

TRUCTURE
PRACTICE
SCALES

CHRIS MARKS



FINAL SELF DIRECTED
AD318

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UNIVERSITY OF BRIGHTON

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STRUCTURE

SPACE AND

SCALE.

There is a distinct relationship that bridges the gap between architecture and furniture.

I want to explore this gap and understand how characteristics of a building can be translated into items of furniture.

Using a range of methods to capture detail and develop ideas. I have collected and documented aesthetic details and values of site specific locations.

I will use this information to create a series of furniture items that each reflect particular characteristics, principles and aesthetics of architectural sites.













RESEARCH TRIP

Brighton train station, completed in 1892 stands as a shining example to the people of Brighton of the achievements induced by the industrial revolution and has always been a Grande meeting place for new arrivals and tourists alike.

Constructed from cast iron and assembled with an astonishing amount of rivets and bolts this building poses as a brilliant example of Victorian iron architecture.

Beginning my trip here, I am leaving to travel to Wiltshire where unbeknown to me i am to visit the site to kick start this creative investigation.





In August of 2016 I was chosen to be a part of the David Linley, School for Fine Furniture. This took me three hours via rail link to the sleepy town of Tisbury, Wiltshire where i was to learn fine woodworking techniques at the hands of master craftsman Johnathan Rose and designer William Warren

SITE VISIT : MESSUM'S GALLERY. TISBURY, WILTSHIRE

The school was held in a 13th century tithe threshing barn now used as a gallery and arts center by the Messum's Wiltshire gallery group.

After undergoing an extensive refurbishment this building that now stands at over 800 years old, Is now a striking example of ancient ancestral timber framed buildings.

I noticed over the duration of the week, the extraordinary craftsmanship, engineering and building techniques that went into the raising of this very special space.

Yet I couldn't help but notice how little has changed in method of construction between this barn and Brighton train station with the application of very similar techniques and evolved principles, centuries apart.





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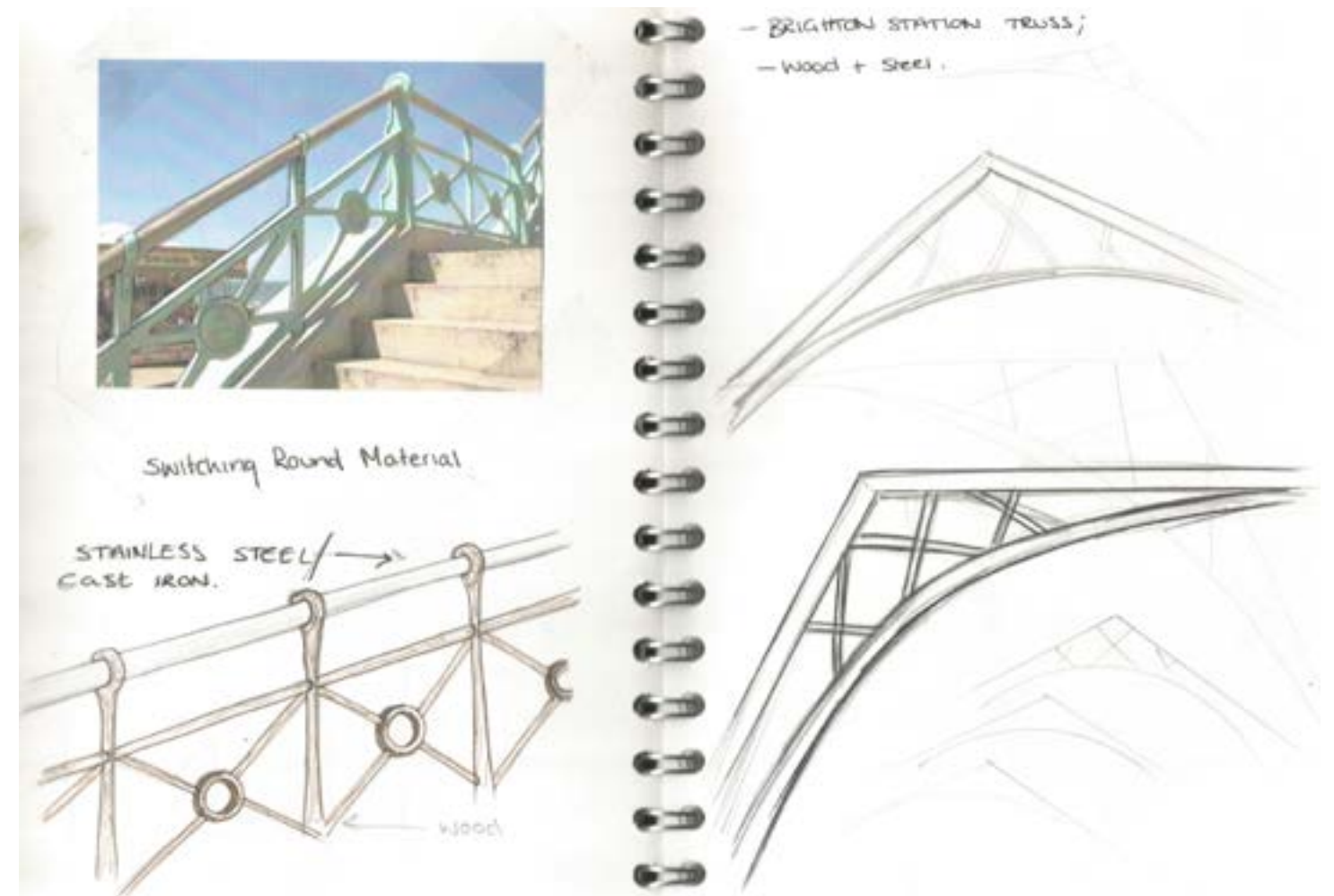
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PROPOSITIONS

How can form be transformed through material to become something else entirely?

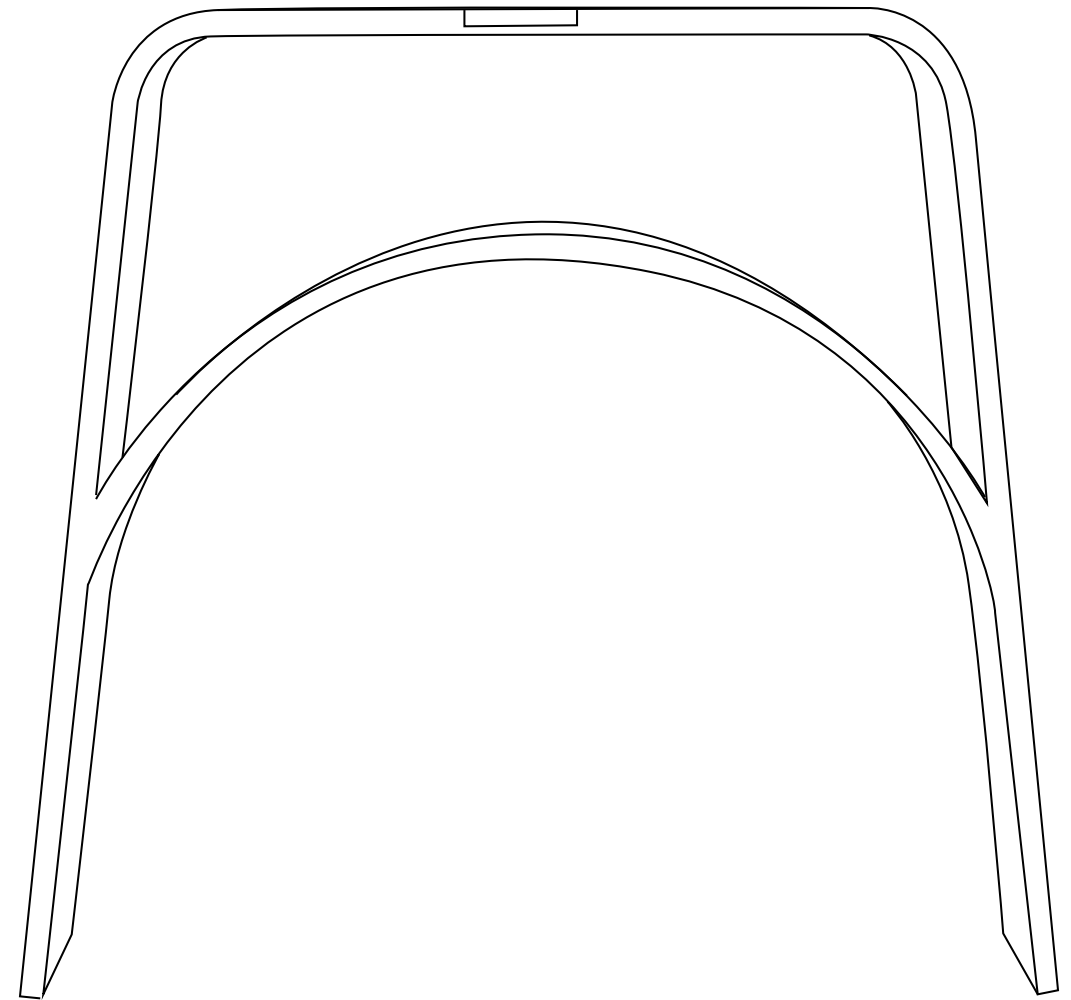
I am proposing an investigation into the void that is 'furniture' and the topic of how and when an architectural form can be considered furniture and which point an item of furniture can be considered architecture.

Through a method of adjusting scale. I am proposing to recreate details and principles applied to architectural sites in a material associated typically with that of furniture. These forms should be able of being presented with the purpose and performance of furniture as a result of principles and method extracted from the observation of architecture.



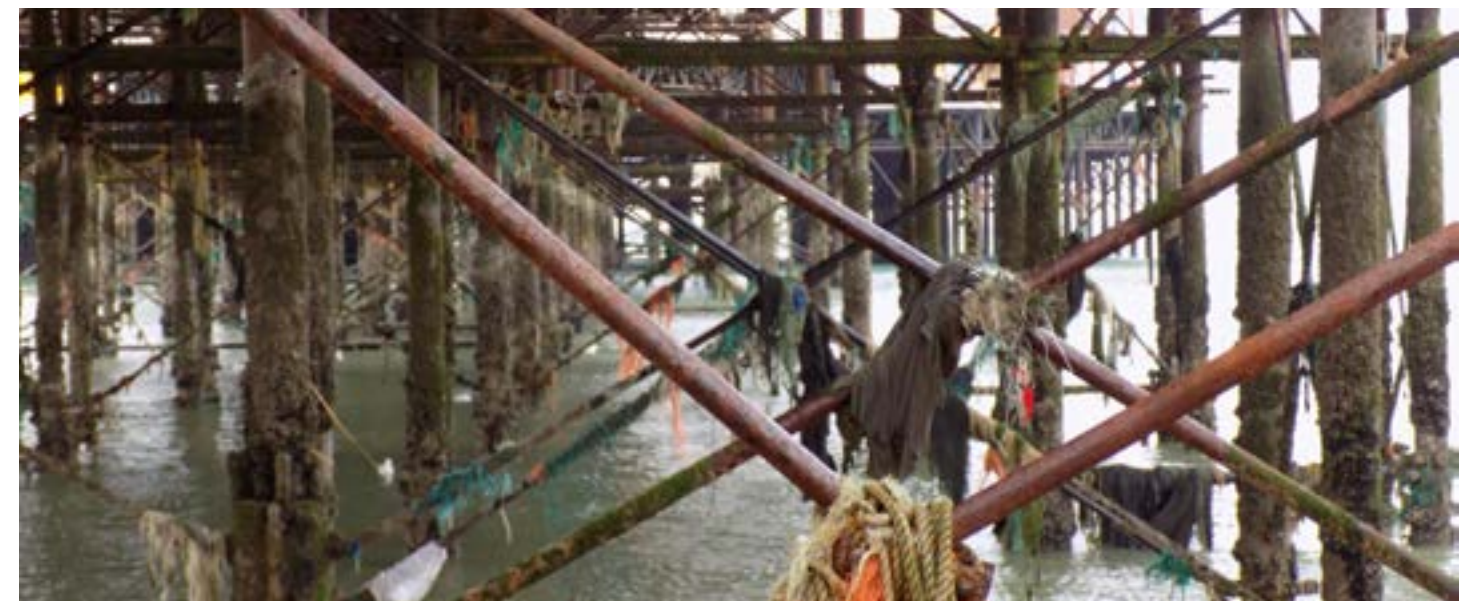
PART ONE

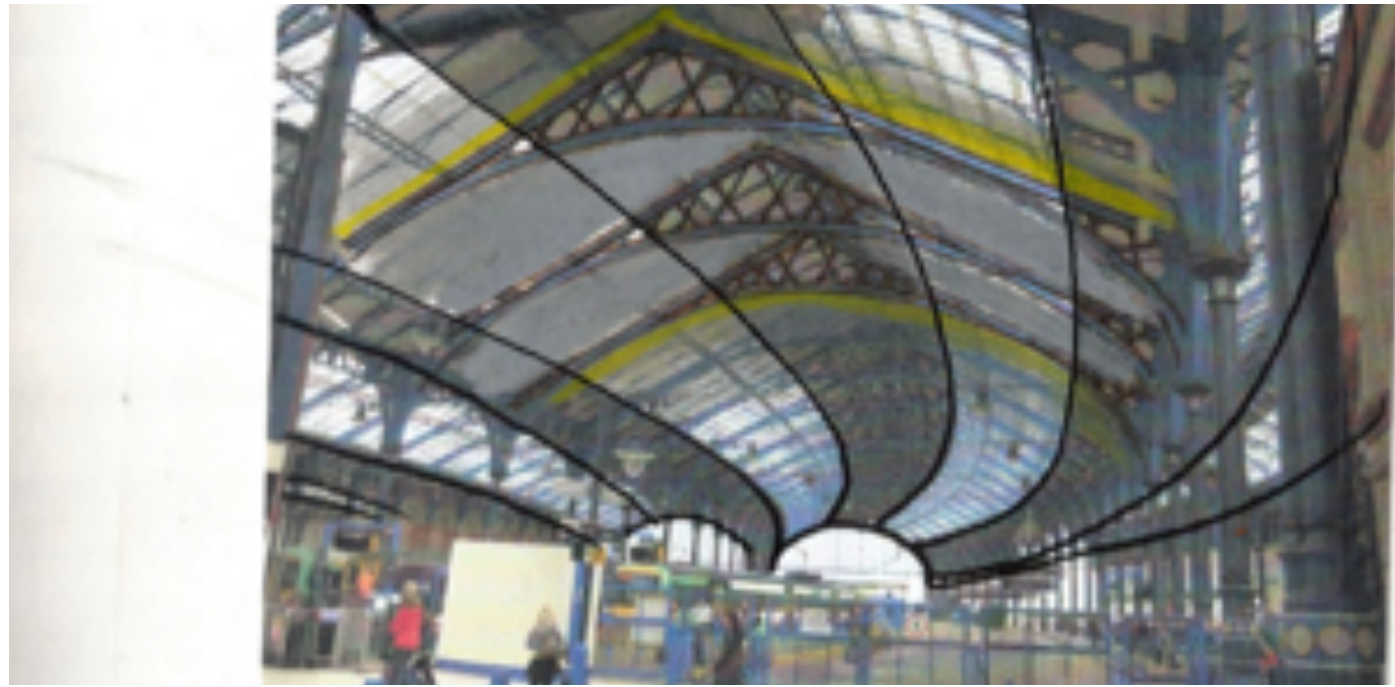
BRIGHTON



Photography / drawing study

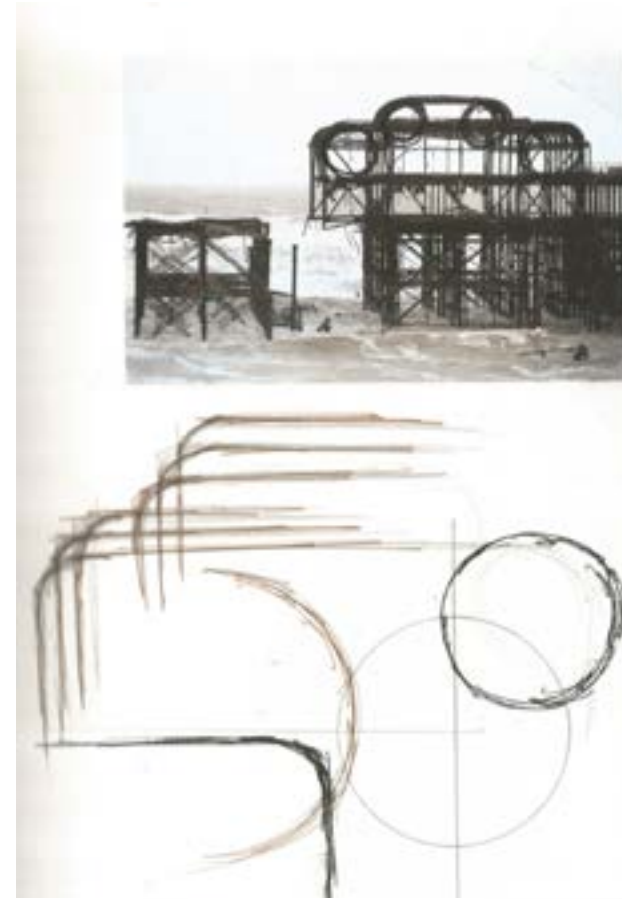
Using Brighton as a starting point i began looking at the Victorian iron structures such as the Brighton stations platform roof and the remains of the west pier.





Drawing over photographs, I am able to identify forms, shapes and details that I record in small sketches and scribble.





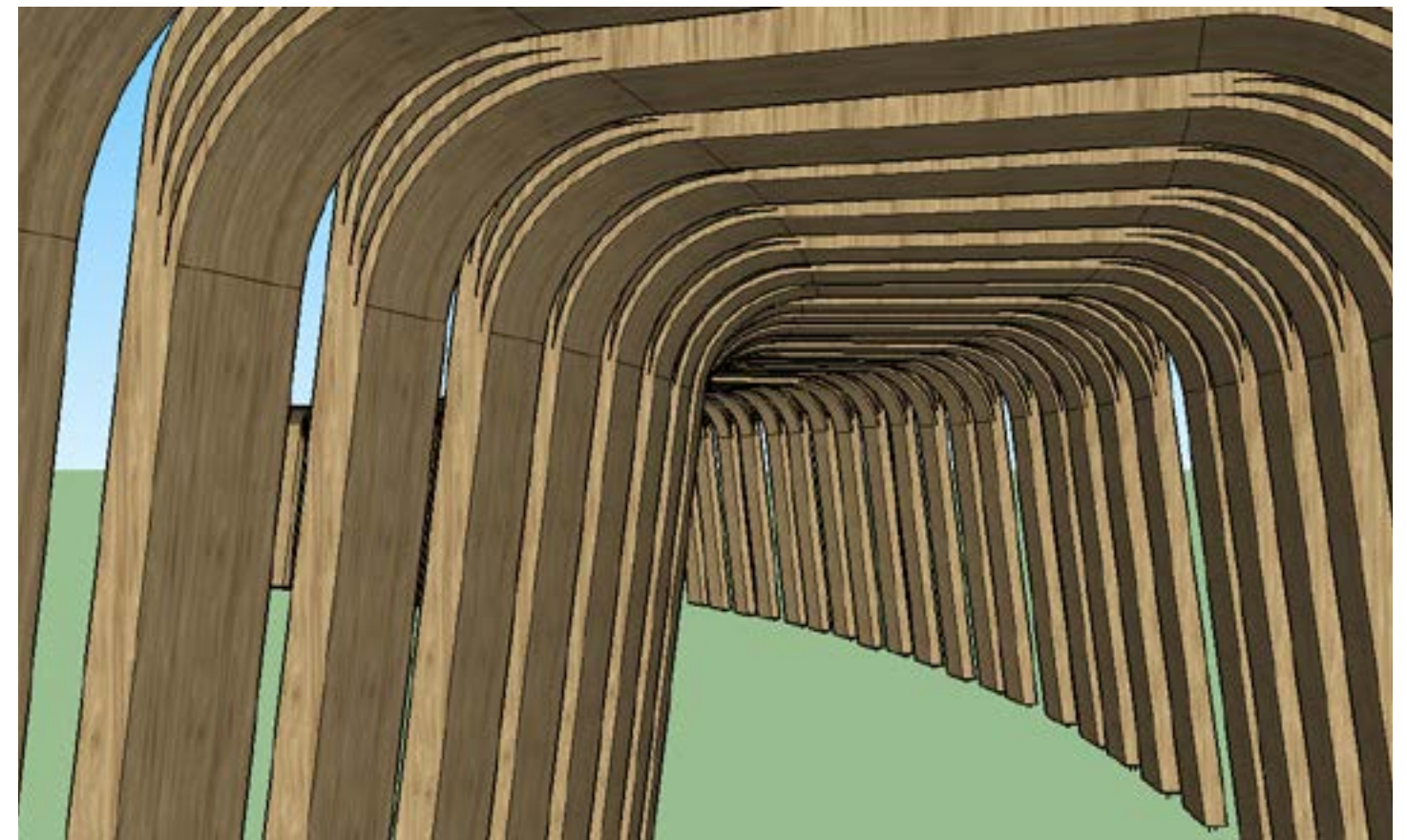
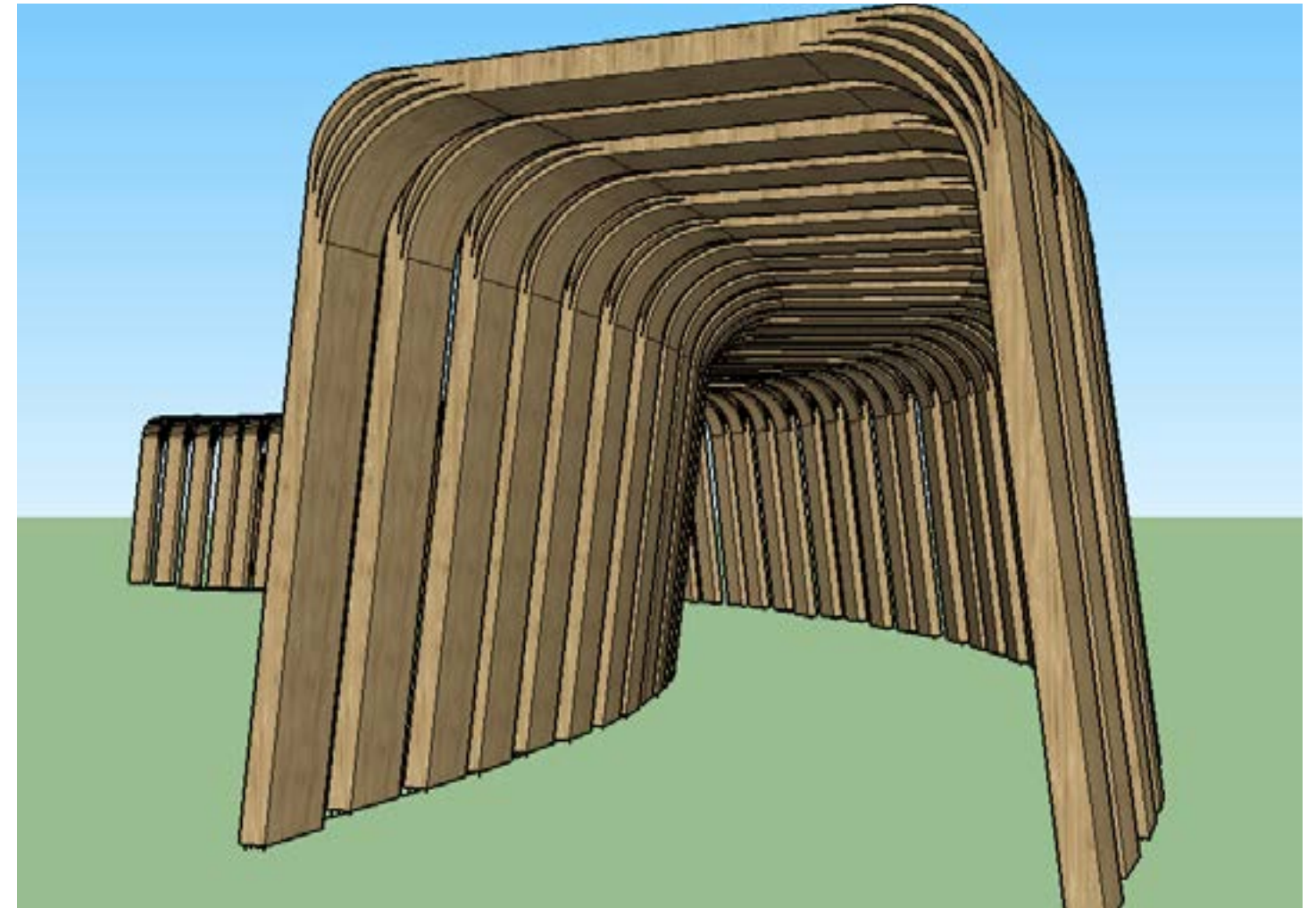
→ Hidden Geometry?

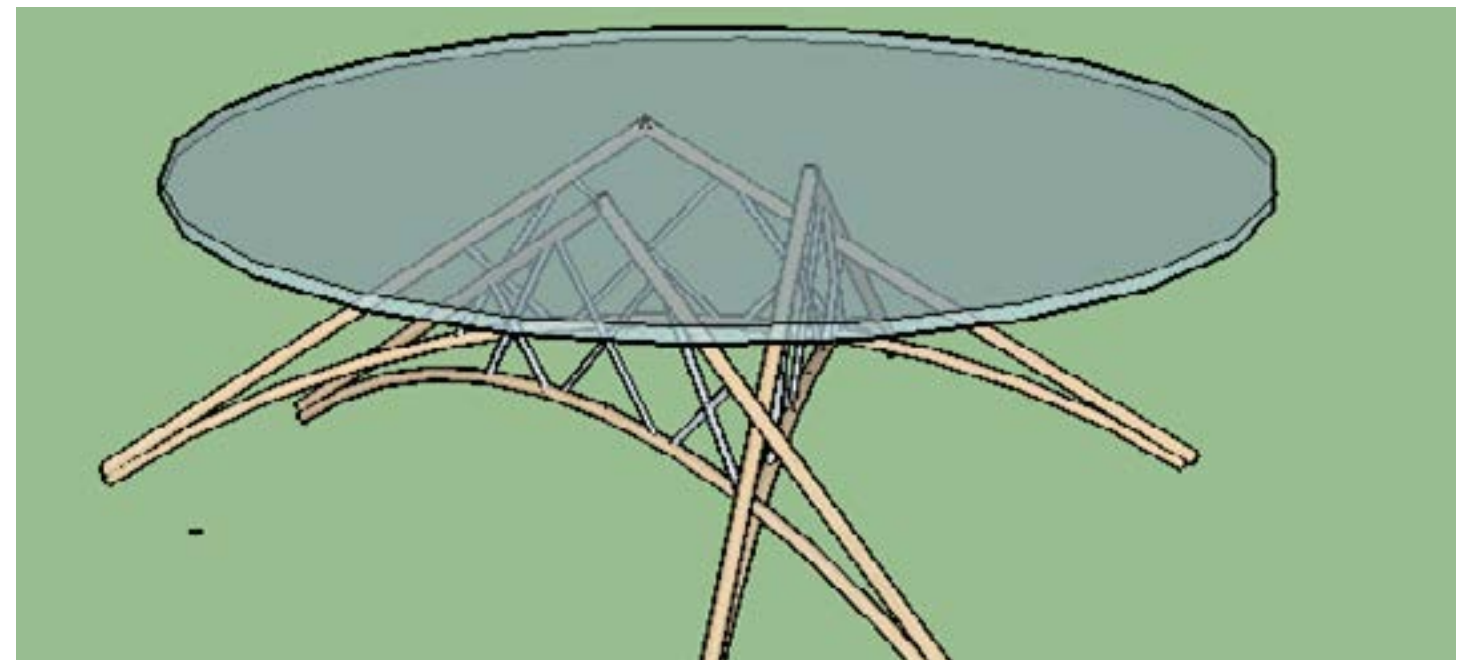
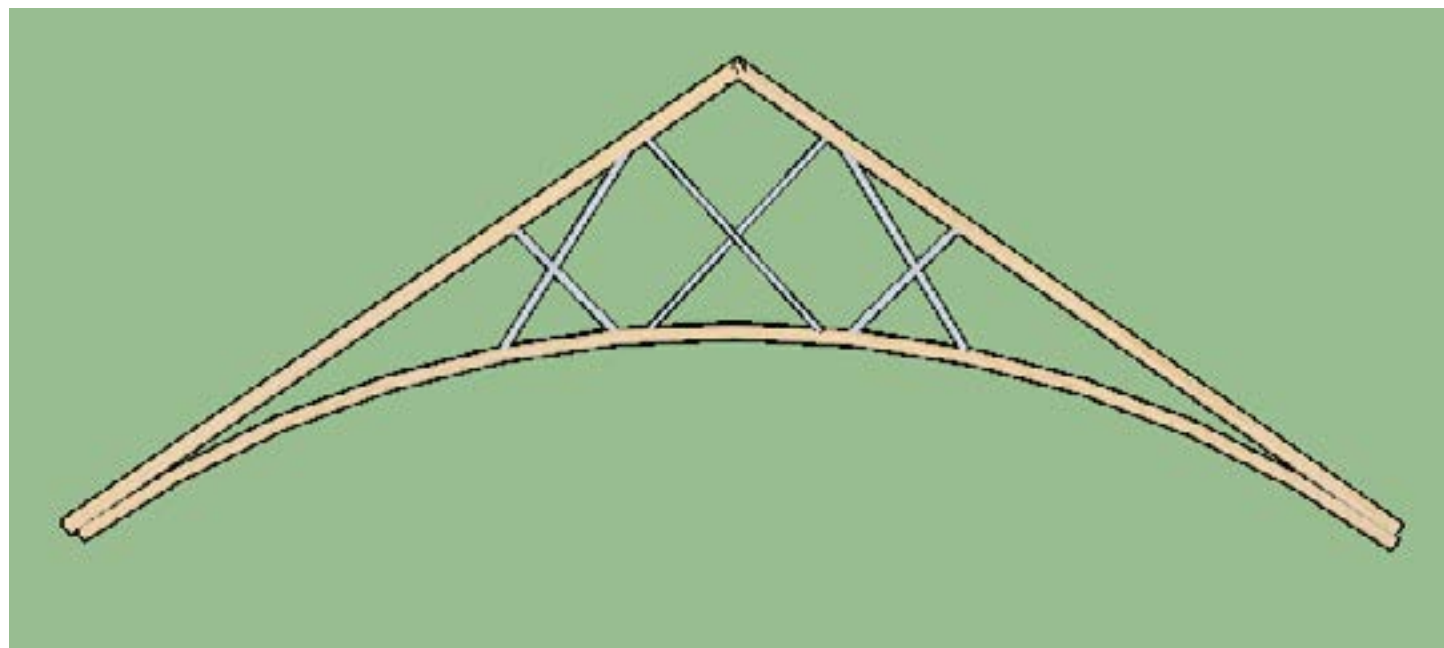
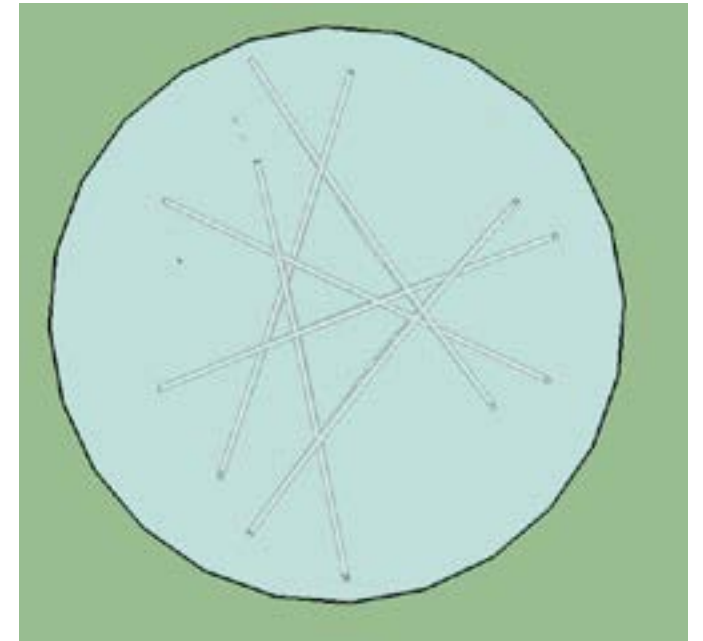
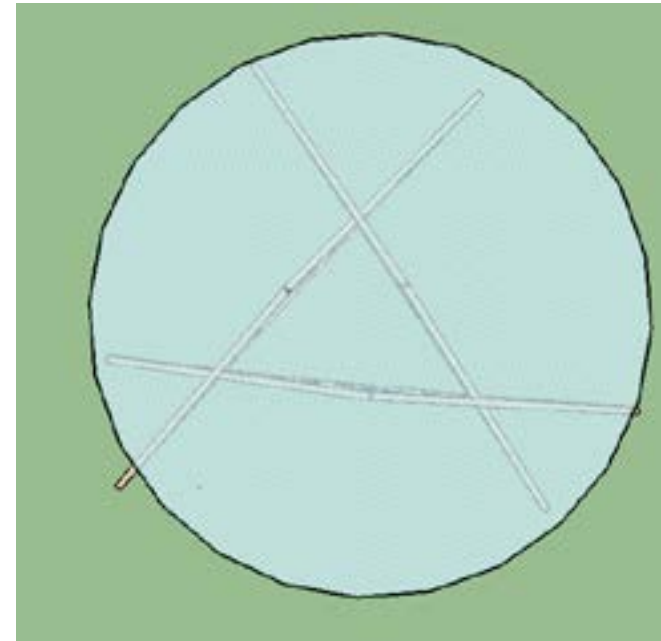
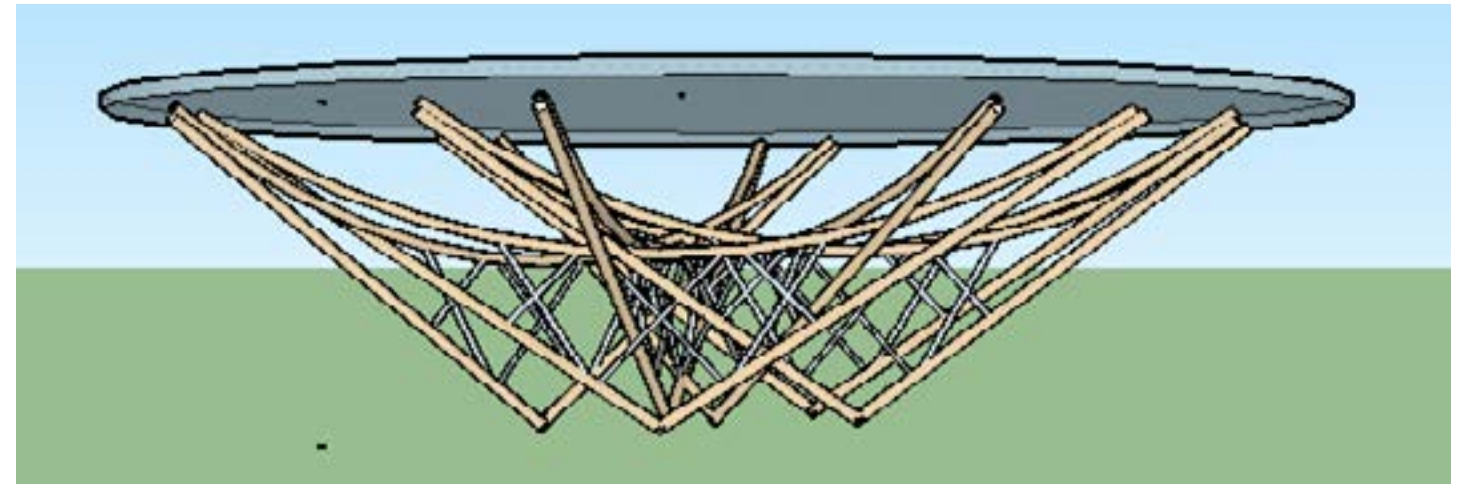


- A piece of furniture designed to look as the west pier, but broken and decaying, maybe made of steel or copper... and oxidized, left to the elements.
- Brutal, industrial, construction.
- Rerets and wealds.

Digital sketchbook.

Using a virtual sketchbook such as Trimble sketch up. I am able to quickly and effectively translate my small sketches into three dimensional digital files. These models allow me to apply texture and material information as well as adjust scale and proportions creating a 'live sketch'.

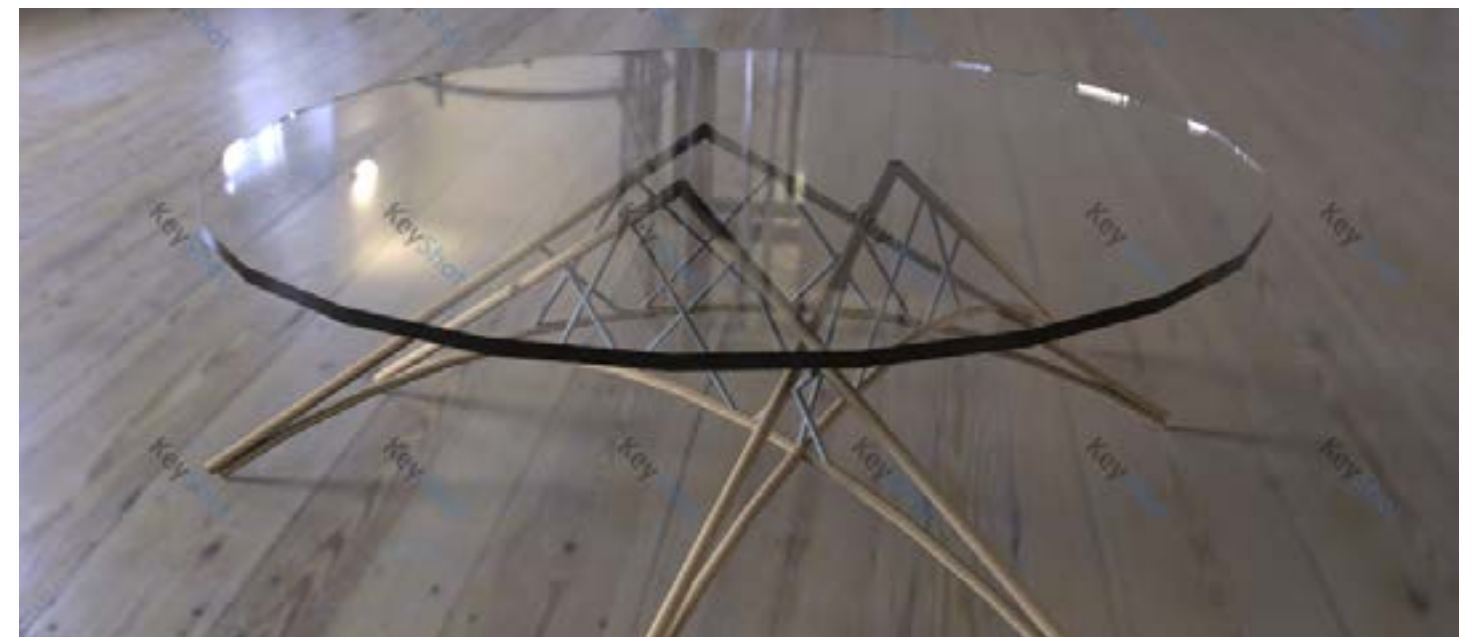




Rendering

Using rendering softwares like 'Keyshot 6' I am able to digitally place an idea directly into an environment. This provides an insight into the potential appearance and presence of an object. I am able to render materials, adjust proportions, control lighting and pan to perspectives that i may not be able to capture using drafting methods on paper. The software also allows me to capture these perspective as screen shots, effectively photographing an object before its been produced.

I find these models and scenes can be very effective and visual communicators when discussing designs and formulating ideas. I find this also helps to prevent being hung up on one idea for too long and sets a steady and progressive pace throughout the project.

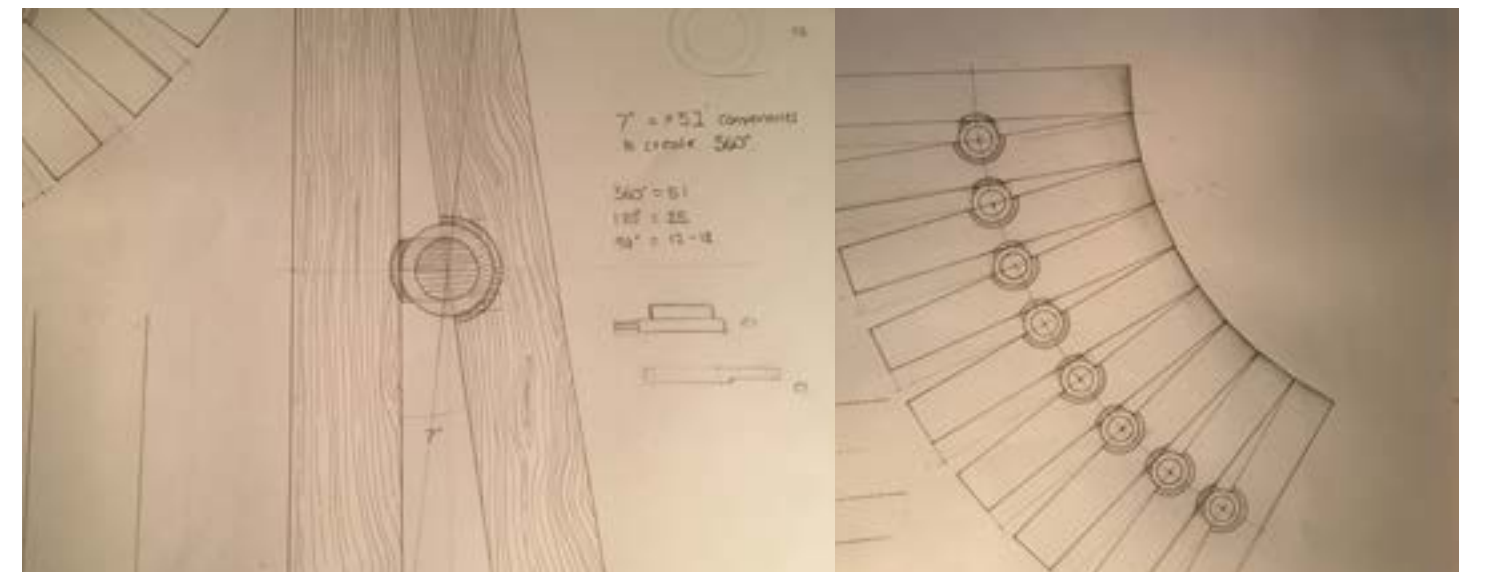


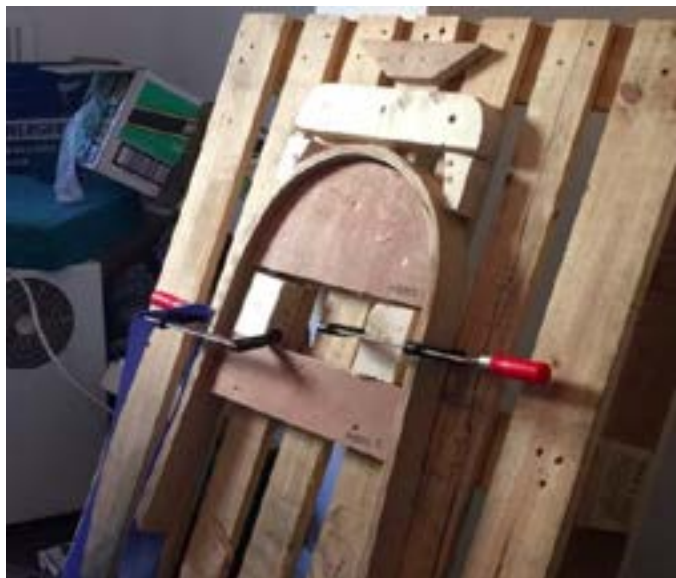
From the digital sketchbook I am able to extract measurements and other information that contribute to the making of models.

In this particular case I wanted to create a modular object that replicates the sweeping curve of the station roof using a truss based system.

I decided the best method of 'casting' wood into a particular shape would be to laminate layers of steam bent ash over a former. This was designed using information taken from the digital sketchbook.

The following prototyping stages were conducted at home using a home made steam chamber and lamination jig.

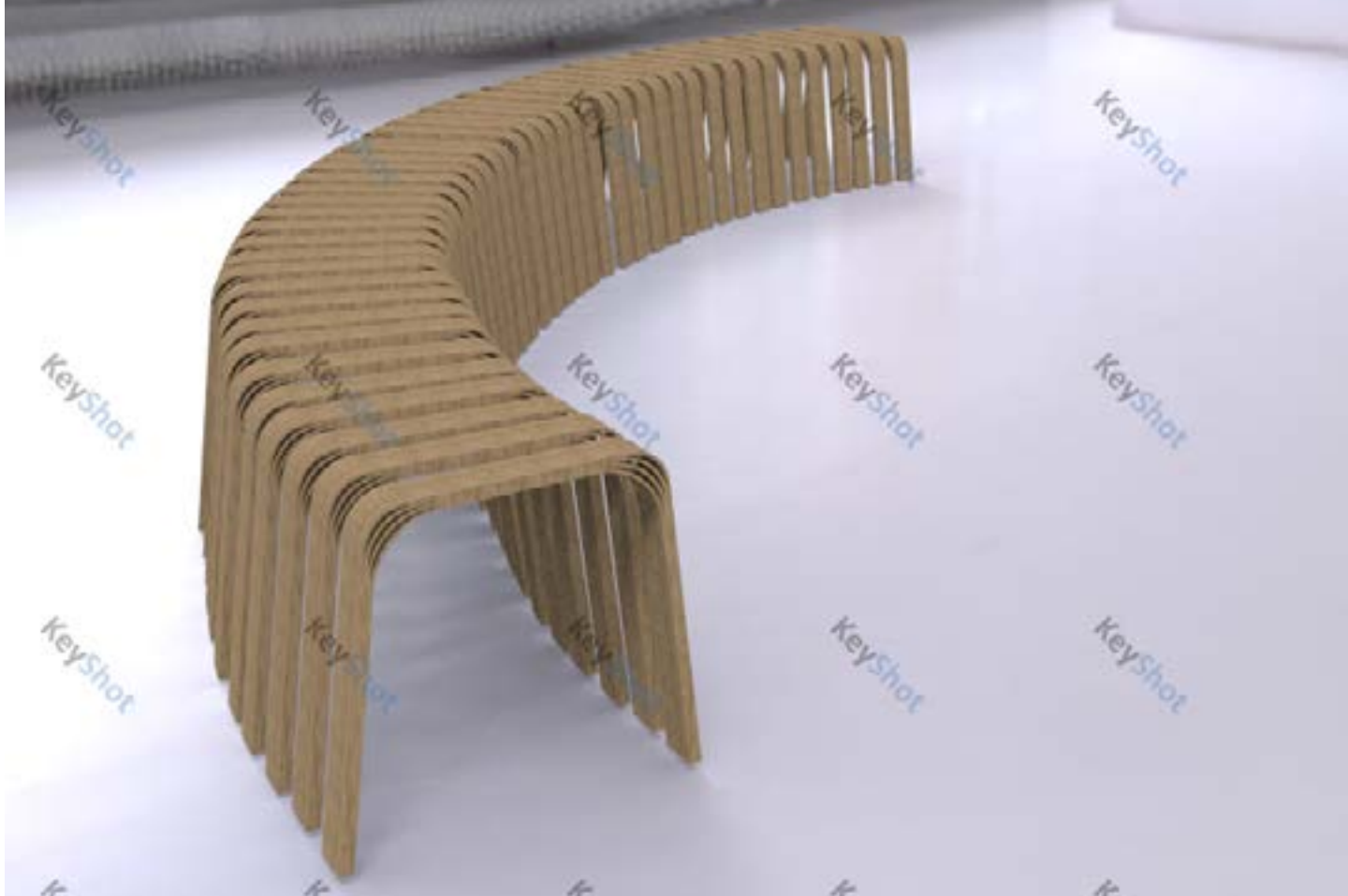




Using 4mm strips of Ash I was able to steam them for a duration of 45 minutes before strapping them over a jig and left to cure for 24 hours. Once dried the forms were tied with string and left for a further 4 days to cure before being laminated over the same jig.



Brighton study outcomes.

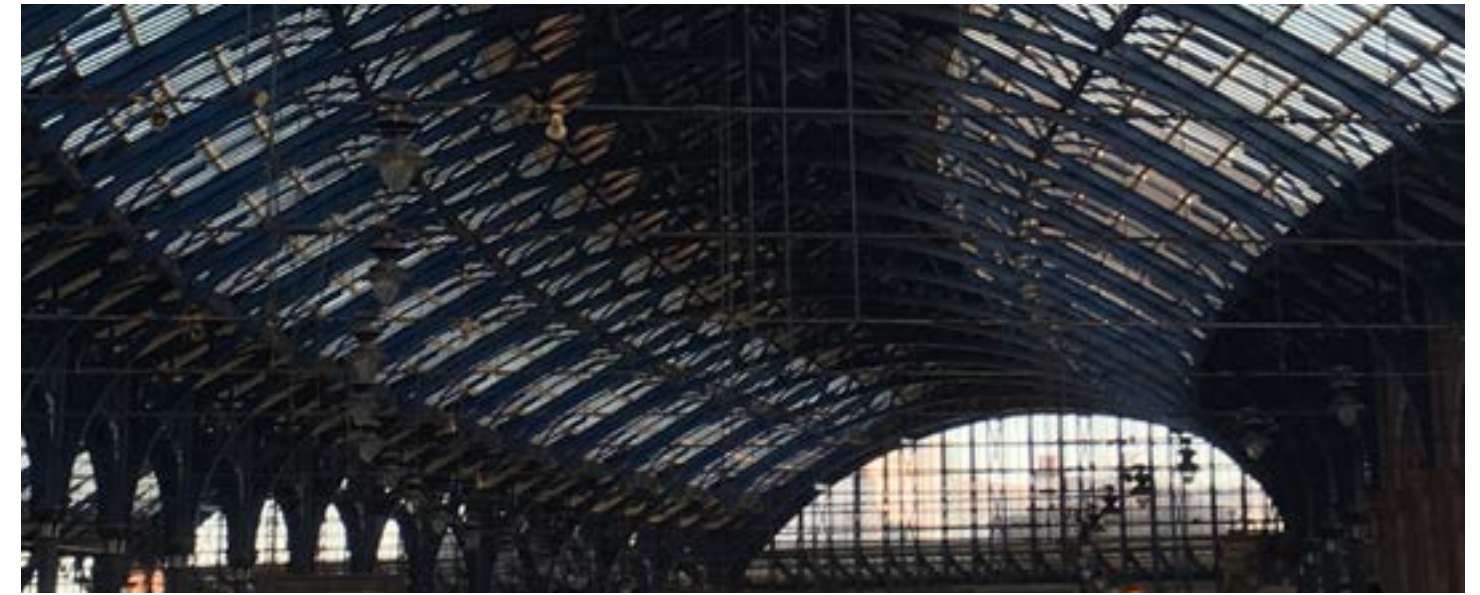


PART TWO

Structural study

The similar material properties of both timber and cast iron is celebrated here with the application of a very simple joinery method. Both the train station and the tithe barn use a very similar construction method despite being centuries apart. I find this method of construction very interesting as it displays a consistency not only across time but across materials.

I want to exploit this method, but first I must understand how this method has evolved from the primitive application displayed in the Tisbury Barn to the complex example displayed at Brighton train station.



In the Shropshire village of Coalbrookdale in 1705, Mr Abraham Darby discovered the use of coke made from local coal to fuel furnaces rather than charcoal. Darby's discovery enabled the economically viable mass production of cast iron.

Research has revealed that seventy per cent of the components of the bridge, including all the large castings. Were made individually to fit and all differ slightly from one another as a result.

Joining techniques used in carpentry, such as dovetail and shouldered joints, were adapted by craftsman for use with cast iron and then secured with cast pins.

This location is the moment in time where Traditional timber joinery methods were translated into another material. This would lead the way to the development of steel frame buildings such as the Station roof in Brighton.



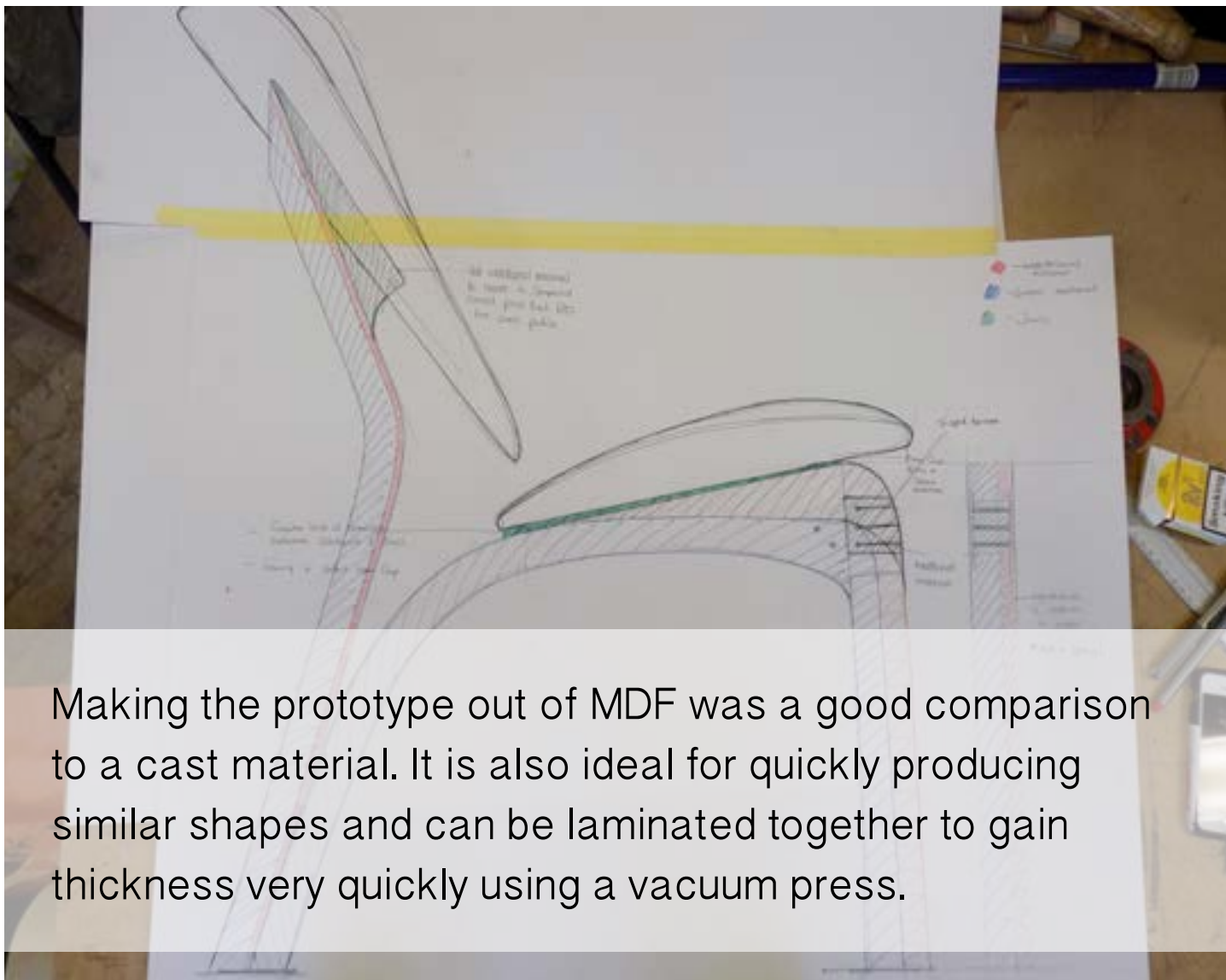
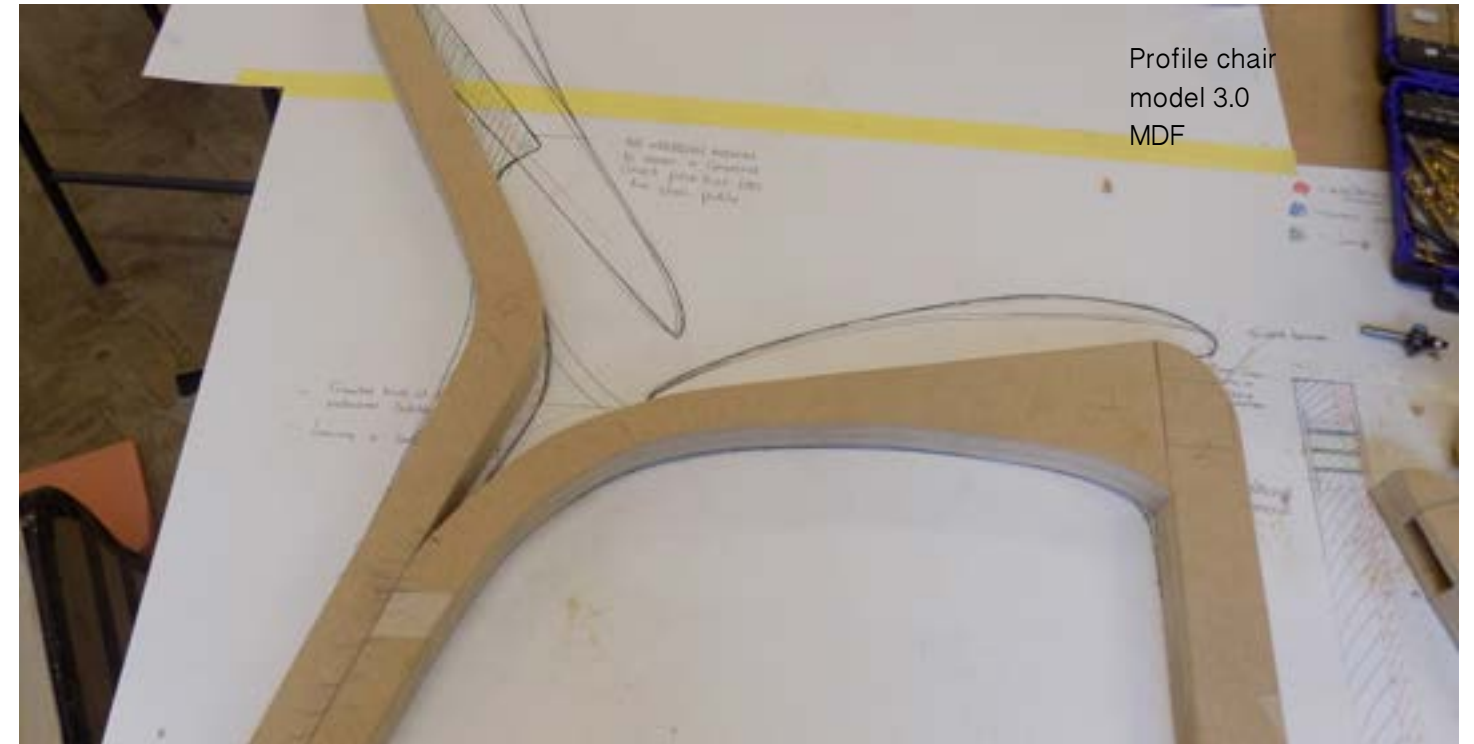




Profile chair
model 1.0
plywood



Profile chair
model 3.0
MDF



Making the prototype out of MDF was a good comparison to a cast material. It is also ideal for quickly producing similar shapes and can be laminated together to gain thickness very quickly using a vacuum press.



Mortise and Tenon



Dowel (riveting) joint

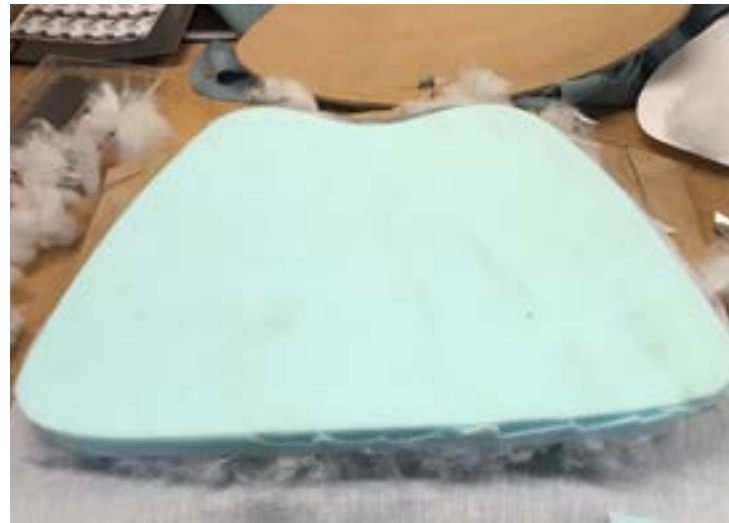


Profile chair
model 3.0
MDF



Using a number of cross members that brace the two profiles together. The members are secured at each end using a half lap shoulder joint pinned into the seat profiles. This quickly creates a self standing structure capable of carrying weight, but unstable and unable to perform as a chair effectively





Using a simple yet effective method of upholstering a cushion, i produced some generic cushion templates to make the chair capable of holding a human in order to understand where the stress's and problems lay. The frame stood up very well to a flex testing exercise where the frame was able to move and flex considerably without a risk of breaking, however a break later occured at the base on the back leg where the dowel joints met the lamination line between the two boards.



Profile Chair
Model 1.0



Profile Chair
Model 2.0

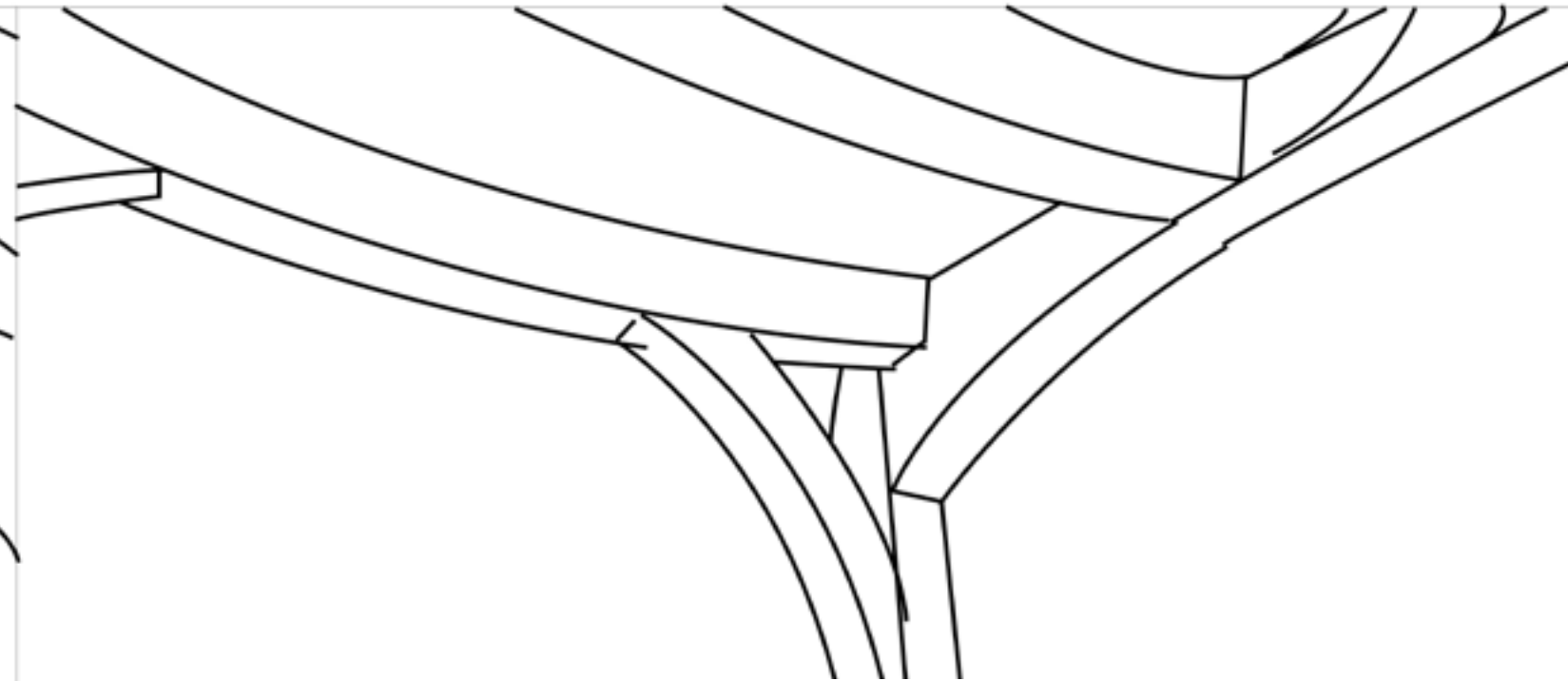
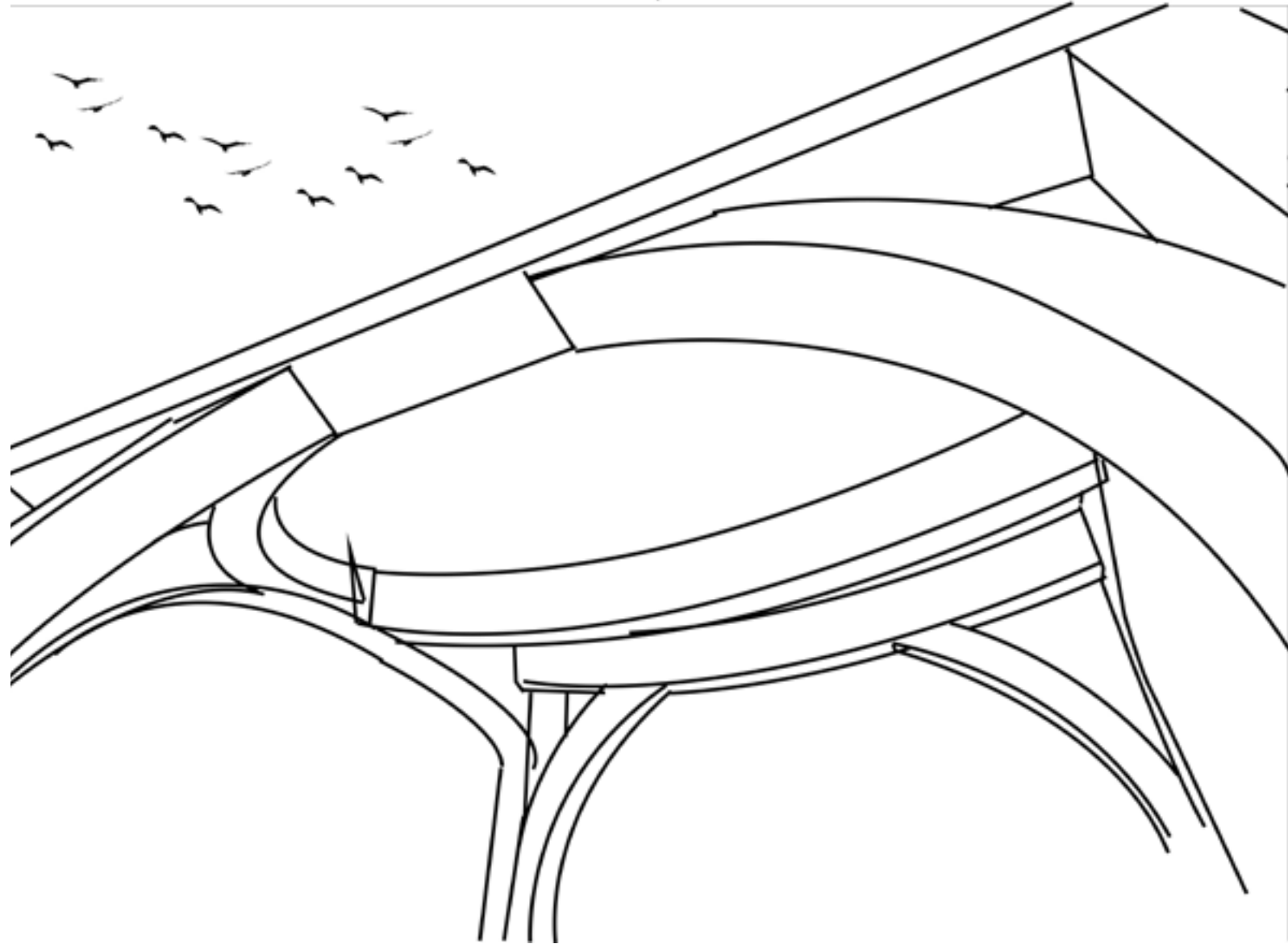
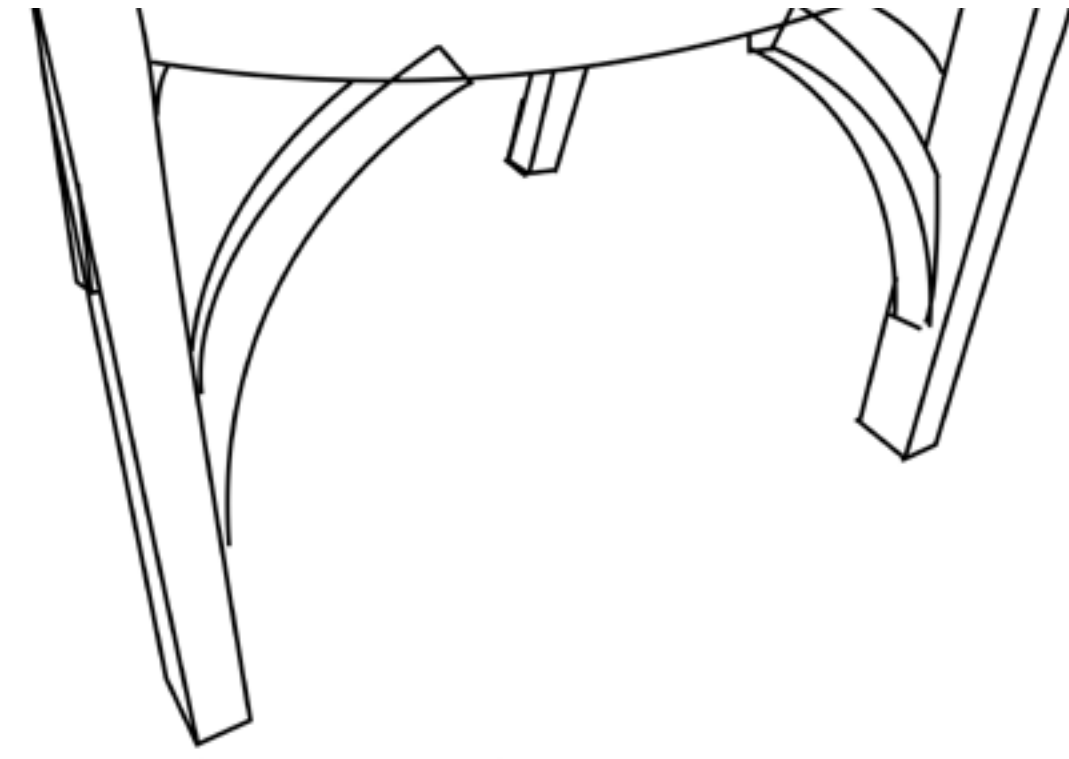
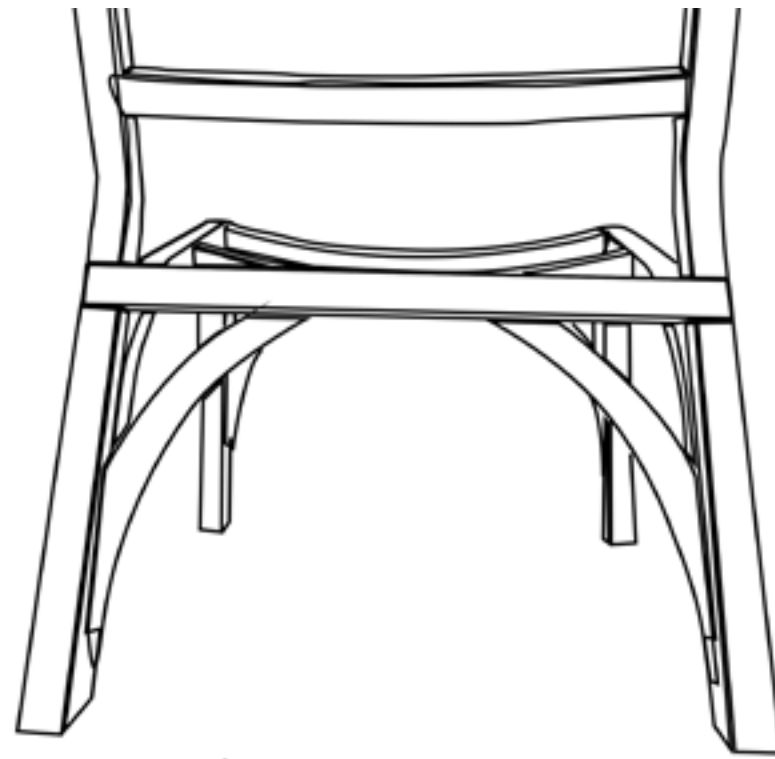
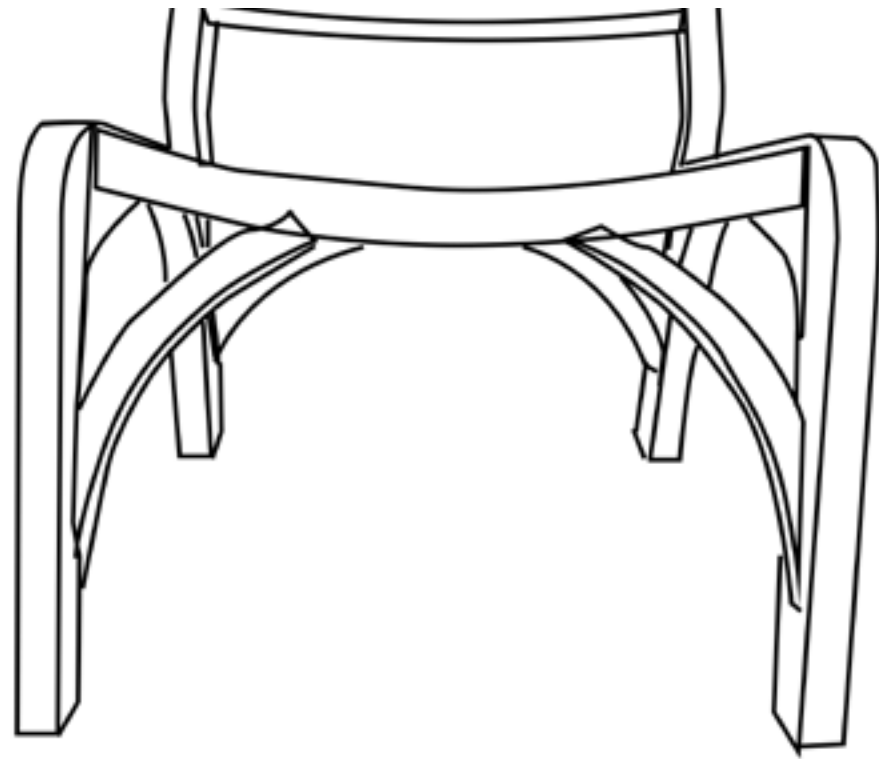




I reinforced the frame using curved braces adding triangulation. Hoping to prevent it from moving in multiple directions.

Not only did this work very effectively but it introduced a new image to the frame and brought a new architectural detail to the table. I feel like it now imitates the underside of a building far more authentically due to the immediate importance of the braces.





I have found it important to remind myself of the impact the structure I am creating can have if it were to be at a larger scale. These illustrations are traced photographs taken of Profile chair Model 3.0 after completion. The addition of birds and trees enable a sense of scale to reinforce the perspective.

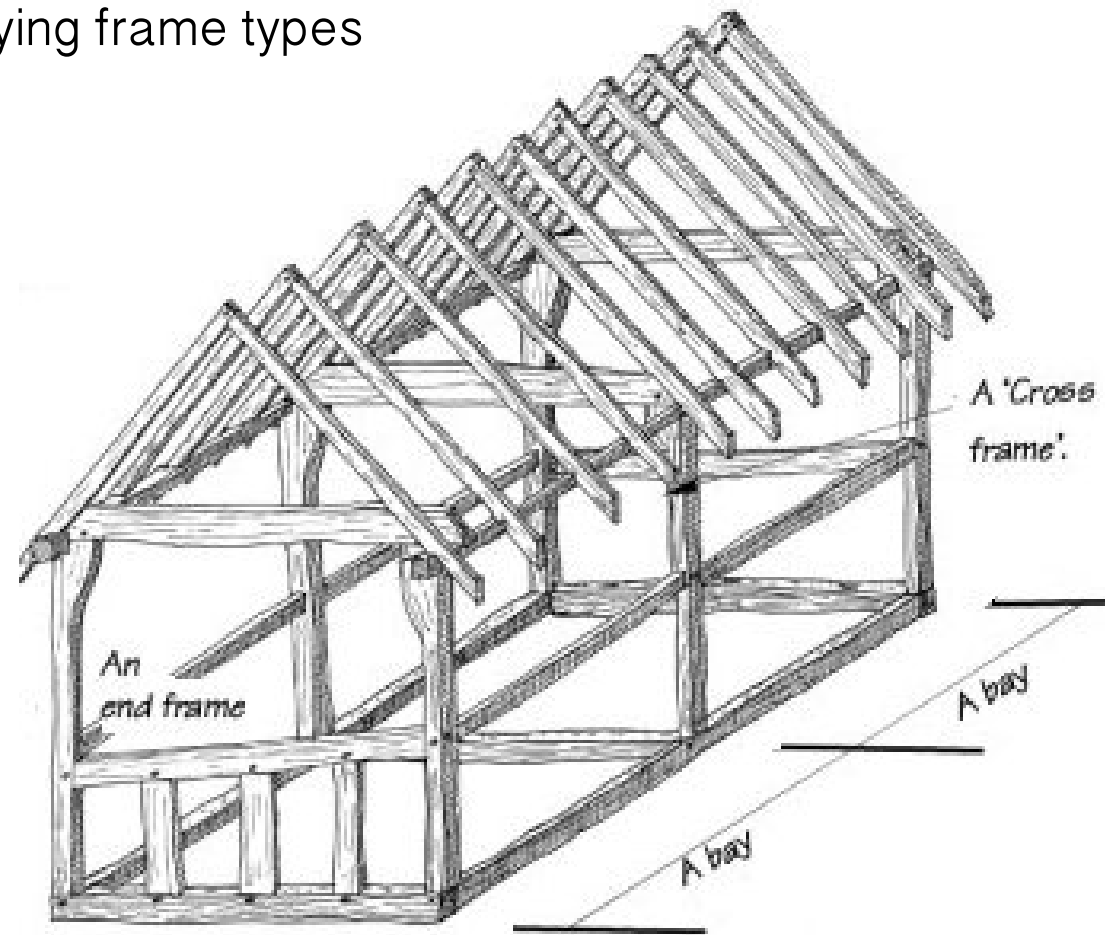


MESSUMS WILTSHIRE

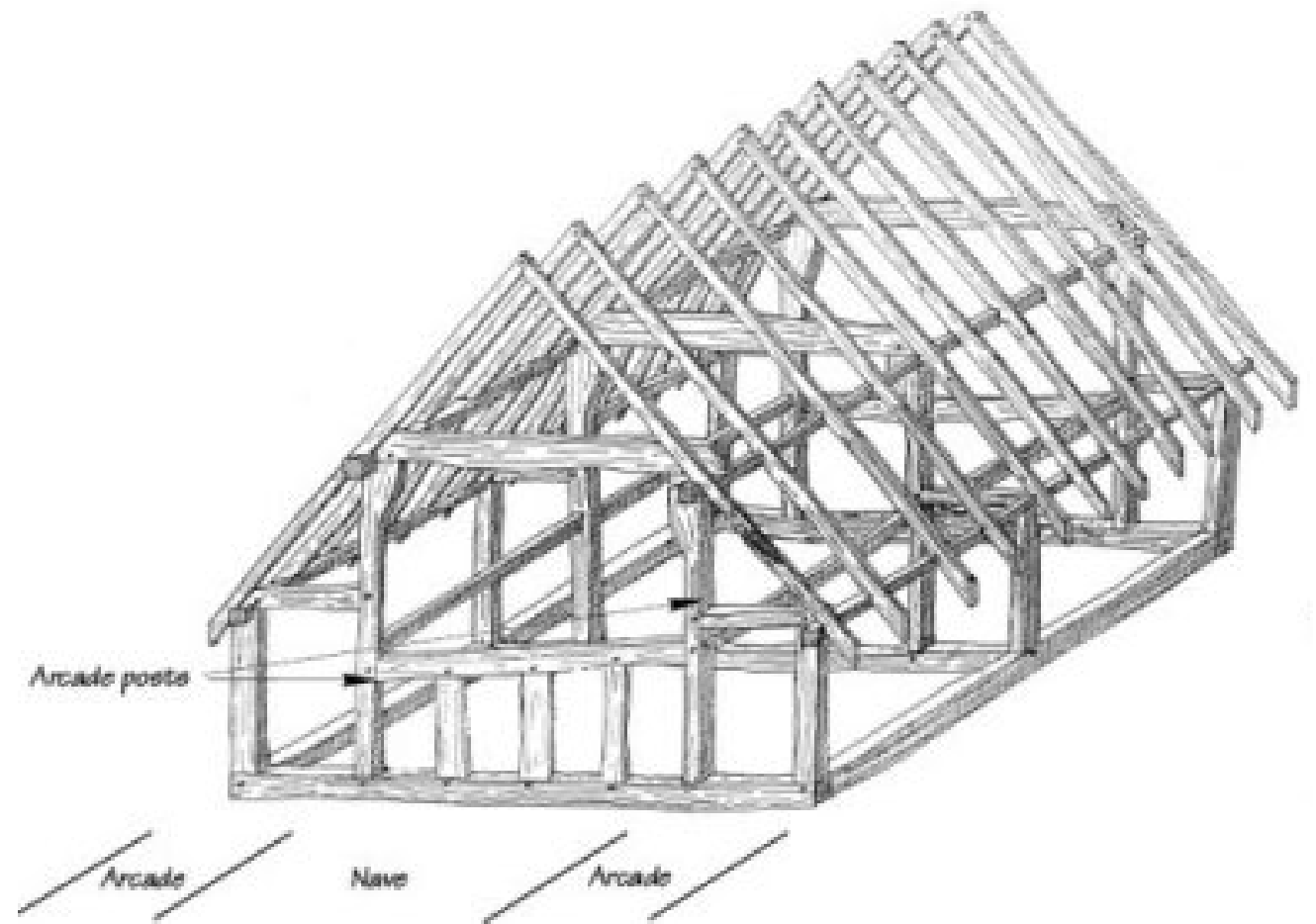


Due to the nature of the barn and its construction method, being ripped physically from tree trunks and the edges often left waney. The joinery takes on a very crude look and appearance, but this specific variable means the barn contains a lot of very well considered joints each one different from the other, cut to fit its counterpart.

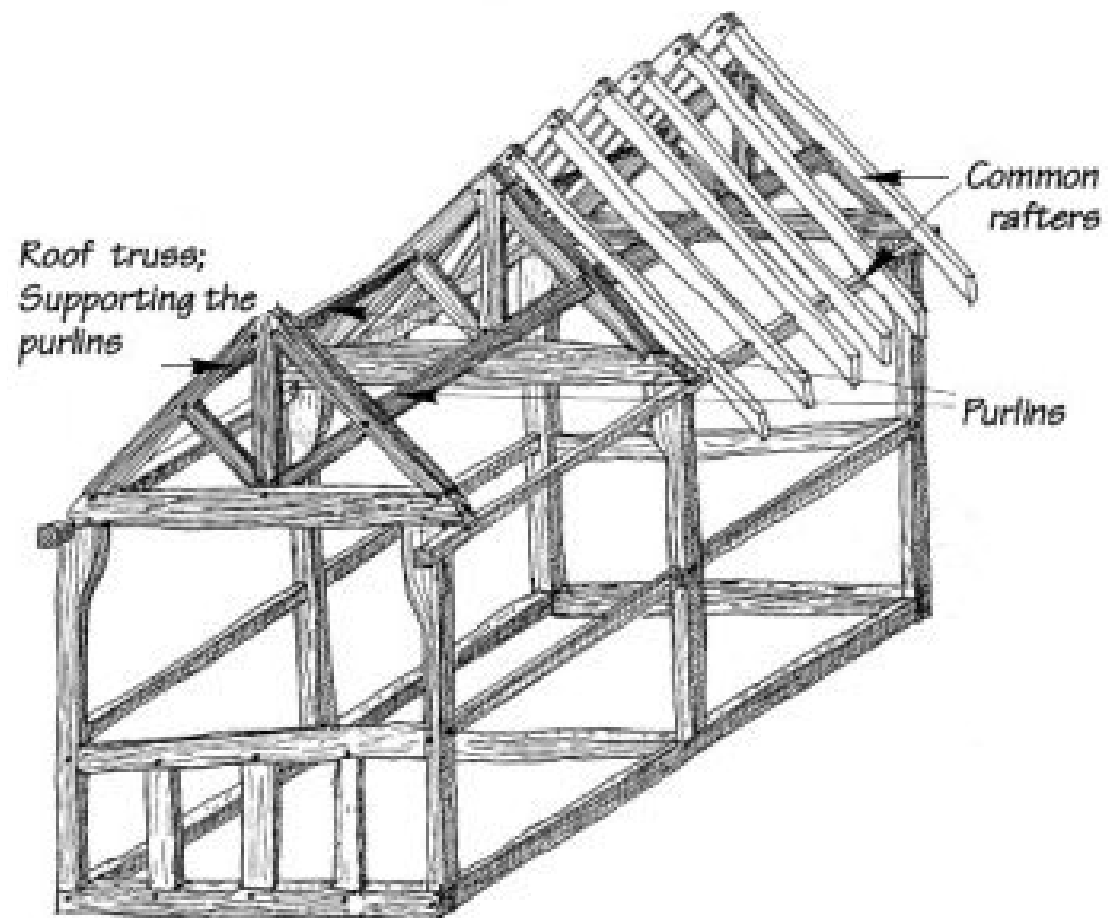
Identifying frame types



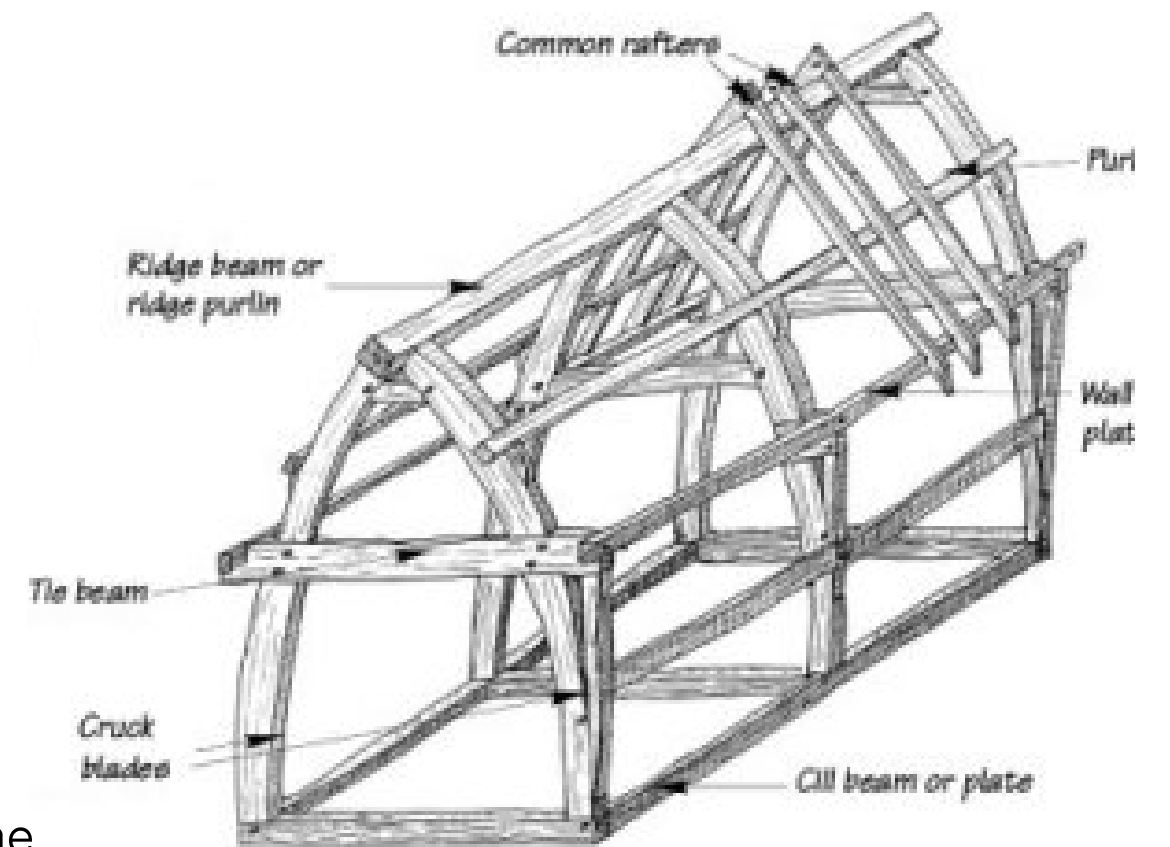
Box frame



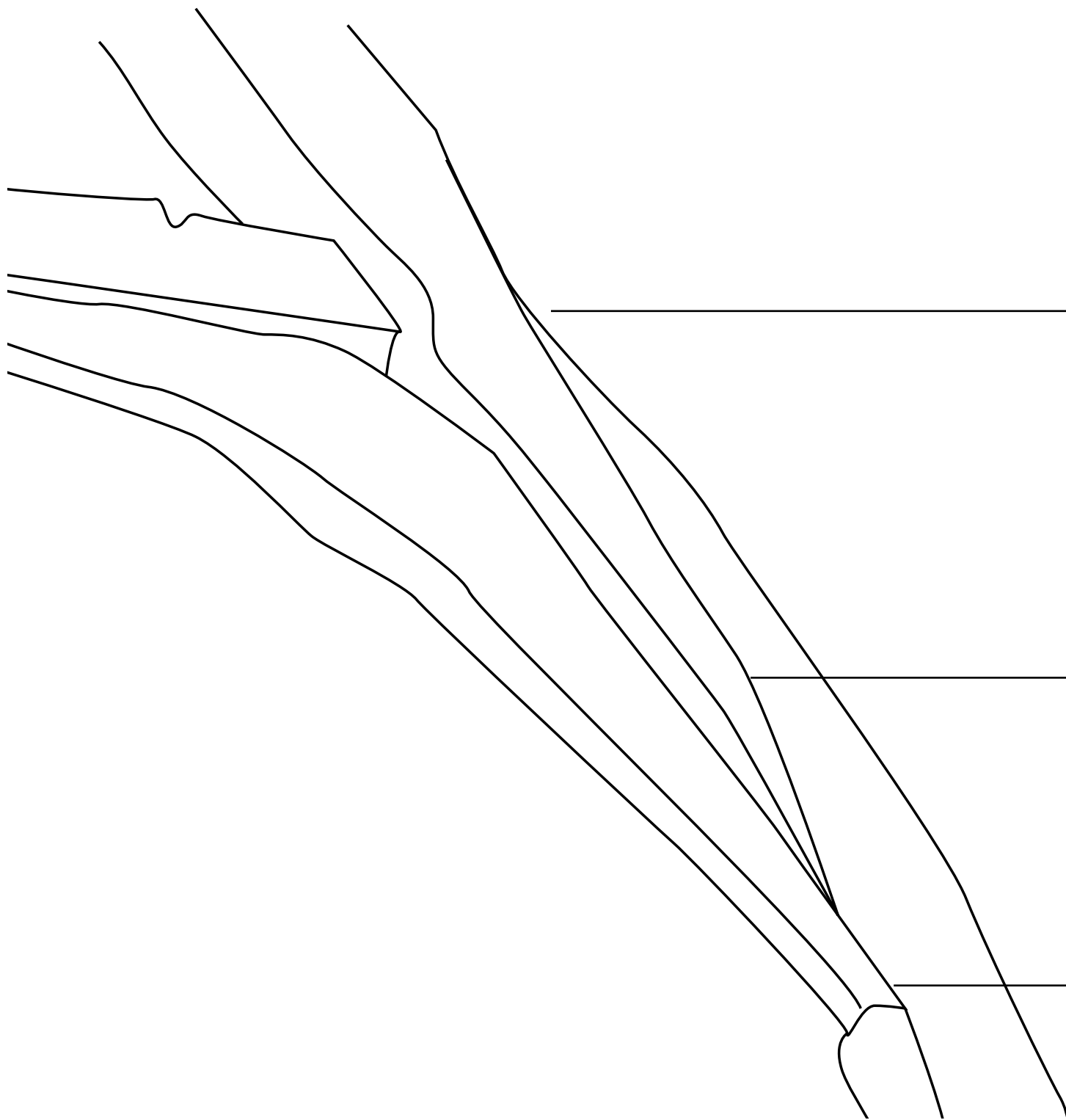
Aisled frame



Post and Truss



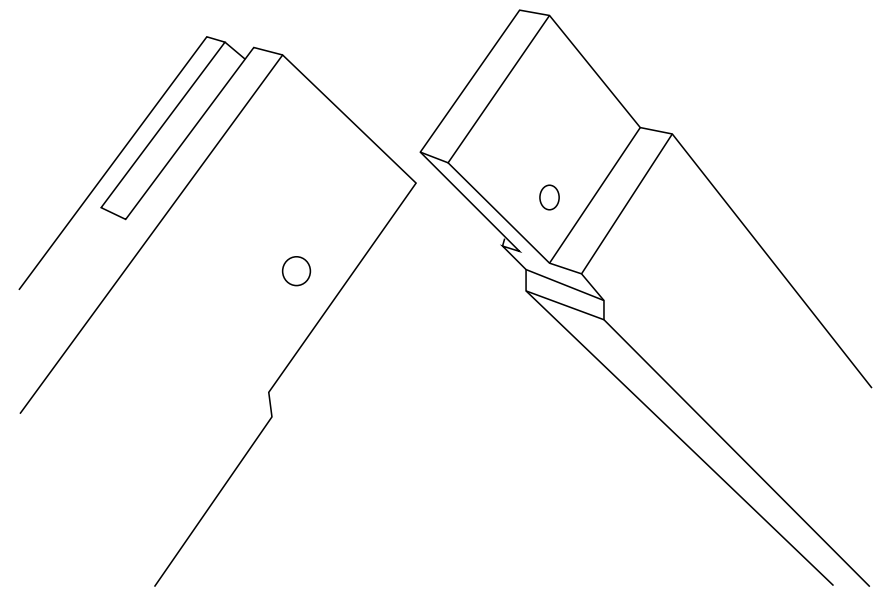
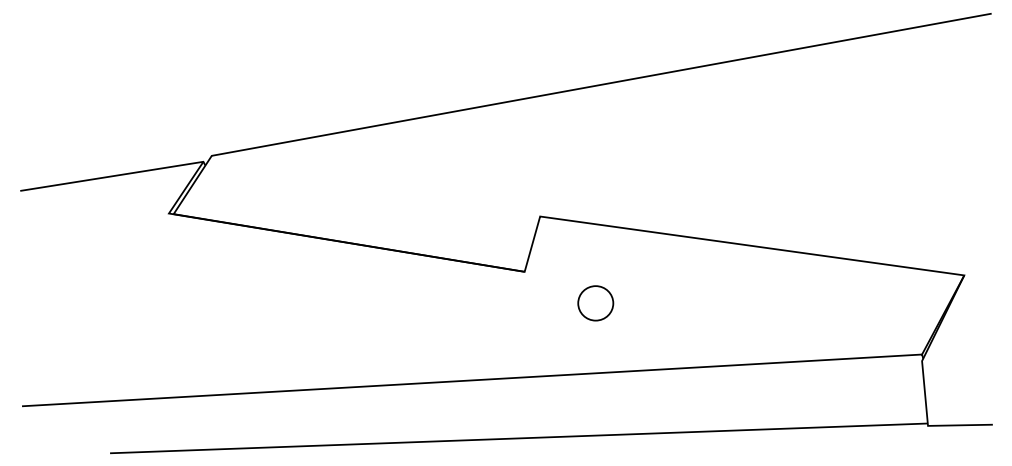
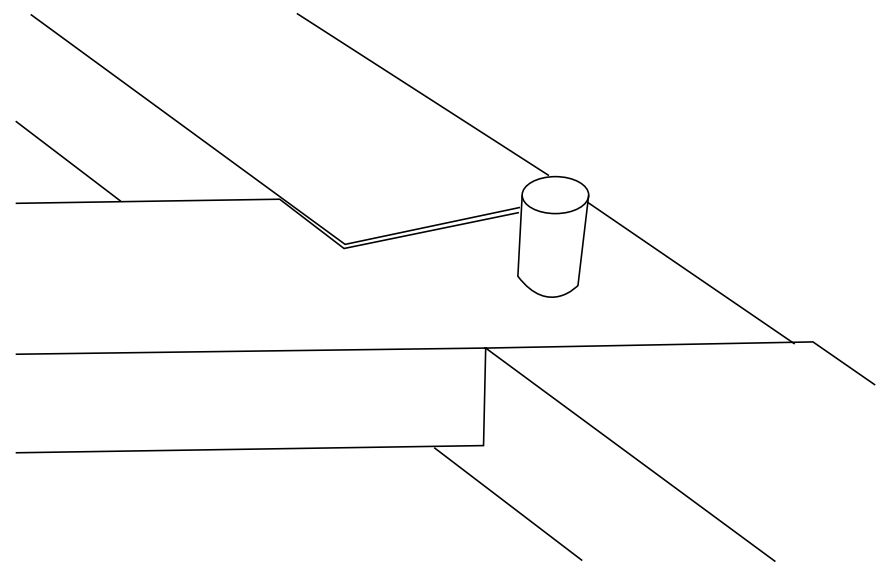
Cruck frame



Half Lap
Dovetail

Scarf

Bridle



Some of the typical joints used throughout the barn are Bridle joints, Mortise and tenon, Half lap, Half lap dovetails, scarf joints and a number of housing joints. These three in particular are the most commonly found

Bridle Joint

Chestnut/Ash.
Oak pegs.



Top;
Bridle joint

Middle;
Half lap bracing joint.

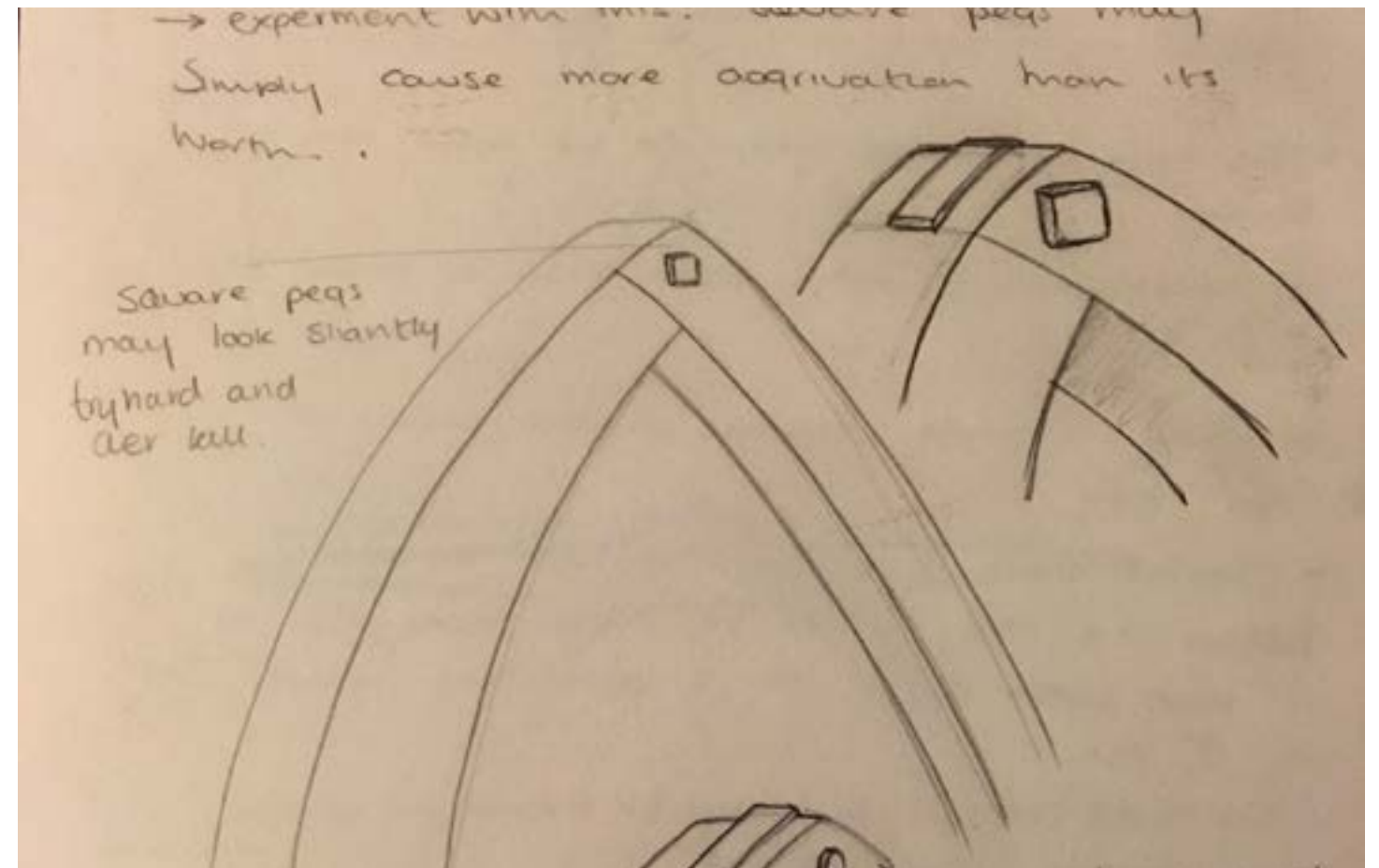


Cruck blade 0.1
Laminated Chestnut
Half lap bracing joint.



Through peg joint
Exposed

Ash/Oak

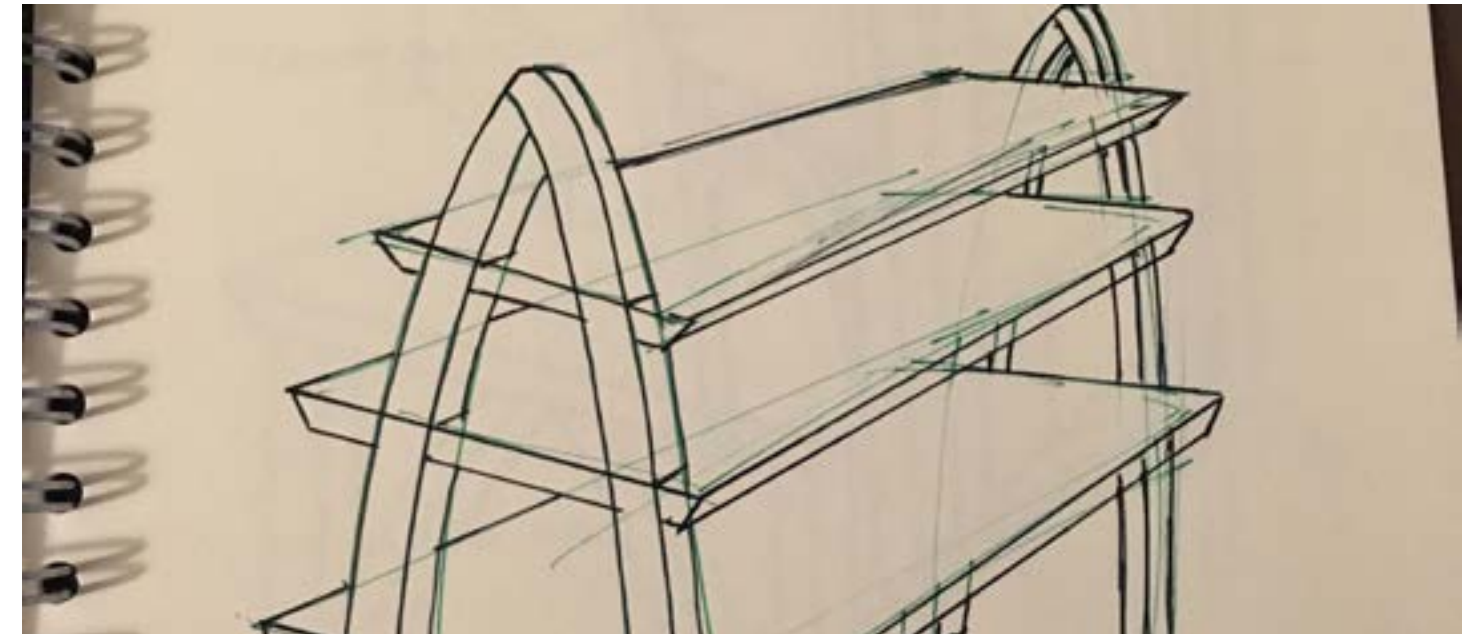




Cruck A Frame
model 1.0

Extruded Tie beam

Chestnut



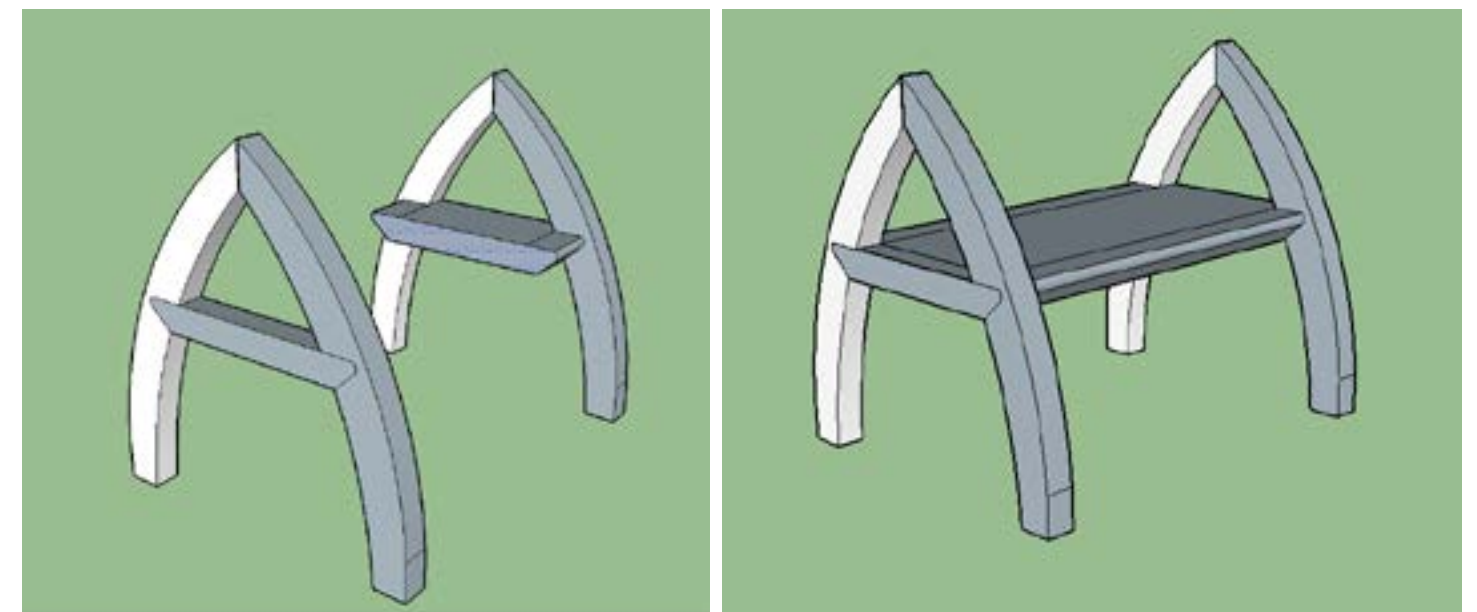
Housing Joint

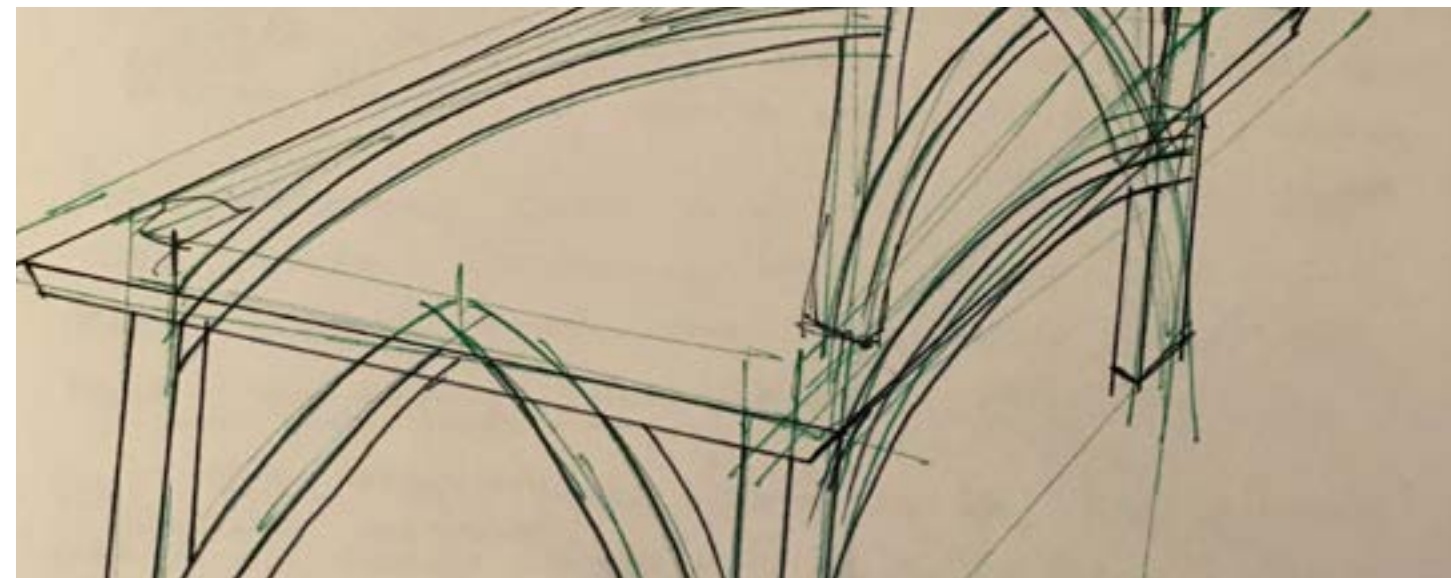
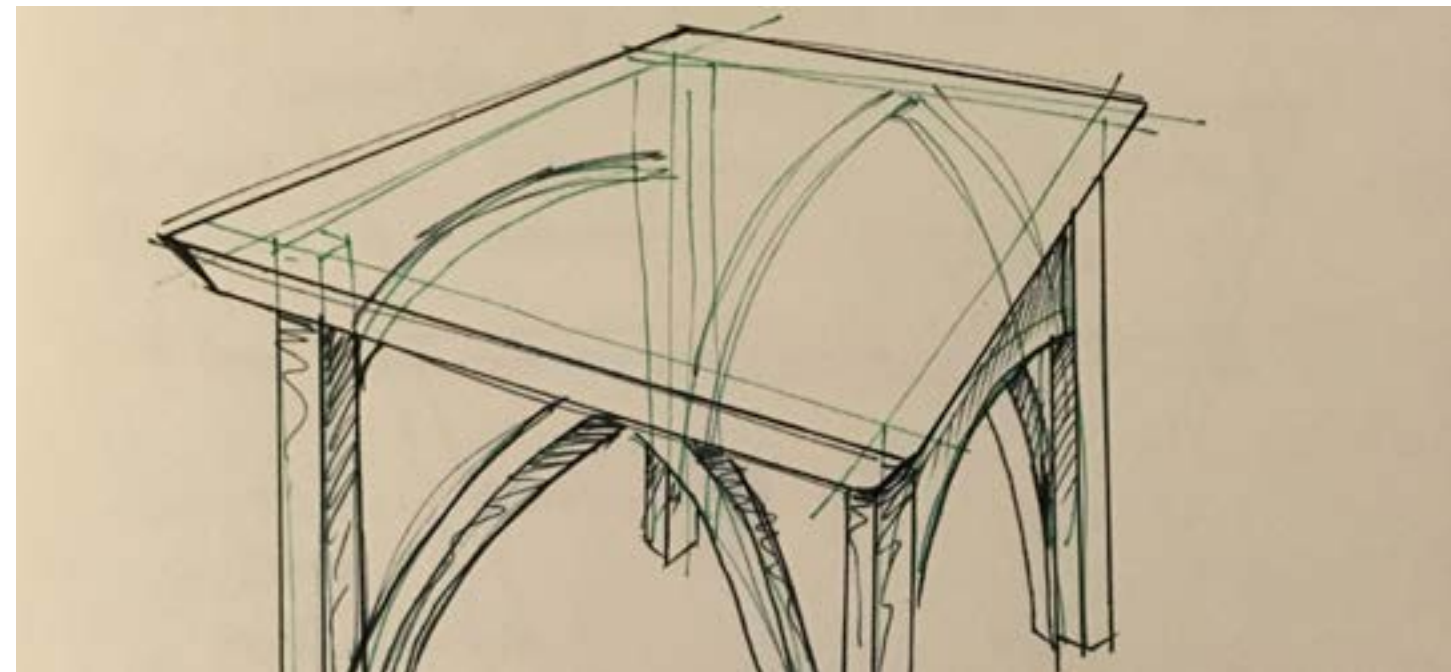
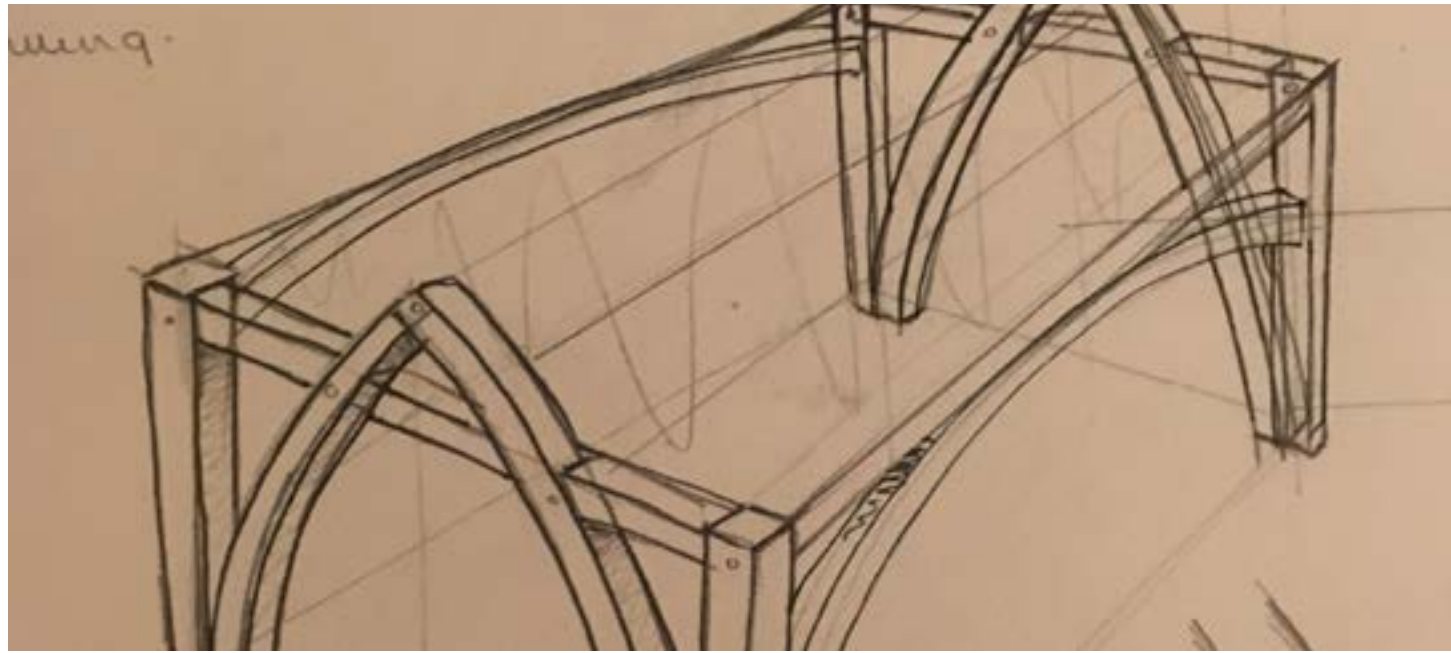


Half lap

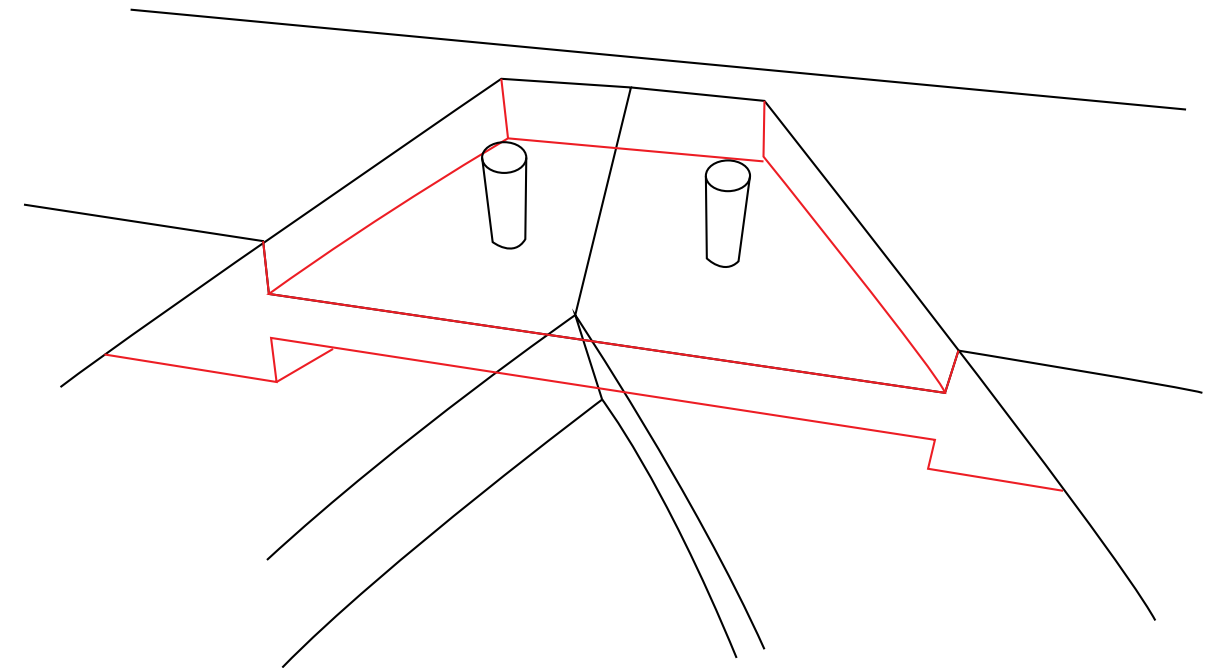
Scaling down the cruck A-frame. I wanted to see what the practical applications this may have.

I initially thought, simply by extruding the tie beam located at the top of the cruck you may be able to produce a flat working surface suspended between two A frames. With the addition of two purlins this was successful, but i felt it was lacking practicality.



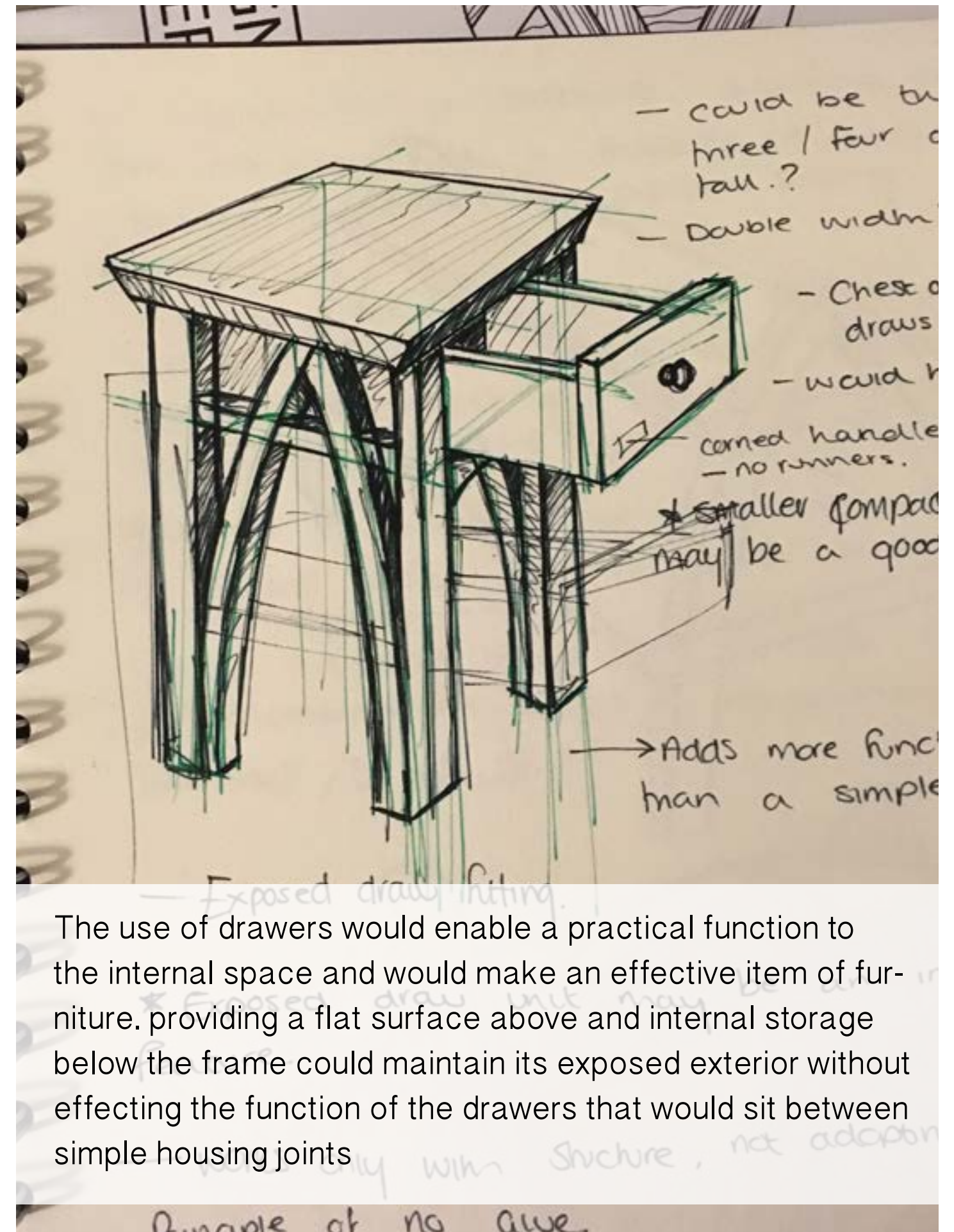


If it were to support a flat surface I swiftly decided that the use of 'jowl' posts or uprights were necessary to create a flat and stable surface. This removes the need for the cruck blades to provide weight bearing properties but it now requires them to serve as a brace preventing movement between the uprights. To connect the cruck blades I designed a three part bridge joint that joins the cruck blades to the collar beam at the apex.

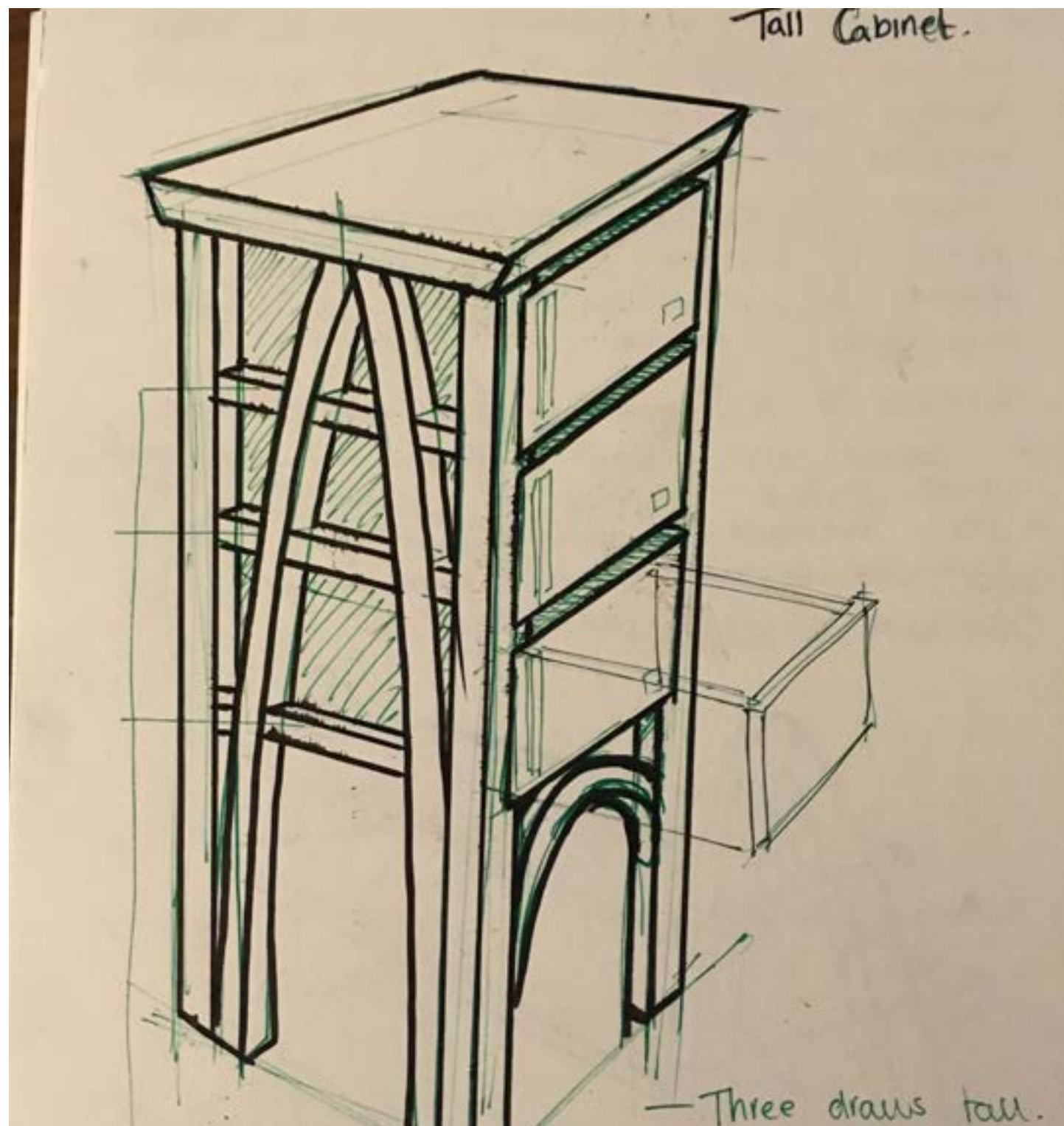




Applying jowl posts allows for a more stable and secure structure with far more points of contact distributing the load equally amongst the frame. Using simple housing joints routed into the sides of the A frames, the concept could now possibly house shelves and or drawers to add utility.



The use of drawers would enable a practical function to the internal space and would make an effective item of furniture. providing a flat surface above and internal storage below the frame could maintain its exposed exterior without effecting the function of the drawers that would sit between simple housing joints



In terms of scale this concept could be adapted depending on the requirement, the height can be increased to accommodate as many draws as necessary, The structure could be increased in width, multiplying it in 'bays'. A two bay structure would have three A frames, a Three bay, four etc.

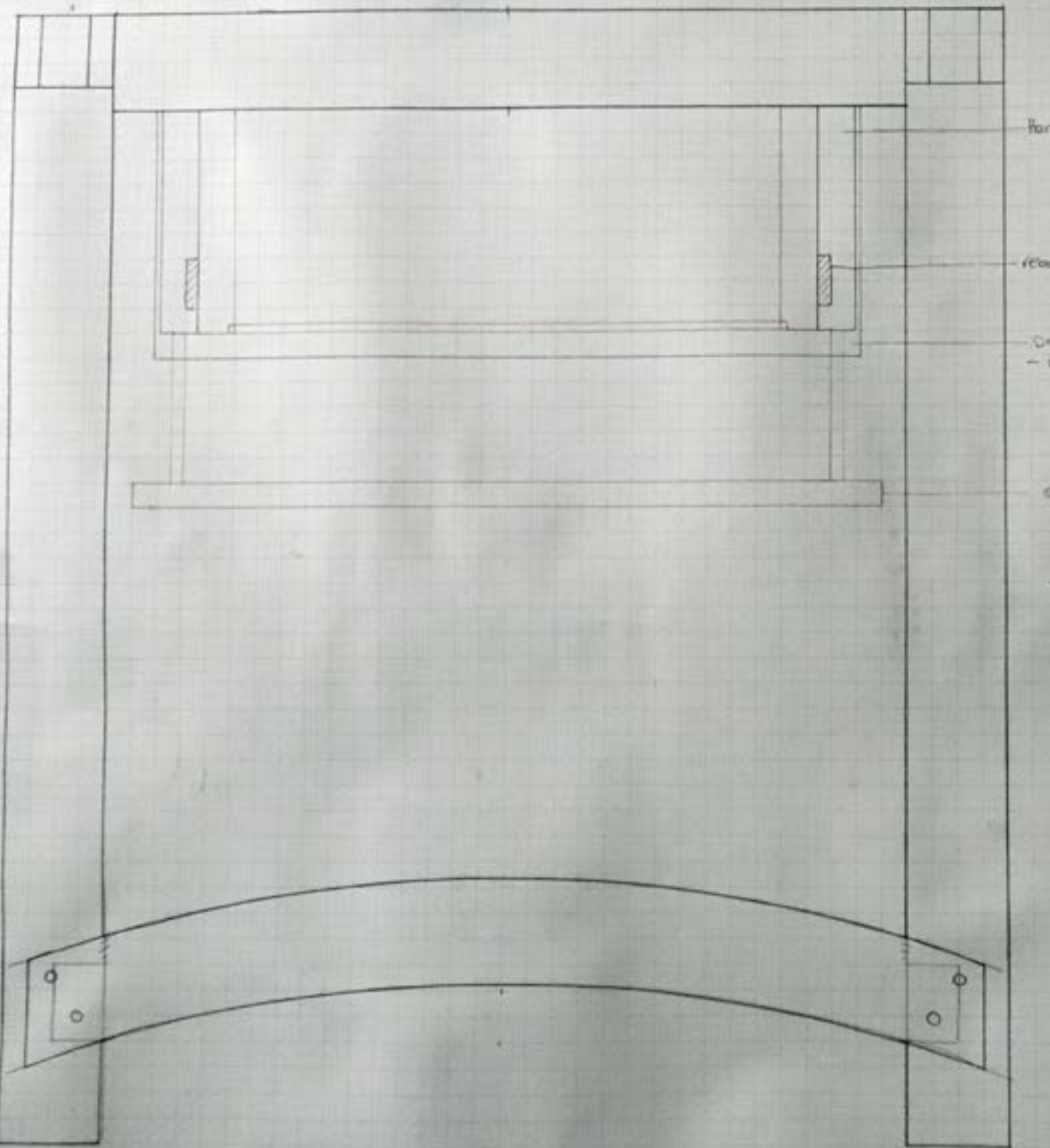


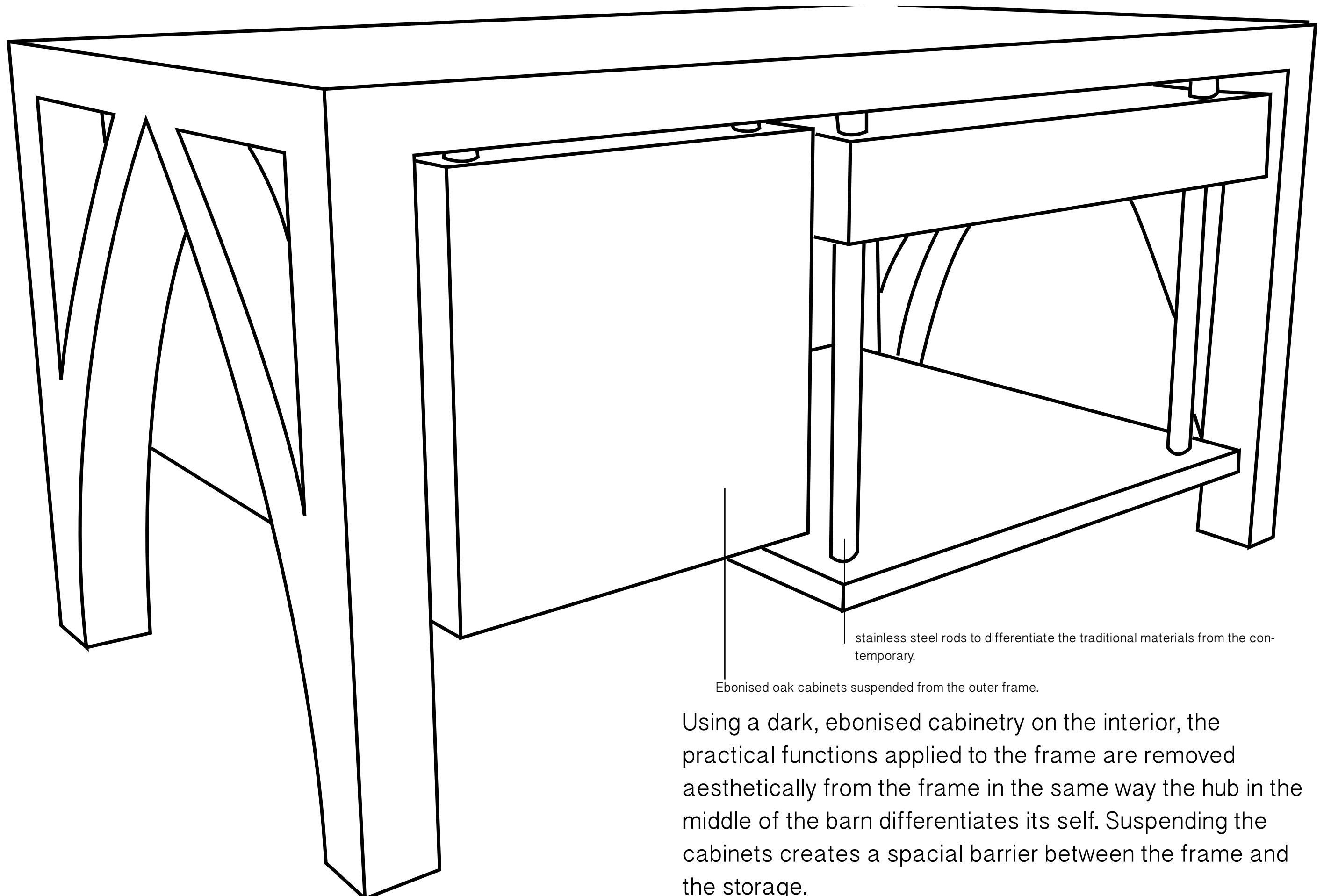


Throughout the restoration of the barn the developers have made sure to leave as few permanent details as possible. all the internal infrastructure has been raised to be a semi permanent installation and to avoid interference with the original frame where possible. The main hub of the center that holds office, shop and cafe space is an isolated cube at one end of the barn leaving as much open space above and around it as possible.

I like this idea of creating utility within the space without interfering at all and isolating the material and appearance making a clear distinction between the two. I thought how this may apply to the utility needed inside of the cabinet concept

Division + Occupation of Space

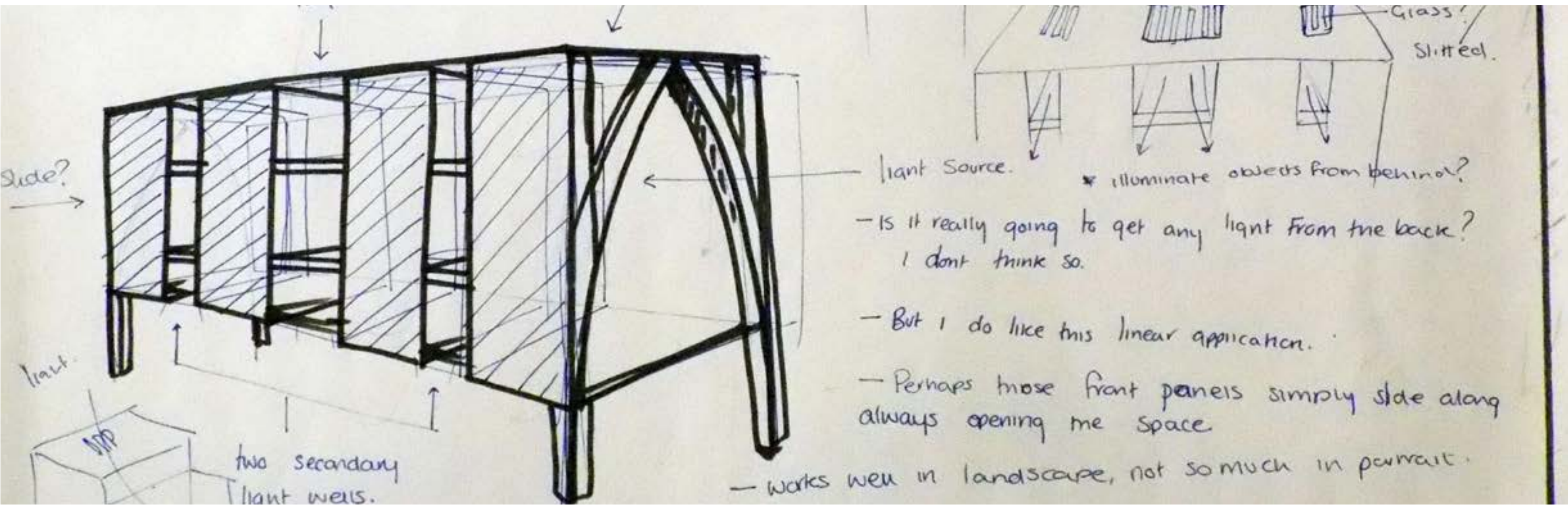




stainless steel rods to differentiate the traditional materials from the contemporary.

Ebonised oak cabinets suspended from the outer frame.

Using a dark, ebonised cabinetry on the interior, the practical functions applied to the frame are removed aesthetically from the frame in the same way the hub in the middle of the barn differentiates its self. Suspending the cabinets creates a spacial barrier between the frame and the storage.



I performed a light experiment projecting a lamp through slits onto an object, my finding indicated that natural light in room would not be effective using this method and larger access of light is required

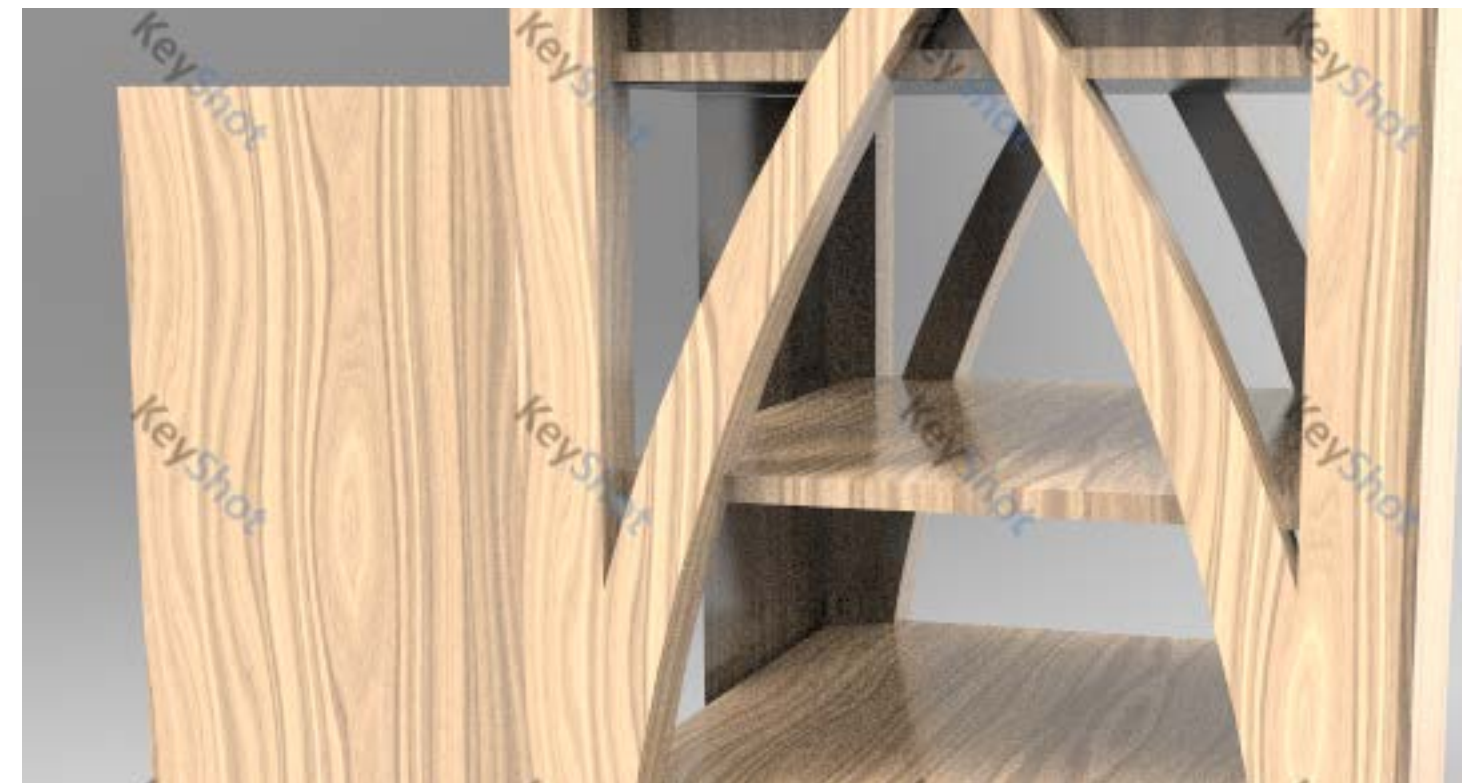


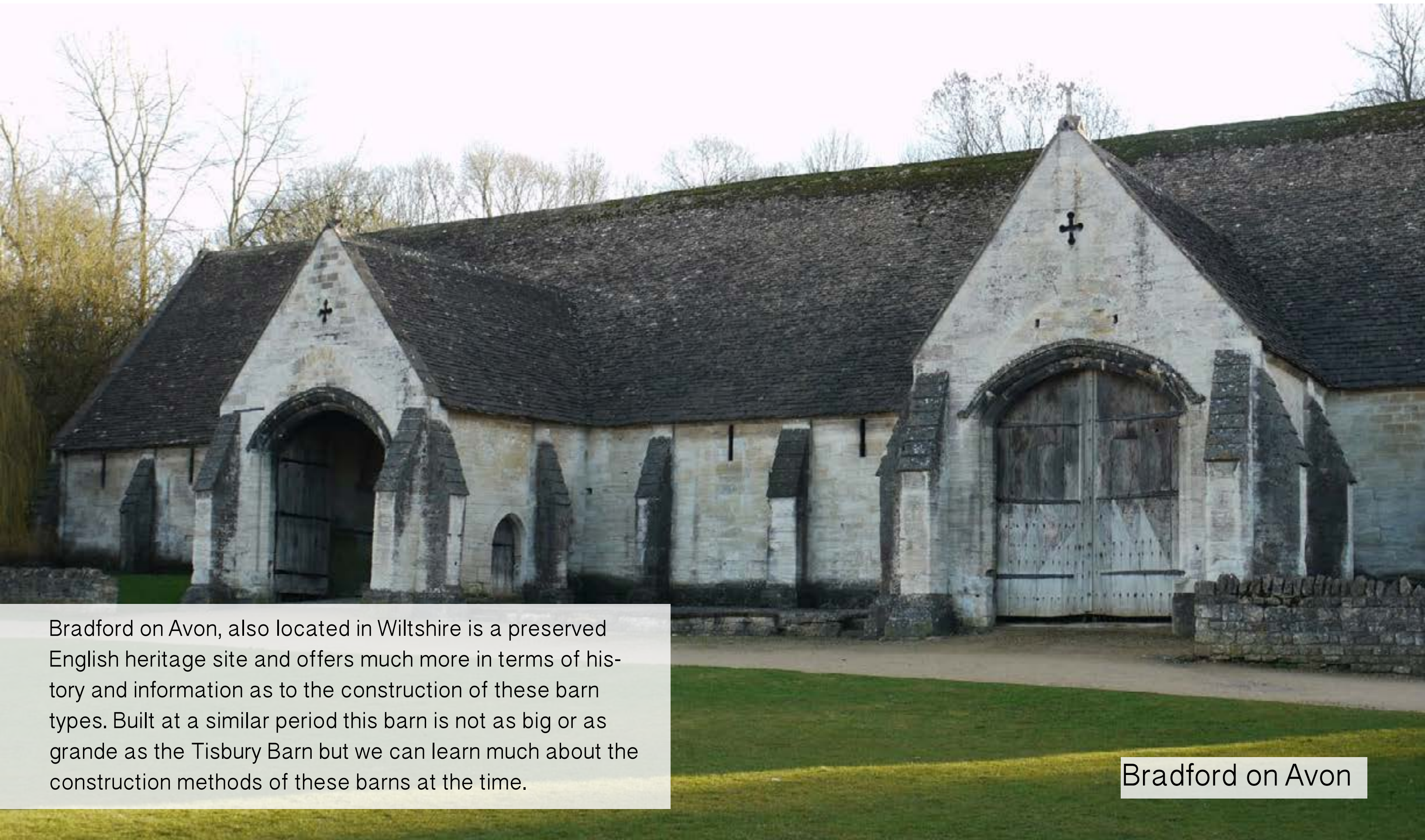




Imitating the traditional lay out of a typical threshing barn door i have applied the use of two large open doors that allow a maximum amount of light into the interior. Traditionally this was used to capture the maximum amount of daylight the extend the working day as well as creating a draft through the space that would pick up the waste from threshing process and carry it out of the barn, the wheat would be held at the 'Threshold' at the base of the doors creating a secure place for the product.

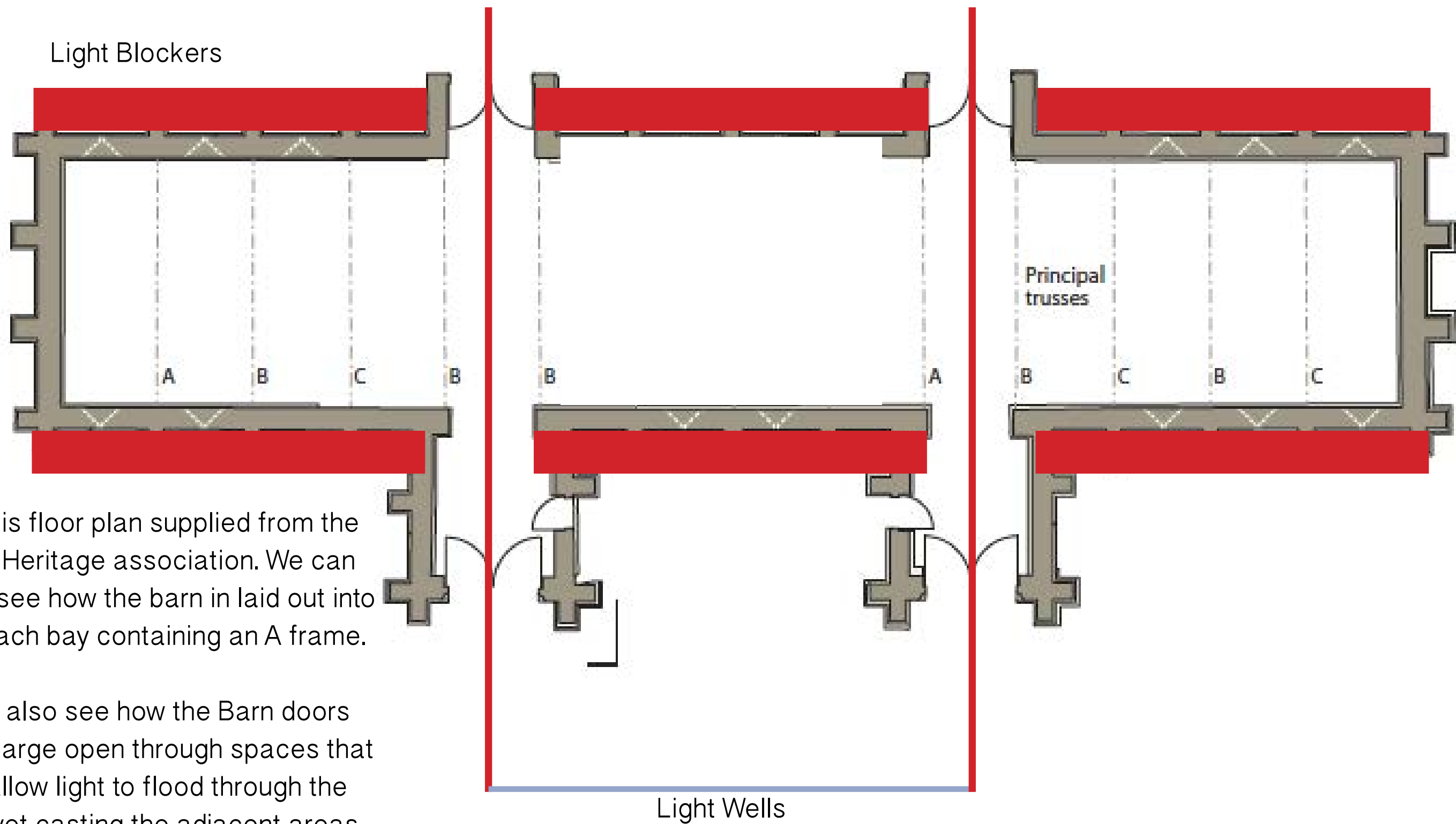
I have applied these same principles with the addition of two large doors that open and expose the space allowing the maximum amount of light in, as well as the addition of a secure drawer at the bottom creating a safe place for storage.





Bradford on Avon, also located in Wiltshire is a preserved English heritage site and offers much more in terms of history and information as to the construction of these barn types. Built at a similar period this barn is not as big or as grande as the Tisbury Barn but we can learn much about the construction methods of these barns at the time.

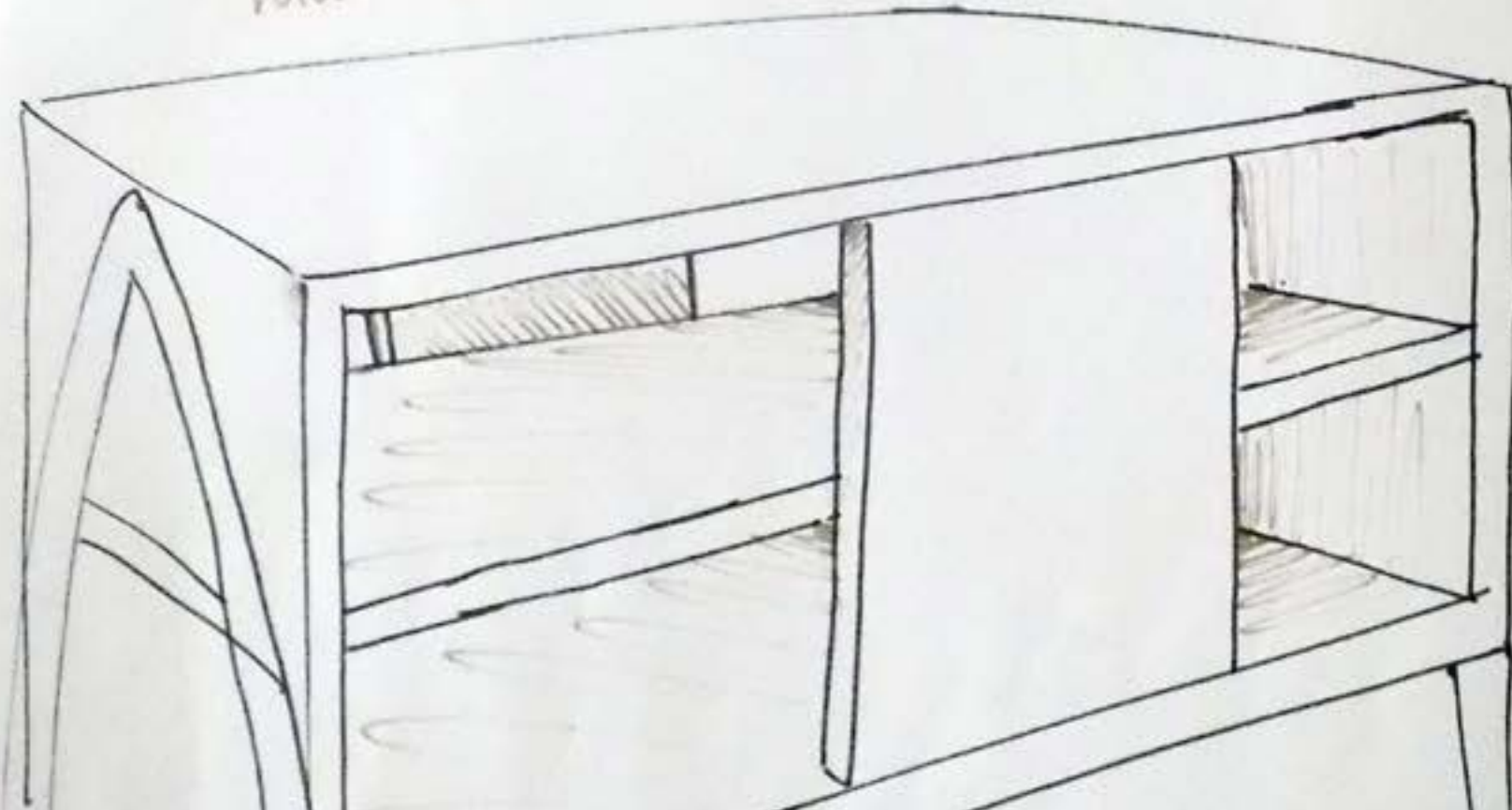
Bradford on Avon



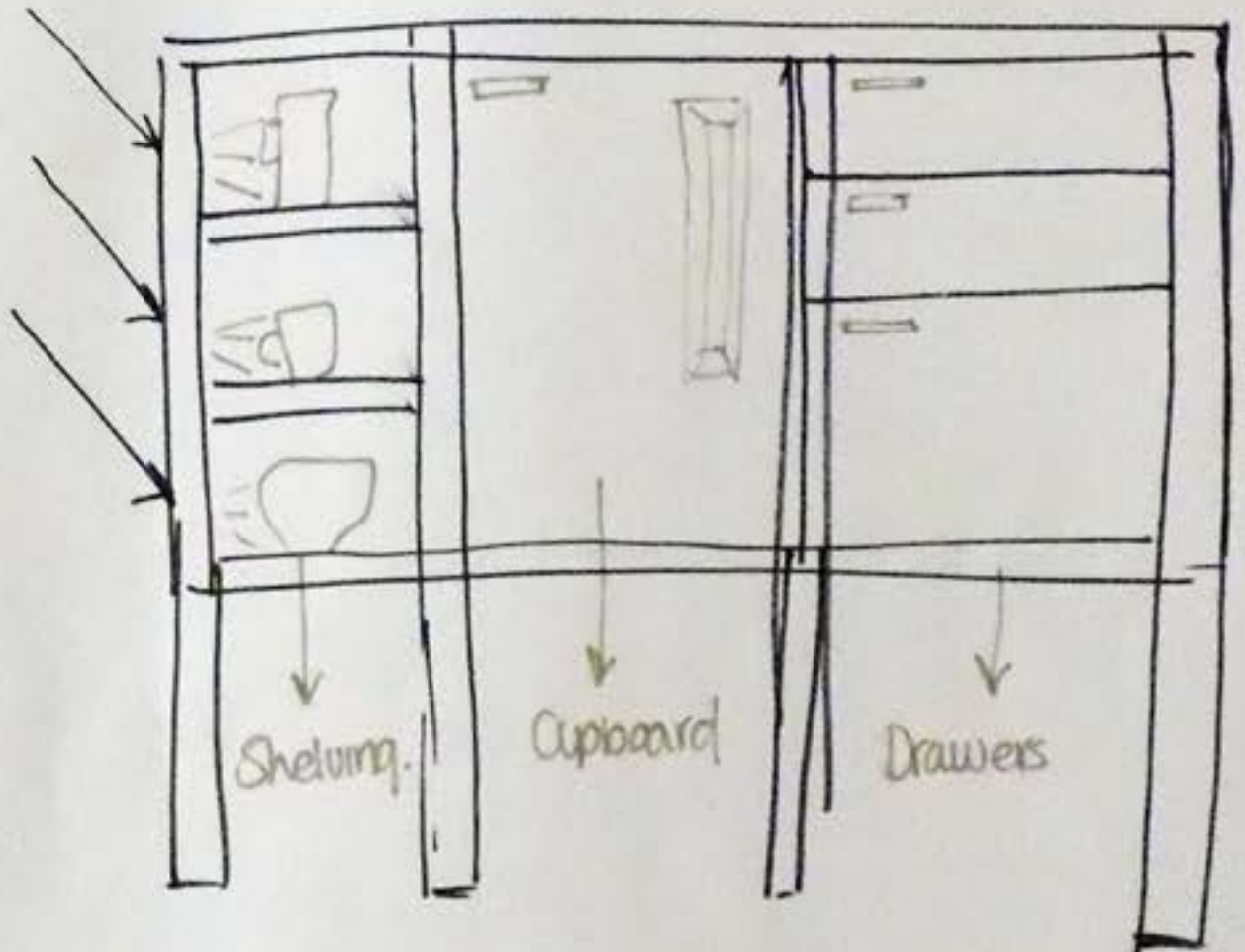
From this floor plan supplied from the English Heritage association. We can clearly see how the barn is laid out into bays, each bay containing an A frame.

We can also see how the Barn doors create large open through spaces that would allow light to flood through the space yet casting the adjacent areas and bays into darkness to maintain not only a cool but shelters area to store grain and produce.

Wide Unit - Storage



1.100 (100 x 100)



Shelving

Cupboard

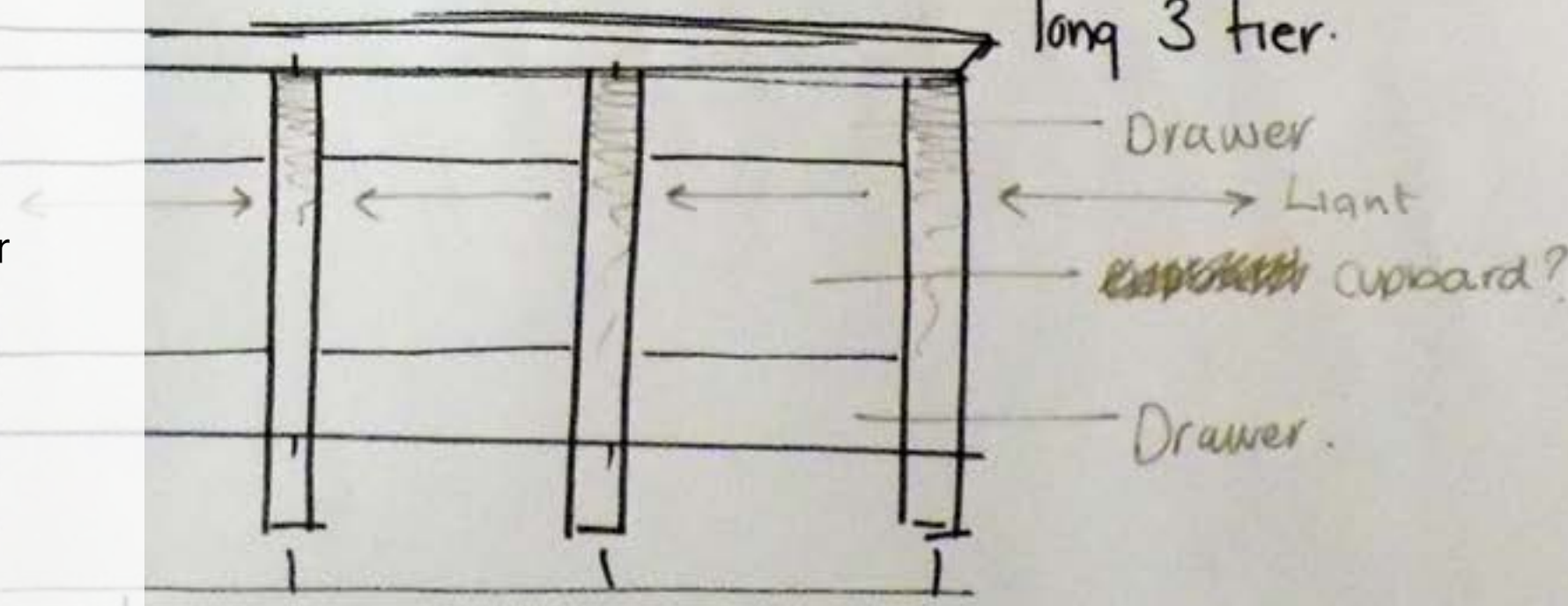
Drawers

model this in Sketchup

I want to apply this same method of shutting off and allowing light to pass through the cabinet.

This method of light direction is what gives the Tisbury barn its edge when displaying large sculptural pieces and also aids in creating the dynamic lighting spread throughout the barn. Being able to imitate this process in the cabinet would allow the consumer to create their own dynamic display spaces for their objects as well as creating hiding spaces for others.

Using semi permanent shutters that can be added or removed will allow the consumer to have control over the light coming in and out of the cabinet giving them a versatile environment to play with.



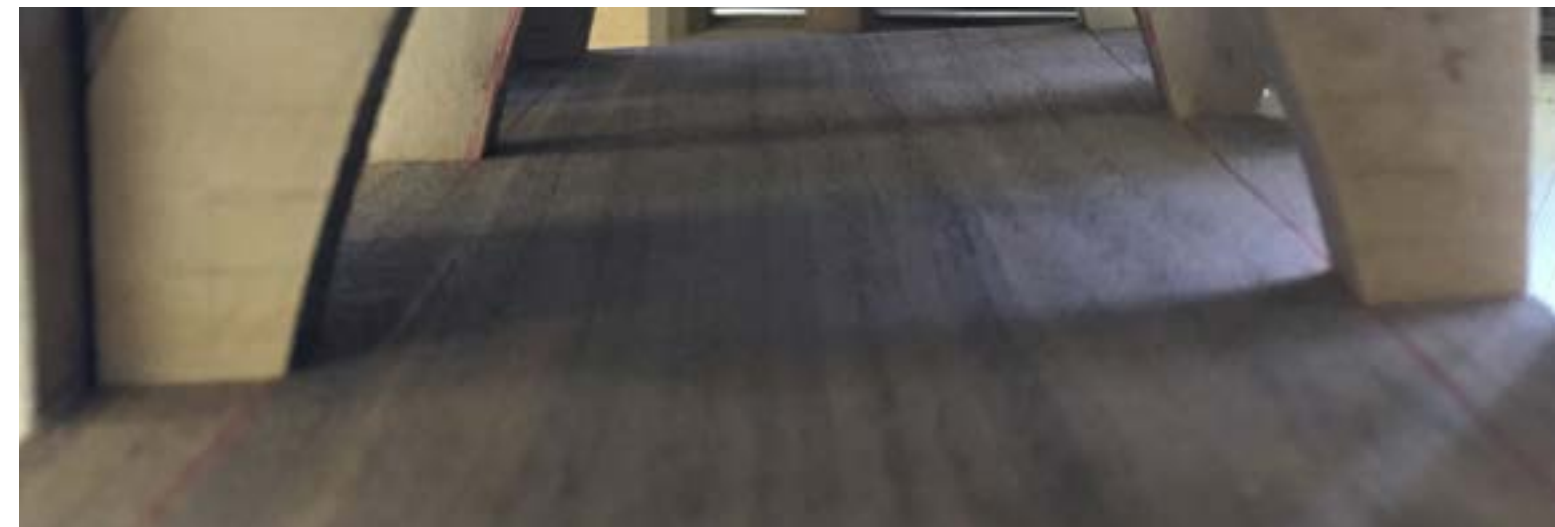
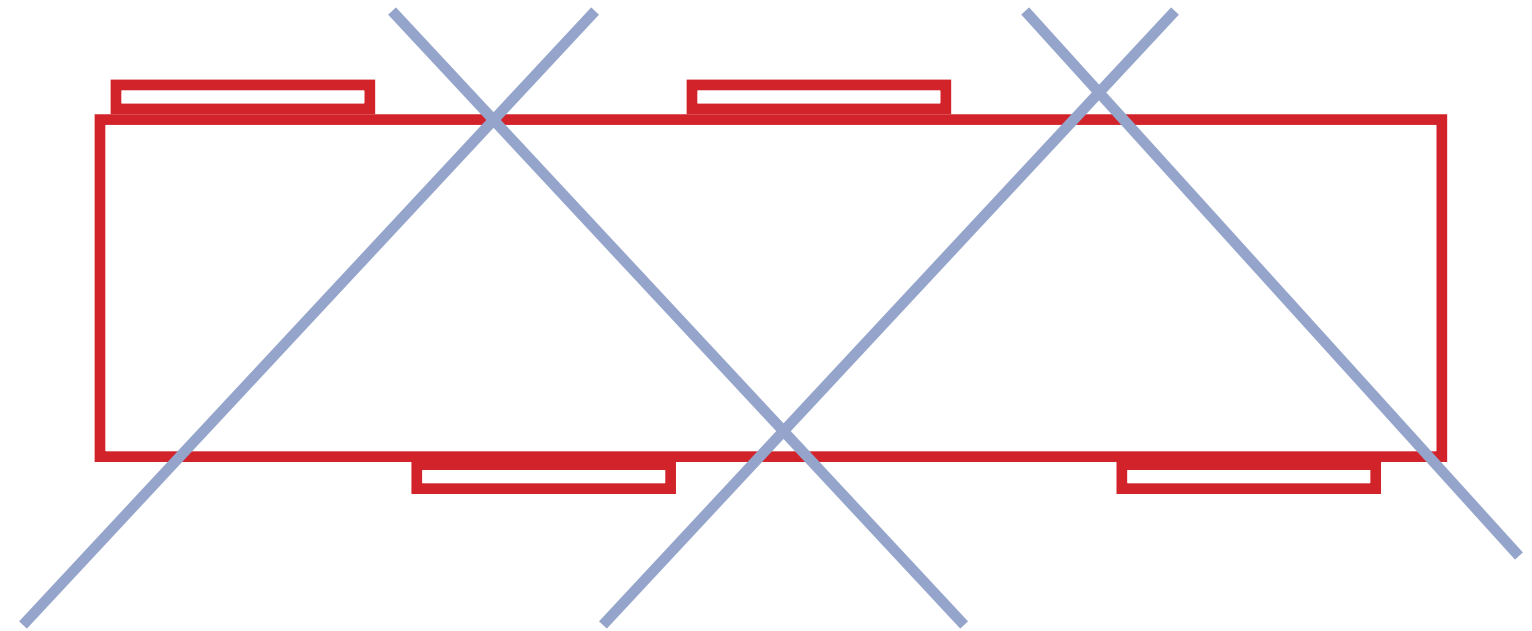
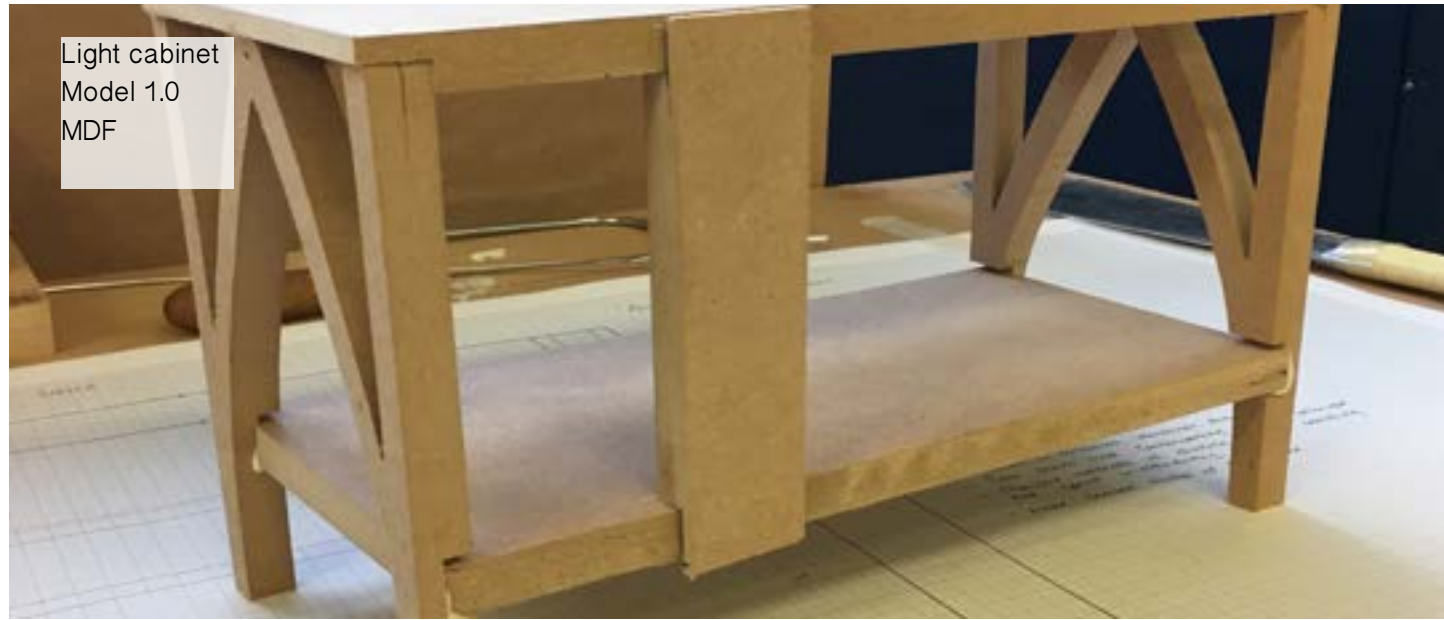
long 3 tier

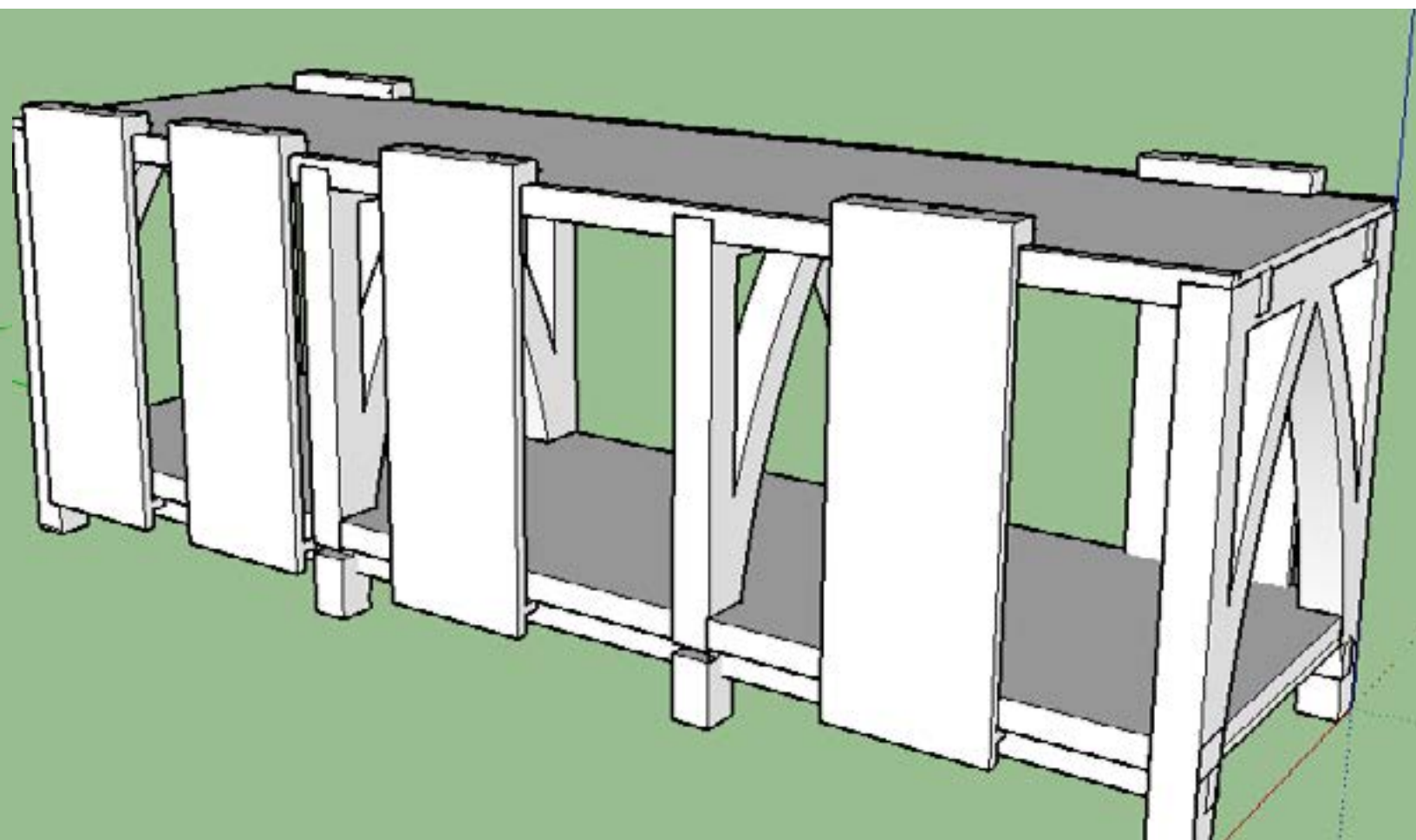
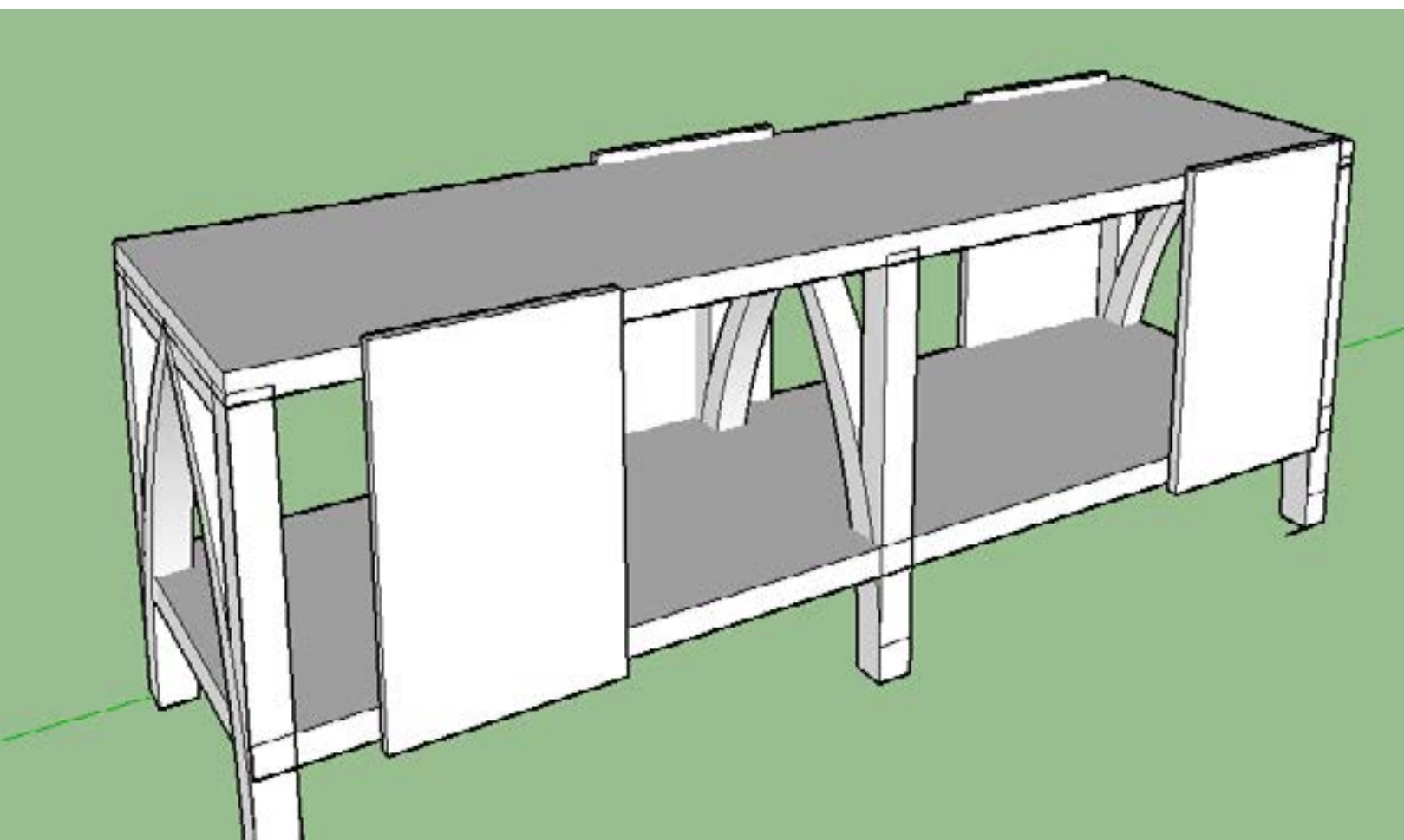
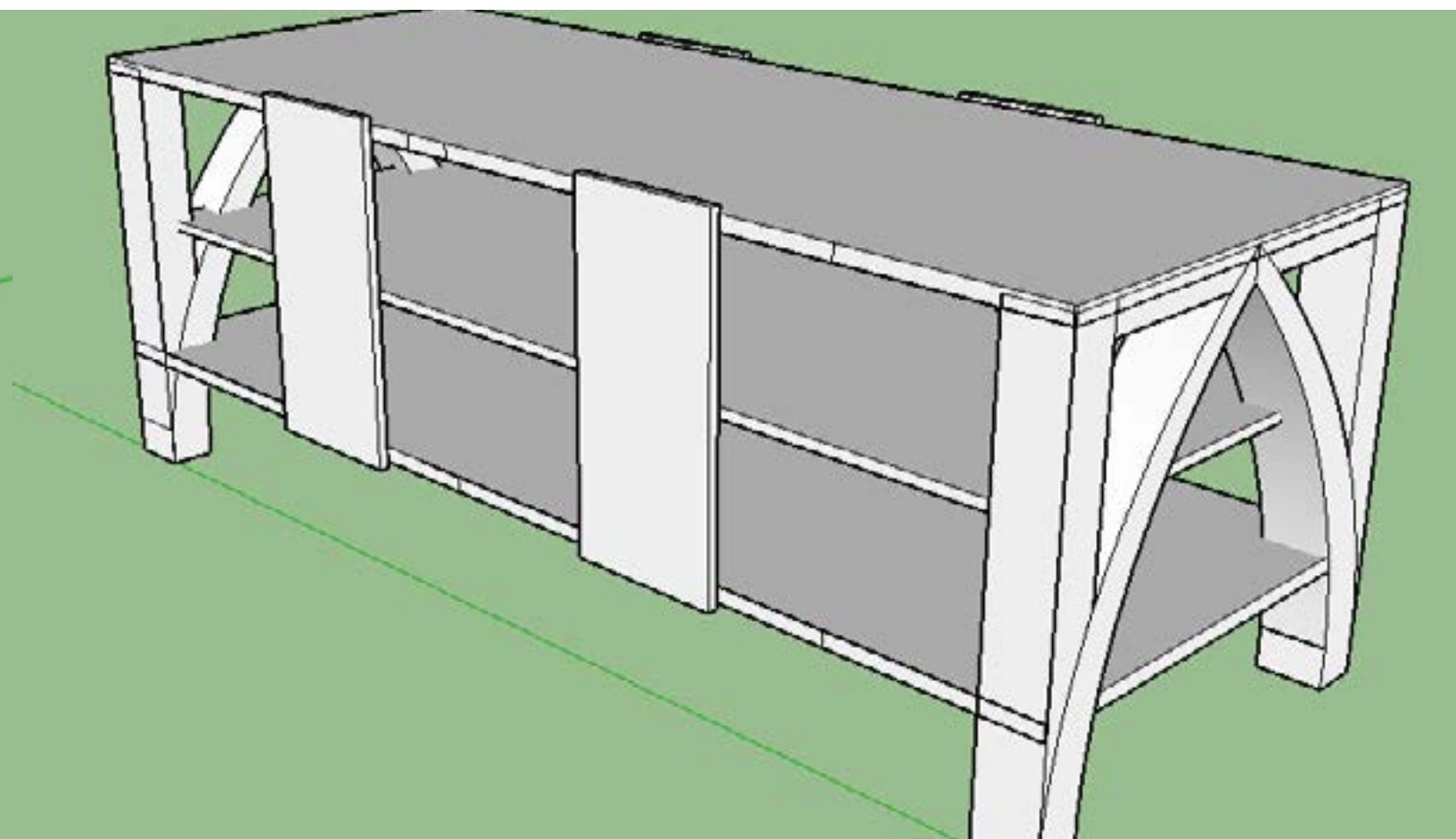
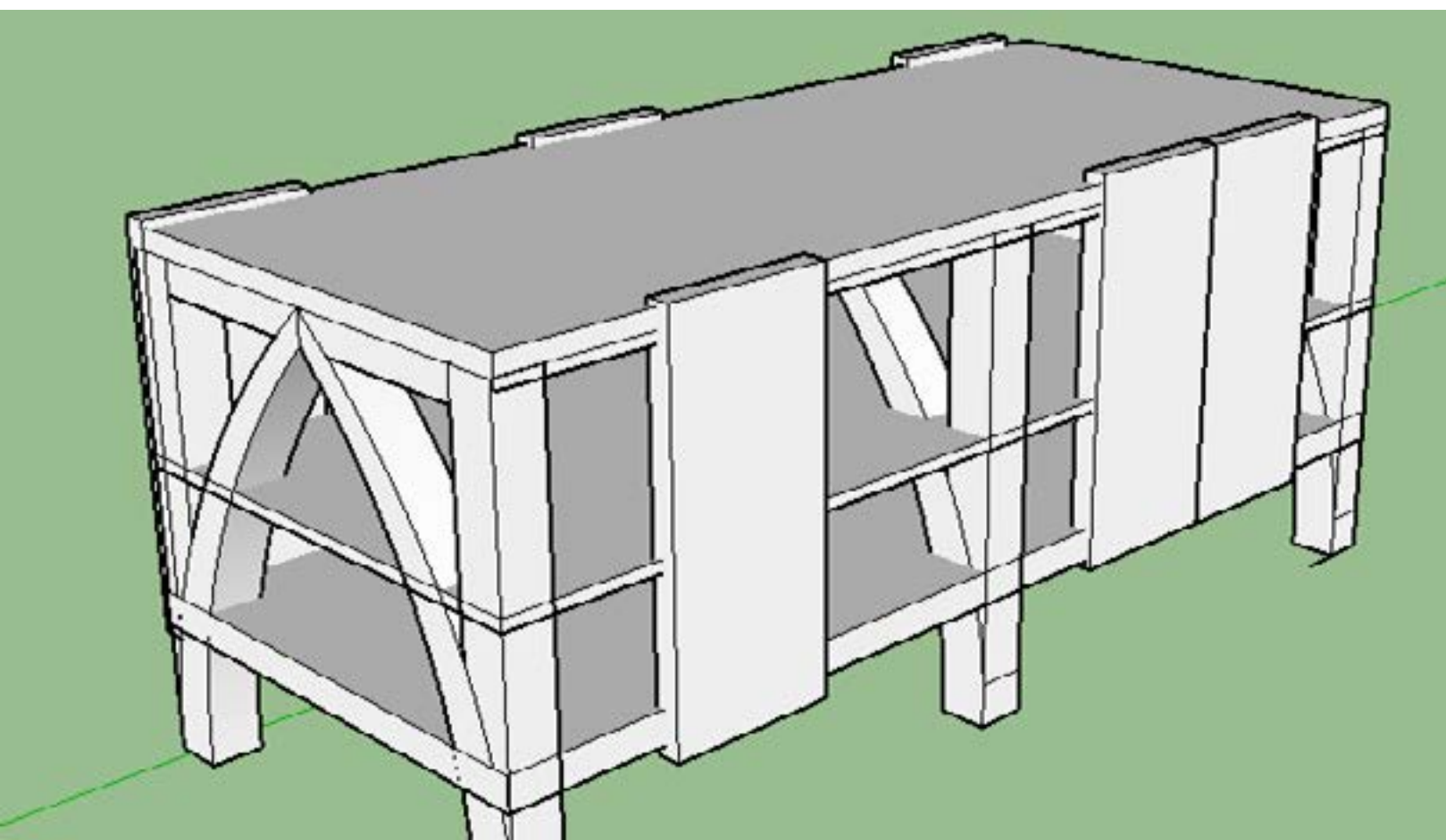
Drawer

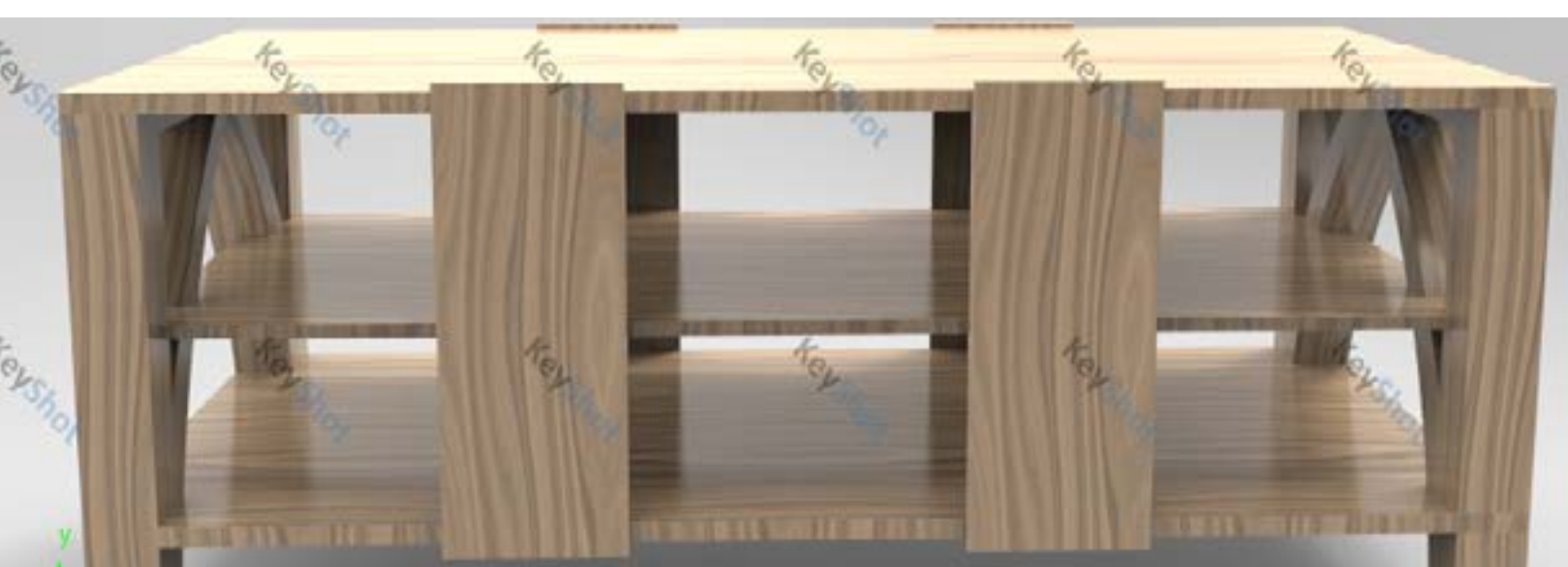
Liant

~~Cupboard~~ Cupboard?

Drawer

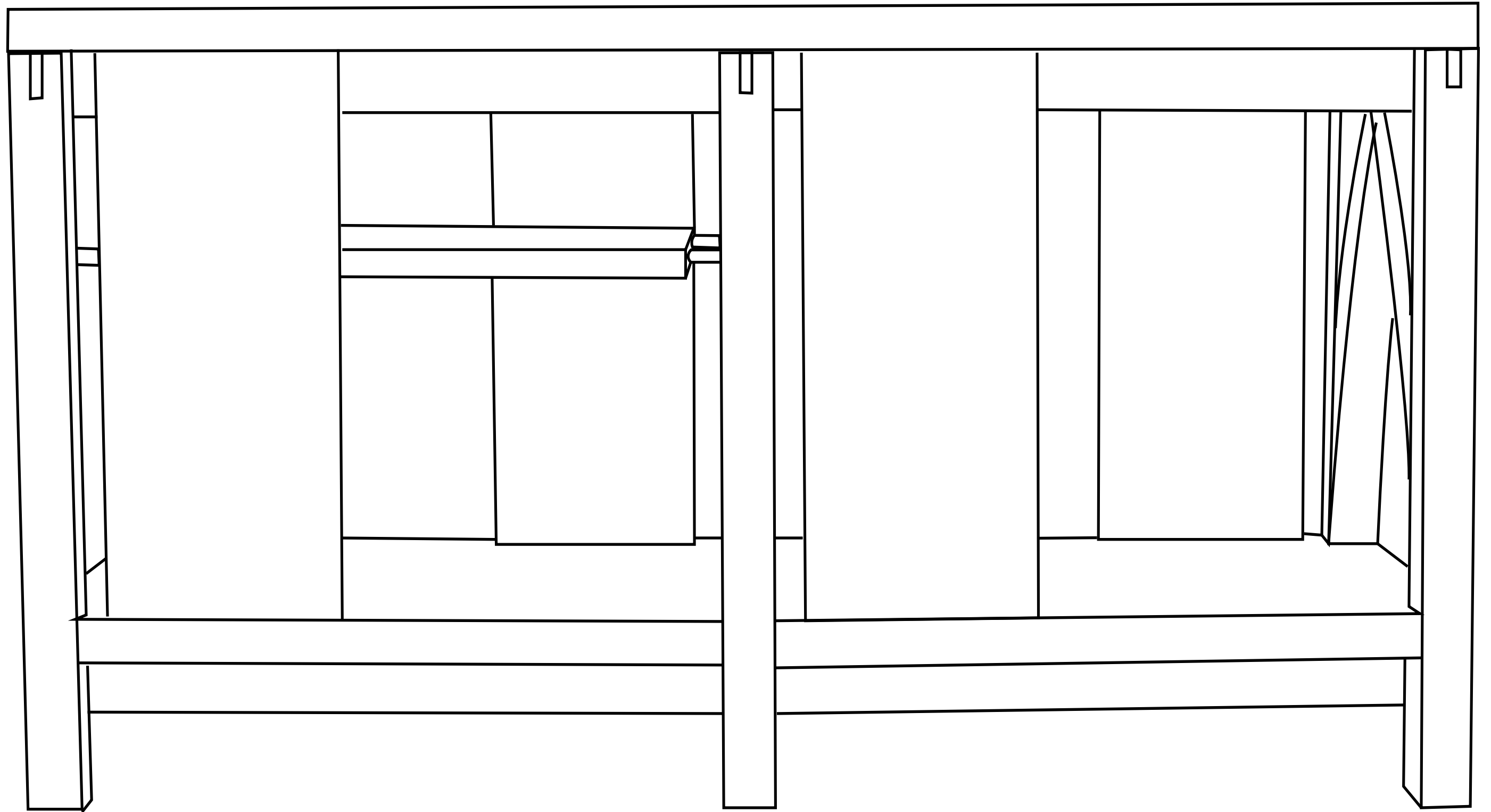


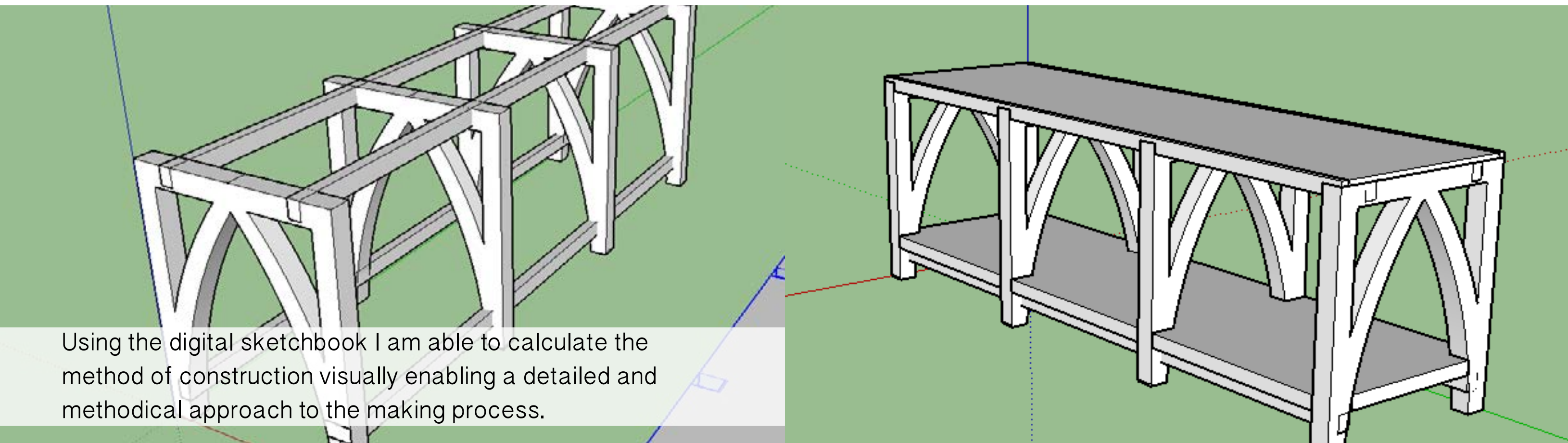
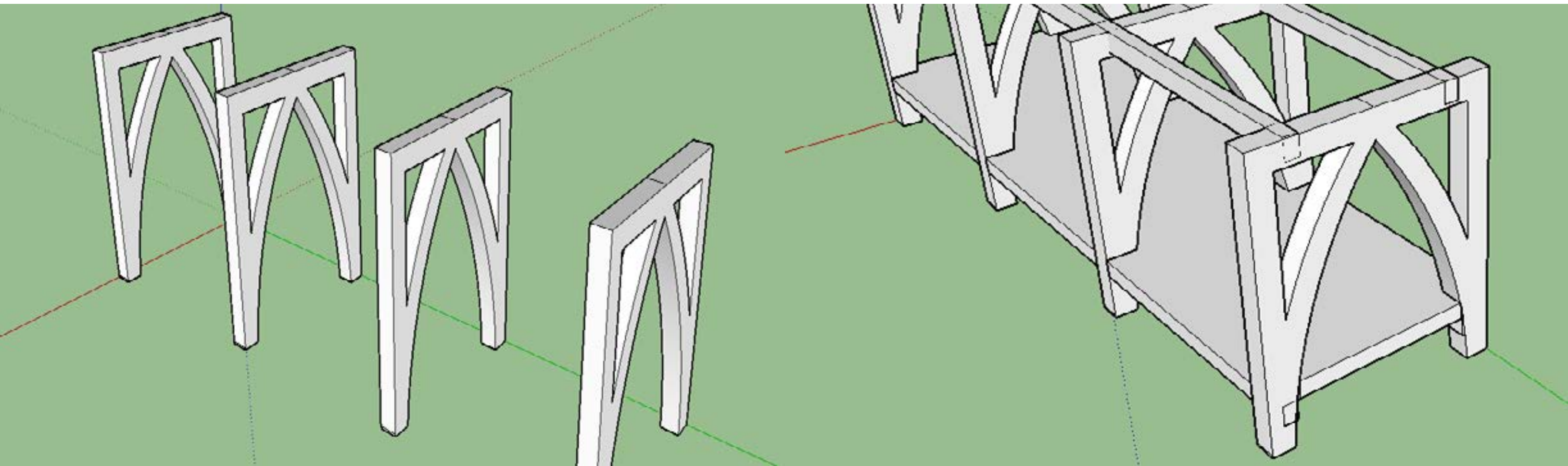


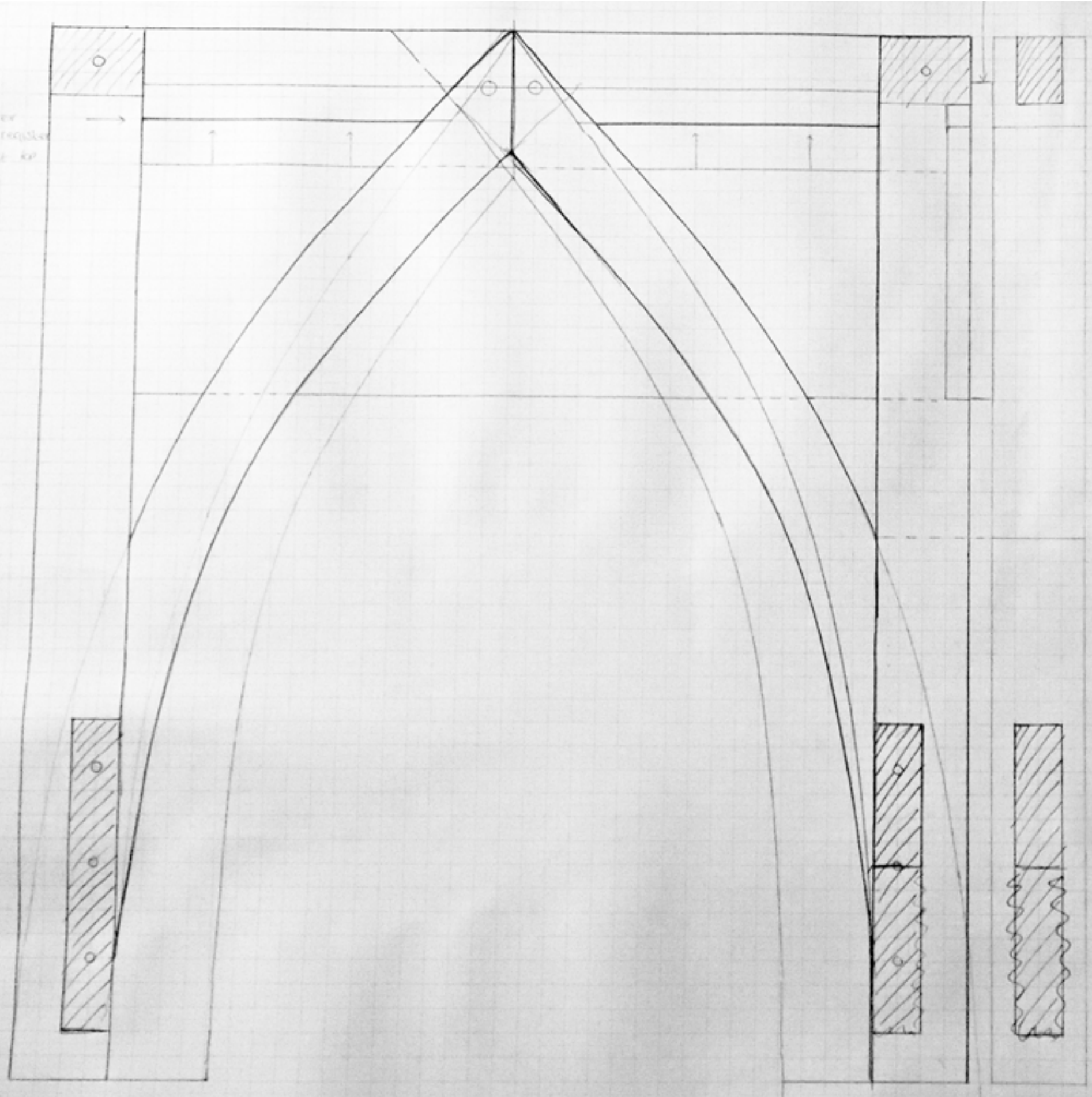


PART THREE.
THE MAKING OF...

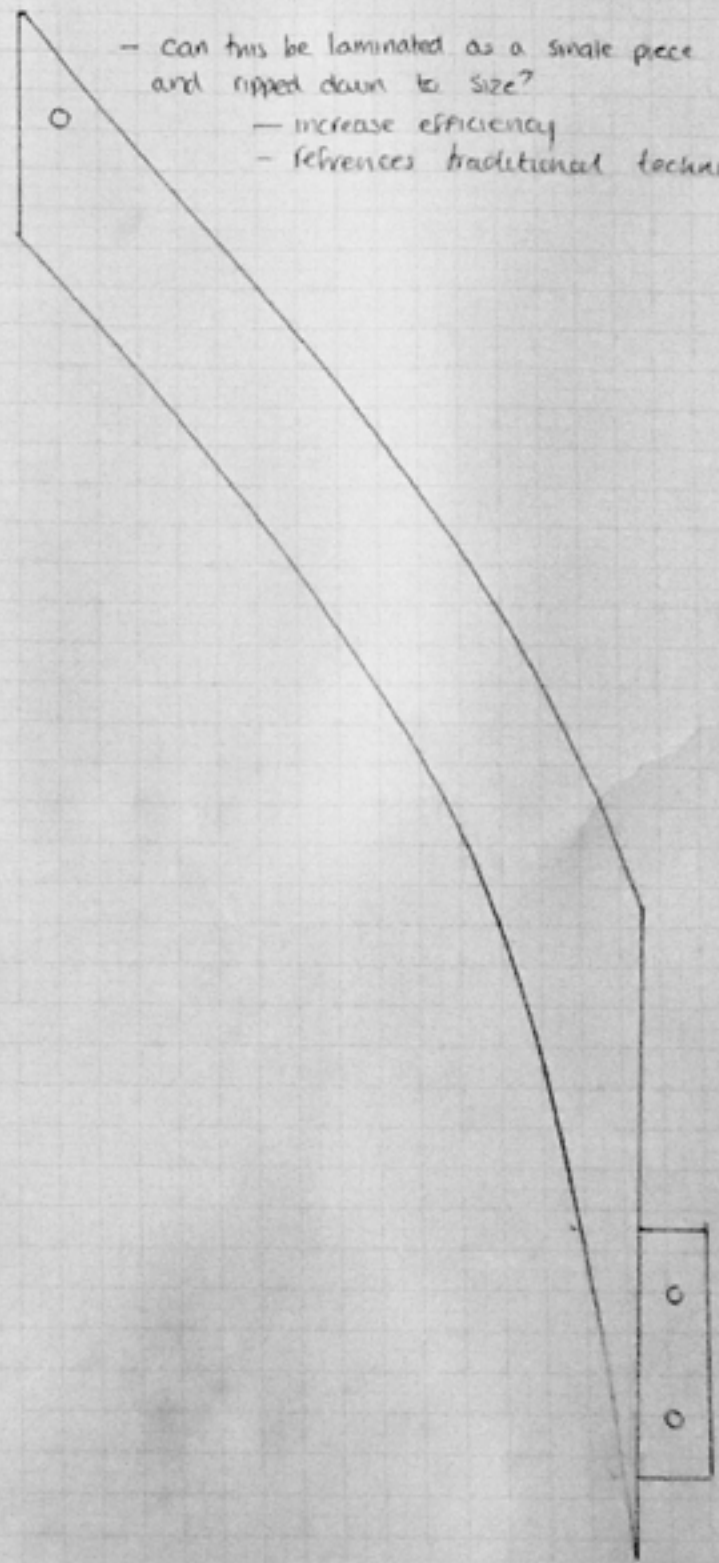
A Cruck frame is where the structure of the building depends on two or more 'A-frames' which go from the top of the building down to the ground. These frames are usually constructed of curved timbers (the cruck blades) using the natural shape of a tree and in many cases the tree is sliced long-ways down the middle so that whatever the shape of the curve the two sides are symmetrical. The two beams are joined together at the top by a 'collar' or tie-beam.







- can this be laminated as a single piece and ripped down to size?
 - increase efficiency
 - references traditional technique



To Do List

- make former for
 - cruck blades 3" w 60cm L
 - fit to template
 - cut laminations ash
 - cut/plane stock ash
 - draw & make former for panels
- Stock
- x4 40mm x 450mm
 - x4 40mm x 400mm
 - x4 cruck blades
 - x2 form posts

- it will definitely be beneficial to crowd this with the drawer as a demonstration of occupation of space

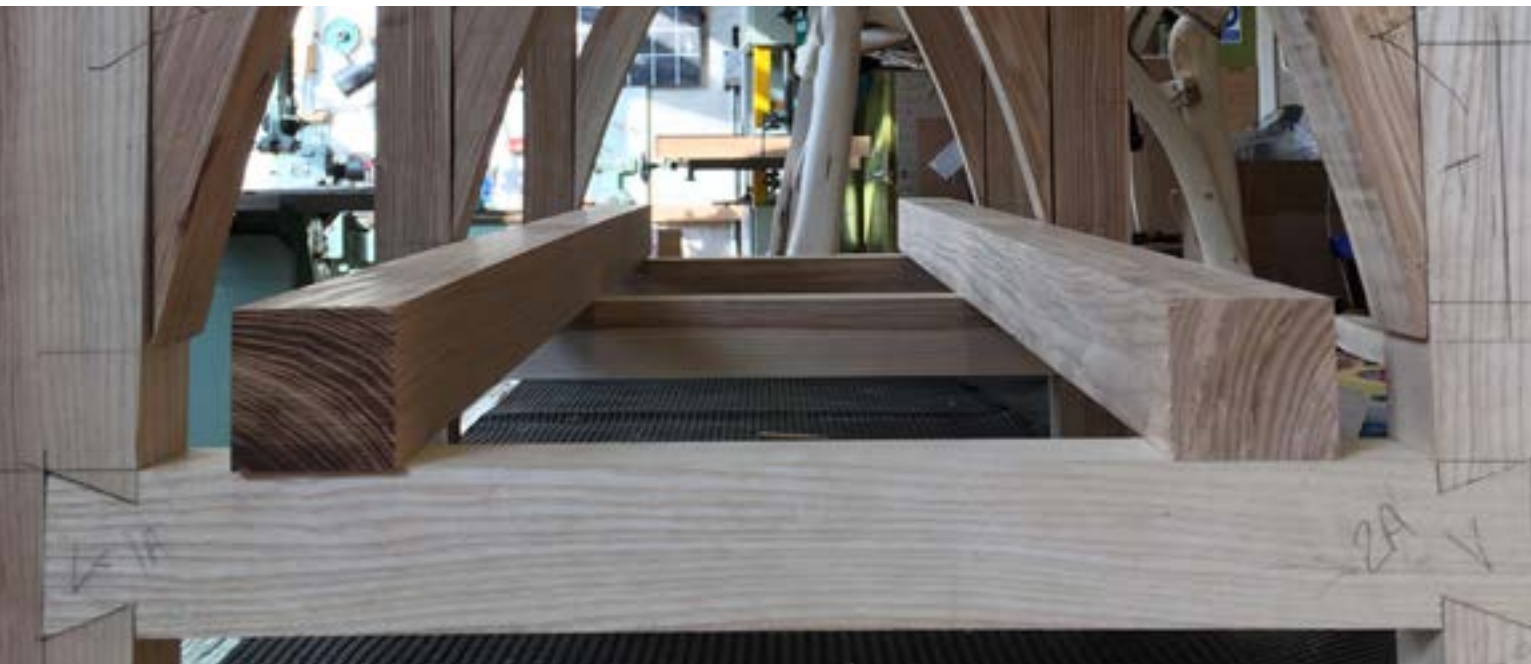


Using a jig designed to be disassembled in order remove the laminations. I am able to produce two cruck blades at once, creating two identical half's. As the curve of the blades are not regular, this was the most accurate way to ensure I had two identical half's minimizing the variables that may differ the outcome.

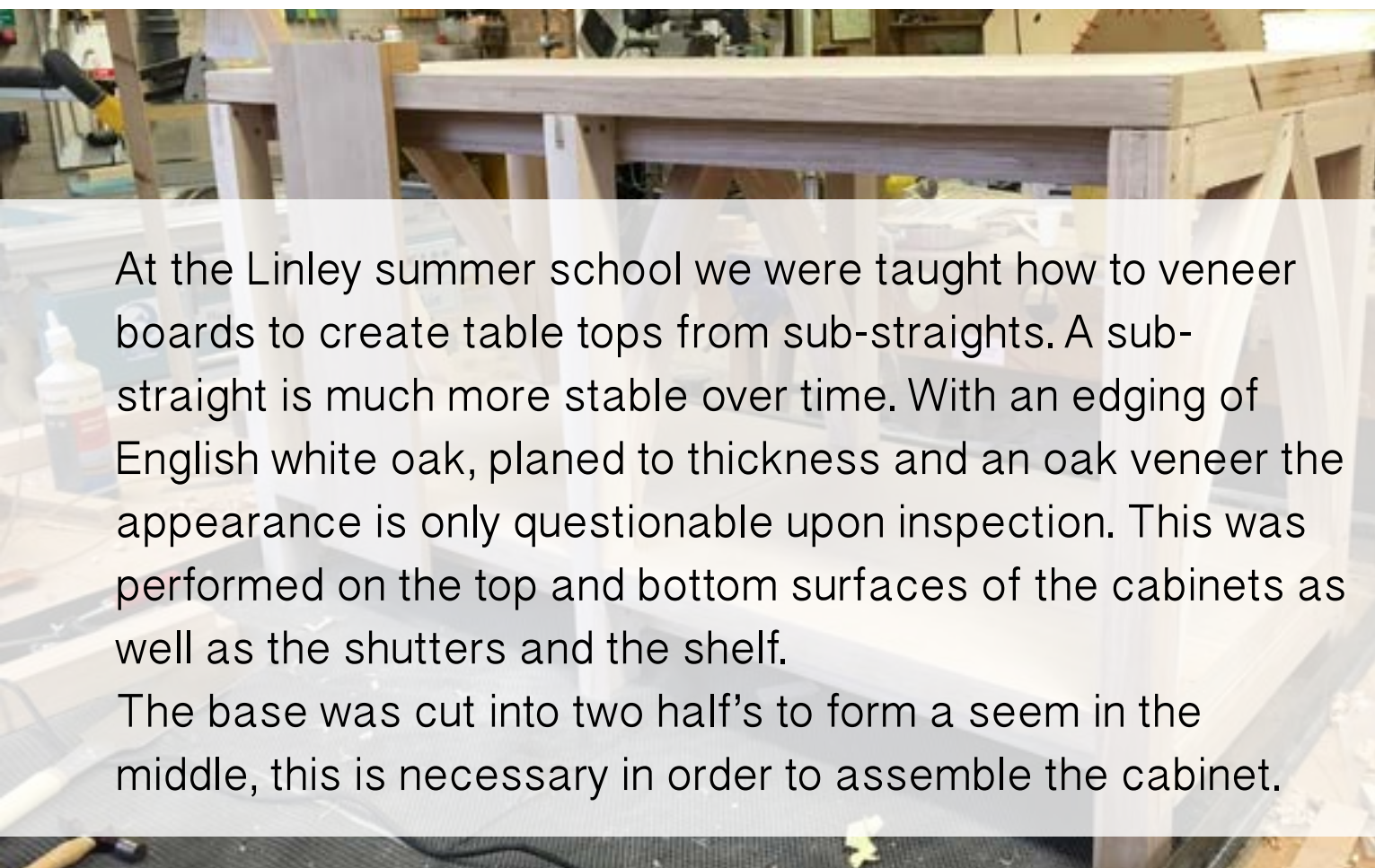
This component uses a bridle joint at one end to join to the collar at the top; and uses a mortise and tenon to join to the posts. The joints are all hand cut and paired keeping the construction as traditional as possible.



Using a three part bridle joint discussed in part two I connect the two cruck blades to the collar beam securing them with a single peg in each blade. The collar beam then connects by a standard bridle to the jowl post's secured with two pegs at each end. The jowl posts connect at the bottom via a tie beam that is half lap dovetailed into each side, secured with a single peg. The cruck blades fit under tension into the jowl posts with a simple mortise and tenon.

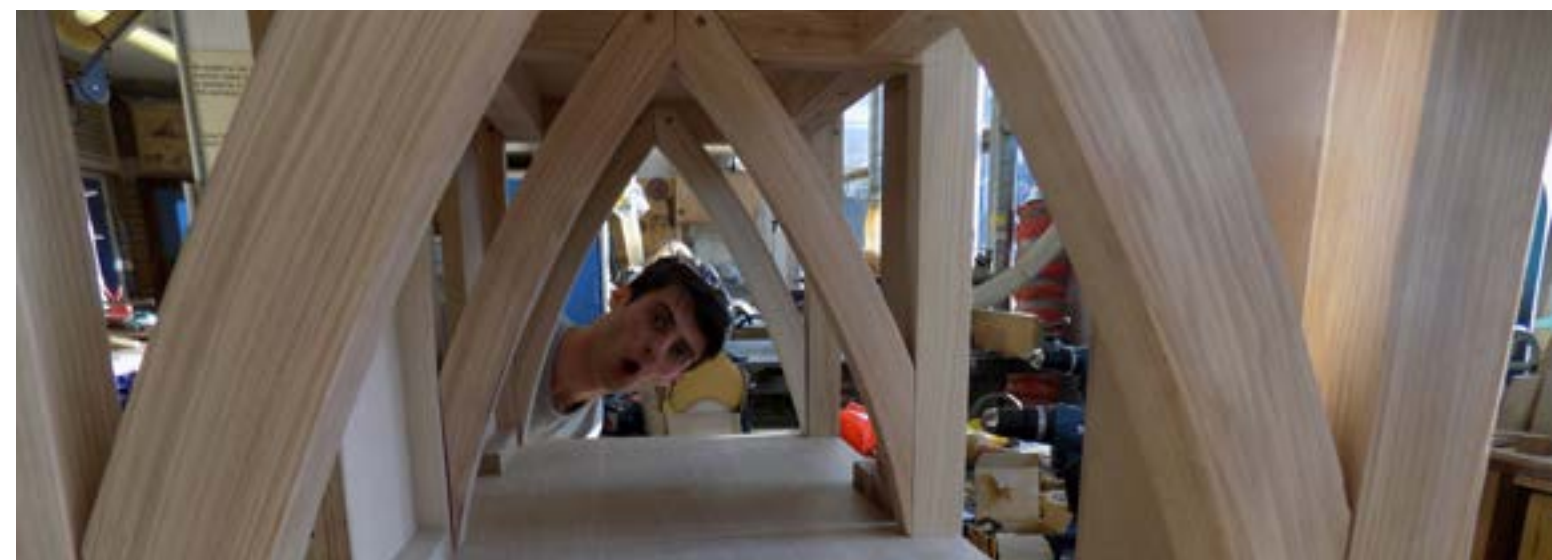


Each cruck frame is attached to one another with the use of four 'purlins'. These run the length of the cabinet, using a half lap joint in the middle cruck and a mortise and tenon at either end. The purpose of this cabinet is not only to display the construction principle of using multiple trusses but also to celebrate the ability to join material in this manner without the use of permanent fixings or glues. All the joinery within this cabinet will require only the strength of its own fit to maintain a stable structure.



At the Linley summer school we were taught how to veneer boards to create table tops from sub-straight. A sub-straight is much more stable over time. With an edging of English white oak, planed to thickness and an oak veneer the appearance is only questionable upon inspection. This was performed on the top and bottom surfaces of the cabinets as well as the shutters and the shelf.

The base was cut into two half's to form a seem in the middle, this is necessary in order to assemble the cabinet.





Assembly of the cabinet went smoothly. However, throughout the construction of this cabinet a lot of the joints, due to a lack of time and material were cut for the first time on the finished components. If I could have avoided this I feel like many of the gaps and crude edges could have been prevented. The gappy nature of the joints as well as a few other mis measured areas have taken away from the meticulous finish that I wanted to initially achieve. However, in reflection they are responsible for much of the cabinet's character and have become part of the language of the object. Overall I am pleased with the result, and positive that the item communicates the presence of the barn effectively.



Oiled to a golden finish. This cabinet is a positive reflection of the materials, techniques, processes and presence of a traditional English timber framed building.

Built by hand this object is a demonstration of how contemporary digital design processes can be paired with an appreciation for traditional craft.

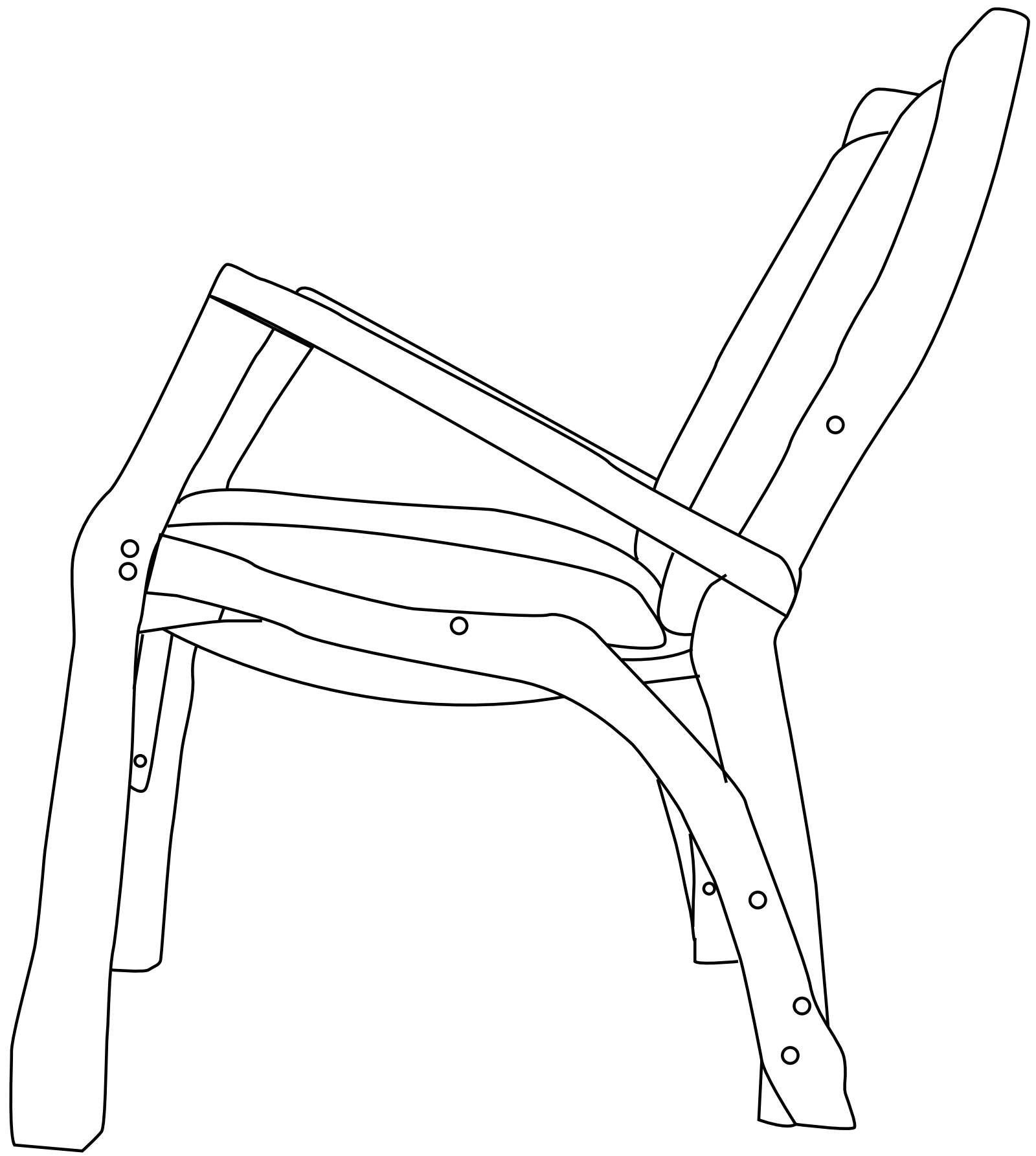
Inspired by the craftsmanship and intricate joinery exercised by the craftsman that raised the Tisbury Tithe Barn. This cabinet is not only testament to the history books of construction and architecture but also delivers a bridge between then and now.



Built as a display cabinet, The semi permanent shutters found in each bay of the frame, act as light filters, capable of shutting off or directing light into the interior space, projecting a natural spot light upon the content.

Built on a single level, the option of shelving enables a diverse use of the space, from storing books, plants, sculptures and the like.

The primary building principle of using bays enables this concept to be extended as far as the imagination will allow with the option of addition drawer or cupboard space.





During a trip to Cuckfield woodlands, I was able to retrieve and salvage what I found to be the appropriate components needed to build a chair. Taking into consideration the bends and the thickness of the timber I began by assembling a vague profile on the forest floor changing out pieces until a profile I was happy with took shape.



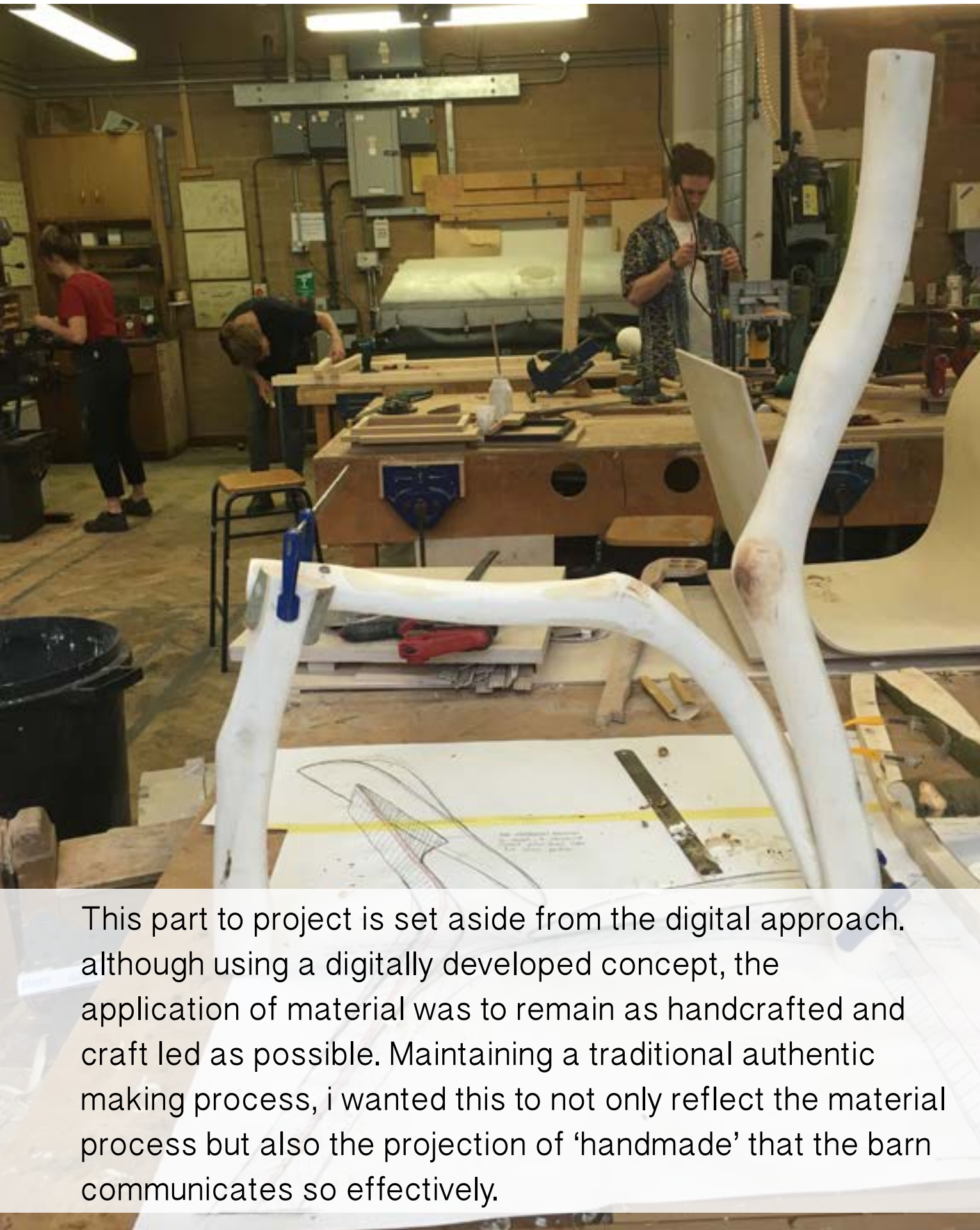
Each branch was ripped down the centers following the natural contours of the branch as much as possible, This was necessary to dry the timbers and to begin to understand how the sections would join together. The sycamore that I collected contained a spalting throughout the centers of the branches, that when split creates a very pleasing pattern reflecting the symmetry of the two sides.



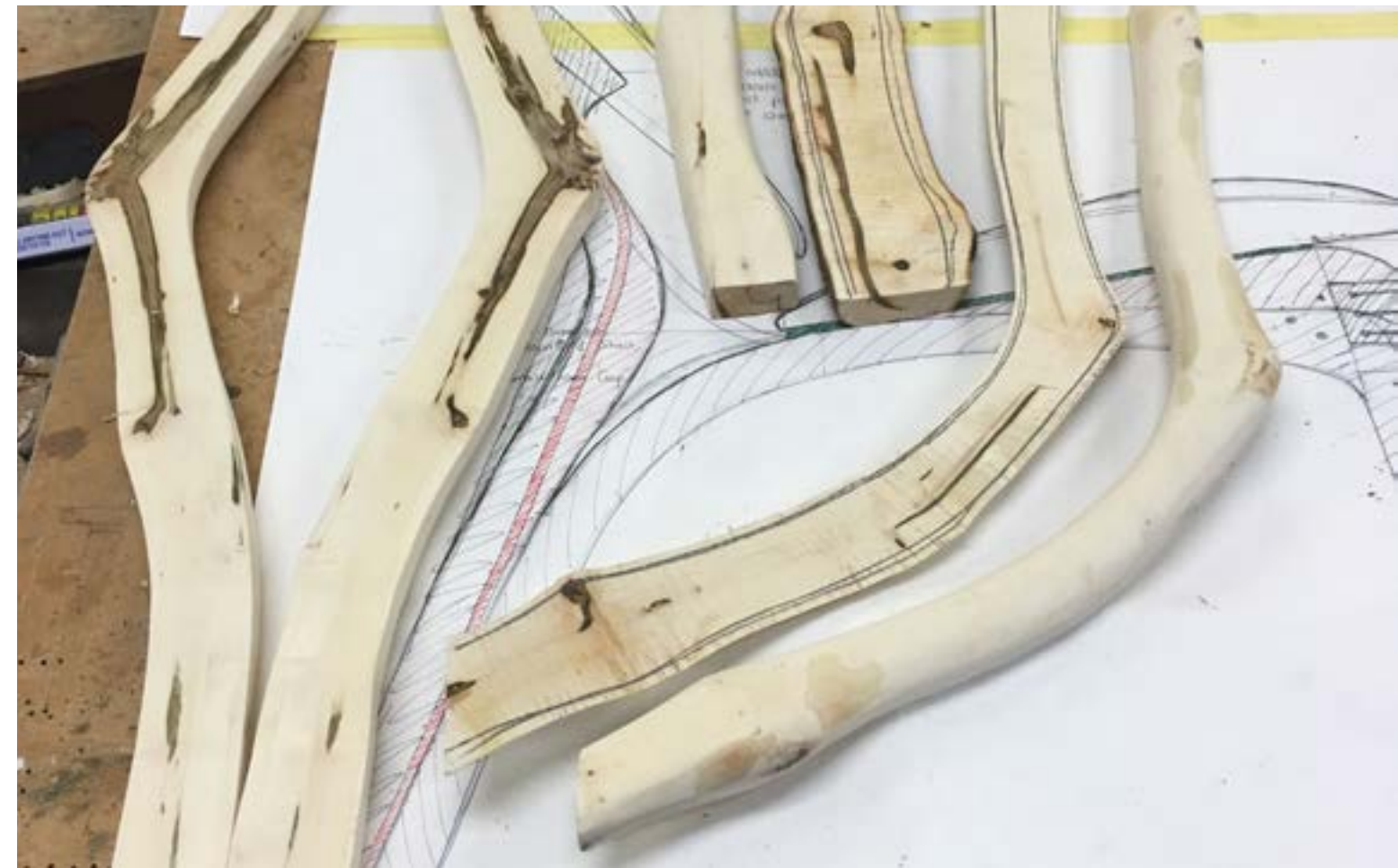


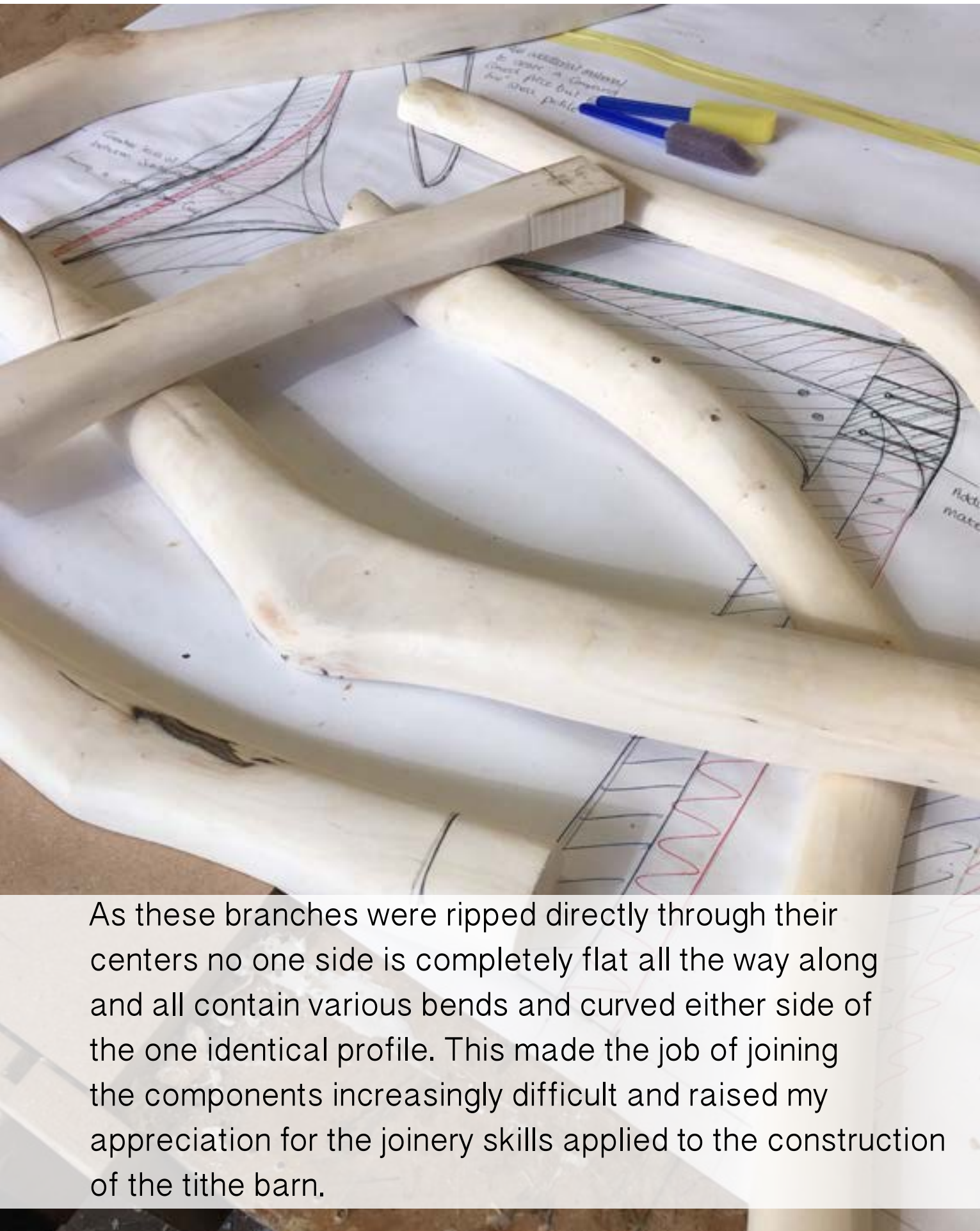
With a spokeshave I began to remove the bark from the branches to expose the bare timber beneath. I found later on that this process has also aided in the drying of the timbers, as their moisture content had dropped by 25% by the following day.

Removing the bark began to shape these branches as components and after a light sanding I began to piece the components together planning and marking the joints as I went.

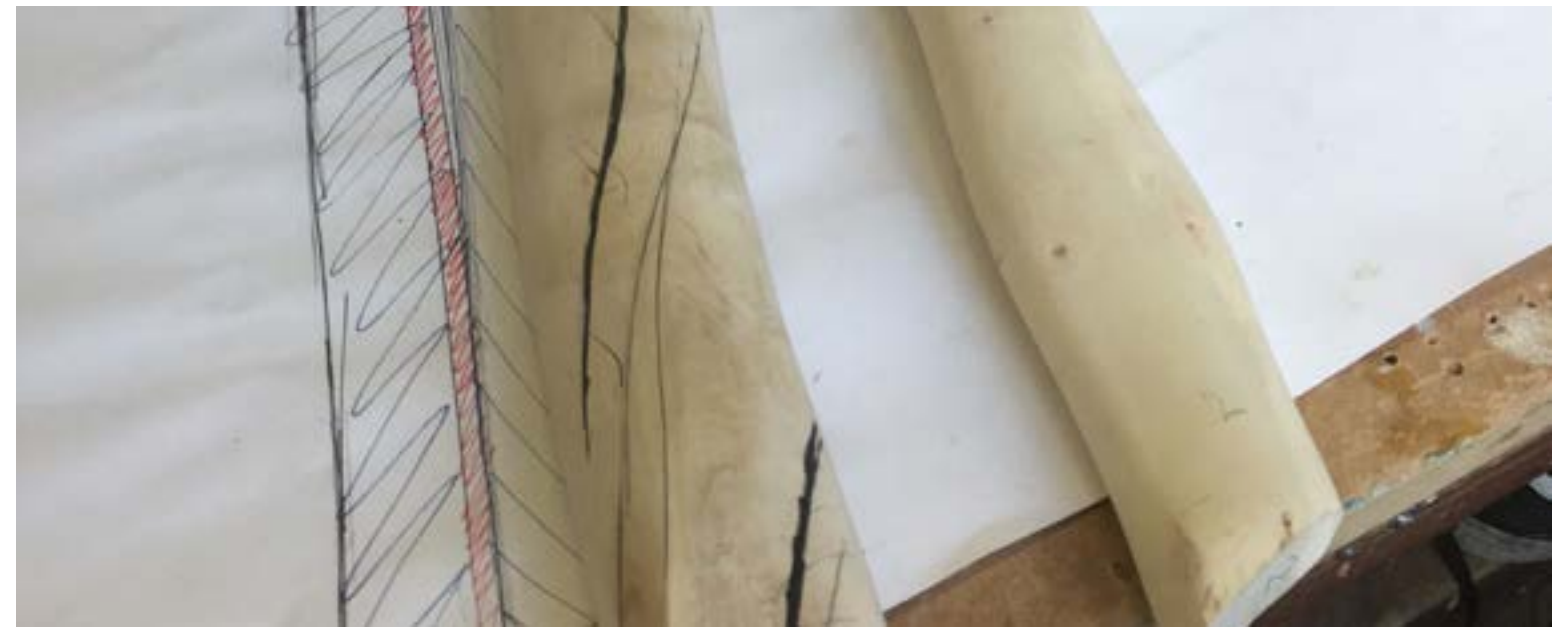


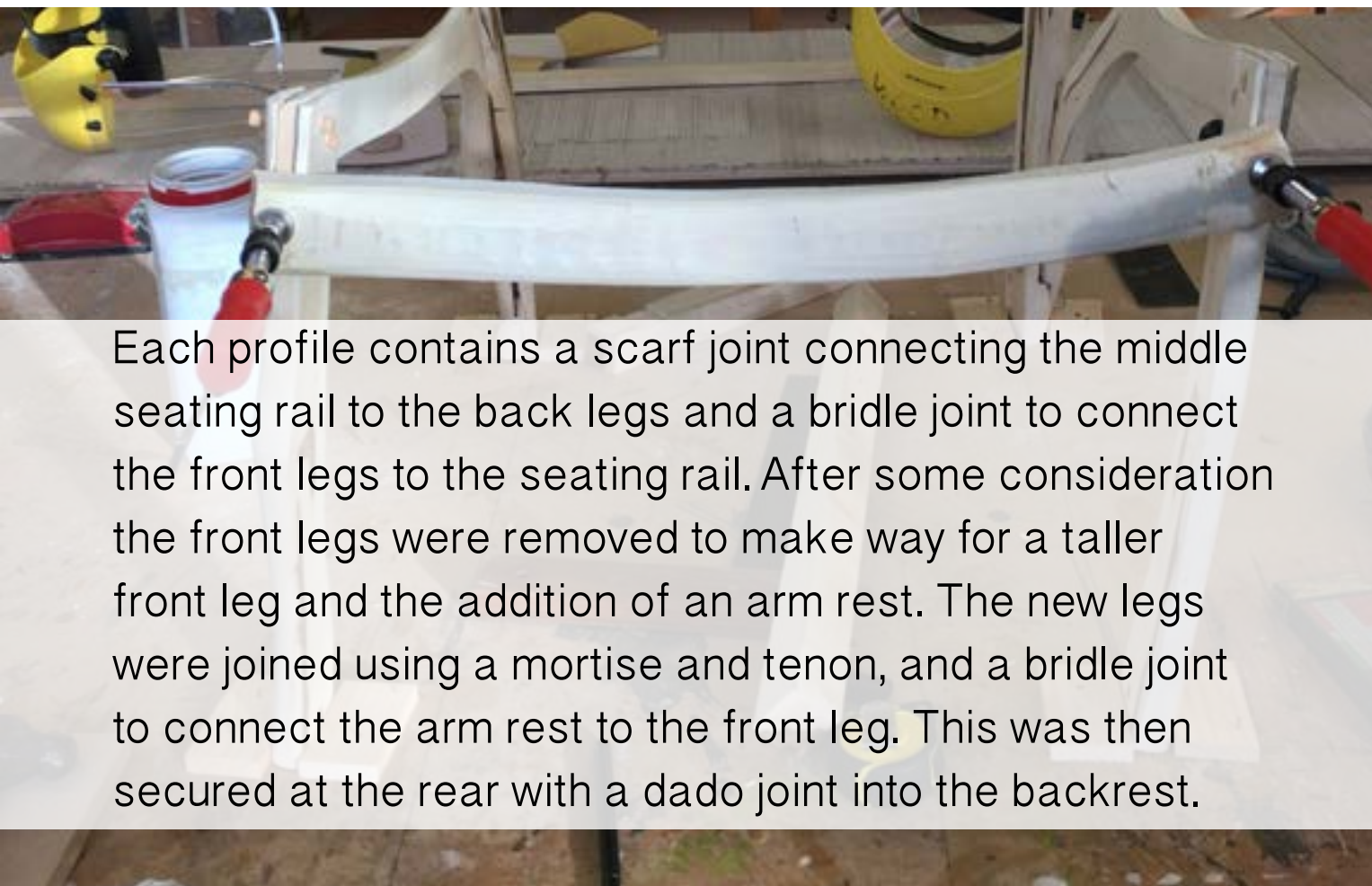
This part to project is set aside from the digital approach, although using a digitally developed concept, the application of material was to remain as handcrafted and craft led as possible. Maintaining a traditional authentic making process, i wanted this to not only reflect the material process but also the projection of 'handmade' that the barn communicates so effectively.





As these branches were ripped directly through their centers no one side is completely flat all the way along and all contain various bends and curved either side of the one identical profile. This made the job of joining the components increasingly difficult and raised my appreciation for the joinery skills applied to the construction of the tithe barn.



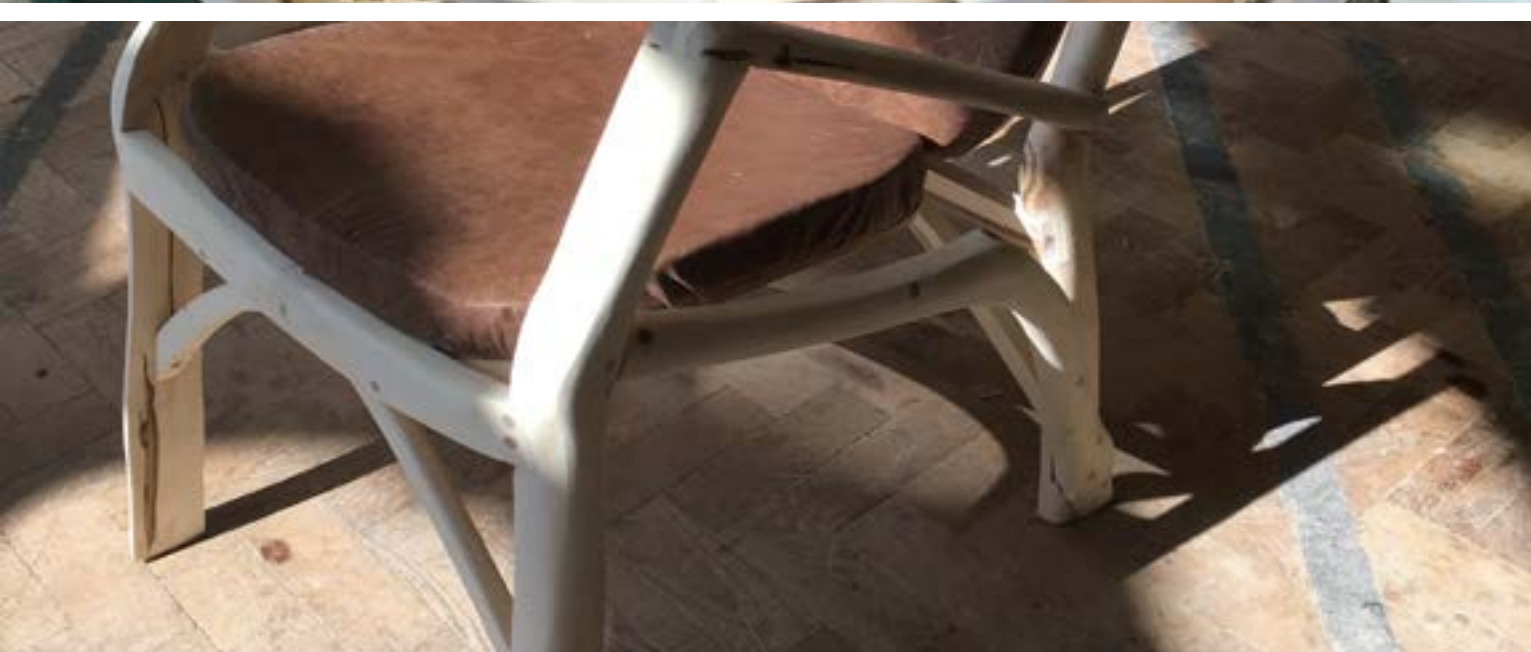




Following the same assembly pattern as the Profile chair models the two profiles are secured together with the use of purlins at the front and back. These are then secured with the use of curved braces that are also cut from naturally occurring curves. These are secured using tenons and dowels.

Due to the nature of this concept, I had no choice but to assemble it using glue but given further development I not only would have used hide glue but I would ensure that the joinery would be able to hold its own weight.





With the addition of a rail to the bottom and to the back of the chair. Two leather cushions are attached using a mechanical fixing.

The cushions are upholstered onto a laminated plywood shell giving the cushion a concave shape, and are covered using a simple clamping method, stretching and tacking the leather in place. The release of the clamps fill the cushions with air creating a simple yet effective technique. The backs of the cushions are then covered in an identical plywood shell matching the same radius, covered in the same tobacco tan aniline cow hide hiding the tacks and excess material .

The frame is shaped by hand using a rasp and sanded smooth to create an organically flowing form created using hand selected timbers.

Finished with two coats of Danish oil sealing it from moisture and protecting it from the wears of everyday life. The natural luster of the sycamore grain jumps through the wood in places, remaining bone like and quiet in others.

Communicating the aesthetics and presence of an age old timber barn, this chair stands testament to the techniques and abilities of our ancestors.





Presenting an alternative to traditional hand made furniture, and providing a different level of finish usually found with green wood furniture.

This chair communicates a historical story of man over material. It boldly displays proven, tried and tested methods of construction associated typically with that of timber frames buildings. yet makes it accessible to be appreciated with in the home.

Upholstered in an aniline tobacco tan cow hide, It represents all things natural and removes it self from the modern world of furniture by standing apart as a crafted object made to be only once, incapable of replication.

A Critical Reveiw;

Light Cabinet -

Having never attempted a cabinet before I feel like this area of the project in particular has been a steep learning curve in all aspects, from material knowledge, processes and the importance of accuracy when producing self reliant joinery. I was given the opportunity to exercise a lot of techniques that I have wanted to explore; and to do so on a project based around a space so very close to me was a privilege.

I do feel that my research into the barn is lacking primary information, as during my visit I was not aware of the project ahead and didn't for see a need to gather the necessary information. Because of this I feel like the development of the cabinet concepts have suffered slightly.

Similarly though, I think the lack of primary sourced information and the reliance on my experience has produces a more authentically aesthetic outcome over an outcome bearing an vague resemblance based on appearance alone.



Woodland chair -

On reflection, this chair has been an intense procedure to endure. Learning and understanding to overcome the little annoyances that lay within green wood such as releasing tensions in the timbers, drying, curing and joining wood sourced from branches opposed to seasoned sawn timber. Has been something I have actually learnt to enjoy and appreciate.

When i first stepped into the Tithe barn in tisbury, my eye were immediately drawn to the crude and unconventional joinery that I was standing beneath and I hope that the unconventional, organic form that this chair takes provokes the same interest in others. I am now enthused to drive this concept forward and create a further series of items using various species of wood. But mainly I would like to apply the use of a 3d scanner.

This concept is something that will only get better with development, but what i find exciting about this concept is the bespoke and unique nature of the materials. no two will or can ever be the same.



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Thats a wrap