

The Design Process of Building a Bunny Mansion

An Honors Thesis (HONR 499)

by

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Abstract

This thesis, in the form of a creative project, explores and outlines the elements and process of design by creating drafts for a custom rabbit hutch. The objective is to create a fun, modern, and functional living space that nurtures the physiological and psychological health of a rabbit by incorporating these concerns in the design process. All elements of the design are supported by research on the needs and living habits of rabbits, as well as building and construction techniques. The finished product is the blueprint to build a living space for a rabbit that meets the needs of the animal in a functional and aesthetically appealing cage.

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Lastly, I would like to thank my pet rabbit Hopscotch. Although she passed away before I could complete this thesis, her memory kept me motivated to create an amazing living space for such an adorable and lovable creature. Her curiosity and personality sparked the initial idea to design a magnificent bunny palace fit for the absolute gem she was. Perhaps someday another rabbit may experience Hopscotch's bunny mansion and enjoy the inspiration she provided for my design.

Author's Statement

Everything we encounter on a daily basis has undergone some form of the design process and testing before becoming a real, tangible object. The term *design process* refers to the steps taken to create a finished product from an idea, and includes identifying a problem, collecting information, brainstorming solutions, building and testing, and improvement on the original idea. Design surrounds us. Someone, somewhere, thought about the exact use of an object and specifically designed it to accommodate anticipated needs and/or complications.

My undergraduate career mostly consisted of constructing a previously conceived design and following instructions given to me by others. This is why I utilized the Honors Thesis as an opportunity to explore the design process. Instead of following instructions, I wanted to make the instructions and explore all of the elements incorporated in the design process. I aimed to explore the creation process rather than the construction process. As a scenic carpenter, woodworker, and pet owner, I set out to use my artistic talents to design a functional and attractive cage for my pet rabbit. Animal cages are often ugly, uninteresting and sometimes even impractical—not to mention being an unstimulating, therefore inappropriate, habitat for the animal. Part of the responsibility of owning a pet is providing a healthy environment that holistically promotes the wellbeing of the animal. Many store-bought habitats do little to support the needs of the animal, which can lead to physical and mental stress for the pet living in the cage. Using my skillset as a carpenter, I knew I could build a cage that fit the needs of my pet, while also being visually appealing rather than an eyesore. Hence, the objective of my thesis is to create an interesting, modern, and functional living space that nurtures the physiological and psychological health of a rabbit.

The idea came to me one day as I sat surveying the layout of my apartment. My furniture is mismatched and ranges from secondhand spunk to down-to-Earth practical, yet it all meshes together to create my personal style. Everything fits together well and compliments one another — except for one thing. Something needed to be done about the rabbit cage. It was large, bulky, ugly and generally in the way. I began thinking about how to improve the cage, both for my own purposes and my rabbit's. I researched ideal living arrangements for a pet rabbit and thought how I could incorporate these elements into a cage that would optimize the space I had to work with. The end result would be a comfortable and healthy space for my rabbit to live in that is beautiful for humans to look at. I decided to build my rabbit cage to mimic the look of a Victorian house, making the design appealing, cute and functional all at once.

While designing the cage, I learned how involved the design process is. All the decisions I made promoted an idea or accomplished a specific goal. There was a reason for each minute detail, and everything was given careful and thorough consideration. When asked why something was made in such a way, I was always prepared with a very specific reason for the design. Nothing could be overlooked, because the whole unit fits together to create the cage. A seemingly small decision in one area could easily affect the rest of the design, which could ultimately lead to the failure of the cage to perform its primary function of housing a rabbit. Several times when I thought I had included everything, a new factor would emerge and need to be accounted for. I designed the cage to be movable and versatile to function well in different spaces. Doing so solved the problem of a comfortable and accommodating living space for the rabbit, and modeling the design after a Victorian

house solved the problem of having an ugly cage. The cage is a functional art piece, as it houses a pet rabbit while enhancing the aesthetics of the space.

My goal was to create a living space that pleased both the rabbit and the humans that interacted with the cage. However, through the process of designing the structure, I learned much more than how to build a rabbit cage. I experienced first hand how involved the design process is and how much thought and time goes into each and every detail. Most importantly, I discovered how to be a creator instead of a constructor. Through this project, I was able to be decisive and authoritative in the design process, manipulating my ideas to create the best cage according to my own personal standards. I was able to emphasize what I felt to be the most important, and take time to fully develop my ideas. I began with a simple goal, formulated an idea into a tangible plan, and effectively drafted the results to communicate the process with others. The formula is complete, and now I am ready to start building and following the instructions I laid out for myself. The difference is that this time, I was able to lead the project from the initial idea to the completed product. I have learned to forge my own path, rather than follow instructions handed to me by someone else.

Design Process

Much of the research that went into this project was related to the design of the cage based on the needs and living habits of a domesticated pet rabbit. This section will outline the major design choices I made when drafting the cage.

Size and Overall Dimensions

The dimensions of the cage in which a rabbit will live must provide enough space to spread out and be comfortable in its enclosure. Therefore, the cage must be large enough for the rabbit to lie down and fully stretch out, long enough for the rabbit to travel three to four hops to and move around, and be tall enough for the rabbit to stand upright without touching the roof (Tamsin "Size Guide"). The Rabbit Welfare Association and Fund recommends a minimum hutch size of six feet by two feet by two feet (RWAF). However, rabbits are curious animals and should not be confined to a small cage all day, as this can cause stress and health issues for the animals (Shapiro). A rabbit must be allowed out of its cage for at least 3 hours of exercise each day if the living space is smaller than 12 square feet. For this reason, Rabbit Welfare Association and Fund also recommends providing an exercise area of at least 32 square feet for each rabbit.

Ideally, a cage would be large enough to provide adequate exercise room and living space for the rabbit. However, such a space totals a minimum of 44 square feet, which is an unrealistic size for the average college student's apartment. This is why I designed a versatile cage that can provide both a comfortable living space and an exercise area depending on how the cage is set up. In order to do this, I designed a habitat that consists of three parts: a small rabbit hutch or "house," and two separate bases that the house can attach to. The smaller base is suitable for a rabbit that will be allowed time to run and

explore outside the cage each day. Its size allows it to easily fit inside an apartment or house without consuming too much space. I also created a larger base that provides enough room for a rabbit to live in the enclosure without concern for lack of exercise space. This larger base is designed to be used outdoors, and therefore does not include a floor so the rabbit has access to the grass for playing and digging. The top portion of the cage—the house or “hutch”— can easily be removed and attached to either base, depending on environmental conditions and space limitations. In the summer, weather and heat permitting, the rabbit can live outside in the yard in the larger run area. During the colder months, or for those who not have access to a yard, the house can be attached to the indoor base so the cage fits in an apartment.

I designed the removable top part, the rabbit house, to be as large as possible without taking up too much space in an apartment. There is no standard size for doorway openings in America, but most doorways that lead between rooms tend to be 30-33 inches wide (Deziel). In order to move my rabbit hutch through doors easily, I made the house 29 inches wide to accommodate this opening. With a length of four feet and a height of two feet, and the addition of a second story on top of either base, the hutch provides adequate living space for a rabbit, given it is provided with play time outside of the cage each day. The outdoor base is eight feet by four feet by two feet, which provides plenty of running and exercise space. With the addition of the house on top, the rabbit will also have shelter from the elements and a private area to provide security from the outside world.

Construction

As already mentioned, the main feature of this cage is that the house detaches from the base to create a versatile housing unit suitable for different living spaces and weather

conditions. I designed the hutch portion of the cage to be removable by building a two inch frame into the bottom of the house. Both the indoor and outdoor bases have an inset the exact size of the hutch that the house fits into. This method allows the house to be lifted out of the inset of one base and easily set into the inset of the other base. The weight of the house will keep it in place on either base, and the inset prevents the house from sliding or moving off the base without needing any hardware or fasteners. This provides a simple way to move the cage from one base to the other efficiently.

Behind the hutch, the large outdoor base has a removable cover for humans to gain access to the cage. The cover is similar to the sides of the base, but is not affixed to the unit. It is lightweight and therefore easy to pick up and move. Because the cover is so light, it is supported by four angle brackets in the corners of the base. The angle brackets will face each other on the inside of the frame, protruding out and acting like pegs to support the four corners of the cover. The removable cover provides access to the entire cage allowing for cleaning and maintenance without needing to crawl inside the base, as well as allowing for easy transport and storage.

The smaller indoor base has a door built into the right half of the front face, which swings completely open. This door is large enough to access the entirety of the base when the house is resting on top, making cleaning the cage easy. The house features several access points on the front face. The main door is large enough to fit a litter box through the opening, and provides enough room to pick up the rabbit when necessary. Two smaller windows open as well, providing even more access to the inside of the house. All of the doors and windows are faced with wire mesh. However, the two windows are smaller than the door to provide a hiding place for the rabbit. These openings allow for adequate

ventilation in the area, which is important because rabbits have sensitive respiratory systems and may become ill from litter box fumes if the cage is not kept clean. Putting all the open access points on one side rather than on all sides of the house gives the rabbit a place to hide and feel secure in an enclosed area.

The ramp that provides access from the base to the hutch is set at an angle of 40 degrees, with strips of poplar every five inches. It is seven inches wide, which is plenty of room for a rabbit to climb up. According to an article on The Rabbit House, an angle of 45 degrees or less with strips of wood every five inches to act as stairs is recommended for a ramp (Lavender). The strips of poplar provide extra grip for the rabbit to use as it climbs. The ramp is attached to the underside of the house with a hinge so it stays in place when stationary, but can be moved easily when switching bases. Cutting the wood for the ramp at a 45-degree angle on the edges that align with the floor and ceiling makes the edge of the ramp lie flat against the floor. As the ramp will be a prime area for the rabbit to chew, it will not be painted and will be constructed without glue. Since it is small and held in place with a hinge, it can easily be replaced if the rabbit damages the ramp by chewing on it.

Materials

Having decided upon the overall dimensions and design of my cage, I shifted my focus to building materials. Rabbits love to interact with their environment, especially by chewing on everything they can get sink their teeth into. Therefore the materials used in the construction of my hutch must be safe for a rabbit to ingest ("Chewing"). Finding rabbit-safe materials posed the largest problem in the hutch design process. I did my best to balance the cost, availability and potential health risks of each material that will go into the actual construction of the hutch to make building it affordable and feasible.

The most important material decision I had to make was the type of wood to use. Certain woods are toxic to rabbits and must be avoided. Other woods are safe as long as they are untreated, pesticide-free, unpainted, and do not contain roots (Kruzer). Theoretically most types of wood may be used, as long as the rabbit does not ingest the wood. Realistically, a rabbit will take at least a few bites out of the material so I decided to only use woods recommended by Bunnyproof.com ("Types of Wood"). Additionally, hardwood should be used, as it will withstand damage from chewing for as long as possible. Due to the cost and availability of each wood type, I chose to use poplar and plywood. Poplar is a hardwood that can be found at most hardware stores. One might think plywood is unsafe for rabbits due to the use of glue, but as long as it has not been pressure treated it is safe for a rabbit as long as they do not consume much of it. Therefore, I used poplar in each base and all parts of the cage that will be easy to chew on. The plywood will be used on the top of the cage in the hutch, where the construction and tightly fitted joints restrict access to the wood and therefore makes chewing difficult.

One concern with using wood as the main construction material is cleanliness. Wood is very absorbent and therefore may not always allow for easy cleaning (Tamsin "Rabbit Hutch"). However, I am not terribly concerned by this, as rabbits can be litter trained. Once a rabbit is litter trained, it prefers to use the litter box rather than its cage as a bathroom. The cage will have a litter box that can be cleaned easily to prevent illness. I will also line the bottom of the cage floor with tiles to make the cage easier to clean, as Tamsin recommends ("Rabbit Hutch"). "Peel and Stick" tiles are readily available at hardware stores and are a safe material to use as flooring, as long as the rabbit cannot pull up the edge and eat it. This is why I designed a solid edge of poplar wood lining the bottom

of the hutch and the inside of the house. Putting the tiles down before attaching the floor to the walls will eliminate access to corners, making it impossible for a rabbit to pull up and chew on the tile. The poplar lining will also be easily replaceable if worn down by chewing.

Both of the bases are faced with a wire mesh to allow the rabbit to see outside the cage, but remain safely confined within the enclosure. Additionally, the wire mesh covers the door to the house and the two windows. This is a feature added for safety that allows visibility from the cage. A rabbit can easily chew through thin wire, so Tamsin recommends using a wire that is at least 16 to 19 gauge. Tamsin continues to explain how weld mesh wire is more durable than a woven wire, such as chicken wire, because if the rabbit chews through one area of woven wire, it will not completely unravel ("Wire Mesh"). To prevent injury to the rabbit due to limbs stuck in the wire, the gaps should be no larger than one to one and a half inches (Tamsin "Wire Mesh"). Therefore, I have chosen to face each base and line the windows of the house with 16 gauge weld mesh wire.

There are very few rabbit-safe sealants and paints. I looked into sealing the wood to protect it from wear and tear, chewing, and the elements. However, if a rabbit ingests wood that has been sealed with a harmful sealant, it may become sick and possibly die (Tamsin "Rabbit Safe Preservatives"). Some rabbit owners have successfully used simple water-based sealants that do not contain heavy metals or volatile organic compounds. Alternatively, some water-based garden paints claim to be safe for rabbits, but it is still advised against painting the inside of a cage even with this type of paint. Cuprinol Garden Shades is an acceptable paint to use on rabbit hutches (Tamsin "Rabbit Safe Preservatives"). Due to the potential health risks of improper sealants, I will only seal the inside of the cage with Protek Wood Protector, a water-based sealant that is safe for

rabbits, and I will paint the outside of the cage with Cuprinol Garden Shades Paint. The wood may absorb some of the components of the paint, but limiting the paint to the outside of the cage where the rabbit will not be able to ingest the color is the safest way to paint it. However, as both the sealant and paints I have chose are safe for rabbits once completely cured, there should be no issues if my rabbit choses to nibble on the cage.

In summary, every element of the design of the rabbit cage was well thought out before implemented. I weighted several options and considered all variables possible in order to create the safest and most nurturing environment for a rabbit while being a beautiful and space-efficient cage. The result is a functional piece of art that serves as a healthy habitat suitable for any rabbit.

Blueprints

The attached pages are the blueprints of the cage I designed. They outline how to construct each part, and assemble all of the parts into a solid unit. The cage consists of three separate units: the house, the outdoor base and the indoor base. Each drawing contains a notes section with additional details and directions for each unit.

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