SCENIC CONSTRUCTION

Hannah Elwin



Learning Objectives:

- Display basic knowledge and understanding of scenic construction.
- Operate hand and machine tools commonly used in scenic construction in line with Health and Safety procedures.
- Display practical knowledge and understanding of the applications of CAD through the generation of technical drawings and ground plans in order to construct scenic units

"Turning fantasy into reality" Design and Visual





"We don't just design... We imagine, plan, and refine to ensure that we always lay the right foundations for success" Scruffy Dog

Student Number - 2101098

WORKSHOP RULES

Health and Saftey

- Always wear the correct PPE, this includes;
  - Masks with the correct filter if necessary
  - Steel tap capped boots
  - Saftey goggles if needed
  - Ear defenders if necessary
- No loose clothing that could catch in anything
- Hair tied up
- Gloves if necessary
- No food or drinks
- Don't work alone

Eyes. Ears. Feet.





Relevant HSE

This HSE, HSE (2021), states when PPE is necessary and what type of PPE is necessary as well as the laws for your emplyer and the employees. Also linked here are other relevent HSE for saftey in theatre.

- https://www.hse.gov.uk/entertainment/theatre-tv/theatre.htm
- https://www.hse.gov.uk/toolbox/ppe.htm

SAFTEY ON STAGE

The Health and Sfatey Act pasted in 1974 has several aspects that apply to theatre:

- Construction Design and Management Regulations 2015
- Control of Noise at Work Regulations 2005
- Control of Substances Hazardous to Health 2002
- Electricity at Work Regulations 1989
- Lifting Operations and Lifting Equipment Regulations 1998
- Provision and Use of Work Equipment Regulations 1998
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations, 2013
- Work at Height Regulations 2005

One important thing I have taken from these and from working theatre is that any materials used on stage have to be fire resistant. As they are close to high powered lights which can be pointed at them for hours at a time. This espeically applied to any material flying as it is very close to the lights and the theatre won't fly the cloths if they are not fire resistant.

Measure twice, cut once

Always measure the line you are going to cut and draw across the wood using a set square to make sure it is straight and double check the length after you have drawn the line across. Always measure the wood you have received as well as it will not come to the exact size you order and check the factory cut edge is straight using a set square.

Materials

You want scenery to be lightweight and cheap as it is always temporary. However, saying that it does need to be sturdy and especially for touring sets they need to be durable so that they can be moved and travel without breaking. The most common material I will use is wood, to make flats, treads, braces, etc.

There are many different types and sizes of wood. The most common type I will use is plywood, but again there are different types of plywood, with different purposes, such as:

- red and white
- hardwood
- birch and marine, which are waterproof and flexible

In this industry the generic sizes of plywood you will mainly use are 3, 6, 9 and 18mm thick. 3mm is flimsy whereas 6mm will last longer. If you are making something such as treads which will be stood on they will be made of thicker plywood, so that it has enough strength. One sheet of plywood is generallly 8 foot by 4 foot, also 2440mm by 1220mm.

The generic sizes of wood,

- 3 mobile, which is 3" wide by 1" thick
- 3" wide by 2" thick
- 6" wide by 1" thick
- 8" wide by 1" thick
- 2" wide by 1" thick

However you order wood in meters and they are not accurate as it depends on which factory and machines are used. So always measure the wood rather than assuming it is the correct size. Measure twice, cut once.
You also get smooth wood which is planed all round and rough wood which is not.



Other materials I have used include polystyrene and contact adhesive. To use contact adhesive you have to spread it evenly over both surfaces, leave it to become tacky. When you put the 2 pieces together you can not move them so they need to be put together accurately.

Equipment

Including study task 1

Drills and Drill Bits and Screwdrivers



The drills we use at university are festool drills as is most of the equipment. To drill you attach the drill bit and lock it in, make sure the drill is set to 2. The switch by the trigger should be pushed to the left to drill and right when bringing it out as it changes the direction of the drill, clockwise to drill in and anti-clockwise to bring the drill out. Clamp what you are going to drill and apply pressure with the drill.

Drill bits are different sizes, all measured in mm, and made for different materials. Drill bits with a spike are for wood, pitched with no spike are for metal and pitched with an exta side are for stone or masonary. You can use metal dril bit on wood but not the wood drill bit on metal

For screwdrivers you want it to be on 1 and you set the number to how deep you want to screw to go in, higher number means deeper, change this on a trial basis. You want to screw to be flush with the edge of the wood. Chose your length of screw based on how thick the wood is.



Countersink

The countersink and pilot bit are both used before screwing the screw in to prevent the wood spliting. You drill both with the drill on number 2. Again use the numbes to change how deep you drill. At university we have the drill bit and countersink attached like the image below.





Angle Grinder

An angle grinder is used for almost 'sanding' metal, it is helpful for things such as wearing down pins, that haven't gone fully into the material, to make them flush. You want everything to be flush so that nothing catches, either on the floor or on someone. Nails and pins not being flush creates a health and saftey risk.

Extractor

Most of the power tools have a connection for a power source and an extractor, which takes away dust, such as saw dust. Always attach the extractor FIRST by pushing and twisting onto the connection. The extractor has different settings, manul and auto. For most situations use auto, this means it will turn on with the tool.

Equipment

Rail Saw

When putting the rail onto your materials, make sure it covers the line you want to cut. The rail does not require clamps as the rubber underneath grips the material, however do be aware it could move as we have experience in the past so have someone ready to hold it. You can different sizze rails, use the one which's just bigger than what you want to cut, you don't want loads of rail hanging of the material. The knobs on the front change the angle of the blade, and the numbers on the front change the depth of the blade, you want it just deeper than the material. Start the saw with the balde out of the material, flick your thumb up on the switch and squeeze the trigger, THEN lower down the blade.





Table Saw

The table saw it the mos helpful when you ned to cut all the pieces of wood to the same width. You set the blade to a certain distance (mm), these measurments are on the table but double check with a tape measure. AS well as width you can alter the height and angle of the balde. Use the push sticks to pushthe wood through and out the other side when it gets close to the balade. It has a master on andoff switch on the edge of thetable, green means on and red means off. Keep the wood flush to the fence as you push it through.



Chop Saw

With the chop saw you can turn the laser withthe button behind the blade, this is helpful to know wherer the blade is going to cut. You are also able to change the angle and placement of the blade to cut diagonally. Start the saw by bringing the blade to the front, pressing on the buttons above and below the handle, then lower the blade and pishing it backwards through the wood. Make sure the blade is all the way down and keep the wood flush to the fence.



Jig Saw

The Jig Saw can be used for many different materials, you just change the blade. A blade with many peaks is for metal and a blade with feew soft peaks is for foam. It has a speed setting on top which changes how quickly the blade goes. The blade lines up with the dip and peak of the W at the front, hold it up to see which, this' wher it'll cut. To sart put the foot of the bed on the material and start just off i by holding the tirgger.

Equipment

Air Compressor

The air compressor is used for a number of different power tools such as a spray paiting gun,a wiggle pin gun and a staple gun. It attaches to the back or bottom of the tool. There is a master on and off switch on the air compressor, green means off and red means on. At the end of the day you bled the air compressor over night, by turning the valvue slighting so it isn't in line with pipe. This lets the water that's built up drip out so it doesn't rust as much inside. When the valvle is in line with the pipe it is hut and when it is perpendicular to the line it is open.



Spray Paint Gun

The spray painting gun work by attaching the hopper and filling it with paint and the nattaching the air compressor by pulling back the metal ring on teh air compressor pipe and pushing it onto the gun, you do the opposite to get the pipe off, push the ring up and pull it off. You then move the gun evenly over what you are painting with the trigger pulled. You can change the air to paint ratio and theis changes the shape of the spray, it can be a line or circle. We used a circle to evenly paint the metal plates. A spray painting gun creates a more even spread than can of spray paint.



Wiggle Pin and Staple Gun

Staple and wiggle pin guns are very similar. For both to work you attach the air compressor to the back, apply pressure to the top of the gun with your hand and hold the two piece of material together, then press the trigger. For both guns be aware of the kick back. I have used staple guns on flats and treads, each time accomplianing it with wood gun to add extra strength. The difference between a staple and wiggle pin gun is that staple guns contain staples, these can be of varing lenths, they need to be long enough to go through both pieces of material to hold them together. Whereas wiggle pin guns contain corrogated fastens which hold the pieces of material together.



Wire Cutters

The experience I have with wire cutters is for polysteryrene. It is a loop of wire heated up to cut through materials. You can use it to sculpt and cut shapes out. I have used them in Principles of design to cut out my puzzel pieces for my design inspired by 'Robt Boy' by Tim Burton





Equipment

Planer

A planer is used to take layers of wood off. It can blade at the bottom and you can set the depth of wood you want to take off. It to great of taking small pieces of or cutting a line of wood out the middle of a plank. You cna also use them to make a rough surface flat. They work the same as most of the other power tool in the workshop, you attach the extractor to the back, appy slight pressure down on to the top of the planer and then move it across the wood. Originaly planners, along with moat woodwork tools were used by hand and were not power tools. The planer was used in the same way by appyling pressure, although much more pressure and moving across the wood to take a shaving off the wood.



Sander

An electric sander is alot faster than sanding by hand and you can use it to take more wood off at once. It has a belt underneath with the sandpaper on the is turned by the motor and is changeable. Again you attch the extracot to the back and then press the button on the top to use it. Be aware it may jump back at you so you do have to appyl some pressure.



Other Equipment I have found helpful to have during get-ins and get-outs, especially when putting sets together

From work in theatre here are some of the pieces of equipment I have found helpful to have on me during get-ins and get-outs, espeically when these involved putting together scenery. They are a screwdriver, with multiple differnt screw heads, an impact gun with multiple different heads, a wrench or two to use to counter each othe. For saftey steel toe caps alwasy when on stage and gloves for the get-ins and get-outs. Sets that are rented often come with lose screws that need to be screwed back in and there are many bolts involved in piecing together the set, for which impact guns are incredible helpful. These are always helpful when flying sets as the guide ropes have bolts holidng them in palce.

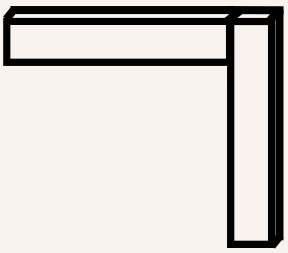
FLATS

Flats are the backbone of most sets. They are normally made of a wooden frame covered in plywood and can have a canvas stapled on top. Staple the canvas on top using the staple gun, also use this to attach the plates to the back. Always staple across the grain not with it to avoid splitting the wood.

The long sides of a flat are called the styles. The short sides, the top and bottom, are called the rails. The middle supports are called the toggles and extra supports on the joins on a broadway flat are called the plates.

BROADWAY FLATS

(Theatre)





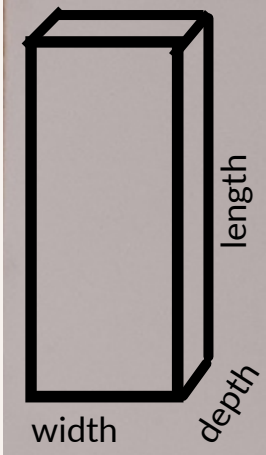




Broadway flats are made with the wood facing flat against the outside plywood, this creates the flatest type of flat. Orginally these type of flats were used for theatre and so changed, stored and transported often, therefore they need to take up the smallest amount of space.

You start by cutting all your wood to the correct sizes and then using wiggle pins to make the outside frame of the flat. Use set squares to make sure the frame is square. Always using wood glue as well as the wiggle pins, screws and staples, unless you need to take it apart, then just use screws. You then attach the middle toggle using wiggle pins, again use set squares, and the angled toggles at either end. Next, staple on the plates at either end of the toggles and the corners, this is called the plate pattern. Finally turn the support structure and staple on the plywood. It is after this that you staple on a canvas if you were adding one.

BROADWAY FLAT PLAN AND MEASURMENTS



Always create a cutting list before you start.

Measurments are always in mm. Remember to check width and depth of wood before cutting as it may be differnet to exact size you ordered.

Staple the plywood on

Use wiggle pins and wood glue to join the corners together

Rail



Calculate the length of the styles by taking off the width of wood for both rails.

2440 - (68 +68) = 2304

Toggles, calculate the length by taking off the width ofthe wood on both sides.

1220 - (68 + 68) =1084

Rails always sandwich the styles

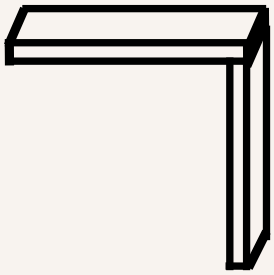


Screw, staple, wiggle pin and glue, however if it's likely to change don't use glue so that you can take it apart.

PLATE PATTERN FOR BROADWAY FLATS

(Film and TV)

HOLLYWOOD FLATS





The main difference between the two types of flats is that hollywood flats have the narrowest part of the wood facing the plywood. This makes them wider than broadway flats. Hollywood flats are more often used to make sets in film and tv, so they do not need to be as slim as possible. They are often more permanent sets than for theatre. Another difference is that because of this they have toggles in different places. They have more toggles, every 2 foot and there can not be an area bigger than 2 foot square without a toggle for support purposes. The toggle at 8 foot, goes on differently with the widest part of the wood facing the plywood as sheets of plywood are 8 foot long and so in flats taller than 8 foot this is the join of the 2 sheets.



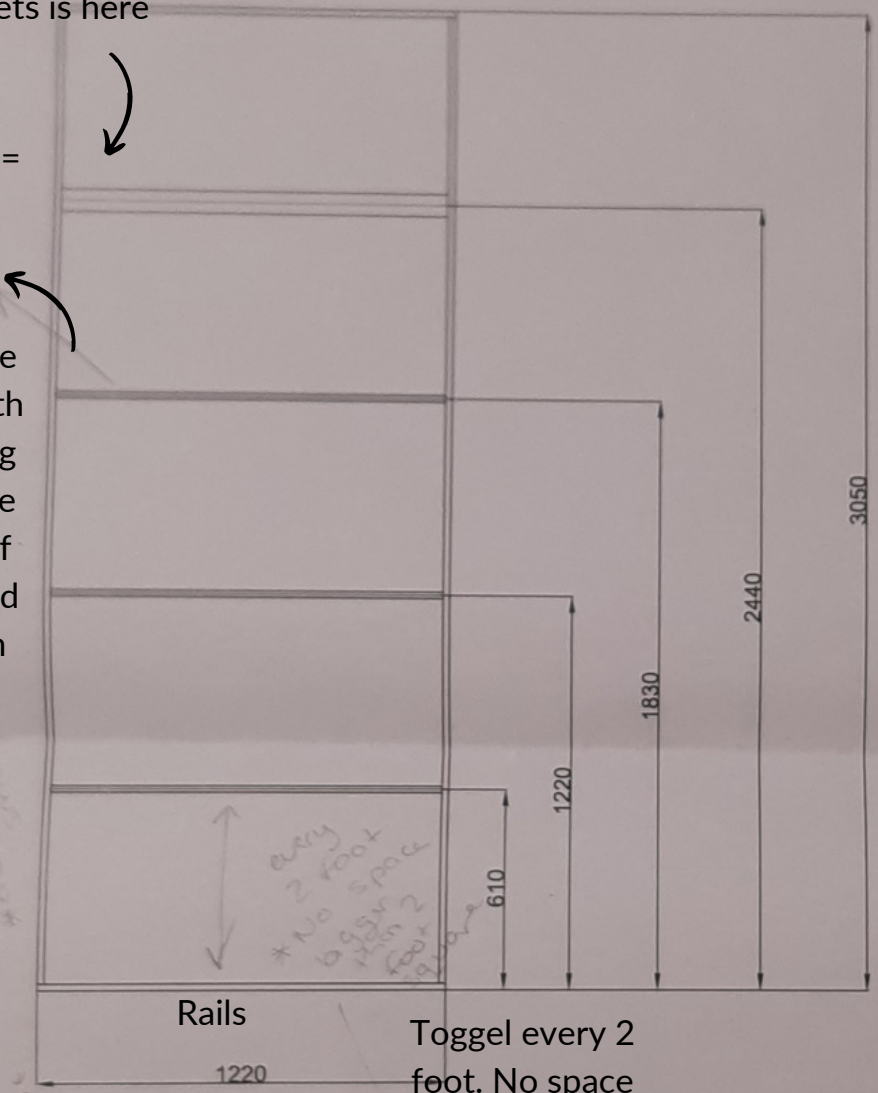




Making hollywood flats is similar to making broadway flats. First you glue and screw the frame together, again use set squares to make sure the wood is square. Again normally use wood glue and screws, however if it is likely you are going to have to take it apart only use screws. Next is the toggles glue and screw in each at 2 foot apart, use set squares to make sure they are square. Turn the frame and staple the 8 foot plywood to the frame, pull the frame square as you staple, if you have to. You can also do this with the broadway flat. Again if you were going to attach a canvas to the plywood this is when you would staple it on.

Toggel at 8 foot goes the other way round so the width is flat against the plywood because plywood is 8 foot long so the join of the 2 sheets is here

Rails



1220 - (20+20) = 1180

Toggles

Calculate the length by taking away the depth of the wood on each style

Rails

Toggel every 2 foot. No space bigger than 2 foot square with no toggel.

Calculate the length of the styles by taking off the depth of the wood of both rails

20+20 = 40

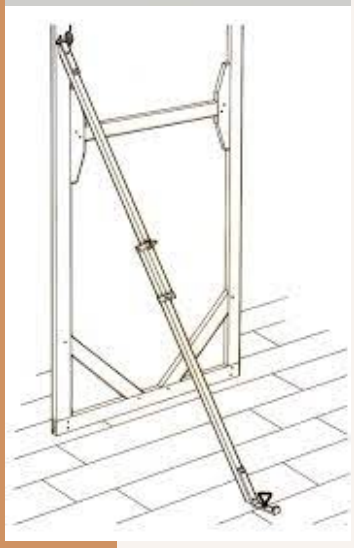
Cutting List

Always create a cutting list before starting

2 Foot = 610mm
4 Foot = 1220mm
8 Foot = 2440mm

BRACES





There are a multitude of different kinds of braces, from french braces, to stage braces. They are all made to hold flats upright and create the backdrop for action and a new world to be created in front of. Everyone creates their braces slightly differently.

French braces, which I have helped make before, are wooden triangles which are screwed to the flat with hindges so that they can fold. These braces provide more support than others, but take up more space. They are best used for large flats. A tip I learnt through make them is to sand off the bottom corners and edges of the brace to prevent injury especially if they are going to be carried alot.

Stage Braces look very different to both French braces and Jack. These take up less space as they are an extendable pole with a hook one end and a metal foot at the other. You put a stage weight on the metal foot and hook the flat to the other end. However these braces "should not be used on flats more than 10 feet high" as they are less effective at providing support.

STAGE WEIGHTS



As mentioned above stage weights, also known as brace weights, are often put on the end of a brace to help hold the canvas upright. They will be placed on the metal foot of a stage brace or the wooden section of a french brace or jack that is on the floor. I have used stage weights on legally blonde to counter balance a heavy flat bolted onto a truck. We found the flat was heavier than the cupboard placed on the front of the truck so it had a tendancy to tip backwards. So to fix this problem we placed 2 stage weights in each cupboard, this elimated the problem and was a great way to hid the weights from being seen. To the left is the truck with stage weights in the cupboard to stop it rolling. Stage weights are especially useful on a tapered stage to stop scenery rolling, we also used this on legally blonde to stop of side unit moved by cast rolling when it was lent on or not being held.

JOINING FLATS TOGETHER

There are multiple different ways you can join flats together, some being stronger than others. The main way I have come across of securely joing flats together is to use pin hindges. However you join flats together it needs to be secure to be no/ minamal risk fo them falling and cauing injury.

Including study task 8

PIN HINGES

Pin hindges are 2 pieces hindges, you attach one side to one flat and the other to the flat you want to join. They normally have 3 or 4 slots between the two, however they can more. I have always used ones with 2 on one side and one on the other. They have to be joined at the exaact same height to allow to slot into place. When they are in place you place a pin through both of the hindges holding them together. This allows the flats to be put up at angles to each other or straight. This is especially helpful if the flats are being placed on truck and the end flats need to fold in and out to reduce space. It also means the flats can esially be taken apart, wespecially helpful for travel theate or hired sets. You have to make sure the hindges a re securely screwed in and it's helpful to have a handful of pins on you during get ins.



RATCHET STRAPS

More so for scenery than flats, however ratchet straps can be used to join both together or just add extra support. They are good as they can be pulled however tight you desire.

HOOKS

Hooks are another way not as much to join flats but to join any additional pieces to the flat, for example when construction the bar scene for Charles Court Opera we made colums which attached to the flats using the hooks to the right. One downside of these is they can be hard to attach as you can't see the hook behind the scenery you are adding.





METAL FLATS AND SETS

Including study task 6

Flats can also be made out of metal, noramaly steel or aluminimum. Both metal and wooden flats are durable and are often clad in the same materials, either cloth or plywood. I have been on theatre stages where only wooden flats are used and where only metal flats are used.

ADVANTAGES OF USING METAL

Metal flats do have the benefit of taking up less space as they are made of very thin square metal tubing. And a metal frame is stronger than a wooden one, as long as the welding is done well. Is makes them slightly more durable espeically for traveling theatre. Metal flats can also be taken apart if they are put together with bolts and then the pieces can be re used, this makes them more sustainable and a good thing to use if a company is looking to be more eco-friendly. Another thing making them more sustainable is that they have a longer lifespan than wooden ones, so in the long run you will use less material which is also more cost effective. metal flats also take less time to make, depending on their complexity. Along with this they are often lighter as you can use thinner metal and still have the same strength as a thicker piece of wood, if you use aluminimum the flat will be even lighter again. Metal flats are also not combustable whereas wooden ones are so you have to treat them with fire retardant before they come into any theatre, this adds more time and money to the set building process.

DISADVANTAGES OF USING METAL

However wood is the cheapest of the two materials to build a set out of and the material most commonly used to make flats in the industry. I also presum this is also because of the equipment needed to make metal flats, alot of companies will have all of the tools and screws to work with wood but not necessarily the ones to work with metal, welding, etc. I personally prefer wooden flats because I know more about wood work and enjoy the process of cutting and screwing the wood together. Everyone has a preference to whether they prefer working with wood or metal and I think this it the main indicator for what type of flats they use. As a set builder you will mainly be working of the material you are told to make the set out of, whereas as a set designer you may be choosing the type of materials as well. Another thing to take into account is the budget as, as I said before wood does cost less.

If your flat is flying you also need to take into consideration the weight, this comes from both the frame and the cladding. If a metal flat is heavier than a wooden flat, you will need to ass more weight to the bar which adds a health and saftey risk. From experience I didn;t feel much difference in flying metall Vs wooden flats other than adding more weight to the bar.

NUTCRACKER

Performed by Atlanta Ballet, the metal set was made by CTS, Cardiff Theatrical Services.





Multiple cast members on the set at once. All performing ballet move which put more tension on the structure, so it makes sense that they used metal as there is no worry of the wood snapping when the cast lean back using it as their only support.

KINKY BOOTS

Metal set designed by David Rockwell for the Broadway performance.







Kinky Boots is set in a factory in Northhampton. The use of a metal set emphasizes the industrial backdrop of teh whole play. Embracing the the storytelling the designer and director managed to combine the two and I think it greatly shows! Rather than hiding the rough exterior of the metal they put it on show, all of the "metal structures, exposed iron, tinted glass" you would find in factory inspired the design. I think the metal arch ways and that fact that it extends to teh ceilings, incorprating the factory makes the space feel larger, more open and the whole play have a bigger effect on the audience. When you go to see a play that feels huge it is a whole different expereience, it leaves you in awe.

HAMILTON

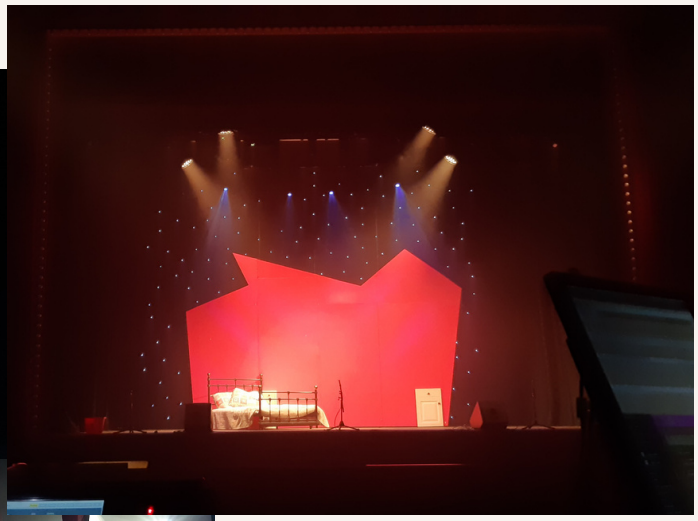
The broadway performance of Hamilton, written by Lin Manuel Manda and the wooden set designed by David Korins.





One of the most famous broadway set is Hamilton. Not is it a wooden set but it also has two revolving turntables in the middle, which rotate in opposite directions. The wooden aspect of the set was chosen due to the era Hamilton is set in, the 1750s. A metal set would have looked wrong and made the set feel too modern. Along with being wooden this set has lots of interesting features, the most obivious during the play being the turntables or revolves. They indicate the "Hamilton's relationship with political rival Aaron Burr" visually. It has been described as an "cyclical relationship" meaning they where never really on the same page but were also present ineach other's lives, spinning around each other. Visually dempnstraighting a relationship to an audience is a unique thing to do and can be challenging to portray but makes it easier for the audience to see that relationhip and also wonder about what it means.





GREASE

Performed by Carmarthen Youth Opera using a hired metal and wooden set.



This set was a mixture of wooden flats and props, mixed which steel rostra which would put together to form treads used as school bleachers and a platform to hide the Greased Lightining Car. The metal section was needed as it was the easiest solution to building bleachers and wooden bleachers would not have looked right. It aslo gave the strength to be stood and danced upon. While the wooden flats also surved their purpose all being flown and were easily to modify to the speicifc theatre as they were wooden.

CLADDING FLATS

Cloth and plywood are the two things flats are most commonly clad in. I have mainly worked with and made plywood clad treads.

CLOTH CLADDING

There are a number of different cloths you can clad flats in, each is stretched over the wooden frame and stapled down just as you would with plywood. Any cloth used in theatre has to be fire retardant, this can be by the fabric being fire retardant or it being sprayed in fire retardant. Either is acceptable but it has to be due to the power of theatre lights which generate heat.

One type of the used fabrics to clad flats is muslin, which again there are different types of of. Muslin's are leight weight, relatively cheap and soft. All fabric are leighter than cladding a flat in fabric. Natural muslin, flame retardant muslin and flame retardant polyester muslin are all different types you could use. Natural muslin is best if you are going to paint it, whereas flame retardant muslin can be used painted or left as it is. Flame retardant polyester muslin "is best-suited for humid environments. It's less stiff than cotton muslin and is durable enough for high-traffic stages".

The other fabric commonly used is canvas. Canvas is a better option if you are painting the flat as it is a good base, however is slightly heavier but still stretchs over the canvas easily. Another advantage of canvas is you can also get coloured canvas so you can spend less time paitning it. This is espeically good if a show has tight time constraints.

PLYWOOD AND HARWOOD CLADDING

If you want flats with a solid surface finish, you can use hardwood or plywood. Hardwood is less commonly used as it tends to bend more, is less durable so is easily damaged and is heavier, however it is cheaper. Plywood is more expensive, however it is better because it's more durable and weighs less. Plywood easy to cut and staple to a flat. You just need to make sure it isn't too warped so that is lies flat. When attaching the plywood you can pull the frame straight and to make the plywood fit the frame. You can them paint the plywood, apply textures and use it as your base. You can also apply wallpaper to plywood or hardwood flats once you have clad them which can make them look more realistic.







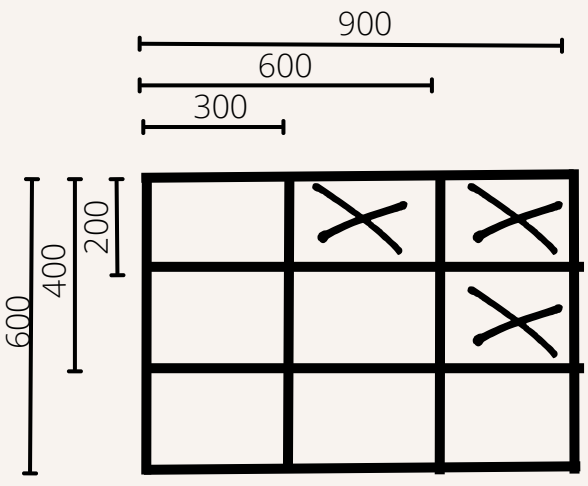
Treads

Including study task 4

Treads are made up of 4 parts, all shown in the next diagram.

- Treads which are the part you stand on
- Risers which are the vertical part
- Stringers which are the side of the tread
- Batons which are supports which go on the inside of the tread





All measurments in mm

HOW TO MAKE: TYPE OF WOOD AND STRINGERS

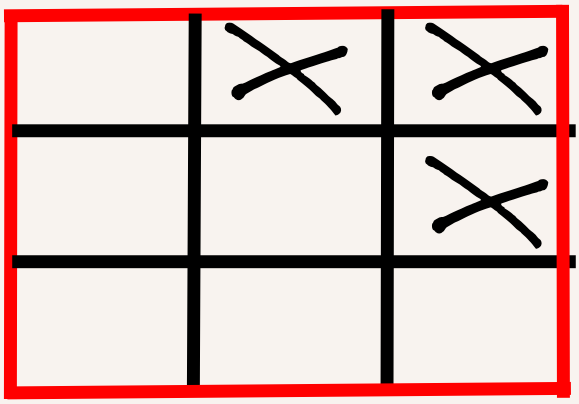
First make a cutting list of everything you need and the sizes. Choose the type of wood you want to make the treads out of. The pictures attached are of the treads I participated in making, they are made of 18mm soft plywood. Even if the stairs are not going to be stood on always use 18mm, unless instructed otherwise, just in case someone does stand on them. This reduces the health and saftey risk. Next measure and draw out your cutting lines on the wood, use a set square to make sure the lines are square.

For the stringers draw a grid with the length of the treads and height of the risers, like the one opposite. Cross out the sections you do not need.

HOW TO MAKE: CUTTING THE WOOD

Cut out the stringers (the part of the grid you want to keep) using a rail saw to cut the red lines on the grid. And then to cut part way into the black lines, do not cut the corners with a rail saw. Cut the corners out with a jigsaw as you can see where you are cutting and therefore the outcome should be more acurate. Line the two stringers up together to see the match, if there are sections that have excess wood, you can sand the excess off using a sander or using the jigsaw.

Next measure and cut the rails and treads, use a table saw to cut a whole plank of wood to the desired width. Then use a chop saw to cut the plank into individual risers and treads. Remember to cut the batons as well, cut these using a chop saw.



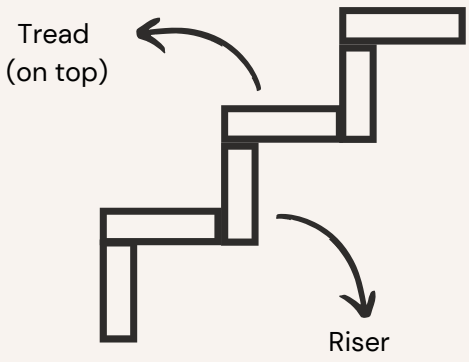
The treads we made were good, where the risers and treads met the stringers, was flush. However the treads were slightly to short to reach all the way back to the risers. When we do it again and as we carry on with scenic construction I will emphasise the importance of measure twice, cut once to both myself and the group I am working with. As well as how missing even a mm can add up if each piece of wood is short or longer by a mm.

HOW TO MAKE: JOINING THE PIECES

Including study task 4

The first pieces you join together are the stringers using the back two batons, one at the top and one at the bottom. Attach them using wood glue and screws. Remember to drill the pilot hole and countersink before screwing the screws in. Next add a baton at the front of the stringers, at the bottom. Then add the risers using a staple gun, make sure they are pushed all the way down to where they meet the stringers. Staple up the sides where they meet the stringers. Then add the treads last, make sure they are flush with the risers and then staple them along the sides where they meet the stringers and front where they meet the risers. You can use clamps to attach both the risers and tread if needed to make them flush and square. Finally turn the treads or go underneath them to staple the bottom of the risers to the treads.

Treads aways sit on top of the risers.



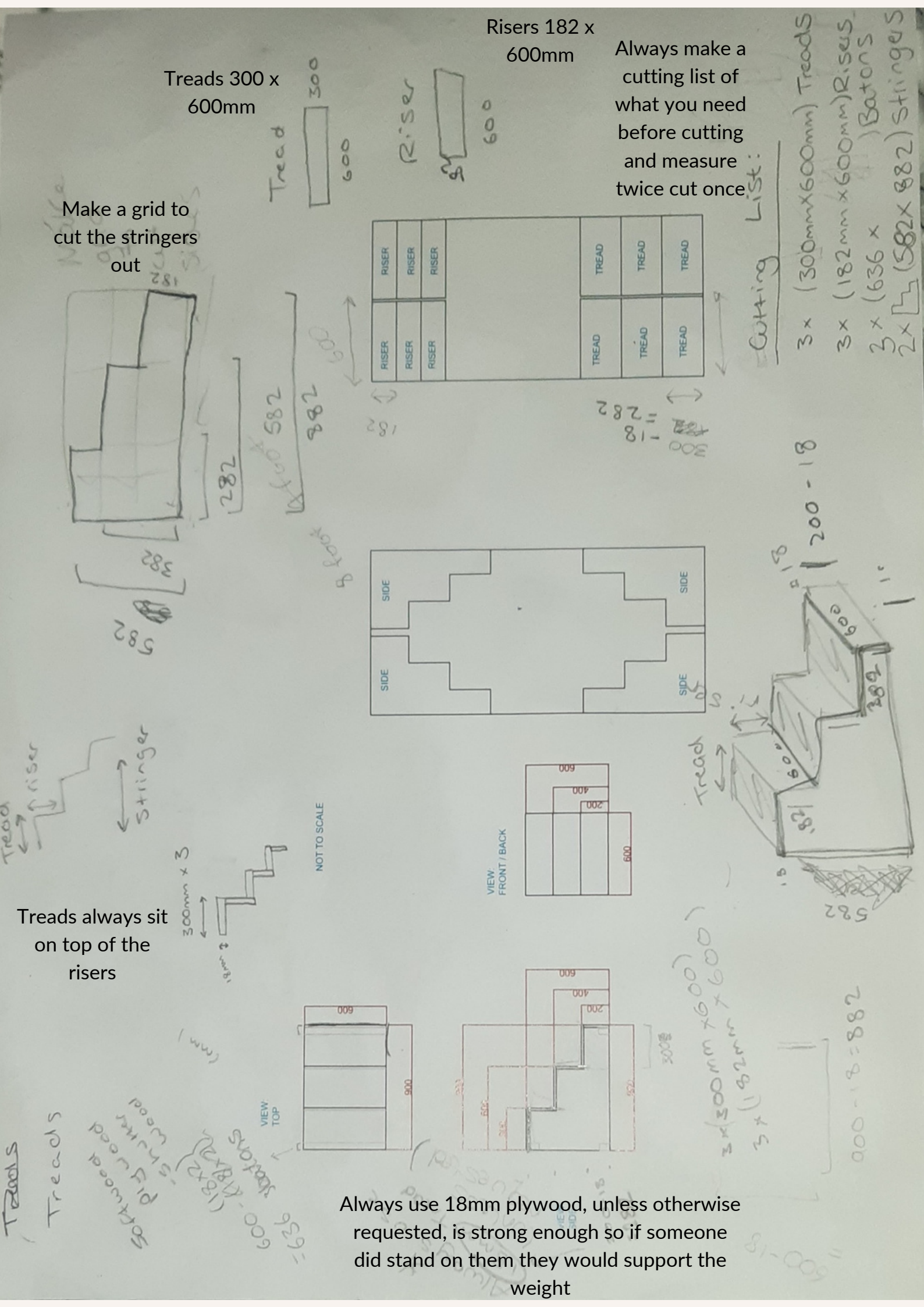


Risers 182 x 600mm

Treads 300 x 600mm

Always make a cutting list of what you need before cutting and measure twice cut once

Make a grid to cut the stringers out



Treads always sit on top of the risers

Always use 18mm plywood, unless otherwise requested, is strong enough so if someone did stand on them they would support the weight

THEATRE TREADS



Treads used in the stage performance of Grease I helped with were made of metal rostrums bolted and tied together with ratchet straps. We used them to create bleachers for the highschool scenes. One issue we came across that in hindsight could have been thought through before hand is the riser height. We discovered that is was quite hard to climb up the steps as it was a big step for adults and this was an amature production. There was the added problem that they were dancing on the bleachers so had to move up and down them relativly quickly. Instead of changing the riser height at such a late date when all the set was made, we solved this isssue through extra dance rehersals and luckily it was only the older cast dancing on the bleachers. However this is something to think about in the future; who are you making the treads for, who will be climbing them, adults or children? Are they dancing on them, sitting on them, do they need to go up or down quickly?

TIPS AND TRICKS FOR MAKING TREADS

- Make sure you use 18mm plywood unless otherwise specified s it measn if anyone does stand on them they are safe.
- Make sure the back bottom brace is securely attached as the treads may be lifted by this.
- Insulate them to reduce sound transmission.
- Treads and risers must all be the same size unless visually different and everyone is aware.
- Make sure the treasd are not slippery.
- Making sure the treads have headroom above them, don't make them too tall to be walked up.
- Backstage treasd should have white tape on the edges and handrails.
- Make sure the treads have no overhang.

How do you stop noise?

Including study task 4

The methods to stop treads making noise are different depending on what material they are made of. For wooden treads you need to make sure there is no gaps between the stringers and treads, if there is add extra glue or nails/pins. Or you can use sound sealants which are glues that are flexible and reduce any sound tramsmitions. For any treads make sure that the handrail is securely attached not only for health and saftey reasons but if it wobbles while the treads are being climbed it will add noise. Another way to reduce the sound transmision is to insulate the underneath of the treads, especially of wooden treads. This is usually done with foam. Adding a soft material to the treads will also reduce the sound transmission of footsteps.

THEATRE TREADS

DIFFERENT FORMS AND FUNCTIONS

Although initally you would think all 'stairs' are the same, once you add cladding into the mix there are multipel differnt types of treads and each of these has a different or multiple different fuctions. Freestanding, box, modular and bespoke are just some of the types of treads, these onse you could all get made by Stage Solutions. Freestanding treads are not attached to anything else, you can use this to isolate them and almost make them into their own stage. Box treads are one of the simpilest fir of treads, they have square risers and treads and would fit into a box shape, an example is the treads we made during the lecture.

Bespoke treads can be made to fit particular stages or sets and can even be curved. This is one type of tread that I find really intruging. Along with spiral and winding treads, I most oftenly see spiral staircases used when filming is being on on location they are much less commonly used in theatre or made as they take alot of time to make. I think stairs can easily make or break a production, in some cases you want ordinaly treads that fade into teh background, however in my opinion the most intruging are once that are out of the ordinary, ones that you see and go how was that made, that is something I haven't seen before. Curved treads involve using thinner plywood on the outside as you have to bend it round, much like the circular rostrum we made to be danced on.





One example of bespoke curved treads being used in film are the stairs for the beasts place in Beauty and The Beast. These initally came to mind when I was thinking of bespoke treads as they highlight The Beast previous glory and grandeur. They draw you right in to belle isolting her in bright yellow at the top of the stairs. These treads were partly physical and partly CGI. Something I find interesting with all live action disney remakes is how they are working from an already produce film, making animation reality. Which is which I think a mixture of CGI and physical set is a good combination.

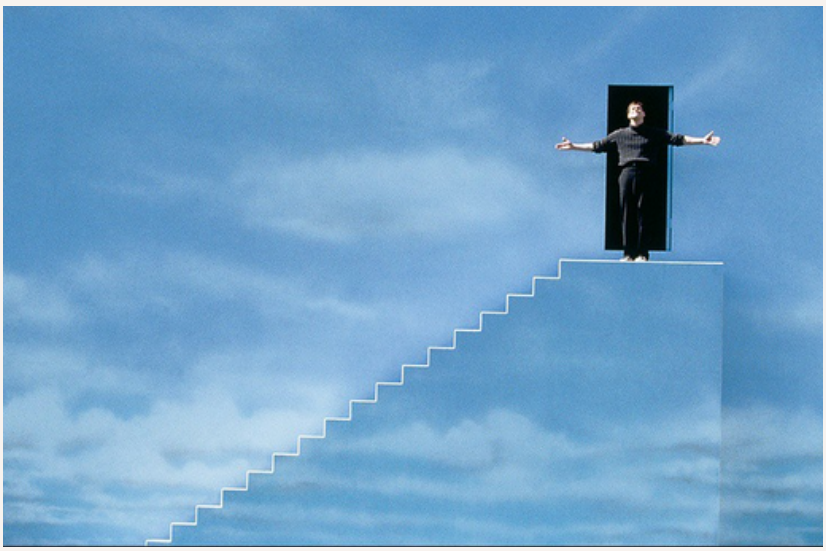
MORE TYPES OF TREADS

Other types of treads I have found along the way are metal and wooden open flight stairs and steel spiral stair case.

Open flight stairs have no risers so you have to use thicker wood. The treads are attached to the stringer on each side and brace blocks are used where risers would be but further back. These give a different look to the stairs and from the right angle almost make them look like they are floating. These can be made of wood or can be steel cored. If using steel you can make the frame out of steel in roughly the same way as a wooden open flight tead and then you can clad it in, for example in wood. Steel open flight treads are more expensive to build and take longer.

TREADS IN FILMS

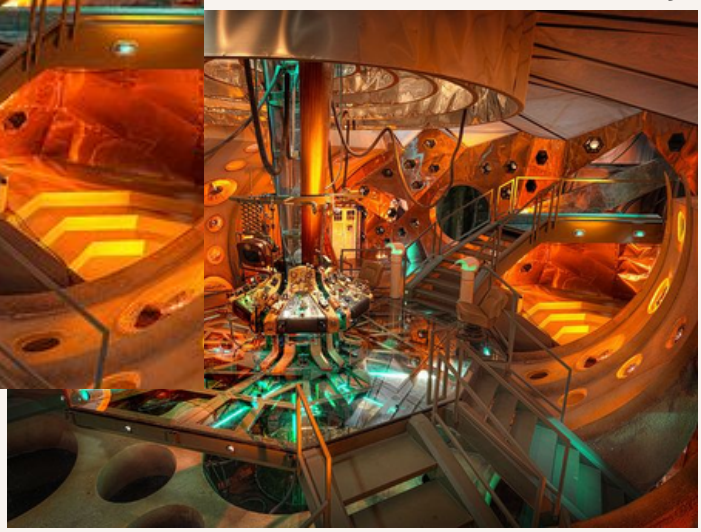
The Truman Show



An example of box treads being used is in The Truman Show where he finally leaves. These treads are cladded the whole way round and painted to match the extrior wall, the whole point being that they blend in. This makes me wander if the whole back wall was green a green screen that covered the stairs as well. Where they clad in green? What can you do with green screen and treads?

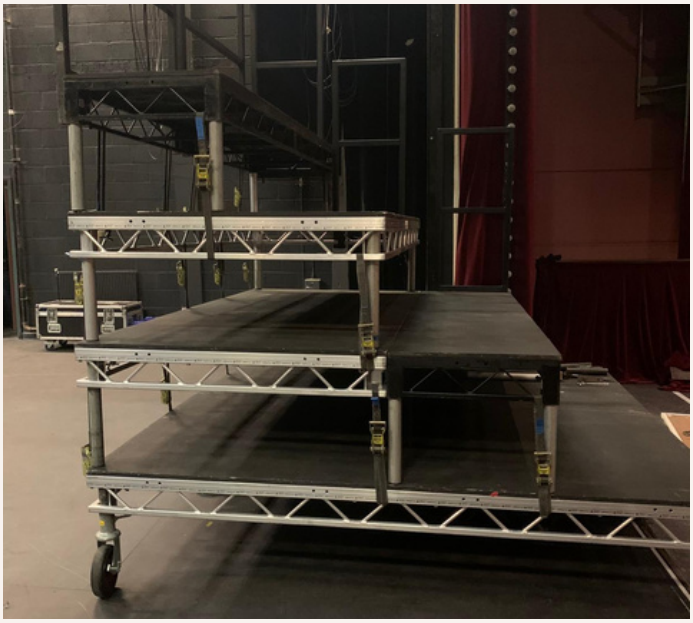
Doctor Who





An example of open flight stairs, also known as floating treads are the treads in Dr Who, in Matt Smiths Tardis. These are metal float stairs, you can see that the treads are attached to the stringers on both sides but there are no risers. These fit so well to the scene, they have industry, other wordly feel as they are not the normal stairs you see evryday.

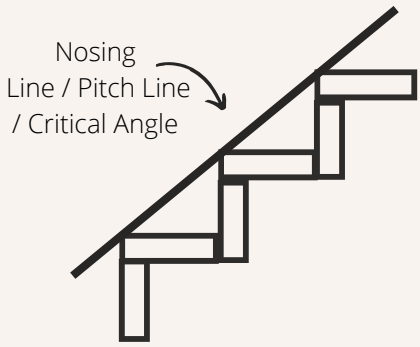
Including study task 4



SAFETY AND TREADS

There are alot of regulations you need to follow when building treads you do not want to be responsible for injury on treads you have made. One thing to think about with touring theatre or if the treads a regoing to a different palce than they are made in is that different places may have differenet regulations and " a touring exhibition will require its stairs to conform to the most stringent regulations encoutnered on that tour". Some of the main saftey regulations and generally health and saftey measures to consider are

- Tread proportions, all the treads and risers must be the same size.
- The mazimum pitch angle is 38 degrees
- The treads must not be slippery
- Backstage treads and landings must have white tape on the edges due to visability
- The treads have to have headroom above to when someone walks up it they do not hit their head. The two measures are 90 degrees to the nosing line and 2000mm above the nosing line and .



The critical angle is "the angle for commercial stairs is a maximum 32.4 degrees.." The critical angle is important as it is a saftey regulation and makes sure the stairs are easy enough to walk up.

ARE HANDRAILS NECESSARY?

Treads have to have handrails of a certain heights however this is often ignored by experienced designers ad si different for public and domestic stairs. As I said earlier everywhere has different regulations for treads, some say that any treads more than 2 risers high have to have handrails. However according to the Technical Standards produced in 2015 by ABTT and other companies if "there are clear reasons assosiated with the requierments of the production or performance that prevent the use of such provisions" then handrails do not have to be used but other saftey measures such as bright lighting and adequte rehersals have to be in palce.

SAFETY BONDS

We had treads on Grease as I've talked about before. These treads had handrails on both sides and the back of them. However at the top they were normally joined to a bigger paltform and the top tread on one side had no handrail so that people could climb them and go across to dance on the bigger paltform. However at two points during the show they came away from the bigger structure and were used infront at induvidual peices. To combat the problem of having a section with no hadnrail we sued saftey bonds which were clipped on using carribeaners. One ofmy responsiblity was during scene changes to make sure these were clipped together when the treads were on there own and unclipper when they were together.

CLADDING TREADS

Our ployester clad treads, after we started using the wire cutter to shape the slabs of stone.



Treads can be clad witha whole rang eof things, such as plywood, polystyrene and fabric. They can be clad with polystyrene and made to look like rock walls and such that are not remotly similar to stairs. Or they can be clad with fabric, painted and have handrails added to look like stairs you would find in a home. This way it is easy to make stairscases from differnt eras as you can use different fabric. However also look at the style of the stairs, they may be narrower or steeper depending on when and where the play is set or they may be wider and grander.

OUR POLYESTER CLAD TREADS

01

When we had finished construction our treads we cut polystyrene to the size of the stringers and glued it to the stringers using contat adhesive. With contact adhesive you have to apply it to both the wood and polystyrene and then wait for it to go tacky You can not move it when it has joined together so you have to attach the polystyrene perfectly first time. It's helpful to have a group of people when doig this to make it flush on all sides.

02

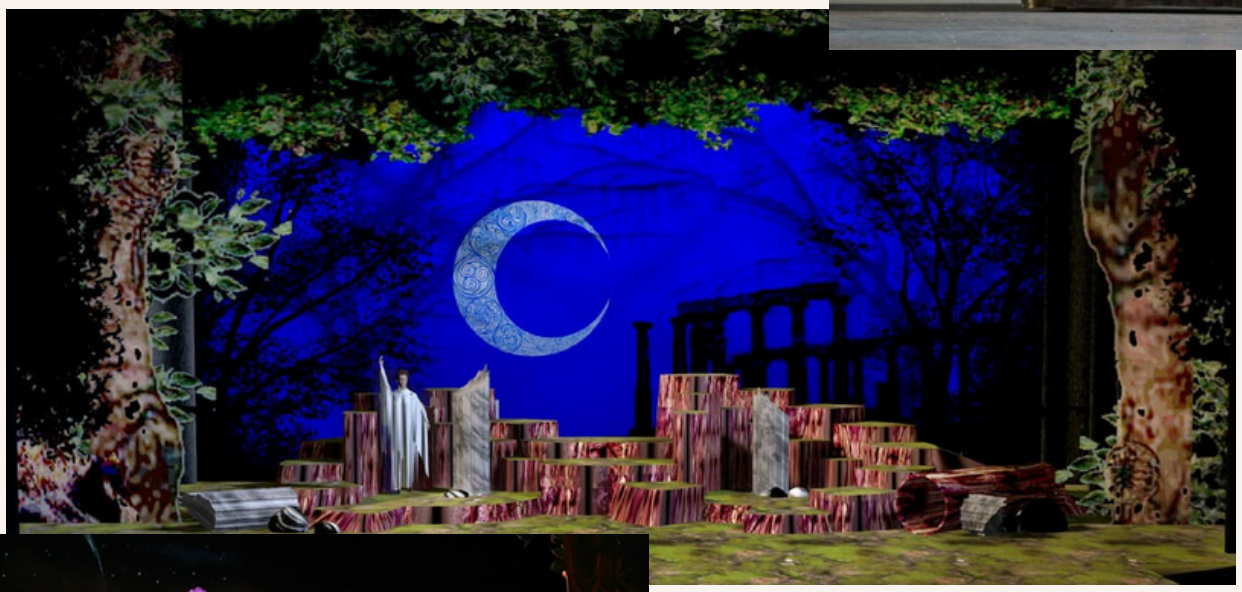
We then drew on stone to look like a dry stone wall. We used pictures of dry stone walls for reference. We discovered it was hard to get all the sides the same or similar as we had different people drawing on differnt sides. We could have correctly this by talking further about how w ewere going to do it before hand and what style we ere going for, the size of the pieces of stone etc. However we could correctly this slightly while cutting the polystyrene out with the wir ecutters, which we did do. We used wire cutters which heat up and then cut through the polystyeren with you apppyling a little bit but not much pressure. WE were able to use these to create texture and shap the bricks. Overally I think this went well however we could defantly improve with practice. One problem we did have was of the wire cutters tripping because of the polystyrene sticking to them so there may be other ways that would be quickre to do this process which's something to look into if i'm doing this sort of thing again.

ROSTRA

Rotra are any raised platform, they can be steel decks placed onto a stage, steel deck on safolding legs, wooden boxes or any platform. Some things to think about with rostra are that they have enough strength, where the rostra sections join is flush and does it need to join with the dsign at all and the sound tramsmission. Rostra can amplify any sound so you may need to insultat the underneath of them. Also make sure any rostra that are being joined to make one platform are are bolted together securly so that they are stable. Some examples of rostra being used in design are in different designs of Midsummers Night Dream designed by London Royal Opera House and Matt Kizer.



The Royal Opera House's design had multipel different rostra, according to Scenic Art and Construction by Troubridge, E and Blaikie, T ther rostras were made as Plywood Gate Rostra. This means they had a wooden frame, with diagonal bracing. They were also all on trucks. I have foud alot of rostra used in theatre are on trucks, this is very helpful as it means crew can easily maneuver them on and off stage, especially during scene changes. However, ti does mean they have to have substancial brakes o nthem as you do not want them to move while being stood or sat on, especially as alot of stages are raked.



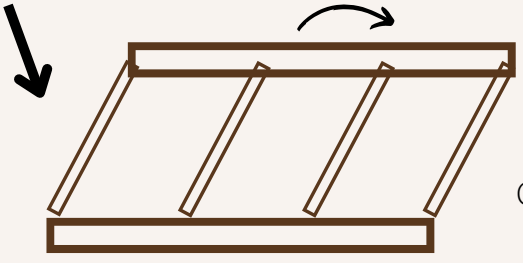
Including study task 2



Matt KIzer's design for Midsummers Night Dream shownto the left. Also has alot of rostra but they joined toegther to form one big multi layered platform. I think this is a cool design as it adds levels to the stage and you can have the charcters at differnt heights. This can influence the story by emphasizing the characters story or power at that particular moment. I do not think the rostra in Kizer's design were on trucks, however it would make sense for them to be made as plywood gate rostra as well because wood is relativley cheap and the diagonal braces add support that rostra need so that they can safely be stood on.

The four different types of rostra I researched are steel rostra, folding-gate rostrs, plywood- gate rostra and block rostra. Each are used depending on the companies budget and what they're being used for

Including study task 2	Steel Rostra	Folding - Gate Rostra	Plywood - Gate Rostra	Block Rostra
What is it?	This type of rostra are more often brought than made. Most rostra can be made out of steel or wood. You noramlly make the decision depedning on which is cheaper with the company and what their specialities leans more towards.	This is a traditional folding rostra. To fold it you can remove the plywood top and end braces and then fold the legs as they all have hindges on them. Below is a diagram of how it folds. It can also be built in either wooden or metal.	This type of rostrum can be folding but mostly is not. It is similar to Folding- gate rostra but the hindges have to be bolted.	This type of rostra is as simple as they get. They are raised blocks that you can put together to create a platform or just use as singular raised platforms.
Advantages	The advanatages are they can be cheaper, lighter, stronger and are often what most theatre already have.	The advantages are it takes up less space when being transported, it's light weight and long lasting.	The advantages are they are more solid than Foldin - gate rostra and take less time to make.	The advantages are they are really simple, lightweight and most drama stuidios or theatres will have their own.
Disadvantages	The disadvantages ar you need a company who specilised in metal work. The cjeap and mos treadily avalible steel is quite thin so may not be strong enough.	The disadvanatge is it takes longer to makes as it has more moving part than most rostrum. This makes it mor eexpensive to buy.	The disadvantages are that they are heavier and mor eexpenisve in terms that more materials re used however they take less time to make.	They are so light weight they may tip over. Are not the strongest form of rostra.



Folding - Gate Rostra

Supports and Construction





To make sure rostra you are making have enough strength you need to make sure there are enough supports underneath to hold the weight of the amount of poeple or set that will be on top of it. The general rule for "general staging purposes is a top surface of 18mm ply, supported every 610 (2')." We used 18mm wood for this rostra. We made 2 semi circle rostra to bolt together to form one circle rostra to be danced on. We created the top top semi circles first, them placed the support underneath in a pattern like this, including one long support across the back straight part of the semi circle which had to be flush on both sides.

Once we had screwed and glued the support on we made sure the ones over lapping the edges of the circular section were sanded back till they were flush. We then used thinned plywood and bent it round the circular outside stappeling it to the top and the supports.

Painting

After the construction of both parts had finished we cut linel to the the right size by placing the wood upside down on it and cutting it using a blade. We then glued on the linel, which was painted light blue. The outside of the rostrum was painted pink and hand drawn flowers were also painted on by one of the 3rd year set desingers.





We took it too the rehersal space as 2 semi-circles, we then left them as too pieces as they were not moving even when danced on due to their weight. Once it had be moved to the performance space it was bolted together. We also left it unbotled in the rehearsal spacebecause the bolts had to be hammered in. We could have fixed this by using a slightly bigger drill bit so that they did not have to be hammered in. However , it did mean the rostra was defiantly secure once joined.

Including study task 3

TRUCKS

Wooden trucks are the most commonly used type of truck as they are very simple. They are cheaper than metal trucks and lightweight so better for traveling theatre espeically. Each truck is just a frame that sit on top of wheels or a rostra on wheels. Both metal and wooden trucks have similar contruction processes, if metal is used on a truck it is most commonly to make a metal frame which is clad in plywood. This is mainly because wooden trucks are cheaper.

JOINING TRUCKS TOGETHER

Large trucks will be made of multiple trucks that are bolted together once in place on stage. If possible, trucks are bolted together before the show and stay like that for the duration; however, sometimes you have to unbolt them to fit them in the wings, as we had to for Legally Blonde JR.

WHEELS (Also called castors)

Trucks can be on a variety of different types and size of wheel. The size of wheel you want depends on the weight, if you get too small a wheel which cannot handle the weight the rubber can start to come away from the metal under the pressure. This happened to us during Grease with a swiveling wheel and it can be very hard to change a wheel under a truck when it is already on stage. One type is swivelling wheels, which makes moving them off stage easier and is a lot easier for the crew. Most trucks I have experience with have had swivelling wheels. Fixed wheels mean the truck can only move in a straight line and are harder for the crew to move. They may be used when the truck has to travel onto stage in a straight line from the wings during a scene. Locking wheels are wheels that swivel but can be locked to a fixed position which only travels in one direction. This can be very helpful to crew if the truck does need to travel in one striaght direction but allows the crew to move it anywhere.

NOISE

Trucks will always make some noise however grease or WD40 can make it quieter, espeically if it's wheels squeaking. Also suprisngly steel trucks can be leighter as "the heavier the truck, the quieter it runs - up to a point". This isn't something I had thought of before.

GUIDES

Trucks like any other scenery should be spiked and this iis ther most common type of guide. You can spike a line from where the truck starts to where it ends which is espeically helpful to have if a truck moves during a scene. We had this during Legally Blonde when Catherine and I as crew were behind the 'hair affair' truck which moveforward about a meter during the opening of a scene as a cloth in front of it rose up. Other guides are pully systems and ropes thta pull the truck off to the side, this is most commonly used if the truck comes off during a scene so that no crew are seen.

HEALTH AND SAFETY

As trucks are moving pieces they do have health and saftey concerns, for example running over toes or cabeling. Crew should all be wearing steel toe caps and any movement of the trucks that invovles cast should be well practiced in bright lighting. It should also go in the health and saftey report and the wasy to reduce the risk, such as practice and making everyone aware where the trucks are going and that they move, espeically making cast aware. Also make sure th treads all have functioning brakes that are substantial enough for the weight of the truck, this is espeically important for raked stages.

Including study task 3

RISK ASSESMENTS FOR TRUCKS

Risk assesments are forms made that contain the potential risks for a particular scenario, who may be harmed, what the company is doing to stop any harm and what further things they can do. The aim is to reduce the risk of harm or injury as much as possible. They chould also include the date, what event it is for and who completed the risk assesment.

Truck Saftey Risk Assesment

Company Name:
Date Completed:
By who:
Version:
Date of next assesment:

What are the Hazards?	**Who might be harmed and how?**	**What is already being done?**	**What else can be done?**	**When do this need to be completed by?**	**Done**
Trucks rolling	Crew or cast near the truck	Brakes on all the wheels	Stage weights in the truck	Stage crew / SM	
Wheels getting stuck	Cast or crew near the truck	Wheels checked before truck put together and moves smoothly before show	Keep an eye on the wheels and any changes	Stage crew	
Injuries from pushing / pulling heavy trucks	Stage crew	Make sure all crew know how heavy the trucks are before moving them	Only have crew move the trucks	SM / Stage crew	
Running over cabeling	Crew and cast backstage	Cabled laid prperly and all taped down	Make sure crew know where the cables run	Stage crew	

Some of the trucks using in Legally Blonde JR The Musical for which I was crew.





The Court Room truck which was and outside frame of the wooden pandels placed ontop of the treads which were on wheels. The picture to the right shows what was behind. Chairs were placed on top of the treads.





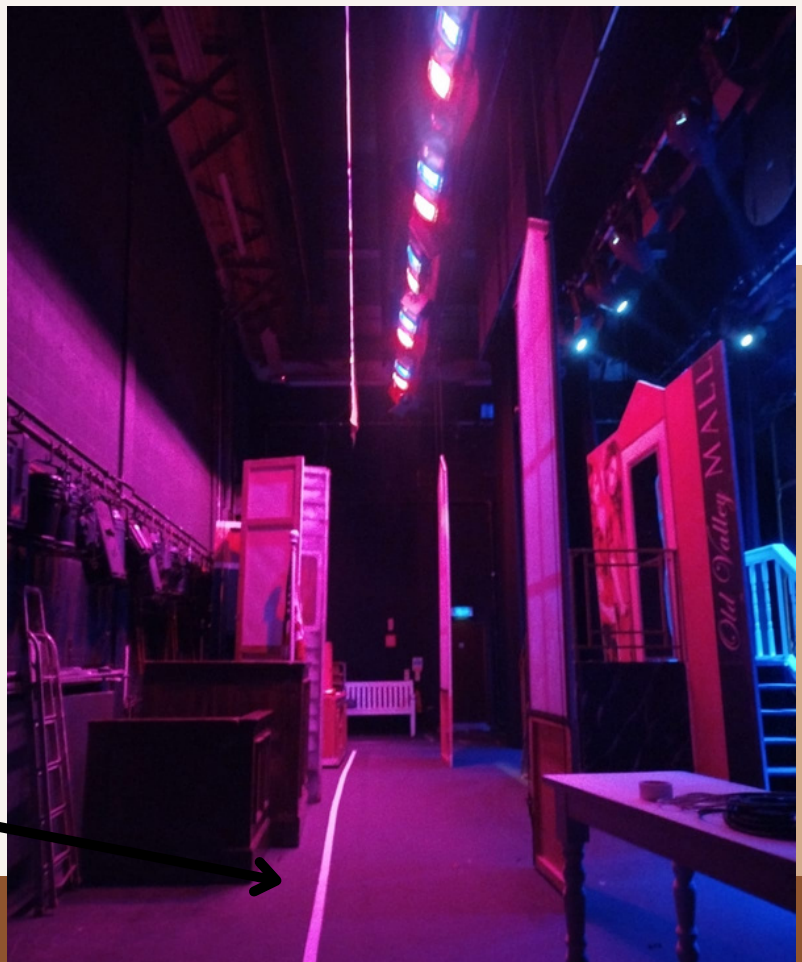
The Delta Nu truck, one side of which was the outside and the other the indise. This truck was turned by the cast during a scene and this was practiced alto in bright light. it laos lhad a piece of flat at one end which folded out and we found swung when it was moved so all crew needed to be aware of this.





The caravan truck unfoldede to form one side of a caravan with treads behind it and a square rostrum on wheels. This truck was very wobbly when unfolded so we made sure we had cast members holding it for the short time it was on stage.

Elle's bedroom this truck aslo had another truck on the other side and was made of two different trucks bolted together, luckily we could fit it in the wigns without taking it apart. The other side was used alot however this side was only used for Elle to wwalk out the door. When see did this and climbed through the doorway we made sure to hold the flat steady.



The trucks behind the scene / stage.

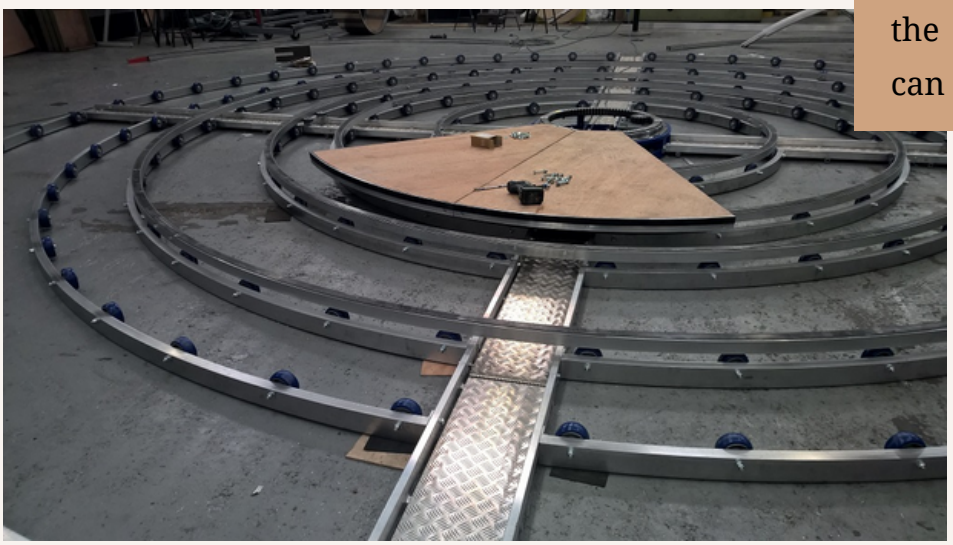
The sike all flats had to fit behind

REVOLVES

Revolves are mechanical pieces of stage that turn. Normally you would make the stage the same height as the revolve so that it disappear into the stage, however their are examples, espeically in film and tv where the revolve is placed on the ground and not sunk which has a unique effect. I think revolves became very popular because even at the mention of one everyone becomes intregued. It is so different to the stationary stage you imagine and the dynamic they add to a show is impressive. Whether it is story the story of two characters realtionship as in Hamilton or telling the story of all the characters going on a journey it excites you.

Making a reveolve is simpiler than I thought it would be. You need a bottom circle with non swivelling wheels round the outside and in the middle. A bearling in the middle to hold the weight of the top circular platform. You then attach the top platform and a motor which you can program using DMX. This is in the most simpliest terms, but you can build from there.

Including study task 5



Bridgerton has some stunning set design from the Queen's place to the extravagantly decorated balls. Filmed mainly on location in staley homes across the UK the set design, set building and set dressing combine to create the picture of wealth and extrvagance that stands out the moment you see it and hihlights the importance and class of the characters. The interal role of society, heirachy and the suppression of females in Bridgerton is amplified by the set which shows the money thrown into each ball and the decorations in each room which scream wealth and upper class.

One feature in season 2 that stood out to me was a revolve used in the ball in episode 8, placed in the center of the room, with the orchestra sat atop was a slowly spinning platform. Although only in the background, I imediatly saw it and replay that part, interigal by the decision, mechanics and the unqiue idea of adding another moving part to an already busy scene. With dances and conversations going on alround it this could easily have made the scene to much however it was done so sutely and so well it add to the scene. It was no longer a small orchestra sat in teh background as they were at most balls, but they were an new intrigueing part. I think after so many balls, however all interesting and intruging a new part was just what they needed to pull the auidence in again. Episode 8 it where i think you can loose or gain an audience and brining in something completly new is a beautiful way to draw the auidence back in. And it defiantly drew me back in.







The sets of the balls although shot on location are still dressed and everything added sets the scene for the regency era. The checkered floor here is so eye catching and the chandeleries hanging from the 'ceiling' even though they are otuside add the magic to the ball.



The treads you find in Bridgerton are all shot on location, not made for the production. However they are an example of bespoke treads, they are classic to that era of houses and the upper class of the Bridgertons. Even if you didn't known their class you could guess it from the wide rising stairclass in the centre of the house, spillting at the end into two seperate stair cases, decorates underneath and adorned with flowers. It all screams

Interesting Sets

Including study task 5

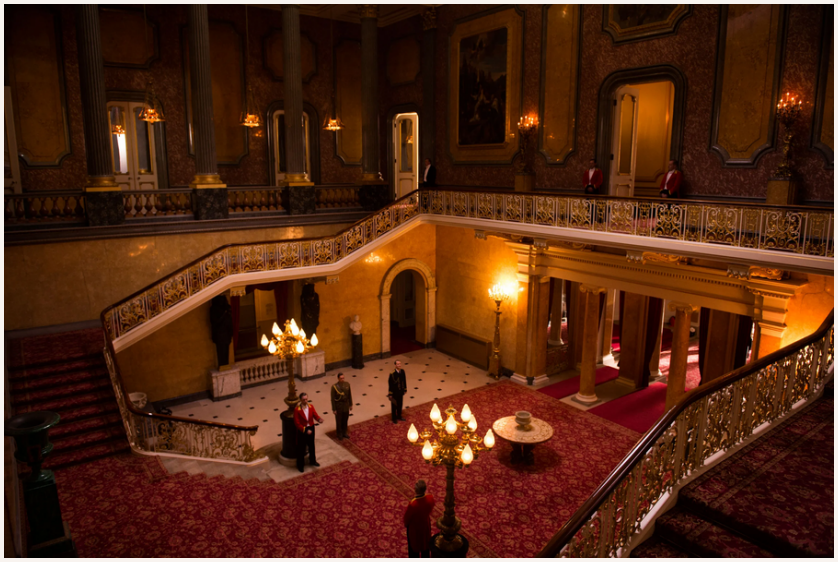
The Crown

I love the grandeur of series like the crown, I think it's the set dressing especially which brings this feel of majesty together to create an arc of elegance over the whole story. From the oil painting hanging on the walls to the vases, trinkets and furniture. The set for the The Crown is believably extravagant and historically accurate, but with an artistic flair through out the story. Although believable the grandeur of the show sets it above the auidence's class, drawing us in to the whole world of royalty

The designer, Martin Childs, has done a great job at matching the set and set dressing to the show and clearly worked closley with the costume department so that everything compliments each other and neither the set or cosumtes take away from the acting and the story.



Another thing I love that is very specific to The Crown is how it spans through 5 decades, from 'post-war ‘50s to the upcoming season's debut in the brazen '80s' with each morphing and changing with the changing times, especially when an older cast is brought in. The subtle changes grandually bring along the time line with visual ques which are emphasized through the set dressing.

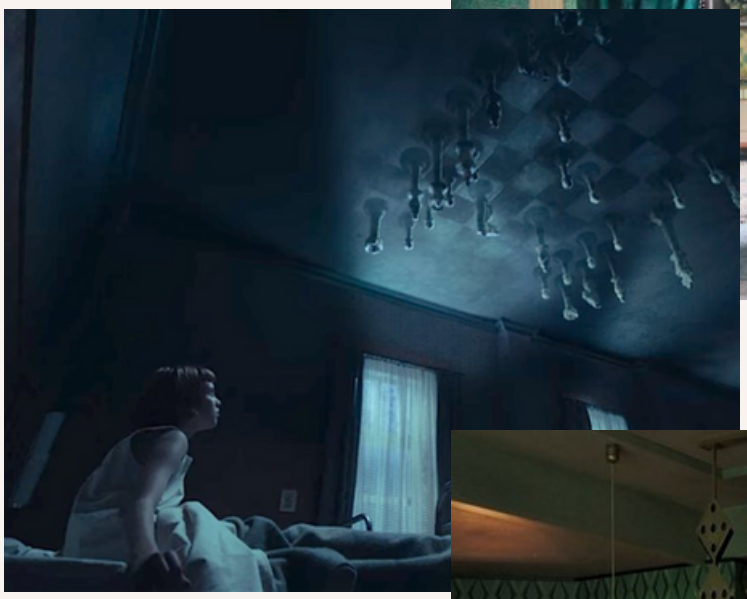


Although alot of The Crown was filmed on location and therfore set dressing played a hugely important role, 400 sets were still used, built and filmed in for each season. They also filmed in 90 locations for each 10 episode season. Some would even say that Buckingly Palace in it's self is "one of the most central characters in the series" and this was filmed in multiple statly homes across the England. Highlighting how you don't always need to build the set, sometimes shooting on location does the job better than building an entirely new set.

The Queens Gambit

This was one of those series where I was almost drawn more to the set and found the story told more through the FX, colours and movement of the actors, than the words spoken. I loved the originality of its unique design and abrupt yet seamless combination of set design and FX to create an almost hyper realistic and abstract feel to the story. Yet somehow the designers still had an ability to combine all of this with some realistic, down to earth scenes. Realistic scenes making you feel like a spectator, able to judge Beth's story from an outside perspective. While the use of FX to create hyper realistic scenes making you feel like you were in the story, in Beth's mind, in Beth's addiction. Another thing I love about The Queen's Gambit is how just from the set design you can tell the era in which it is set just from the "living room was adorned with floral wallpaper, green velvet sofas and chairs, a feature fireplace with starburst mirror and ruffled curtains." All of this is classic 60s decor.







Six The Musical

Lights in the treads is an intresting concept I am intregued by

Metal frames



Reflective raised floor

Six, one of my favourite musicals, has a unique set as it'd made up from one single set that's on stage for the whole performance and it is the lighting design that tells the story. The set is made up of the beams and floods of light that fill the stage as well as LEDS in the metal frame work. I think this is a really interesting way and different to alot of stage shows. It really tells the story of the cast forming a girl band. It is an unusual mix of modern technology to tell a historic story, mixed with an unusual backdrop. Another thing I love is that the floois reflective, the raise the whole stag eto put a reflective black floor with gold circle down, which reflects everything the light do making it feel even bigger. In Six they also use treads to create an almsot seperate stage for the band who are present and see for the whole show, again different to hiding the band away in the band pit. I love this show as it is so unique there isno part I have seen before in other palys and I love how the female girl band carries through into the crew as the band are all female. Another cool thing they do with the lighting is at one point have it all go dark apart from the neon areas, which are medievial collar the cast are wearing, glass the cast and band are wearing and hair extensions, I think this a really inventive way to mix up a scene and something you need to put everything into to make it work.

The Play That Goes Wrong





The Play That Goes Wrong is incredible designed to do exactly what the crew want it to do, the opposite of what you would normally want. Instead of holding and keeping the set together you want it to fall apart. Instead of props that stand upright, you want them to fall over. Instead of reducing the ridk offire you want one to start. Of course all in a controlled way, everything still has to be saftey checked. The set designer, Nigel Hook, and cast came up with the whole set. Orginally it was just design and made by the actors and then when it went into a full size production they added the set designer who came up with alto of the ideas to have more things falling of the walls and he wanted a more "pantomime look". Behind the set is where all of the controls are and "To the untrained eye it's complete chaos and it certainly is during the show" everything will have seperate controlls and they have a whole team of people controlling them. One things especially important for this show but really should be thought about for most shows is having spares and drawing out the patterns for props and set you're not sure will be avalible to buy inthe future. This is one way of making sure the show can alwasy go on and nothing will be missing. For this show however it is espeically important as thigns are purposfully broken all the time, exploding, collapsing and falling apart.

Something this play has that I hadn't often thought about for behind the scenes is foley. They have foley crew amplifying the counds as people fall through windows or fall over things. This is a great way to stop he actors injuring them selves while still have and being able to amplify the sound effects, making the dramic moments more comical and dramatic.

METAL SETS- WELDING

Including study task 9

I have talked about the advantages and disadvantages of metal sets before and I have said how the process of making metal sets takes longer and you need professionals with a different skill set or additional skill set to woodwork. However it does create stronger and longer lasting sets that can more easily be reused. To make metal sets you need to be able to weld sets together, grind off any excess and know about metal.

There are different types of welding and different types of weld. Welding is the process of using electricity to heat up two pieces of metal and join them together. The type of weld is the type of join you are making between the two pieces of metal. Everyone has their different main ways of welding, here are 7 ways I have come across:

- MIG Welding - Gas Metal Arc Welding (GMAW)
- TIG Welding - Gas Tungsten Arc Welding (GTAW)
- Stick Welding - Shielded Metal Arc Welding (SMAW)
- Flux Welding - Cored Arc Welding (FCAW)
- Energy Beam Welding (EBW)
- Atomic Hydrogen Welding (AHW)
- Plasma Arc Welding.

MIG welding machines are the most commonly used machines because they can be used industrially or personally. They work with multiple kinds of metal, including steel and aluminium which are the two main types used to make theatre sets. It is also relatively quick to do. MIG welding machines have the largest range of metals they can work on and has an adjustable power output. It is also one of the most cost effective forms of welding. There are also different types of MIG welding machines, such as Tyristor machines, which "generally best for fixing objects or mounting them on a suitable surface". This machine creates good quality welding that will last, however it can handle a smaller variety of metals. Stick welding is considered the strongest type of welding and can weld thick sheets of metal. However MIG welding sounds like the best fit for theatre sets.

The reason there is so many types and equipment for welding is that "there isn't a single welding machine that is suitable for all welding purposes."

When welding remember ppe, you need a welding helmet, gloves and protective clothing. This goes for a lot of metal work as spark can go flying.

WELDING JOINTS

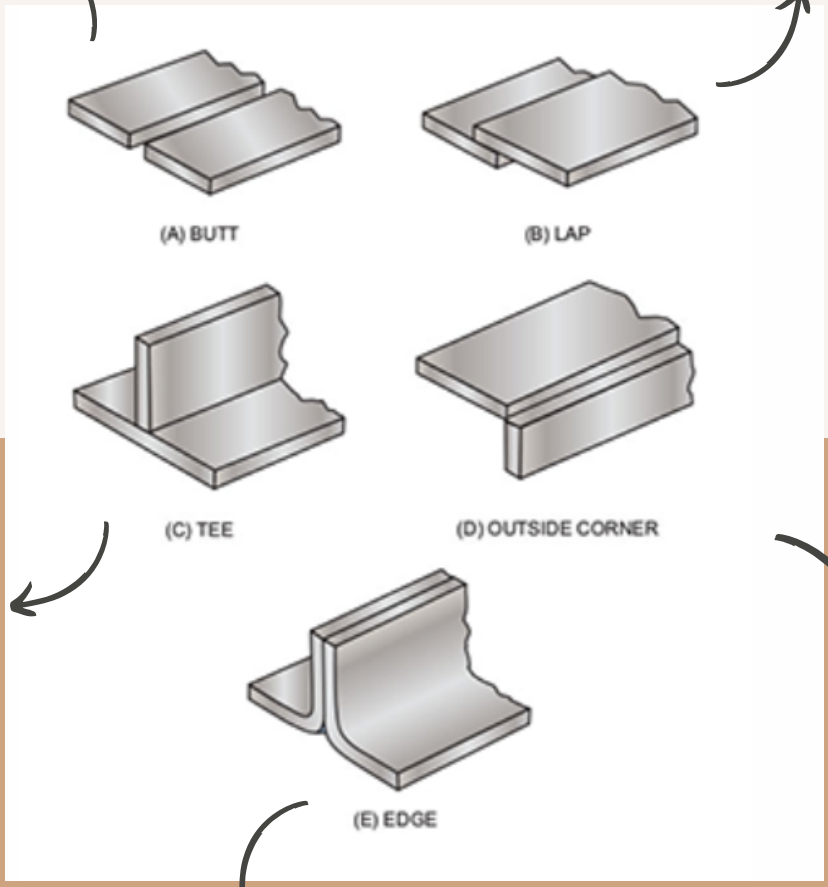
Types of weld are the different types of joints, the 5 basic joints are:

- Butt joint.
- Tee joint.
- Corner joint.
- Lap joint.
- Edge joint.

A welding joint is only as strong as the welding, however when done well they are every strong and should last a long time.

A butt joint is the simpilest type of joint, it is welding the edges of two pieces together so that they are both flat. You can doa process before called edge prepartion where you make grooves in the metal to make a stronger joint.

A lap joint is similar to a butt joint but the two pieces overlap each other, this is normally used when the two pieces are different thicknesses.



A Tee joint is when you weld the two pieces at 90 degrees to each other this can only be done if you don't want the metal to be flat.

An edge joint is when the two pieces are out together so that the flat surfaces of both touch, normally by bending the wood.

A corner joint is the same as a tee joint in that the two pieces are placed at 90 degress to each other however with a tee joint the pieces are joined at the end to create a corner.

METAL SHEETS AND PRICES

There are many different types of metal you can buy. I mainly looked at what size you can buy steel and aluminmum in and how much it costs as most sets I have worked with and known of being used are of those two types. The size you can order types of metal in depends mainly on where you order it from and how big their machines are.

Aluminium sheets comes in different sizes and thicknesses. The thickness range from 0.9mm to 6mm and the size ranges from 100mm square to 2500mm by 1250mm. Aluminium is really lightweight and durable, it is also used for furniture, engineering, spacecrafts and ships just to name a few. The cost of aluminium;

- One 0.6mm thick 100mm square sheet is £3.75
- One 6mm thick 100mm square sheet is £14.31
- One 6mm thick 2500mm by 1250mm, which is the thickest and biggest aluminium sheet that 'buymetalonline' do, would cost £ 636.13

This is the cost just from one company, another company may be different and they would also do different size sheets. For examples metal sheets in Wickes range from 0.5 to 3.5 in thickness and are either 1000mm or 500mm in length. So as I said it depends a lot on the company you order from.

Steel sheets also come in different sizes and thicknesses. The thickness of stainless steel sheets ranges from 0.9mm to 3mm and the size ranges from 100mm square to 2500mm by 1250mm. The cost of stainless steel;

- One 0.6mm thick 100mm square sheet is £7.89
- One 3mm thick 100mm square sheet is £39.20
- One 3mm thick 2500mm by 1250mm, the thickest and biggest sheet of stainless steel that 'buymetalonlinedo' would cost £979.96

So overall stainless steel is more expensive to buy the same amount or a thinner sheet than aluminium.

Wooden sets are cheaper to build, as wood is a lot cheaper to buy. However metal sets last longer and require less ongoing costs so overall metal sets are cheaper. For the build costs, one 18mm thick 810mm by 410mm sheet of plywood costs £14.47. Whereas one 1mm 500mm by 250mm sheet of aluminium costs £15, so for the same price I would have almost double the amount of wood. Both prices from B&Q.

CONSTRUCTING A TREE

Including study task 10

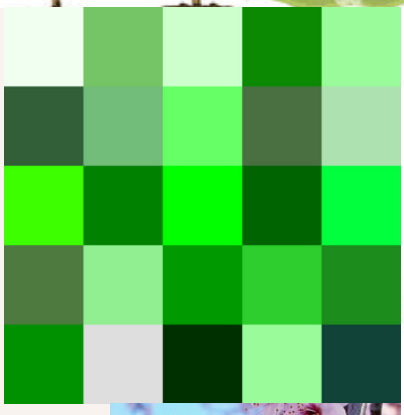
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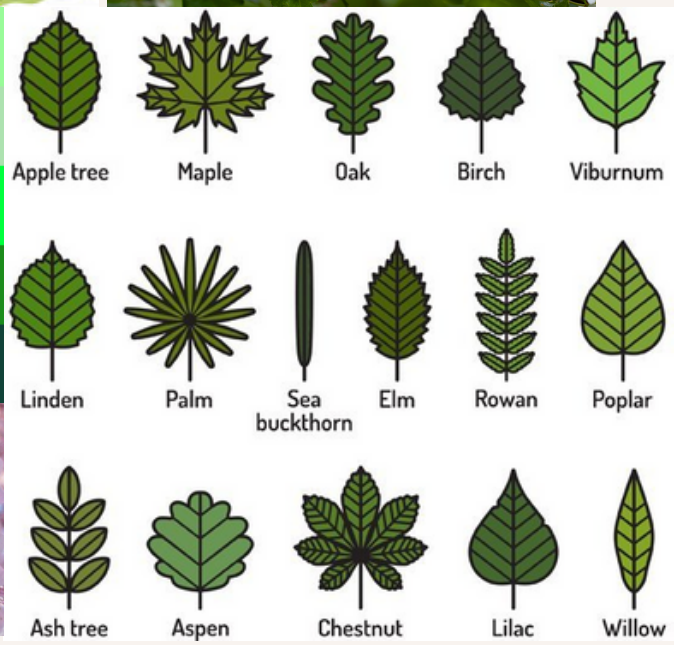
- Cast members climbing on it
- How would it be fixed to the stage
- How could you make something so prominent not overwhelm the stage
- This should include materials
- Some estimate about cost, time and resources needed.

I would first research different types of trees, which one I liked more and what I wanted the aesthetic to be - gloomy, joyful, dying tree or green, blossoming tree, what is the atmosphere of the scene? I would then make some models using white card and plasticine or clay. I would look at colour, shades of brown, green and pink using colour swathes, as well as types of blossom.









The 7 steps of design,

1. Comminitment
2. Analysis
3. Research
4. Incubation
5. Selection
6. Implementation
7. Evaluation



When I had done some research one types of trees and colour I would start thinking out the construction process.

Inital questions to answer:

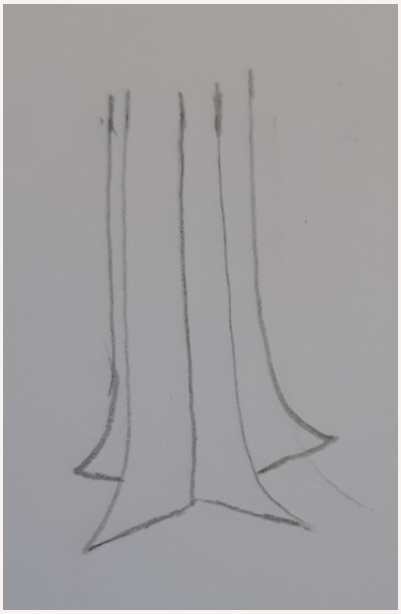
Making the tree strong enough to have people climbing on it. Would I use metal, wood? How would I secure the base down so it didn't fall over?

THE TRUNK

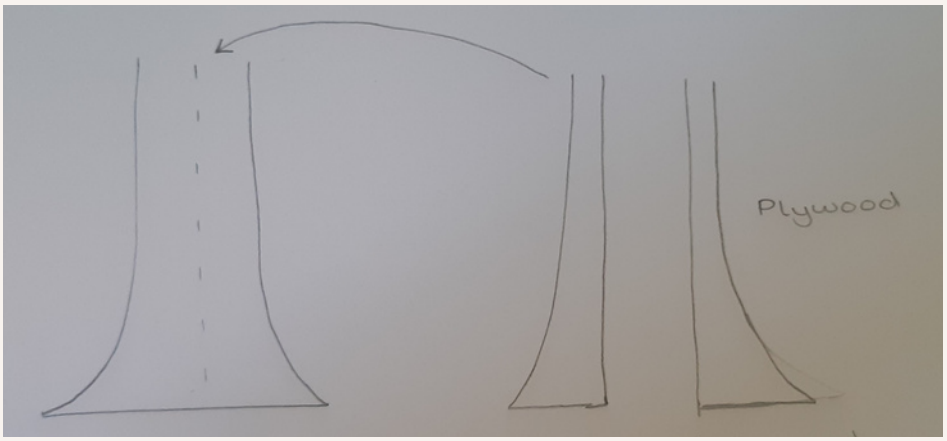
For the trunk I would use sheets of plywood arranged similarly to a white card model. I would have 3 sheets, one straight through the middle and two either screwed or stapled to the middle piece. As show below.

To increase the strengh I would sandwich a sheet of steel inbetween the plywood sheets.

I would also add footholds on the back for the cast to be able to safetly climb up. These will all be evenly sized and spaced.

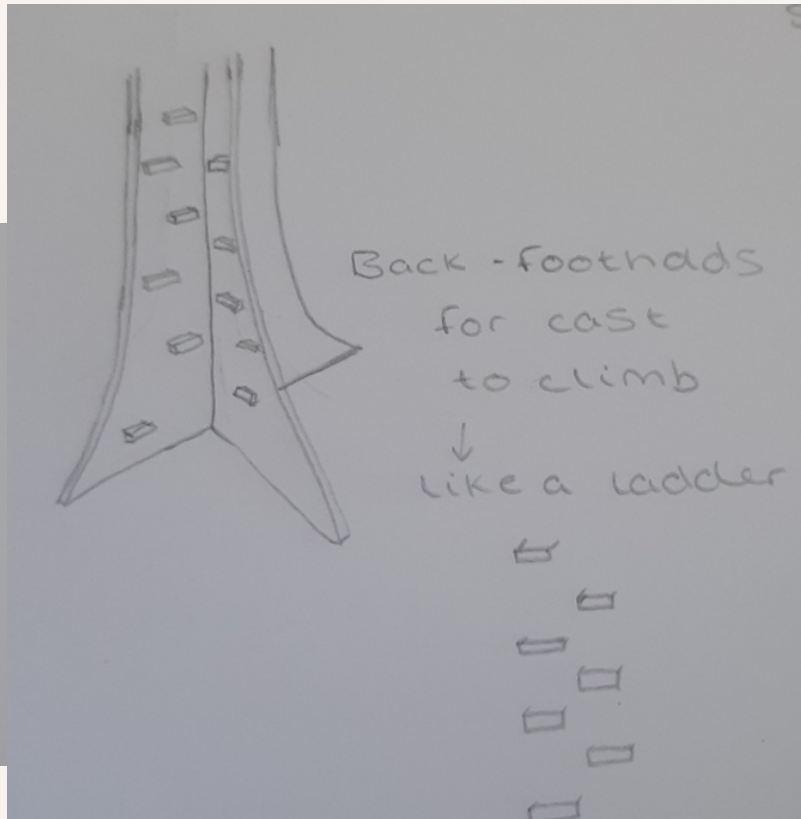


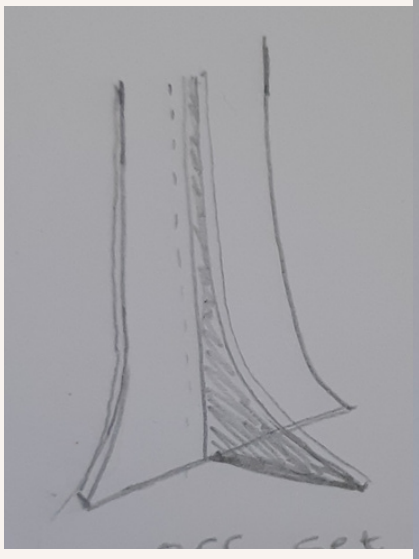
The overall tree trunk structure.



The back, footholds for the cast to climb up safetly.

The sheet to cut out of plywood. If snadwhiching with stell then cut two of each.





The front, off set the too panels that are being screwed/ stapled on so you have room to attach both.

THE BRANCHES

For the branches I would again use wood, however this time I would use planks instead of plywood sheets to give it more strength. I would use the wood as a frame to dress using fabric. The branches would be planks of wood with the sharp edges planed off and sanded to be rounder. I would screw the branches onto the trunk and then screw smaller branches coming of these. I would make sure their weight was held securely by having rope or ratchet straps hidden under the dressing going from each branch to the trunk. The cast would be able to climb up the trunk and stand right at the top of the footholds so it looked as if they were in the branches.

DRESSING

When the frame of the trunk and branches was made I would use fabric, possible dyed brown to drape over the structure. I would also paint it to add other shades of brown and possibly yellows and greens. I would use stuffing underneath the fabric to give it more shape. I would only drape the front and round to where you could see, leaving the back with the footholds open for the cast to climb up safely. I would do the same for the branches .

ON STAGE

One of the asks for this project was that the tree does not overwhelm the stage. I would handle this by having it off to one side of the stage, this way it would not be dead centre taking everyone's attention. It is also less likely to tower over the performers if it is not right behind them.

I would also make the tree no more than the the height of half the stage, which may change depending on what stage the tree will be on. While making it I would make the wooden frame, branches and trunk included, to a height of 2750mm. The height of an average male is 1753mm and so I would add 1 meter on top of this as there is cast climbing it and it make it easiest to measure and cut I would say 2750mm. However it would be slightly taller with the fabric on top. However, plywood comes in the 2440mm by 1220mm so it makes sense to make the trunk section of the tree 2440mm tall and it would also save time.

Fixing the tree to the stage is another important task, especially as the cast are climbing it. I would fix this by having extra braces on the tree which could have stage weight placed on top of them and then be covered in dressing. If this did not provide enough stability I would attach an eye hook to the back of the tree and the[illegible]e rope to tie this to the floor behind the tree.



COST AND TIME

Two sheets of 2440mm by 1000mm plywood for which I would need to order two sheets of 8' x 4' would cost £71.90.

One sheet of 2440mm by 2000mm plywood would need two sheets of 8' x4' which would cost another £71.90

If adding steel in the middle double the above which makes £287.60 and then add the price of the steel.

Two sheets of 2440mm by 2000mm steel, I would use four sheets of 1000m by 500mm steel. It would not matter that the steel was slightly shorter as it would still provide the same support. Four sheets of 1000mm by 500mm steel would cost £140.00.

Two sheets of 1000mm by 500mm steel to make the side pieces which are going to be would cost 2000mm by 1000mm, would cost £70.00.

So all together the steel would cost £210.00 and with all of the plywood needed would cost **£497.60**.

And then for the branches three planks of 22mm by 150mm by 4800mm which will make two 2000mm branches and I will use the off vuts for the smaller branches. So three planks will make six branches and the all the smaller branches and cost £44.40

One plank of wood should be enough for the footholds which could be 200mm by 50mm and need to be atleast 18mm. This would cost £19.20

Canvas fabric costs £31.00 per 1m so 10 meters would cost £310.

So overall for materials with the steel it would cost approximatly **£871.20**

The labour would take approximatly:

Measuring 1 hour
Cutting 3-4 hours
Glueing the steel and wood together 3 hours to dry as well
Attaching the sides and footholds 2 hours
Attaching the branches and smaller branches 3 - 4 hours
Dying the fabric and letting it dry 2 hours
Dressing the trunk and branches in fabric 3 hours

So overall it would take 19 hours. AS this is from rough calculations I would give an extra couple of hours and say 23 hours maximum which at £18 an hour for two people would cost **£828,.**.

So overall the project would cost roughly **£1699.20**.

AUTOCAD

Using software such as autoCAD can be helpful to visulise what you are constructing and you can put all of the measurements onto an image. You can:

- make plans of stages and locations, which may be needed for numerous reasons such as making sure the set will fit and seeing where lighting bars are.
- draw flats and scery witht the sizes so you know what to cut.
- design scenery using hand drawn images and photos as you can layer images and then draw over them.

For this you need to know how to use the basics of autoCAD. Below are most of the basic functions of CAD. Below are most of the tools you can use on autoCAD and labelled are the ones I have used and are the most helpful to use.

LINE: Draw a straight line, you can input the length of the line you want in mm.

ARC: Draw an arc, with the start, middle and end point or there are differnt options.

POLYLINE: Draw a curved line.

CIRCLE: Draw a circle, you can input the radius or diameter depending on which you select.

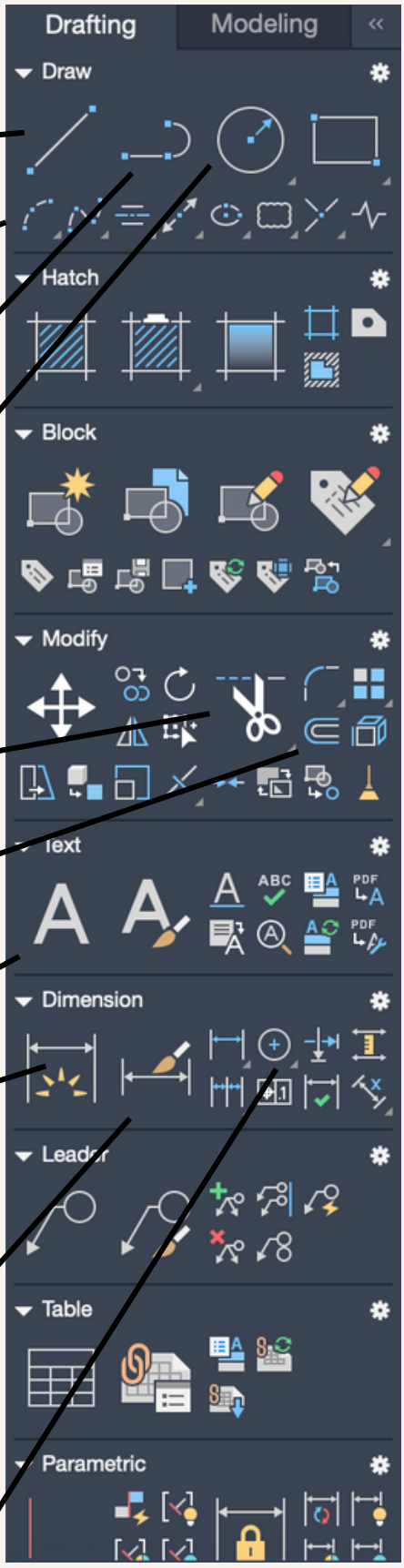
TRIM: Allows you to cut of part of a line.

OFFSET: Allows you to offset a line by a certain distance.

TEXT: Allows you to input text.

DIMENSION: Allow you to show the length of a line by clicking on both ends of it and then brining the measurment out.

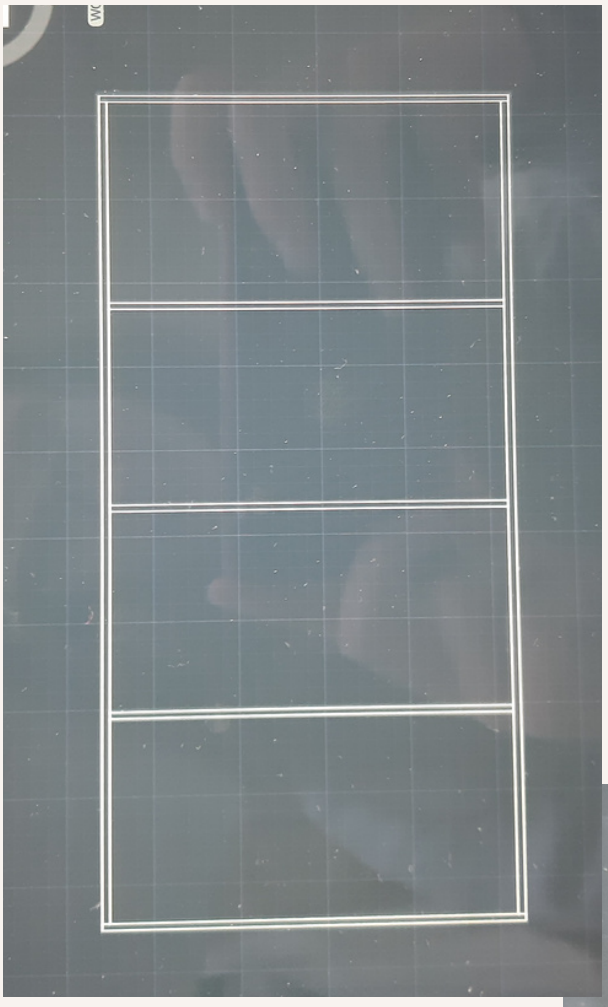
DIMENSION STYLE: Allows you to change the settings for dimensions, eg: colour and size.



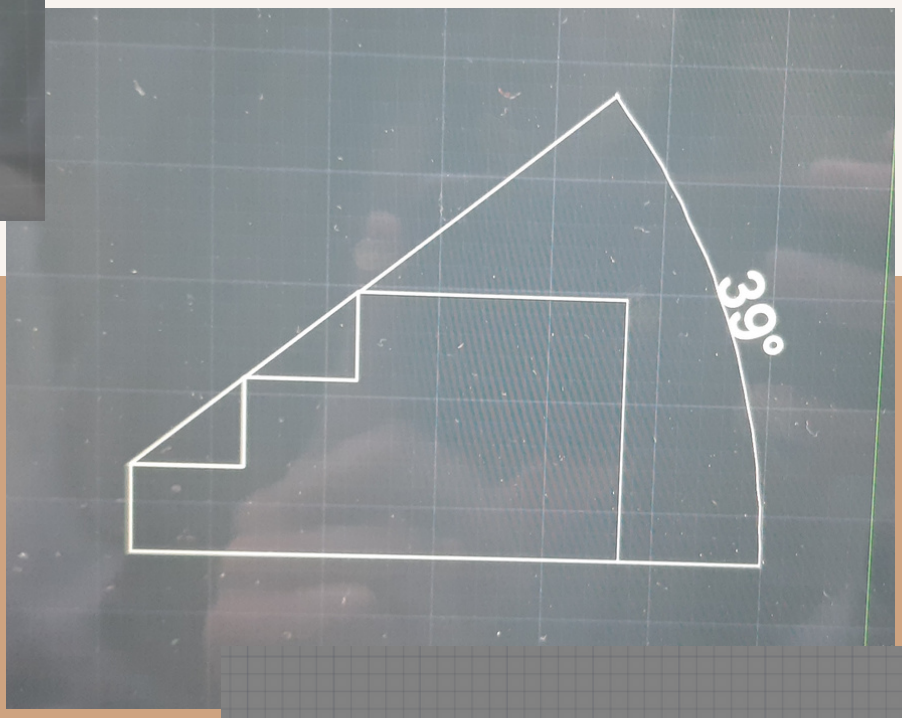
CENTRE MARK: Allows you to show the dimensions of a circle, either radius or diameter.

My CAD drawings

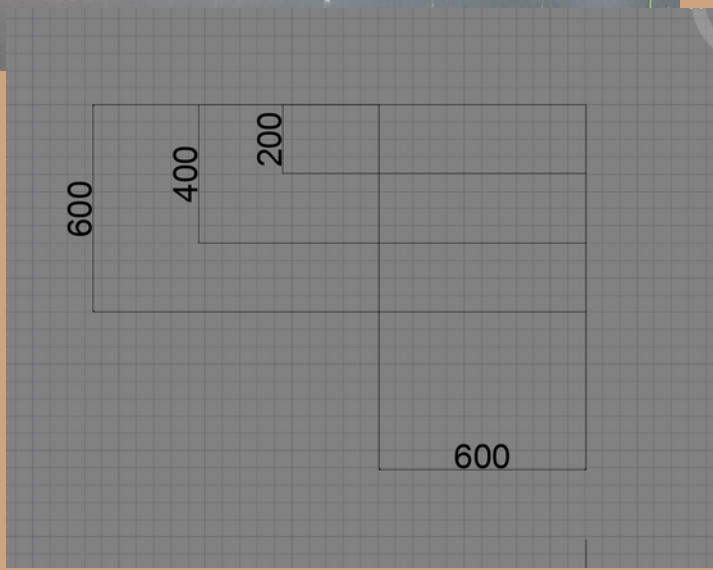
Including study task 11



An example of drawing a flat using CAD, you would use the ortho mode button to make each line at 90 degrees, and the offset button to make the toggles a certain length from the end and each other. Toggles are at every 2 feet which is 610mm , so you would make the first line at 600mm and then then off a line 5mm each side. This is an example of a hollywood flat. You also use the trim to cut out the lines in the corners so that the rails sandwhich the styles. Flats and other scenery are always drawn from the back to show the structure, however I would recommend drawing both the front and back.



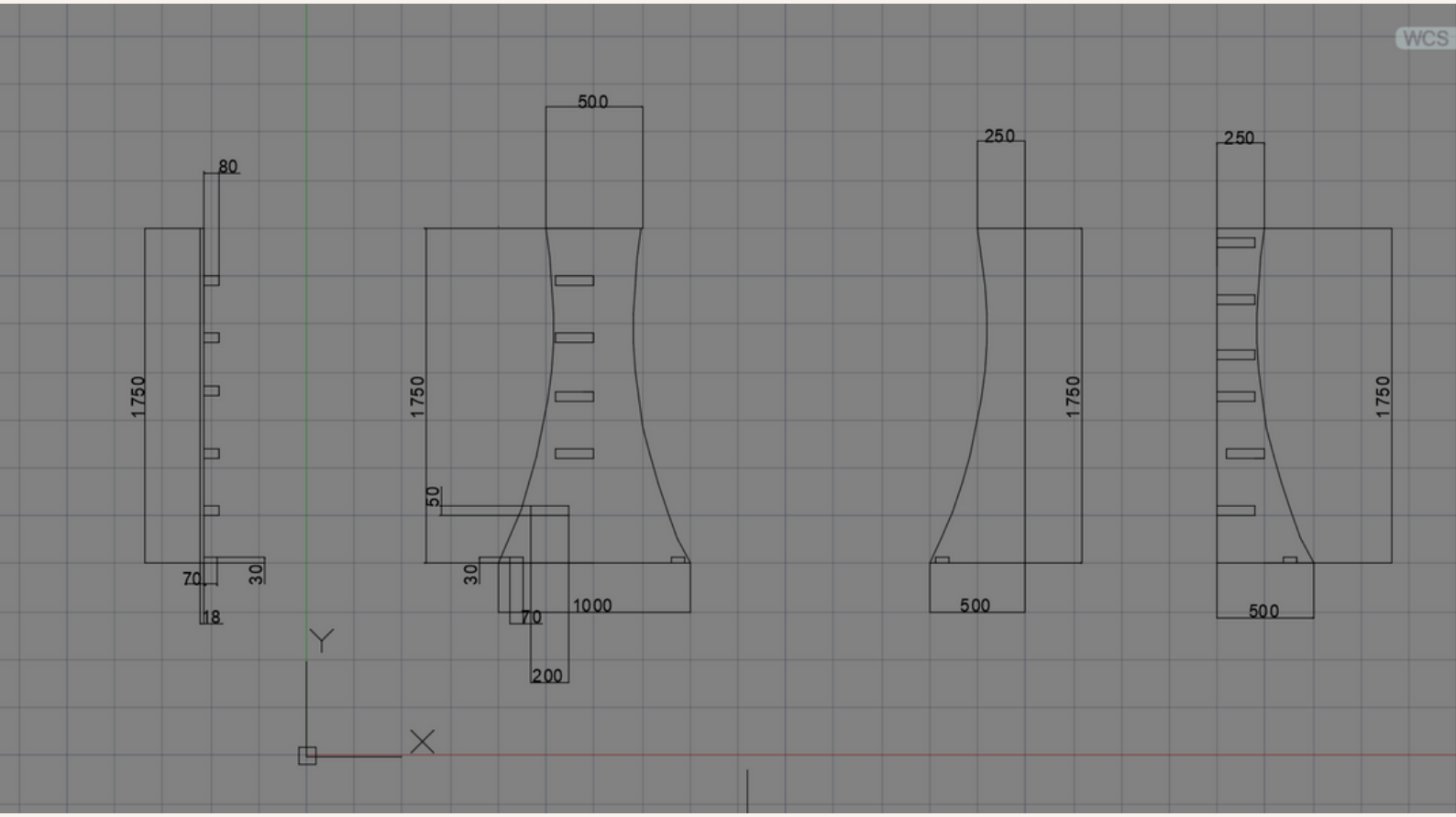
An example drawing treads in CAD and calculating the critical angle, which has to be below 32.4 degree for health and saftley on domestic stairs. Again you use the ortho button to make each line at 90 degrees. You calaculate the critical angle using the centermark button in dimenisons, which looks like a circle. You then click on the bottom of the stringer and the corner of any tread and riser. and pull the dimension out.



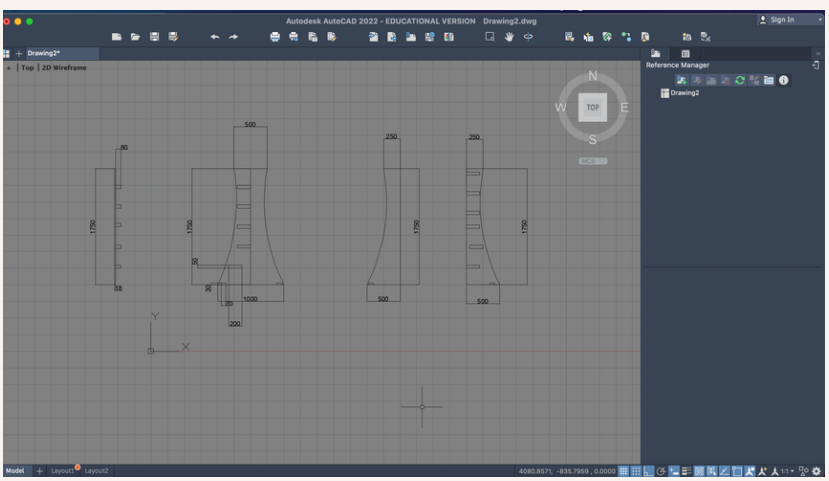
This is an example of the front of a set of treads. Where there are three risers which are each 200mm high and the width of the treads is 600mm. I drew this by using straight lines and turning on the ortho mode to only draw them at 90 degree angles.

CAD STUDY TASK

For this study task of using CAD to draw a piece of scenery, I chose to carry on from my construction design of a tree. I drew the trunk, including the footholds in CAD using the measurement I talked about earlier. I did not draw the branches because these would be made out of planks of wood and then dressed in fabric. The height of the trunk is 1750mm because I wanted the tree to be 2750mm over, so I left 1000mm for the branches to spread up and outwards. I made the diameter of the base of the treee 1000mm, because I wanted the weight to be spread across as big a base as possible to make it more stable, without the bases being disproportionatly sized. I made the height and length of the footholds 50mm by 200mm. As I needed them to be long enough for the cast to place their feet on, however the cast do not need to put their whole foot on it as long as it also comes out from the tree enough. For this I made them 80mm long so that the cast can safely fit their feet on the footholds. I liked doing this studying task because it built my confidence using autoCAD and gave me a push to use it to draw other things and I think I could use it pretty well and confidently now.



The drawing to the left shows the footholds from the side and then 18mm sheet of wood. The next drawing to the right shows the middle section which will have footholds contrasting the ones on the side of the trunk. The two drawings to the right and the front and back sections of the trunk. Each of the sections has a piece of either wood or metal at the bottom which is how it will be attached to the stage.



Cladding Scenic Elements

Including study task 13

Plywood, Polystyrene and Fabric

There are different ways and materials you can clad 3D scenic elements in. Plywood is the most common, it is usually stapeled on and then painted. With plywood you can completly change it by adding other materials or you can enhance its natural state with stains, dyes and varnishes. Although you can also apply wallpaper to it or polystyrene as we did with our treads.

You can completly change plywood by adding materials such as polystyrene you are then able to carve it and again paint it which can help you get a more realistic shape. For this you can use treads or boxes as your base or just solid polystyrene.

Another way to clad scenic elements is in cloth, this is a technicue I am less familiar with however it is similar to cladding with plywood. You stretch the cloth over the frame of the flat and staple it down. Cladding a flat or scenic element with cloth makes them a lot lighter and you can bunch it up easily creating texture. Cloths also come in a large variety of colours and textures and can be made to blend between different colours. One major company I found that handles fabric is J.D.MCDOUGALL their website is https://mcdougall.co.uk/ and just from looking on there for a few moments you can see the huge variety available.

Protective Coatings and Flame Retardants

Protective coatings are neccessary especially if the set is going on tour, being used for extended periods of time or shooting at outdoor locations. They also provide extra strength and can be fire resistant which is necessary especially for any scenic elements going into a theatre. Some finishes are, varnish, gloss, primer, fire retardant liquids and sprays. Varnish and gloss help protect from the weather and normally have a shiny finish. Flame retardant sprays can be used on fabric as well which is a positive especally if the cloths are flying.

Scenic Finishes

Scenic finishes can also involve making scenery look decayed and having wear, so it looks older than it is, textured, or like almost any material. This could be using metals that easily oxidise to look rusty.

Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

200
1822 - 2022

The 200 Project

For the universities 200th birthday they comissioned three 200 signs. These were made of polystyrene, waterproof MDF, steel and jesmonite and placed on top of steel deck which was then decorated with a scene specific to each campus. For Lampeter this was a wooden planter that is going to be filled with soil and have herbs and other edible plants planted in it. For Carmarthen the steel deck will be covered in wood and metal to represent the working history of Carmarthen and for Swansea it will be... They also all have projections onto them and lights shinning at them.

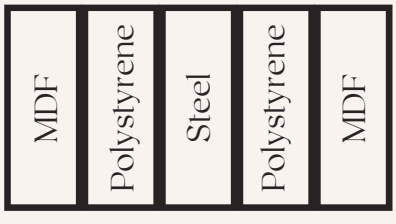
While I helping with this project I was able to learn about alot of new techniques as well as refine techniques I had previuosly learnt.



Materials

The plystyrene 200 hundreds, which are a 2 and an infinity sign were cut out using water jets in Swansea. The waterproof MDF 2 and infinity signs were then also cut with the water jet however this had to be seperatly as it has to be at different power settings for different materials. The metal sheets to go in the middle of the 2 and infinity signs were cut out seperatly and unfortionatly did not match the polystyrene or MDF, so make sure that the design if not altered along the way espeically if the materials are being cut out by different companies.

The polystyrene, MDF and steel were stuck together using contact adhesive, which I have talked about before and as I said you need multiple people to put them together as once they are together they are stuck.

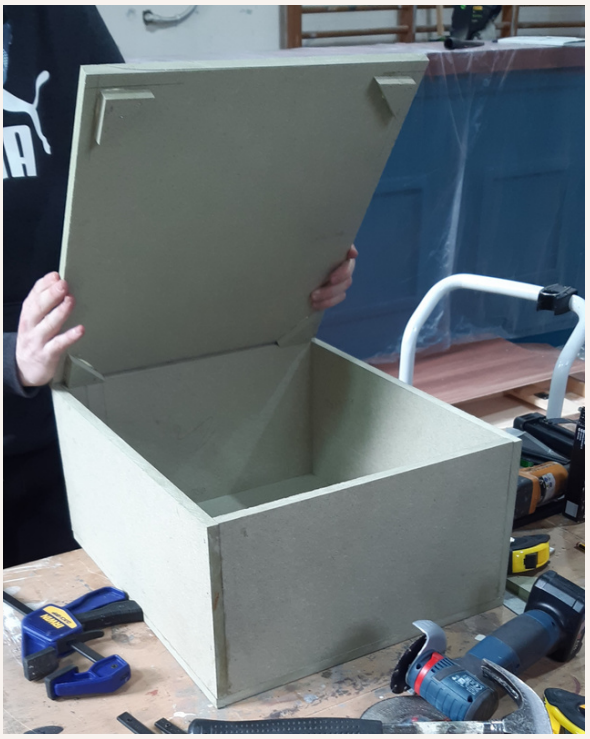




Jesmonite

We then mixed jesonite and dye which was put onto the signs with fibre glass fabric. This was then sanded down to reduce the lumps and make it smoother. Another layer of jesomite was then added on top once the first layer was dry and then a final and third layer once the below layer was dry. Again it was sanded down to reduce the lumps and will be varnished to gve it extra protection to the Welsh weather.

Although I had never used jesmonite before I had done fiber glassing which simmilar, I found it quite easy to use, you just have to remember the quanities of power, liquid and dye to add. Picture above courtesy of Gareth Otely.



Projection and Lights

We also made boxes for the projectors and lighting control box to sit in, we made these out of water proof MDF to provide protection. We started by measurin the size of either the projector or lighting controls, measuring and cutting the MDF. We then glued and clamped 5 sides of the box together, making sure the shorter sides sandwiched the longer sides then we stapled the box together. On the lid we added triangles to make sure it was in the right palce and wouldn't easily fall off.

Attaching the 200 signs to the steel deck

Once we had put the 200 signs onto the steel deck, attaching them using a metal frame at the bottom and scafolding legs which were bolted to the top of the steel deck. We found that the sign wobbled too much and as it was going outside in the wind it was decided to add rope from the top of each letter to the steel deck to hold it in place. For this hook were attached to the top of the numbers and then to the top of the steel deck. This was done for all the 2's and infinity signs.



Lampeter - Planter

Before the 200 signs were attached to the steel deck, for Lampeter the wooden panels for the planter were cut out and bolted together. The ends of the bolts wer grinded off to give it a smooth finish. I was able to practice using a grinder and I have become more confident with using one since and remembering not to go too close to the nut. Three of the four sides of the sides of the wooden planter were then attached to the steel decking. to still provide access to underneath the steel deck. When on location all four sides will be attached. As for all three signs they were we assembled in the workshop and have pictures taken. They will then be disassemble, taken to Lampeter, Swansea or Carmarthen and resurrected using the pictures.

Carmarthen -Stone and Wood

For Carmarthen stone and wood are going to be used to clad the steel deck because Carmarthen is surrounded by countryside full of stone and wood. The 200 signs will be the same waterproof MDF, steel and ploystyrene covered in yellow jemonite and only the cladding of the steel deck will be diffferent.

Swansea -

For Swansea the steel deck will be clad in something different to define it, it will e specific to the area of Swansea just as the ones for Lampeter and Carmarthen are specific to there areas.

BAR SCENE FOR THE PRODUCTION OF PATIENCE FOR CHARLES COURT OPERA COMPANY

Set Builder

Selves that are screwed onto the flats

Mirrors in each arched section



Extra section of the bar made first with an internal frame

2 large colums at either end and 2 small columns in the middle



Behind the bar.

Being a set builder for Charles Court Opera for a bar scene to go on tour with them gave me the chance to further develop my skills. I along with the other set buiders built the frames for the flat providing the backdrop for this scene, which we then clad in plywood. I helped construct the braces which will hold up the falts. We constructed colums which clipped to the flats with ..... with we also clad in plywood. I cut out shiny reflective silver paper to act as mirrors on the flats. We cut out shelves for the flats and I helped to make a second section of the actual bar.



The frames of the flats and one of the four columns which will be attached to the front of the flat clad in plywood. There are three flats behind the bar, two are identical and the middle on is slightly different.





As you can see at the side the flats are going to be clay in plywood that has already been stained, we attached the plywood by stapeling it to the frame of the flat, Pictures courtesy of Lucy B.

Braces which will hold up the flats behind the bar.



This picture show the almost completed construction of the bar. It has yet to be glossed in this picture. The flats will stand behind this as demonstrated in the design photo. Picture courtesy of Maisey.

Little Revolution - Set Design

Seating

Little Revolution's set used simpile things in a new manner. One thing I really liked about Little Revolutions was tha the seats were incorparated into the actual performance. This is not something I often think about, I normally think of the auidence as very seperate to the play. However evene if the audience are seperate there seats can still be involved. For example during this play the seats which were made out of wooden boxes which had be painted in greys and browns were used when the cast played a beat with drumsticks to intensify the scene. On the note of using music to intensify a scene they also had plastic matts with collages of the blakc lives matter protests on them which hung from the ceiling on metal chains. These plastic mats were also hit to highten the tension and amplify the atmosphere of a protest.

Scafolding was another everyday object used in Little Revolution. The scaffolding tower stood tall in one corner of the performance space. It was dressed in posters and fabric and set the tone as soon as you walked into the performance space. Scaffolding is not fancy and give the idea that something is being built. This fit perfectly with the theme of the play as they are protesting for things to change, for everyone to move forward and to grow. To solve design problems of have ots of set in a small perforamnce space the shop reference to by al the characters and owned by one character is just a white sheet hung across the corner of the room. This made sure that an eleaborate piece of set in the small space did not draw the auidence away from the play but still gave some intregue. It left me thinking was the shop would actually look like.

Lighting

The performance space ahd black curtains the whole way round providing a dark environment for the lights to spand out in. The lighting was similar for alot of the play however when the tempo sped up and the drumming beat was used to amplify the scene flashing lights were incorparated and when the speed of the play slowly down the lights slwoed down, become spotlights and having a dim orange glow. The lights shiningon the scaffolding also emphasized the change as they emphasized the tower of sccfolding making the shine and catch your eye.

SCENIC ART



Carrying on from scenic construction one thing I find very intreguing is scenic art. For Grease I was given the opitunity of painting some of the flats which formed the backdrop for multiple scenes including the garage and basement. There were two panels each representing a different group, only side the pink ladies and the other the T Birds. Partly using a stenisle and partly by hand I painted the graphity on to match each group as if they had painted or written it on themselves.

SCENIC ART AT THE BRIDGERTON BALLS

Bridgerton has many grand balls however one in particular in each season has caught my eye as it has designs painted onto the dance floor. In season one there is a breif clip showig the staff of the house painting it onto the floor. I presum ti must be washable paint as it is done on location in histroic buildings however it never looks smudged. I think this is such a intricultly designed peice of art that is incirparated into the scene and beautifully represents the era. For exampele this is scene where the Bridgerton's ball only has a small attendance the floor design helps to fill the space and make it not a boring usual wooden floor.



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