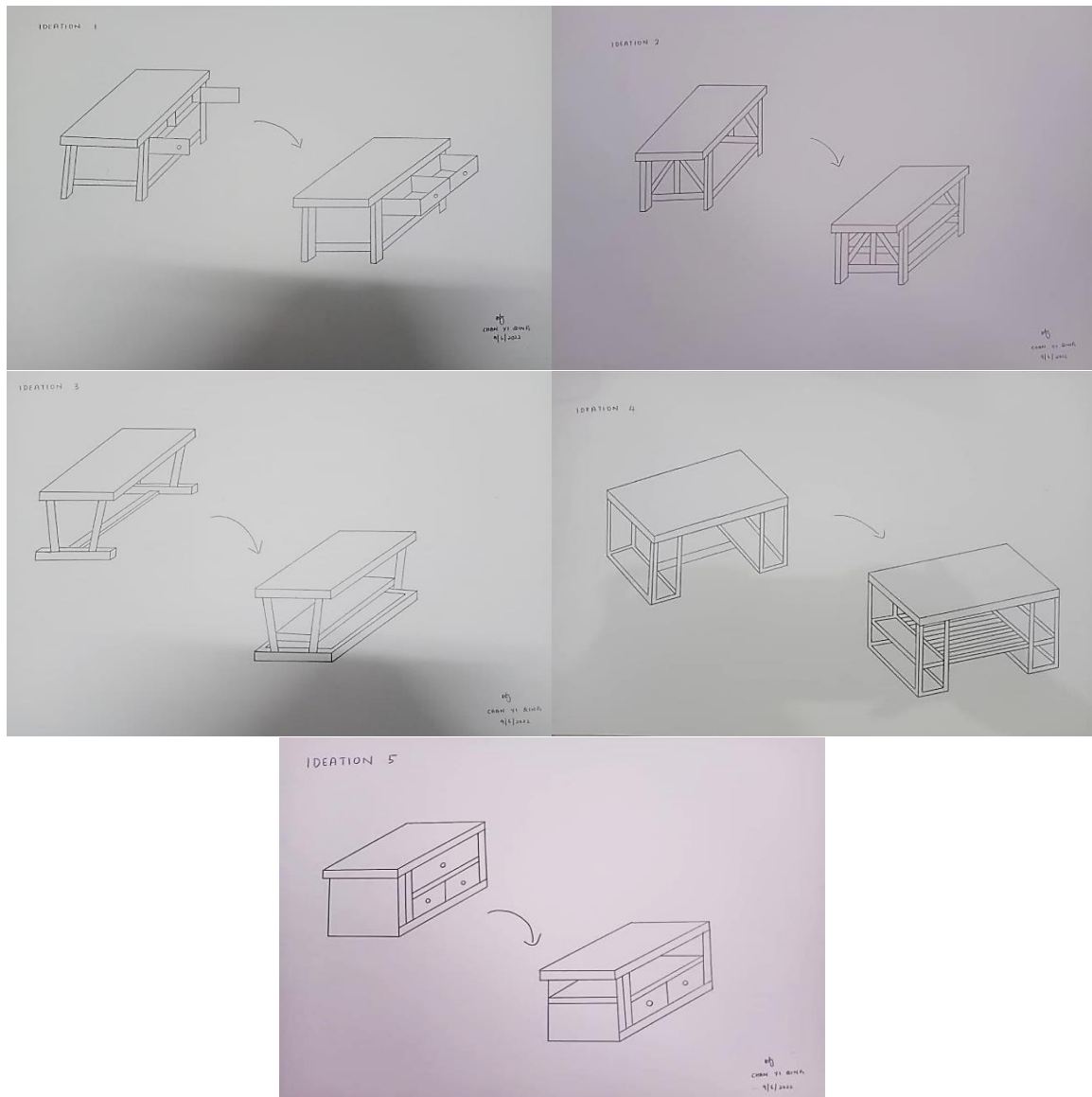


Figure 3: Ideation sketches

3.4 Idea Development

Following that, three ideations served as the foundation for future growth throughout the idea development process (Ideations 2, 3, and 4). The three designs were picked since they fit the design requirements as well as the present idea. Figure 4 depicts the development of this study's idea.

3.5 Final Design

In this study, 60 Selangor residents aged 21 and above were chosen to complete a quick final design survey. Table 2 summarizes the final design findings. According to the results of this survey, the most popular design is Design 3. The majority of respondents evaluated or selected items that matched their design preferences.

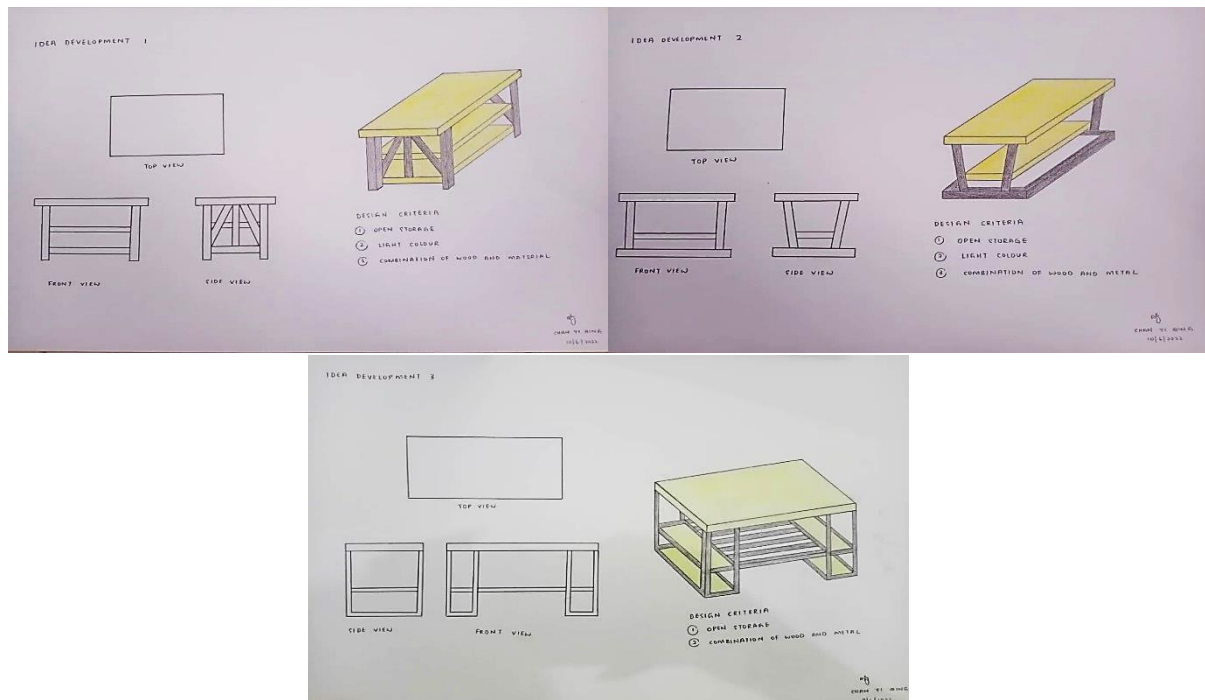


Figure 4: Idea development of minimalist coffee table with waterproof

Pre-final design 3 was adopted as the final design because majority of the respondent preferred pre-final design 3, also known as idea development 3. A rectangular coffee table has a height of 45 cm, a width of 55 cm, and a length of 90 cm. The measurements of the coffee table are based on tiny coffee table specifications. The coffee table is constructed of wood and stainless steel to meet the waterproof requirement of the design. In addition, this coffee table has five open storage compartments. The coffee table will be waterproofed with two layers of sealer and one layer of lacquer. Figure 5 depicts the finished minimalist coffee table with waterproofing.

Table 2: Summary of final design survey

Element	Percentage (%)	Description
Demographic	75	Female
	58.33	26 - 30 years old
Design selection	41.66	Design 3
	43.33	I am satisfied with design

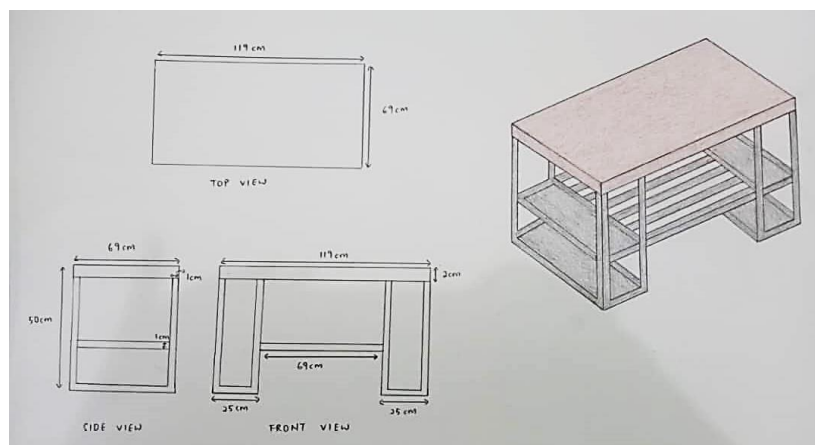


Figure 5: Final design of minimalist coffee table with waterproof

3.6 Mock-up Development

At a ratio of 1:5, the mock-up development was built with MDF, a ruler, pencil, scissors, an eraser, and glue. Super glue was used to secure all of the joints. Figure 6 depicts the mock-up of this study.



Figure 6: Mock-up of minimalist coffee table with waterproof

3.7 Technical Drawing

AutoCAD software was used to generate a technical drawing for the waterproof minimalist coffee table. Figure 7 displays the prototype's technical drawing. Technical drawings were created to the exact dimensions and components of the intended final design. The material of the coffee table was also shown in the AutoCAD drawing. The illustration was available in orthographic and isometric view. The unit of measurement in this technical drawing is millimeters (mm).

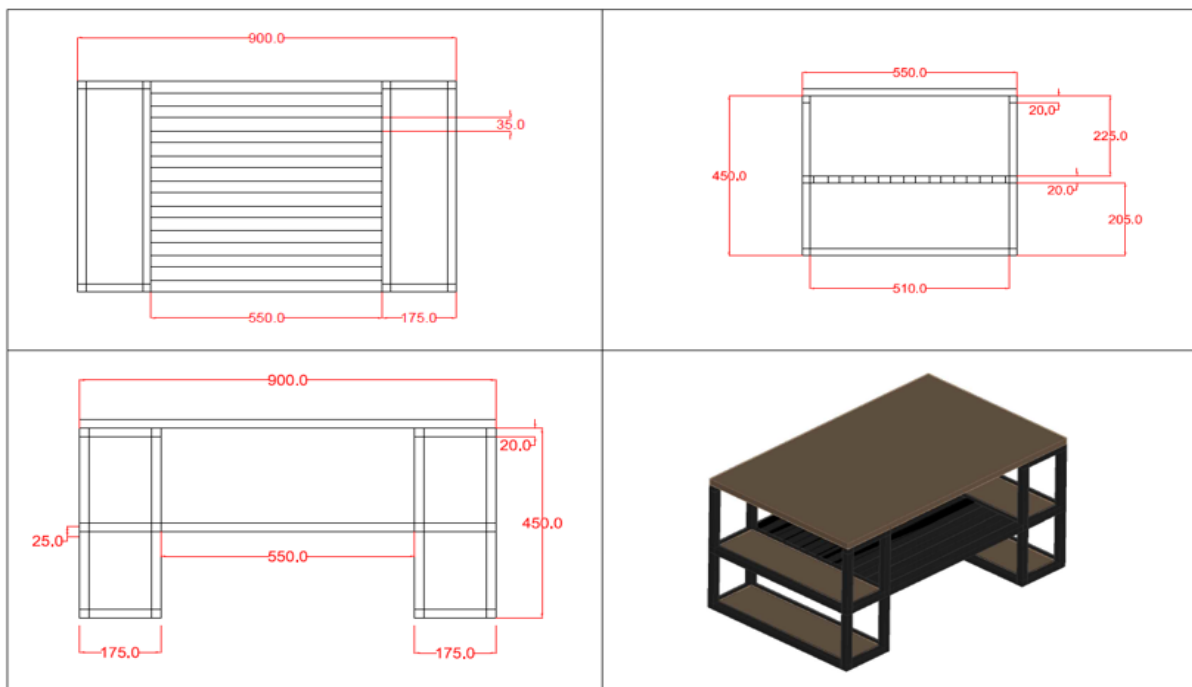


Figure 7: Technical drawing of minimalist coffee table with waterproof

3.8 Prototype Fabrication

The prototype was made of rubber wood and stainless steel. The minimalist coffee table sections that were made of rubber wood was coated with sealer and lacquer. The prototype has five open storage sections. Rubber wood was utilized for the four-sided open storage, while stainless-steel was used for the frames structure of the storage. Cedar wood is chosen as the primary material candidate. Due to the high cost of cedar wood, rubber wood was used in this prototype fabrication instead. Although rubber wood is not waterproof, protective seal covering allows rubber wood being protected from moisture. Rubber wood is not only preserved but also improved in appearance by staining and painting.

Furthermore, Tung Oil is substituted by sealer and lacquer throughout the prototype manufacturing stage. Rubber wood is finished with two layers of sealant and one layer of lacquer. This is due to the change in wood material. Sealer and lacquer are suggested by the furniture maker to suit with the rubber wood selection. Figure 8 represents a waterproof prototype of a minimalist coffee table.



Figure 8: Prototype of minimalist coffee table with waterproof

4. Conclusion

The study's objectives were met with success. The data from the questionnaire was used to develop a waterproof minimalist coffee table. The questionnaire was delivered to 60 Selangor citizens aged 21 and above who live in low-lying areas. The coffee table's design goals include storage, a light color, and a combination of wood and stainless steel. This study included 30 thumbnail sketches. The thumbnails were then used to generate 5 ideations. Following that, three idea developments were chosen for further development from the ideation. Finally, because of its visual appeal, idea development 3 was chosen for the final design. The minimalist coffee table prototype was built from rubber wood and coated with two layers of sealer and one layer of lacquer. Minimalist coffee table with water proofing meets consumer need since the design criterion is based on the questionnaire responses. This design assists flood-affected respondents in avoiding furnishings from damage when flooding occurs.

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