Major Work

Industrial Technology

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Out Door Bench

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Statement of intent

My goal is to make a three seater outdoor Bench that will make the perfect outdoor garden lounge that is not to expensive. And can deal with the harsh weather of every day to day wear. I'm going to achieve this by looking through the market and looking at all the designs. It will have to use a coating of outdoor paint to with stand the harsh conditions of outdoor climate.

I like old classical wooden designs and I really tried to bring the old touch into the design. I decided on this because there is a degree of difficulty and completing it.

It will be used for any one that has the space in the garden and use it and will last. It is going to be used for just social gatherings and BBQ's.

It will be 1800 long and have a dark finish. The cost of it is $150 estimated no more (this includes brash bolts and all wood plus paint). It will be able to sell for $250 RRP. It can be moved easy through doors as the width will be a bit over 500mm.

Measurement specifications 500mm by 1800mm estimate. Estimated to hold 250 KG with 3 people

Research & design concepts

Image not available

The back of the bench will be a design so that the style and elegance of an old wooden bench

The legs that are used here are great for weather and if you where to have the job put on grass it would not move

The best outdoor timber is Teak coated with a outdoor gloss to last through the harsh conditions of rain. However you cant buy teak with all the sizes that are needed in the job so for feasibility of the job radiata pine was the best choose followed by a stain and a coat of all weather sealer.

Mortis and tenon joints well be used to join the top of the frame. As it is most suitable for the job.

Steps involved in cutting a mortis and tenon joint.

1. Prepare timber to correct thickness and width.

2. Mark out places to cut with a mortis gauge on the tenon and the mortis. Make shore your markings fit to the design measurement of the job.

3.Cut the tenon with a tenon saw starting with even up strokes to start. then use a guide to cut the corner pieces off.

4. Now drill out the mortis. Line the drill piece up with the size of the tenon. Then drill the area marked out.

Aim is to allow a degree of difficult through strong joinery and have strong joints so that it can support 3 people

Justification of materials, components and processes

Options	Choice	Justification of choice
Materials • Pine Wood • Hard wood • Pacific Maple	• Pine Wood	• It's the only wood that comes in all different sizes needed for the job.
Components • Brass screws(rail joints) • Silver screws • Sikkens Stains	• Brass screws • Sikkens Stains	• Brass is strong and good for weather resistance. • Best for weather and colouring
Processes • Dowel joints, mortis and tenon and stoped housing joints • Dressing timber • Marking out • gluing • painting	• Cutting, drilling, sawing and use of all machinery	• I used all these joints for extra strong support for 3 people

Management

Estimated Timeline

	Dates everything was completed in hours																									
	term 4 week 9	week 10	term 1 week 1	week 2	week 3	week 4	week 5	week 6	week 7	week 8	week 9	week 10	term 2 week 1	week 2	week 3	week 4	week 5	week 6	week 7	week 8	week 9	term 3 week 1	week 2	week 3	week 4	week 5
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Statement of intent																										
design folio																										
Planning																										
finalising																										
Construction																										
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cutting back legs																										
sanding legs																										
templete for top frame																										
cut out top frame																										
templete for middle design																										
cut front to size																										
cut mortis and tennon in top																										
then same on leg																										
cut out arms																										
cut out slat holders																										
drilled dewols in legs																										
drilled dewols frame																										
sanded all pieces																										
final adjustments																										
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Finance Plan

Items	Expected cost thought to pay	Actual cost	Date Purchased
Timber	$150	$135.40	1/2/01
Brass screws	$15	$11.95	12/5/01
Outdoor weather paint plus stain	$20	$18.50	31/7/01

Total 165.85

Equipment used in job

1. Screw driver
2. Try squares
3. Marking gauges
4. Rule
5. Chisels

6. Mallets
7. Saws
8. Plane

Please refer to page 35

For uses for tools

Workshop safety & OH & S issues

- Using the **thinknesser**. Protective eye ware should be worn at all times and never be removed until you have completely finished.

- Using the **band saw**. The band saw is used for cutting anything even bones and meat like a butcher. So when using something a dangerous as this a few things need to be addressed. When cutting a piece of wood never feed with your hands in be hind the blade many fingers have been eaten by this machine. Eyewear should be worn. Always wait till the blade has stoped spinning before removing wood. Also shirt and loose clothing should be kept tight to the body.

- The **disk sander** is used to power sand the wood to a perfect 90 degree angle you need specific eyewear and a steady hand.

- The **circular saw** is used to cut pieces of wood straight and with adjustable widths. This machine requires eye ware and a long piece of wood that can be used to feed the last bit of wood though so you hands are not in harms way.

- ALL MACHINARY REQUIRES PROTECTIVE EYEWEAR AND ALL CLOTHS NEED TO BE KEEPED TIGHT, FACE AND DIST MASKS MAY BE NEEDED WHEN LOTS OF DUST APPEARS HARMFUL. All safety equipment was provided by Vaucluse high school with the proper safety equipment.

Workplace Communication

Workshop Drawings

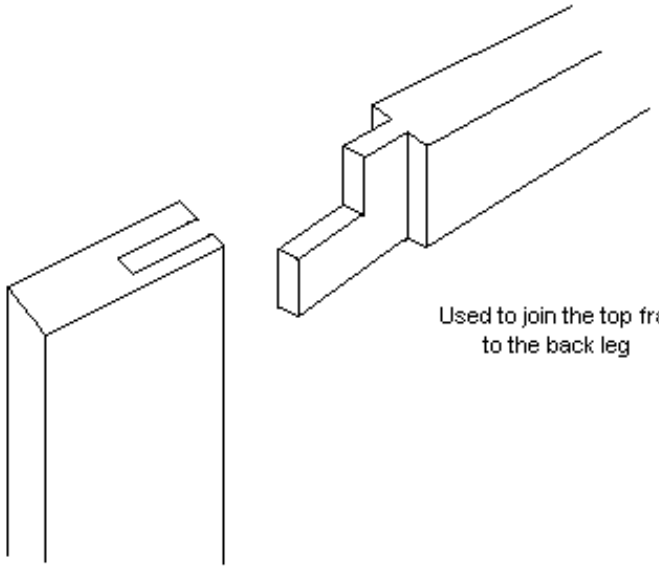
Image not available

Cutting list

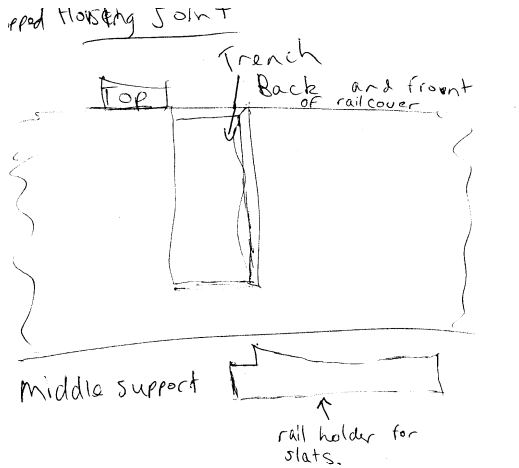
Description	width & thickness	height	piece no.	total length
front & back leg	80 / 80	1000	4	4000
slats	50 / 19	2000	7	14000
supports	35 / 70	500	4	2000
middle design	400 / 19	600	1	600
side rail covers	150 / 19	500	2	1000
front & back rail covers	150 / 19	2000	2	4000
top frame	200 / 19	2000	1	2000
arms	35 / 180	500	2	1000
back slats	30 / 19	600	6	3600

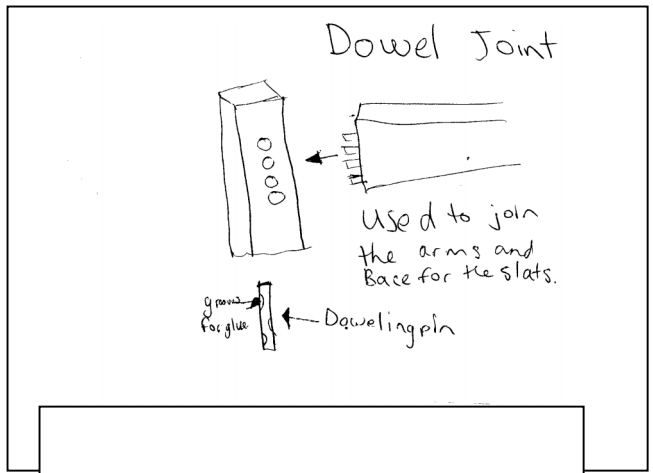
Sketches

MORTIS & TENON JOINT



Used to join the top frame to the back leg





Calculations

The calculations on the job where;

1. The front legs need to be cut lower than the back legs to 1000 down to 7000 to allow for the curve of the arms.
2. Cutting the mortis and tenon need to be a bit stronger than 1/3 across the mortis so on each piece I did from 19 mm 5/9/5. Cutting the middle piece at 9 so that it would support top frame.
3. The supports for the slats are made 550 in from each side to give extra for 3 people at once.
4. Having both sides of supports to be at right height with marking out

Project Evaluation

Evidence of ongoing evaluation

The mortis and tenon joint used in to join the top frame to the leg was a good an serve its prepose as supporting the back of the chair.

The middle design was made to short but was integrated in to the design of the structure. It is then made stronger with extra support.

With over 19 dowel joints, 2 mortis and tenon joints and 4 stopped housing joints this is truly a strong and difficult job that I have achieved over 8 months of hard work.

Warped timber needed to be screwed in to place to hold the support beams.

With cutting pieces they needed to be cut short and shorter to get them to fit in just right with a trial and error method

The thicknesser broke down and arteria methods need to be used. So I decided to use the circular saw to cut the big legs out.

The templates I made really helped the shaping of the job.

Appropriateness of design and modifications

Modifications need to be made to the design when I encountered that the back design didn't fit with the required measurements as a result of the back leg angle. However this problem was over come by the using another piece so that there was more support need for the back of the chair.

The design had to be altered to the frame of the slat holders. If three people where going to sit on the chair it would require a reasonable amount of weight. So modifications need to be made instead of three slat holders it would be preferred that I use four with stoped housing joints with screws so that it provides a standard amount of weight with dowels.

Evaluation of outdoor bench

The top frame was made first with the middle design and should have been made last to line up exactly with the slats

The hardest part of the job was joining up about 20 joints with glue and and getting everything straight.

All hardware was provided by high school and with all the different machinery the school has any job is attain with proper safety.

The cost of the job was $165.85 with all adjustments and paint which makes this a cheap and worthy investment for a timeless garden bench.

Production

Quality of product

The product was made to 100% of my ability and with hours and hours of getting every joint to sit exactly flush with the surface of the part that it joined to. I surprised my self in that area where I thought that everything was going to be out by a bit, but nothing was even with the legs to legs including arms and side pieces all going from one piece to another it looked pretty nice in the end.

The stain was difficult as I expected. And it really gave the job the look that I wanted a really nice old style finish.

Evidence of a range of skills

The range of skills I used in the job.

- Dowel joints – after making over 19 joints with dowel pins it became easy easier and easier. And I know where my faults are that needed to be addressed in the first place. This joint was every effective and served its prepose in all aspects of the job. Drilling with a guide so the holes were straight.
- Mortis and tenon joint – the joint used was effective to the part of the job. It is strong and fits and looks good. Chiselling and drilling the holes of the job.
- Stopped housing joint – this joint was made with worped timber and need to be exactly right on both sides. The way around this was screwing the joint together.
- Use of staining
- Gluing and clamping of job
- Making various joints

Degree of difficulty

Drilling the dowel was easy but getting it to line up straight was another thing. So I needed to plug the holes and redrill them.

Cutting out the middle design was hard to get the curves all accurate on the bandsaw and sanding took a few hours just for one piece

Cutting a mortis and tenon joint on a piece of timber 2 metres long while standing on a bench.

Having to router the legs.

Getting stain evenly over job

Use of appropriate material

Radiata pine I think was a good decision in my job. If I used hard wood it would have be two times more expensive and with today's standards of joinery and outdoor weather paints you can change the colour of the wood to look as expensive as any hardwood.

Brass screws coated for special weather protection.

Use of industrial technologies

This folio was entirely constructed from Microsoft PowerPoint 98. All pictures where acquired by digital camera and scanner.

All machinery that was used was from Vaucluse highs wood tech prac room. Machinery and hand tools used;

- Power sander – finishes job just before
- Disc sander – painting squaring ends on all pieces
- Hand drill – used in making dowel holes and screws holds
- Circular saw – used to cut each piece of the wood to size
- Band saw – used to cut curves around timber
- Drop saw – used to shorten pieces and square ends
- Router, bench router – used to curve edges on any corner

Hand Tools

- Tenon saw – used for cutting out mortis and tenon joints
- Screw driver – used to screw in screws
- Sanding block and sand paper used to tidy up the job
- Chisel – used to make joints