

## A Level in Design and Technology: Product Design (H406/02) Problem Solving in Product Design Sample Resource Booklet

### Date – Morning/Afternoon

Time allowed: 1 hour 45 minutes

**You must have:**

- the Question Paper

#### INSTRUCTIONS

- You must read this Resource Booklet through before answering any questions.
- The recommended reading time for this Resource Booklet is **35 minutes**.
- This Resource Booklet is to be used when answering all questions.
- The question paper tells you when to refer to the information contained in this Resource Booklet.
- This document consists of **8** pages. Any blank pages are indicated.

#### INFORMATION

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The stimulus in this booklet relates to issues and problems that may be encountered at festivals.

## DISCARDED FESTIVAL TENTS TO BE DONATED TO REFUGEES

Discarded tents and camping gear from this year's festival are being collected and donated to refugees in Northern France as part of a scheme run by a Bristol-based charity.

A charity foundation which was set up by volunteers in September last year to provide humanitarian relief to refugees in Europe, asked those leaving the festival if they would like to donate any sleeping bags, tents and non-perishable food to the cause and have also joined the clean-up operation to help dismantle the different camping sites and retrieve any usable equipment.

Monday saw the departure of around 155,000 festival-goers from the 900-acre farm in the south of England after five days of music and arts.



In their place, a group of around 800 litter-pickers have spent the first half of the week picking up around 1,650 tonnes of waste. According to festival organisers, last year, an estimated 11 tonnes of clothes and camping gear were abandoned, including 6,500 sleeping bags, 5,500 tents, 3,500 airbeds, 2,200 chairs, 950 rolled mats and 400 gazebos.

Bad weather, which led to this year's festival being particularly muddy, means that even more equipment is expected to have been left than usual, and organisers are expected a clean-up bill of up to £1 million.

This year, festival organisers tried to cut down on the waste created by the festival by asking each attendee to sign up to its 'Love the Farm, Leave no Trace' pledge when they purchased tickets. Through the pledge, attendees promised to use toilets and not urinate on the land, use the bins provided across the site, take all belongings, including tents and camping equipment home, and make use of the 100 recycling pens located in each campsite.

Reusable steel pint cups, made from recycled material, were also provided for the first time this year after three years of research and development. At the 10 major bars across the site, customers were asked to pay a £5 deposit on the cups, which could be exchanged for clean glasses when they bought more drinks, in an attempt to cut down on disposable cup waste.



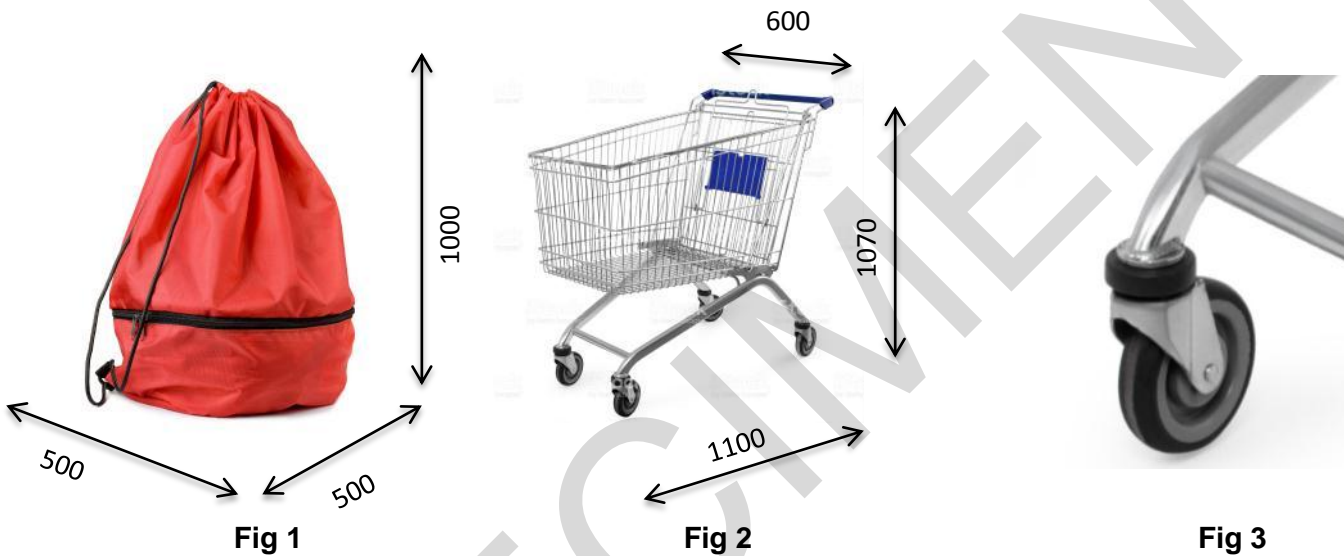
## Response to Market Research

Market research has identified that the costs associated with festival site clear-up are sufficient to provide each festival goer with a hard wearing stuff sack on entry to the festival site (see **Fig. 1**).

The aims of this stuff sack are:

1. Encourage festival goers to take equipment back with them that no longer fits in the original product packaging e.g. tents and sleeping bags.
2. Target festival goers that want to give their belongings to charity can do so, rather than take them home. As part of a **reward scheme** they will receive £5 from a warden at the campsite if they leave their kit packed into the stuff-sack for collection.

The stuff sack will adequately accommodate the majority of personal camping equipment including a tent.



Market research has also identified that this venture will be more successful if festival goers are offered a transportation product to help move the stuff sack and other belongings.

Festival operators are keen to re-coup the costs of the stuff sacks whilst encouraging festival goers to leave the camp-sites tidy. A similar concept to supermarket trolleys (see **Fig. 2**) is suggested where festival goers could pay for the use of a transportation product and return it to a station at the end of the festival. These trolley stations would be conveniently located around the camp-site, car parks and the entrances and exits of the festival site.

The festival operator believes that a large shopping trolley (240 litre capacity) could be an excellent festival camping kit transportation product subject to some modification.

### 240l volume shopping trolley - key attributes:

Material: mild steel wire and tube

Unladen weight: 22 kg

Surface finish: zinc plate then lacquered

Capacity (load): 140 kg

Festival operators are keen to retain the following key attributes of the shopping trolley:

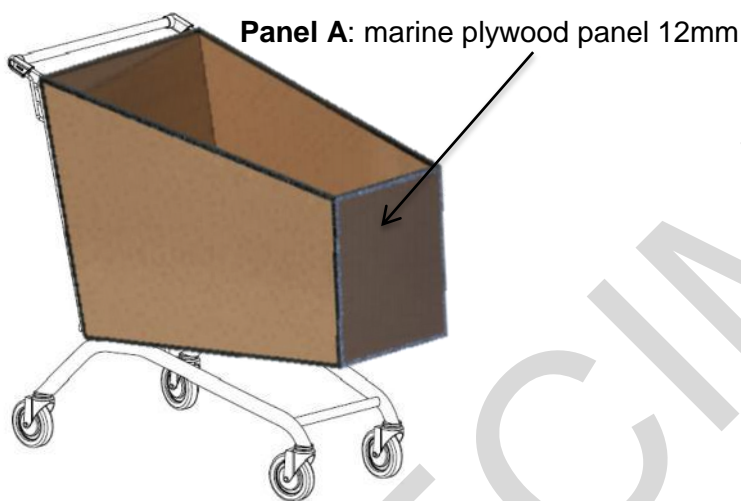
- *Ease of maintenance and cleaning*
- *Resistant to the elements*
- *Lightweight to enable ease of loading onto vehicles*
- *Interlocking, stackable or compact footprint when in the 'trolley' station.*

## Transportation Design Concept

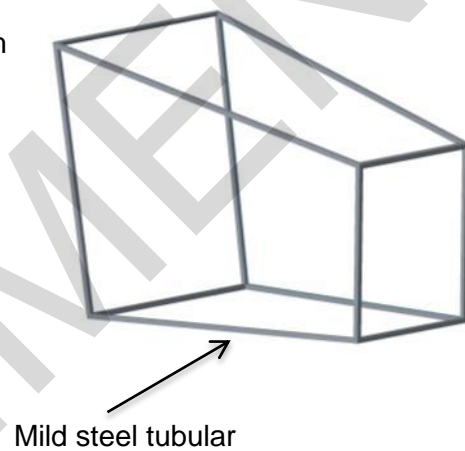
With the help of one of the manufacturer's designers the festival operator has provided rough concept outlines of how they think the modified trolley could look, **Fig. 4**.

The main change is that they would like the steel wire enclosure to be replaced by solid panels, and enclosed to keep the contents of the transportation unit clean and dry. Any small loose items will not fall out. This will also give the transportation unit a secondary function as a storage unit on the camp site.

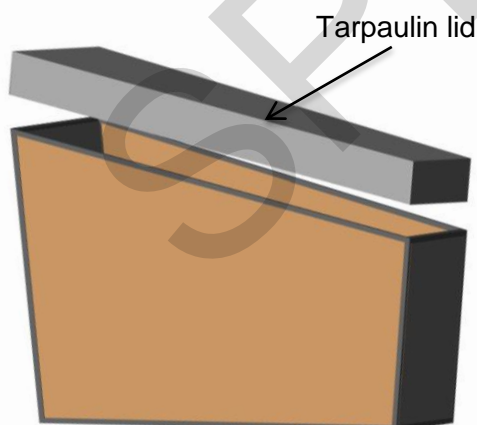
In order to maintain similar overall weight, the designer thinks that the new enclosure should be made of 12mm exterior grade plywood panels (see **Fig. 4**) and a 13mm square mild steel tubular frame of 1.6mm wall thickness (see **Fig. 5**). The designer suggests that the enclosure needs to be kept dry from the elements with a tarpaulin shown in **Fig 6**. The tarpaulin will need to be attached to the trolley to prevent it being lost.



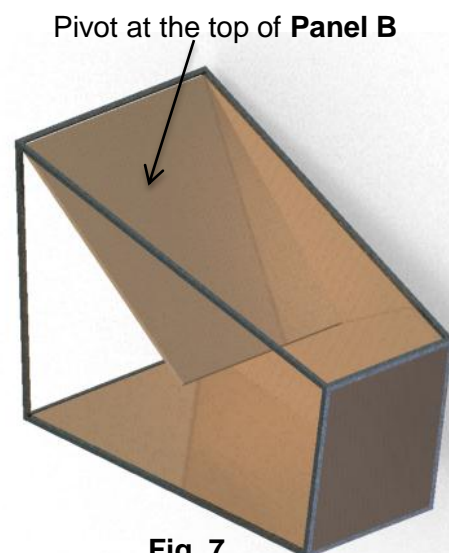
**Fig. 4**



**Fig. 5**



**Fig. 6**



**Fig. 7**

In order for the transportation product to interlock with other trolleys in the 'trolley' station, **Panel B**, shown in **Fig. 7**, will need to be able to pivot. The nearest side panel in **Fig. 7** has been removed from the illustration to provide an uninterrupted view of **Panel B**.

### **Festival camp site clear-up operation**

An international charity operates festival stores which can be found at many music festivals around the country. The stores are popular with festival goers as a place to buy second-hand clothing, rain coats and wellington boots. The charity is interested in expanding the fund raising they are making at these events to support the work that they undertake in other parts of the world.

The festival operator has teamed up with the charity who will also distribute and manage the stuff sack collection operation. All sellable items of camping equipment recovered from the festival can also be sold by the charity to add to their fund raising.

#### **Predicted statistics for the 2017 clear-up operation:**

2017 festival attendance:

- 5% increase on 2016 attendance.

Distribution of stuff sacks:

- 10% of festival goers take stuff-sacks at the entrances
- True cost of stuff sack including labour to distribute at entrances - £2.00 each.

Stuff sack reward scheme

- 40% of the stuff sacks distributed will be filled.

Stuff-sack collection:

- Truck hire (not including fuel) with workers (driver plus loading/unloading assistants) will be £380 per full day
- Workers can work a maximum of 8 hours per day
- Trucks and workers can only be hired for full days, even if only required for part of a day
- The capacity of each truck load is on average 255 stuff sacks
- On average, loading the truck, driving to the charity's collection centre, unloading and returning to the festival site takes 2 hours
- Fuel costs will be an additional £15 for each journey
- After dropping off the final load at the charity's collection centre, trucks are to return to the festival site.

Camping equipment left in stuff sacks for collection:

Camping equipment item:	Proportion of filled stuff sacks expected to contain items (%)	Percentage of items that are likely to be re-sellable by the charity (%)	Average profit of item in charity store (including washing, repair and labour) (£)
Sleeping bags	60	65	5
Tents	30	60	25
Airbeds	50	50	7.50
Rolled mats	40	95	5

**Table 1**

## Trolleys for children

The festival operators are in discussion with a trolley hire company that provides its services at numerous music festivals around the country. Hire of these trolleys is very popular by parents that want a place for their children to rest during the performances, particularly late in the day.

The hire company hires more trolleys to parents with children than to any other users. In order to make their trolleys more appropriate for this application they have developed the 'Wagon' trolley. This is a simply constructed adaptation of the trailer. It uses tubular supports and a fabric canopy/cover.

The promotional material is very directed to parents:

*"Hiring a trolley saves you time and energy, easing you in and out without breaking your back. Carrying all the load, if you're turning up alone or if you're a family bringing the kitchen sink along with you."*

*"Trolley the children when the festival is up and running hire a trolley overnight to wheel your children around in. Add some blankets and cushions, pop the kids in and off you go!"*

*"With the little ones in the trolley, either asleep or enjoying the ride, you'll get to see so much more of the festival and they are comfortable, safe and sound, right by your side."*



Fig. 8



Fig. 9

## User opinions of the wagon trolley

Parents:

### **Positives:**

1. Lots of space for the children.
2. Fun for the children 'Kids love it'.
3. Steers well.

### **Negatives:**

1. Needs better protection from the elements.
2. Would be good to have a larger range of options, rather than just the wild west wagon!
3. It is hard for the children to go to sleep as there is little noise protection.
4. When the wind picks up the canopy flaps around and distresses the children.
5. When the weather is bad, they tend to get returned by the parents.

Hire operator:

### **Positives:**

1. Popular with parents aged 30 something with small children.

### **Negatives:**

1. The mattress and cushions get dirty and damp.
2. Hard to keep an eye on them in the dark.
3. The fabric fades in the sun.
4. The canopy gets badly abused and often comes back torn.
5. The roof struts often get broken in use.

### Response to feedback:

The negative feedback indicates that there is a design opportunity to better meet the needs of parents with young children at music festivals.

The classic Volkswagen Campervan shown in **Fig. 10** is an iconic vehicle that is often associated with music festivals.



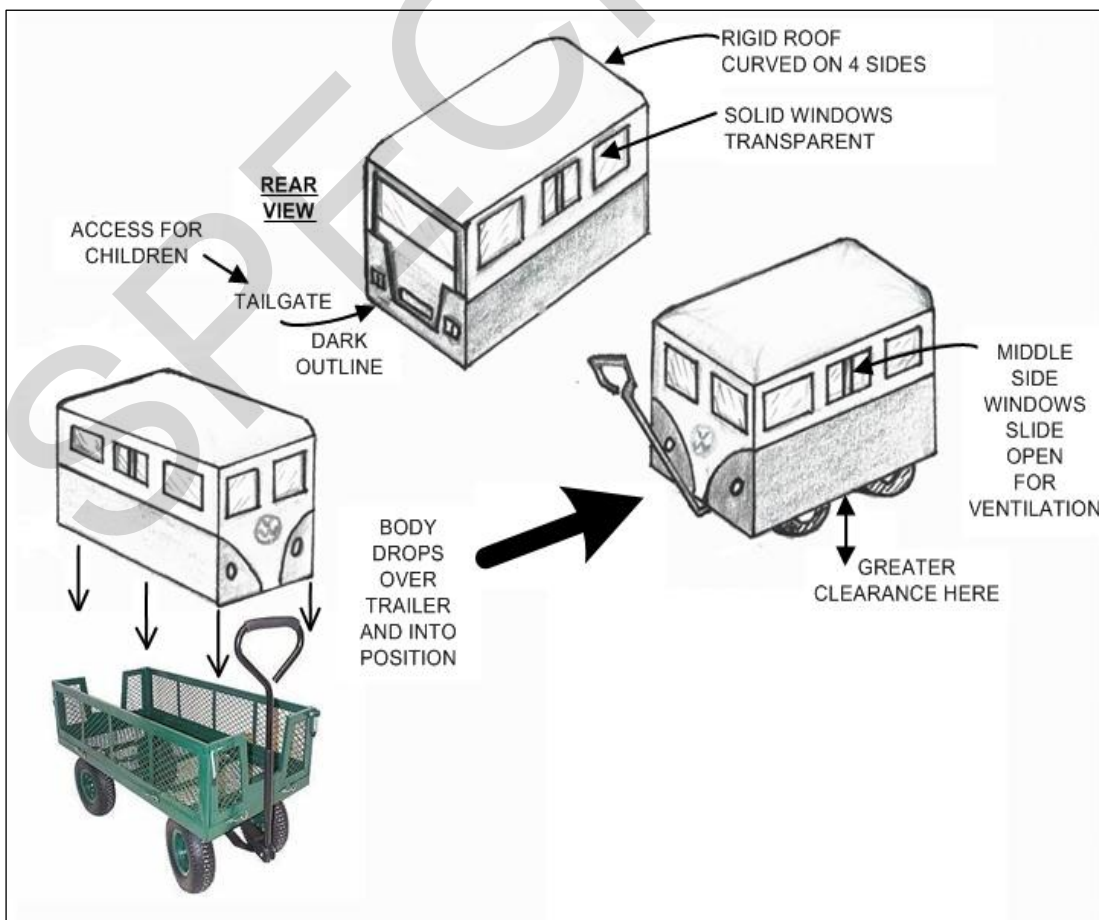
**Fig. 10**



**Fig. 11**

Market research has indicated that a wagon trolley based on the classic VW Camper would be desirable by festival goers with young children. An increased hire fee could be charged for these 'Camper Trolleys' and a significant increase in profits would be likely.

In order to standardise the fleet of trailers with the existing wagon trolleys the hire company would like any new products to be based on the same heavy duty trolley shown in **Fig. 11**.



**Fig. 12**

**A list of requirements** has been drawn up for a replacement body as follows:

The body must have:

1. a rigid structure
2. a temporary fixing method to the base of the trailer
3. low weight to ensure the centre of gravity is low
4. high strength and robust to withstand impacts from above and the sides
5. waterproof materials
6. water tight during a down pour of rain
7. opening windows for ventilation
8. complement the original design of the VW camper
9. appropriate for both sun shade and rain protection
10. a method for children to get out of the trolley.

**Fig. 12** shows the initial concept ideas and an early prototype for the body of the 'Camper Trailer'.

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