

(i) IDENTIFICATION & EXPLORATION OF THE NEED

- The major design project that I will be designing and constructing is a tilting utility trailer that attaches' to the rear of a ride-on lawn mower.
- The purpose of my major design project is to assist my family and me with transporting garden products around our property. The motivation for me to make such a trailer was that I saw an opportunity to make transportation of garden products on our property easier, and that I had seen other similar trailers in use on other properties. The trailer will be used by members of my family, including myself. It will be used for light duties such as carting/transporting soil, firewood and grass clippings. The trailer will have a simple attachment to the ride on mower and a tilting tray with a removable tailgate. With appropriate usage and good storage the trailer should last along time.
- If my major design project could be a commercial proposition its target market would be anyone who lives on a property or a farm and who owns a ride on lawn mower.

(ii) AREAS OF INVESTIGATION

- The trailer is to be designed to suit the average ride on lawn mower.
- Its weight must be kept to a minimum to allow ease of handling by manual means when not connected to mower (an estimate at this stage would be about 10-20 kg force on the towbar, when trailer is empty)
- It is not envisaged that the trailer would be able to be dismantled for storage, so it would need an area equal to the size of a wheelbarrow for storage.
- Cost is a major consideration. It must also be kept to a minimum as I have only a small budget.
Investigation of local mower centres indicate that a commercial unit would cost anywhere up to \$450.
- Since the finished product will be used by my family, and on our lawn mower, it must match our mower.
- Also as it will probably be stored outside the trailer must be strong and protected from the elements.
- The trailer could be made from plastic or timber but upon careful consideration neither would prove to be as suitable as steel.
- Other applications: Perhaps a larger version could be used with say a small tractor on a hobby farm.
The tipping mechanism would be very useful.

(iii) CRITERIA TO EVALUATE SUCCESS

Function:

- It must suit the mower.
- It must be able to be towed and reversed with ease and without damage.
- It must be able to empty the load with safety and ease.
- The tailgate must be able to be removed and replaced easily.
- It must be easily and safely able to connect and disconnect from the mower.
- Size must match that of the mower (relative).

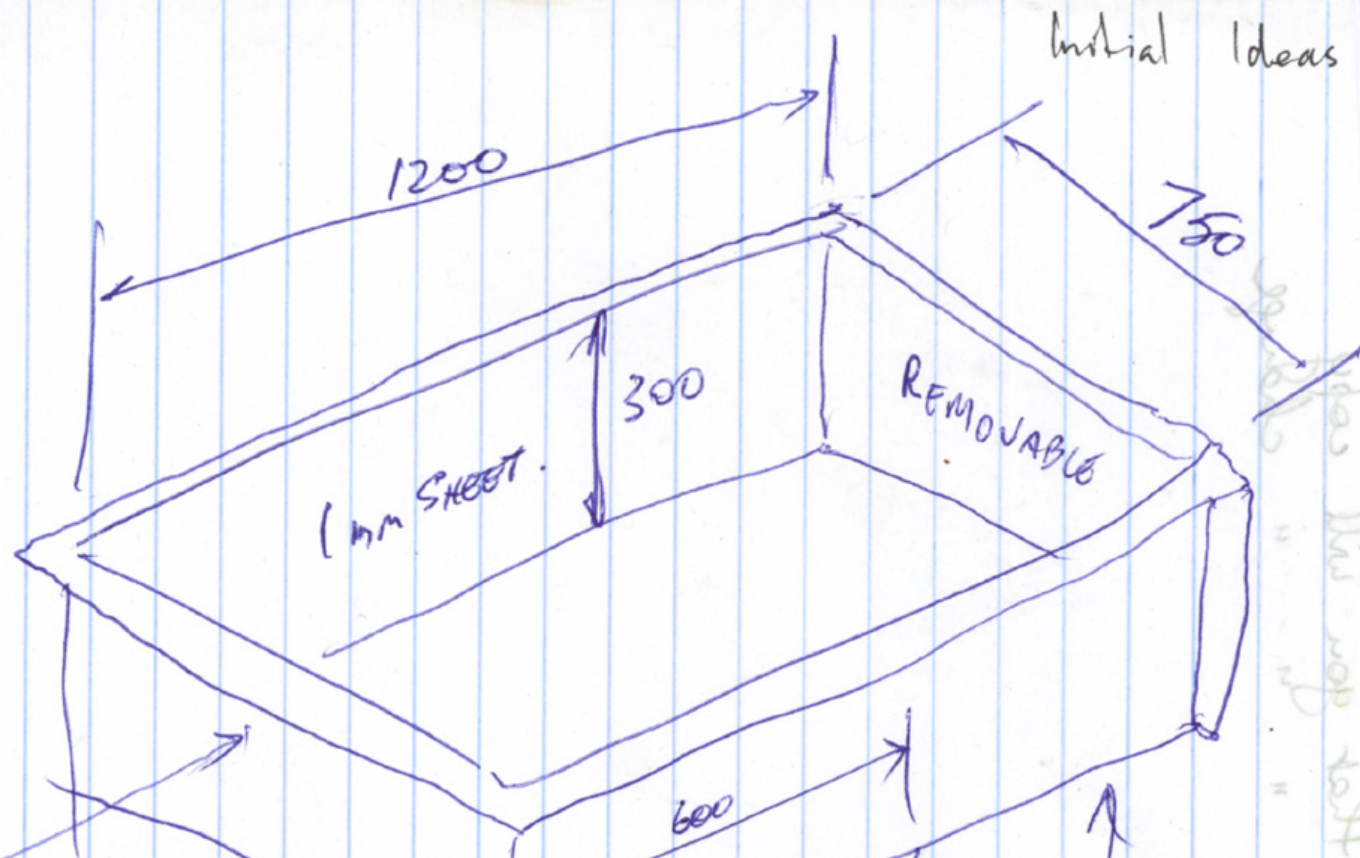
Aesthetics:

- It is preferable that its appearance suits that of the mower.
- It is preferable that it has a glossy finish.
- Other appearances are less important.

Methods to determine if successful.

- A survey of local experts (neighbours) will soon establish if it is successful.
- Also load tests will quickly determine any floors.

MASHOKT
 14.5 HP
 LAWN MOWER
 RIDE ON
 Towball Capacity -
 Vert load
 90N max
 Horiz load
 150N max



Seems light weight
 have to reinforce
 motor attachment
 750

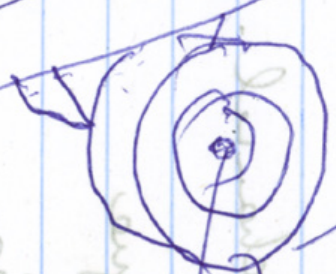
φ10



40 x 40
 SQUARE
 TUBE

TILT LOCK

TILTABLE



400

15 x 600 - 6

φ25 AXLE

PNEUMATIC
 TUBE TYRE
 4 PLY

Initial Ideas

- Durabi
- Aesthe

(iii) RESEARCH, EXPERIMENTATION & TESTING

Design ideas

- Refer to “Toro” catalogue and “John Deere” web page.
- Refer to “Road Plas” plastic trailers catalogue.
- Photo of friends trailer and quad bike.

Materials

- Measured the thickness of steelwork on other designs and increased where I thought necessary - mainly in the tailgate area.
- I chose mild steel over plastics as information on plastics was not readily available.
- Timber was ruled out for obvious reasons to do with life span.

Tools

- A quick trial with the “Brobo” quick cut proved to be easier and cleaner than by hacksaw.
- The MIG welder was used in preference to an “arc” welder because I have no experience in either, and after a quick lesson on the MIG, I found it to be much more user friendly.

Techniques

Test 1. Weld procedures

Aim: To determine the procedure for welding MS sheets.

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- Portable Power Equipment



ATTACHMENTS

21 Utility Trailer

- Big, 800-pound (21-cubic-foot) capacity
- Heavy-duty 16-gauge-steel box
- Tailgate swings out or can be removed
- Dumps at 35-degree angle for easy unloading
- Spring-loaded hitch pin attaches to optional rear hitch
- Locking mechanism on dump lever handle prevents unexpected release of latch and payload
- Large, 10-in. wide tires provide good flotation and minimal turf compaction
- Compatible with all Gators except E-Gator, Turf Gator, ProGators, M-Gator, and Worksite Gator

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(v) IDENTIFICATION &
JUSTIFICATION OF IDEAS &
RESOURCES

Resources – Throughout the project the main resources were the teaching staff at CHS.

- In the early stages (particularly with the purchase of the steel) an engineering firm was approached for materials, cutting of materials and advice on bending.
- Any reasonable engineering firm with experience in sheet metal could have been consulted.
- I used this firm on my fathers recommendations as he had them do work for him in the past. This proved to be a bonus with the extra knowledge they had.
- The internet and visits to local mower centres were also useful resources for information at the concept stage.
- Another resource was the use of a friends lathe to machine the shafts for the wheels. As I had little machine experience and inefficient time to learn, I asked my friend to turn down the shaft ends.

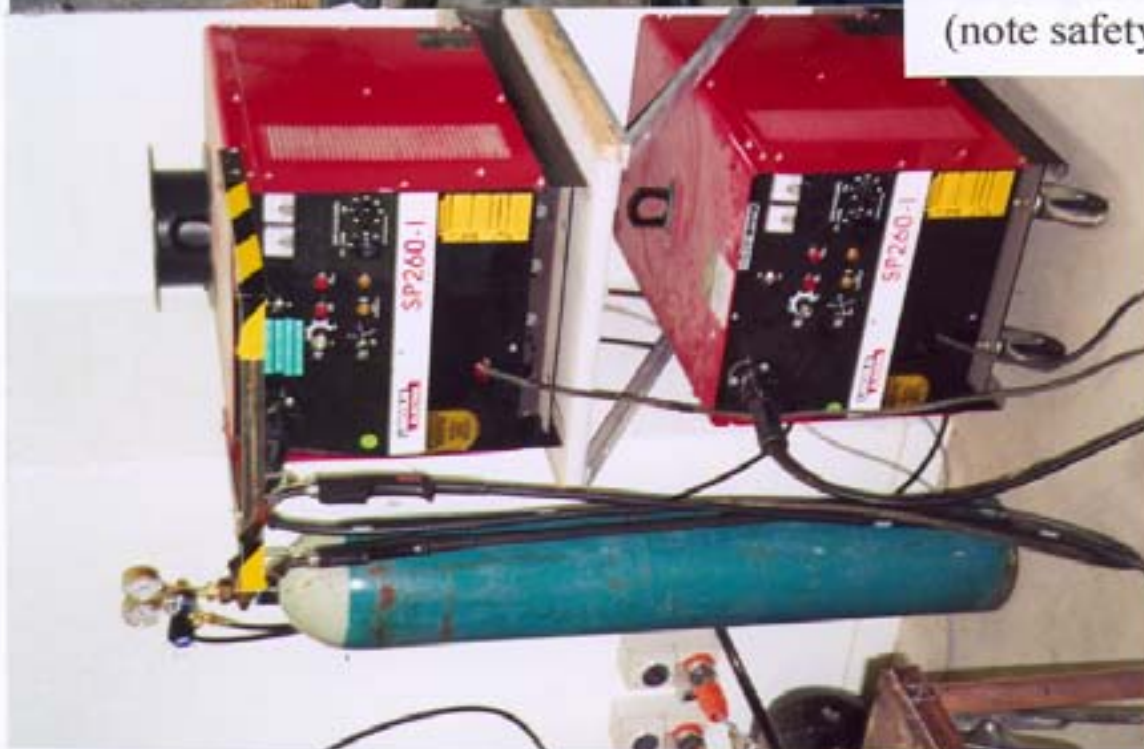
Ideas – The design was based on a proven concept but the problem areas (highlighted by my neighbours unit) were resolved after talks with my father and the school staff

(vi) EVIDENCE OF THE TESTING OF
DESIGN SOLUTIONS &
APPLICATION OF CONCLUSIONS

Tailgate latch design – This was really the only part of the project that could be tested when made. While at this stage I have not filled the trailer with 300kg of soil (to protect the paintwork), I have done a quick check of the latch by driving over a rough circuit at full speed. The tailgate remained closed so the design has proven to be O.K.



MIG Welding
(note safety mask)



Manufacture



Guillotine



Grinding



Drill press



Brobo Quick cut

i) EVIDENCE & APPLICATION OF PRACTICAL SKILLS

Skills used;

- Design skills were used in the concept sketches.
- During manufacture various metal work skills were utilised, such as welding, bending, drilling, cutting and grinding.
- To finish the project, painting and surface preparation skills were required.
- Finally, to prepare this folio, typing and presentation skills were needed.

- Several of these skills were obtained during the project (such as welding and painting). If I had more money and time I would have had lessons in the above and believe the finished project could have been even more professional.

ii) CONSIDERATION OF THE PRACTICES IN INDUSTRIAL/COMMERCIAL SETTINGS AS THEY RELATE TO THE MDP

In an industrial setting the primary objective is to keep the customer happy and at the same time make money. In my project, I have manufactured a product which achieves virtually all the objectives at a cost below the budget.

I have used good commercial techniques in acquiring the raw materials (the donated pieces would not occur in an industrial setting).

I have used safe and efficient workshop practices when manufacturing the trailer. This is evident by having no accidents and little rework being required.





Road Test



Rd

28th 8.02.

To Whom It May Concern

Re Ride On Mower Trailer.

Some time ago I requested to have a look at my ride on trailer for his Year 12 project.

Last week to my surprise he again asked me to evaluate his finished project. I have about four acres of lawn to mow each weekend and therefore consider myself to be quite an expert.

My first observations were that it looked very good. Upon close scrutiny it proved to be, just that.

has used thicker steel and given it a good coat of primer. This will hold it in good condition as my trailer is showing signs of rust. He would not allow me to give it a full load test (as he didn't want to scratch the paint) but I did tow it around and it performs as it should.

All in all it appears to be a sound unit and I expect it will last longer than my commercial trailer.

✓



PRODUCT



DETAIL 1



DETAIL 2



DETAIL 3

- use of appropriate materials, tools and techniques has led to the management and production of a quality major design project.
- a range of research sources have been used (testing, experimenting with tools, magazine and internet stimulus).
- investigation of materials used has been demonstrated in both the folio and the realisation.
- the application of results is obvious in the final realisation of the trailer and supported by a display of experimental results.



DETAIL 4