



Oxford Cambridge and RSA

Monday 20 June 2022 – Morning

**A Level in Design and Technology:
Product Design**

H406/02 Problem Solving in Product Design

Resource Booklet

Time allowed: 1 hour 45 minutes



INSTRUCTIONS

- Use the Resource Booklet to answer all the questions.
- You should spend **35 minutes** reading this Resource Booklet.
- Do **not** send this Resource Booklet for marking. Keep it in the centre or recycle it.

INFORMATION

- This document has **8** pages.

ADVICE

- Read this Resource Booklet carefully before you start your answers.

The stimulus in this booklet relates to issues and opportunities connected with the need to lower travel congestion and improve air quality in city centres.

Green Industrial Revolution

In November of 2020, the Government published 'The Ten Point Plan' for a Green Industrial Revolution. The aim of the plan is to create hundreds of thousands of new jobs by investing in British industries whilst also protecting future generations from climate change and the destruction of natural habitats.

Point 5 of the plan includes providing more active and sustainable transport, as well as measures to help pedestrians and cyclists. This includes the spending of £2 billion on segregated cycle lanes across the country to promote safe cycling to commuters.

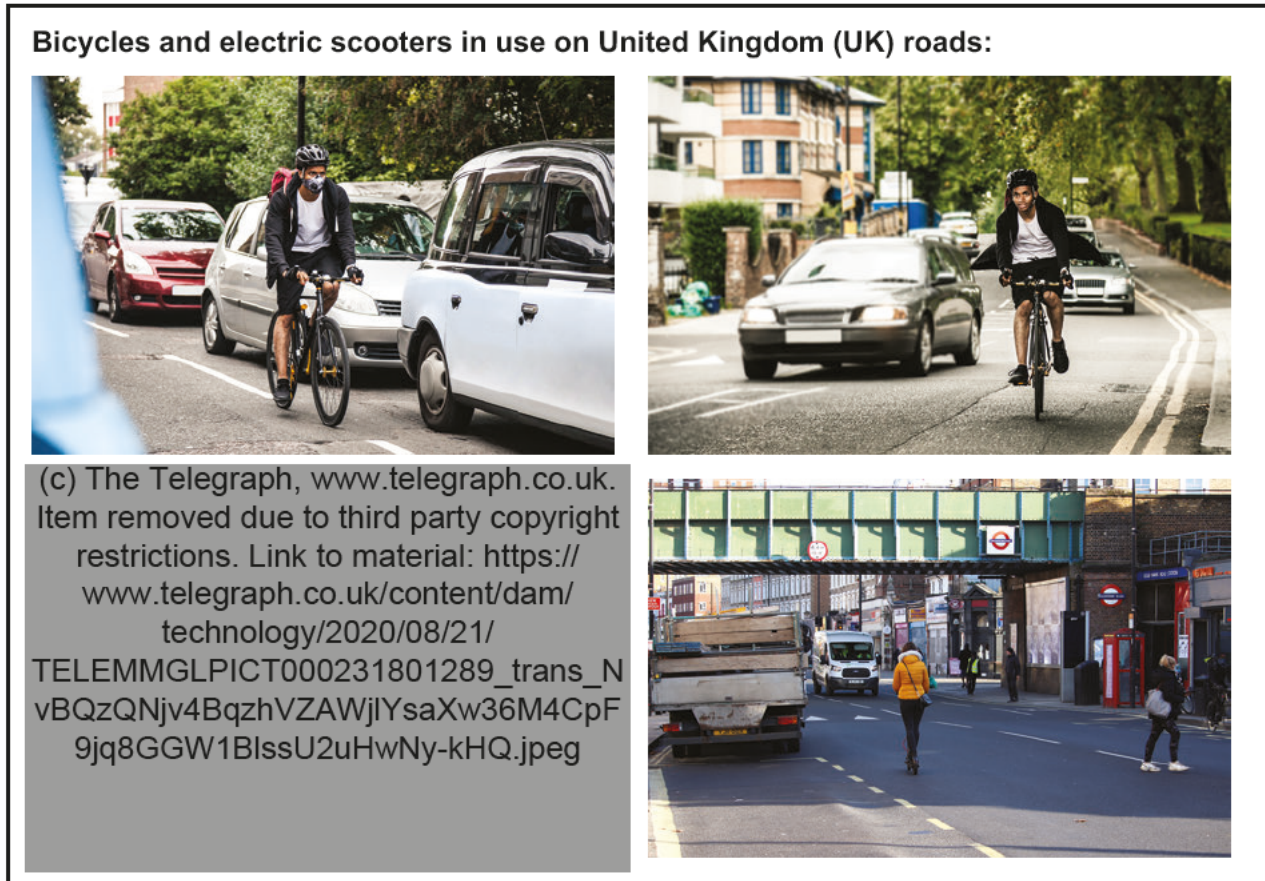


Fig. 1

Measures need to be taken to provide safe travel opportunities and reduce the number of casualties on UK roads.

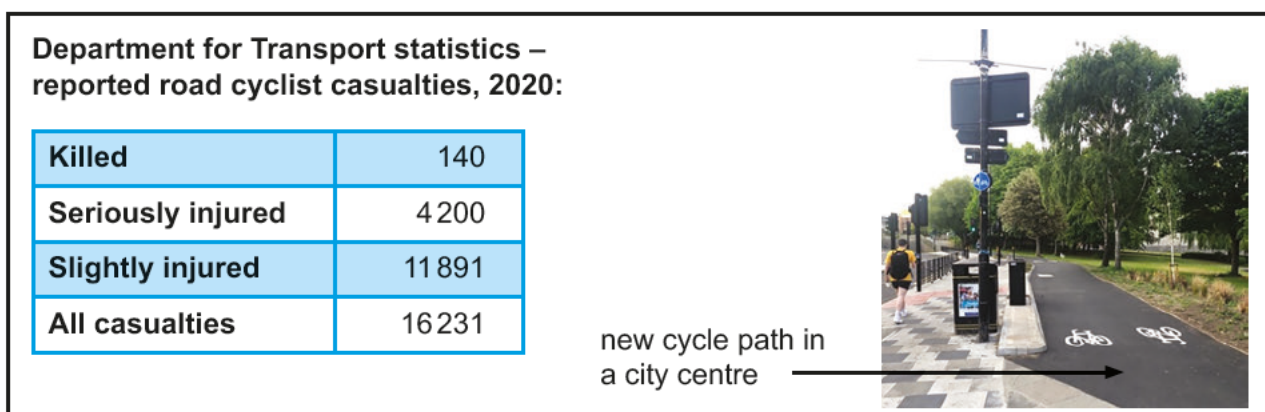


Fig. 2

Alternative transport

Councils are expected to improve the way that residents, workers and students travel around cities in order to reduce travel congestion and improve air quality.

Alternative transport methods, such as cycling, should be promoted to reduce the use of cars.


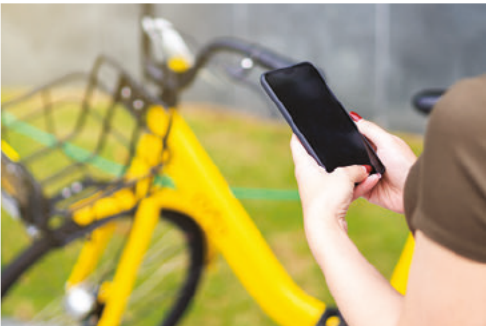

<p>Rental schemes</p> <p>Rental bicycles and electric scooters are a feature of many city centres. They offer a cheap, convenient and environmentally friendly method for tourists and visitors to get around and see the sights of a city. Users download an app onto their mobile phone and use this to locate and pay for the use of the rental vehicle.</p> <p>Rental bicycles</p> 	<p>App location and payment</p>  <p>Rental scooters</p> 
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Fig. 3

The council needs to assess the feasibility of operating its own alternative transport scheme or using a private contractor.



<p>Typical rental bicycle:</p> <ul style="list-style-type: none"> • £500 • Riders must be aged 13 or over • Dual mechanical brakes • 3 speed gearing • Stainless steel main body construction • Weight 16 kg 	 
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Fig. 4

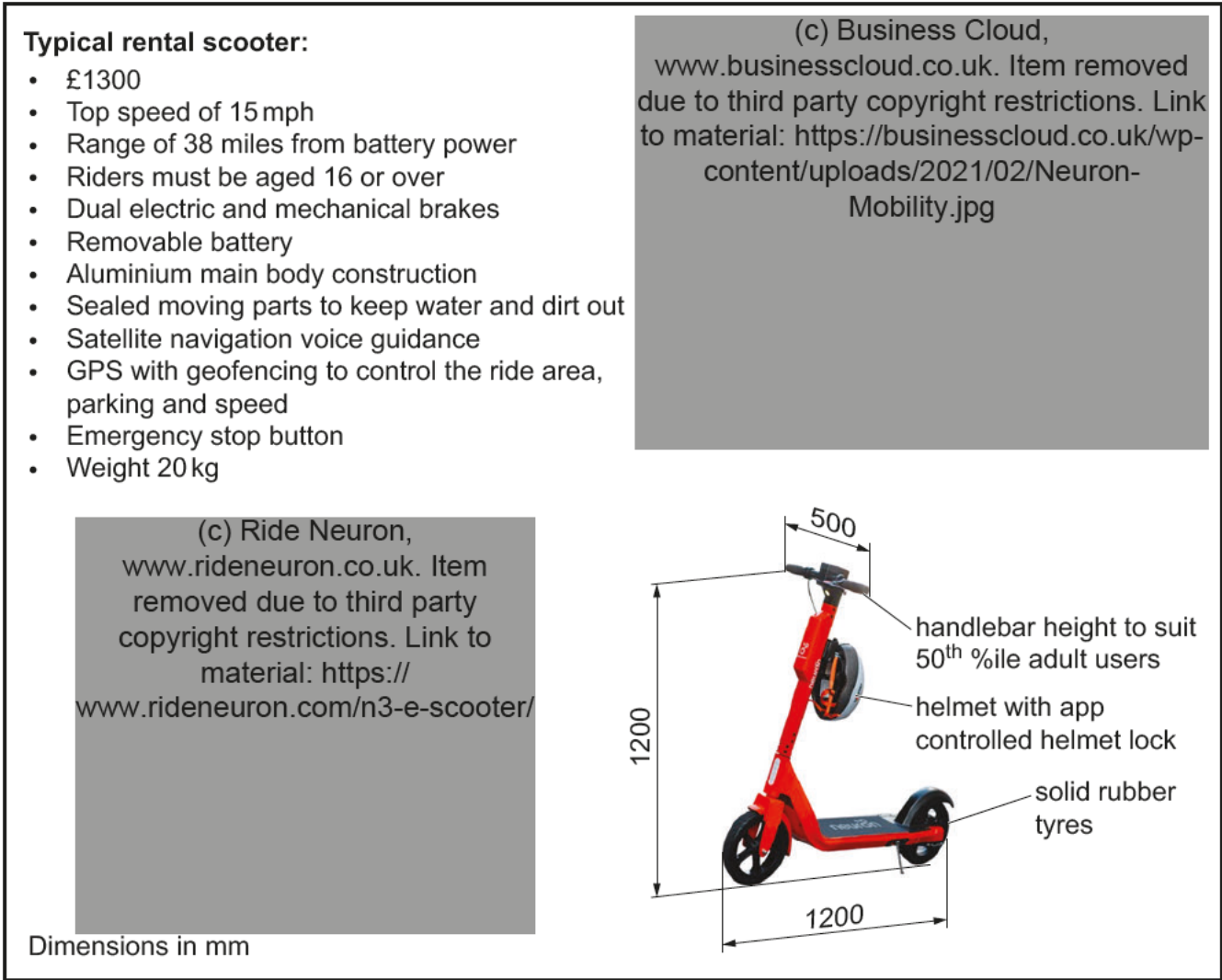


Fig. 5
(not to scale)

Trial e-scooter rental scheme

The results of initial investigations into operating a rental scheme have convinced the city council that the most appropriate course of action is to work in partnership with an experienced private contractor.

The city council has chosen a company, ‘Scoot-E’, that has experience of operating electric scooter rental schemes internationally. A trial scheme will be run for 12 months to assess the viability of a permanent e-scooter rental scheme.

For the trial to be successful, the marketing strategy needs to create demand for the e-scooters and increase their use across 12 months as shown in **Fig. 6**.

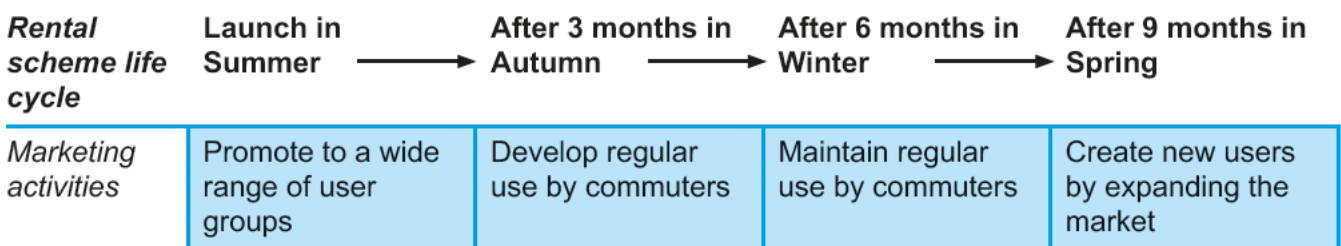


Fig. 6

Trial scheme e-scooter parking locations

Locations around the city have been identified for use as pick-up and drop-off points as shown below:

Outside a university



Opposite a school



Feedback from e-scooter rental trial scheme

The trial scheme proved to be very popular with students and commuters in the 20 to 35 age range and there was a reduction in the use of cars for short journeys. During the trial period, feedback was obtained from a range of stakeholders. Problems related to abandoned e-scooters as shown below:



Problems:

- Potential hazards
- Access issues for pedestrians, cyclists and other vehicles
- Damage to e-scooters
- Abuse from vandals
- Dealing with concerns from residents
- Discarded and abused e-scooters damages the image of the rental scheme



Fig. 7

E-scooter stations

Following the success of the trial, the council will continue to work with Scoot-E to provide the e-scooter rental scheme on a permanent basis. Council planners turn their attention to addressing the problems identified from the trial by providing dedicated e-scooter stations for the parking locations used in the trial. Users will be given discounts if they return e-scooters to the stations.

Each station will comprise:

- a stand for storage of the e-scooters;
- a shelter that will provide some protection from the elements and also enhance the focal point for the return of e-scooters after use.

Design inspiration

The council has funded the installation of stands for children's scooters at local junior schools and planners believe that a similar design would be appropriate for the storage of e-scooters when not in use.

E-scooter stand

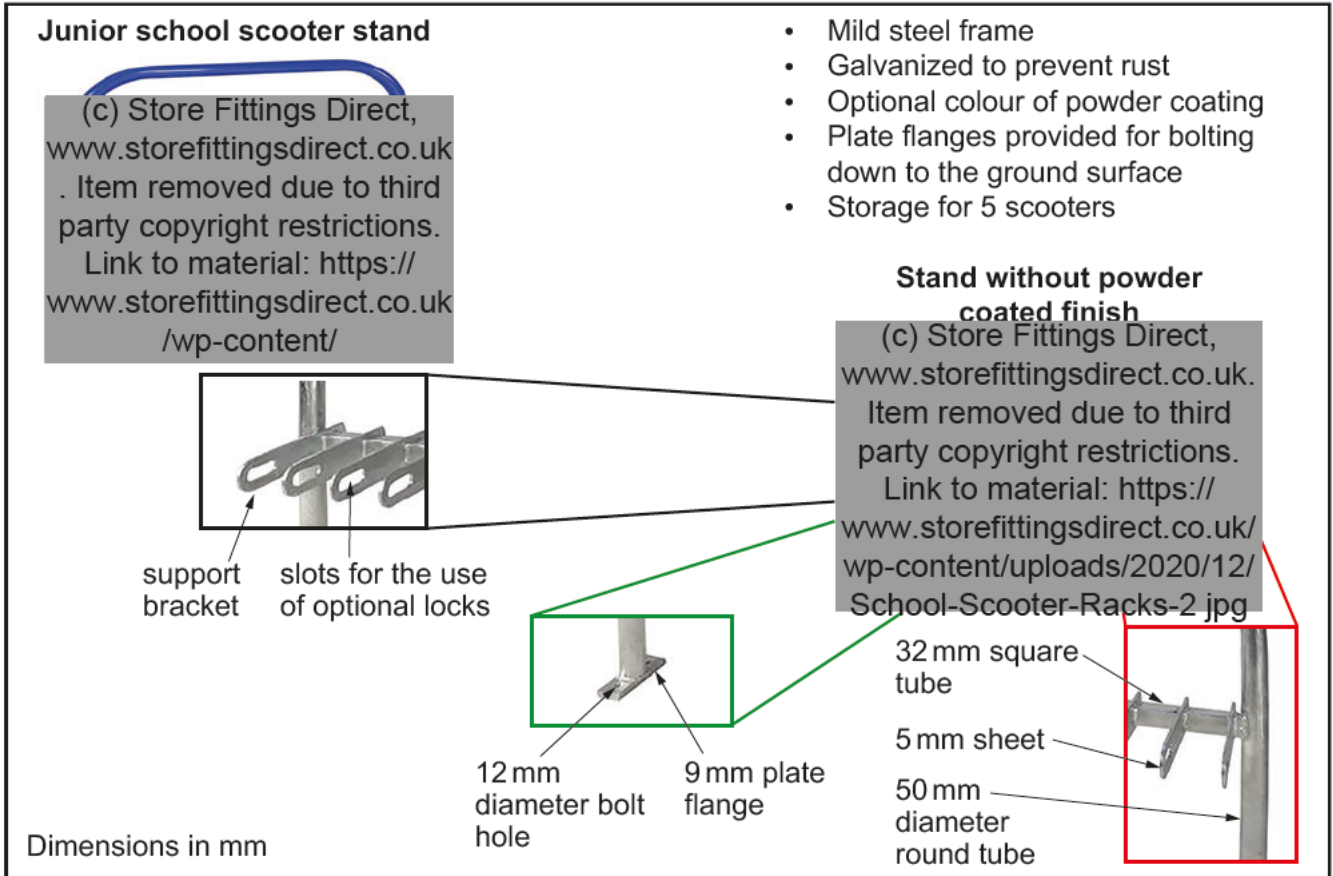


Fig. 8
(not to scale)

The manufacturer of the junior school scooter stand, ‘Stand-up’, has been asked to provide a modified version of the design to be suitable for use with larger rental e-scooters.

The manufacturing process of the junior school scooter stand is analysed to inform the process required for a larger stand.

The new larger design includes the curved 50 mm diameter mild steel tube shown in **Fig. 9** below.

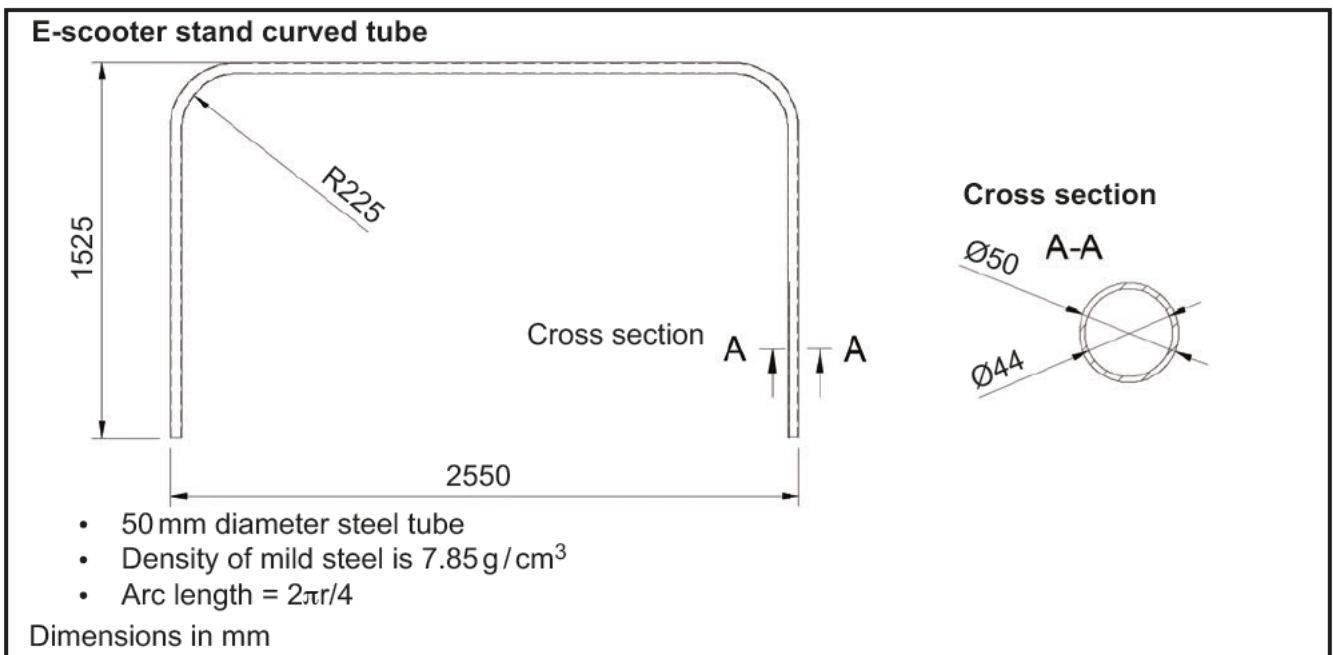


Fig. 9
(not to scale)

Sheltered

'Sheltered' is a manufacturer of high-quality cycle shelters. The council has approached it to develop a sustainable, aesthetically pleasing shelter for the e-scooter stations.

Eco-shelter

One proposal from the design team is the Eco-shelter shown in **Fig. 10** and **Fig. 11**. It is designed to be a low-carbon solution to meet the council's needs.

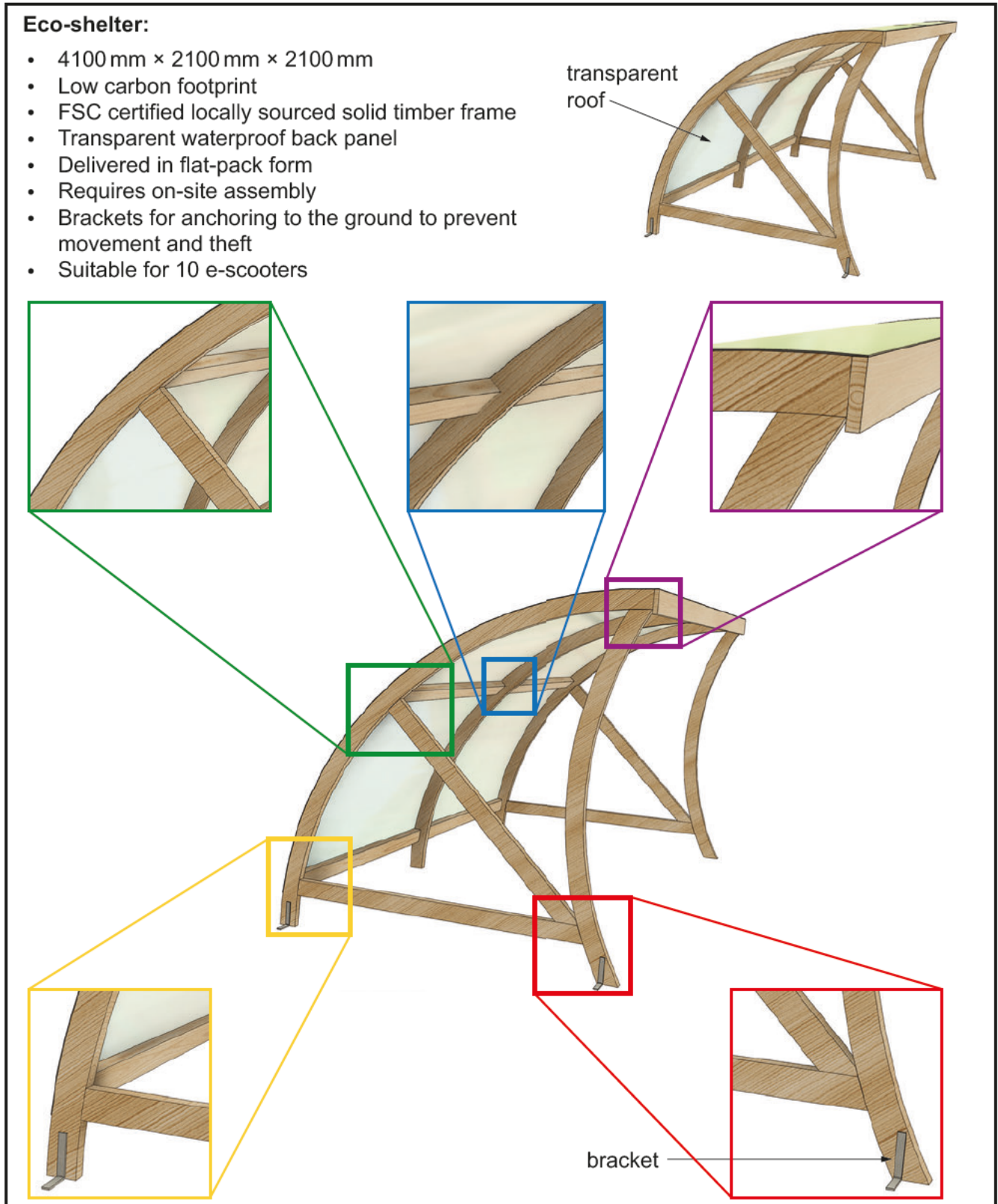


Fig. 10

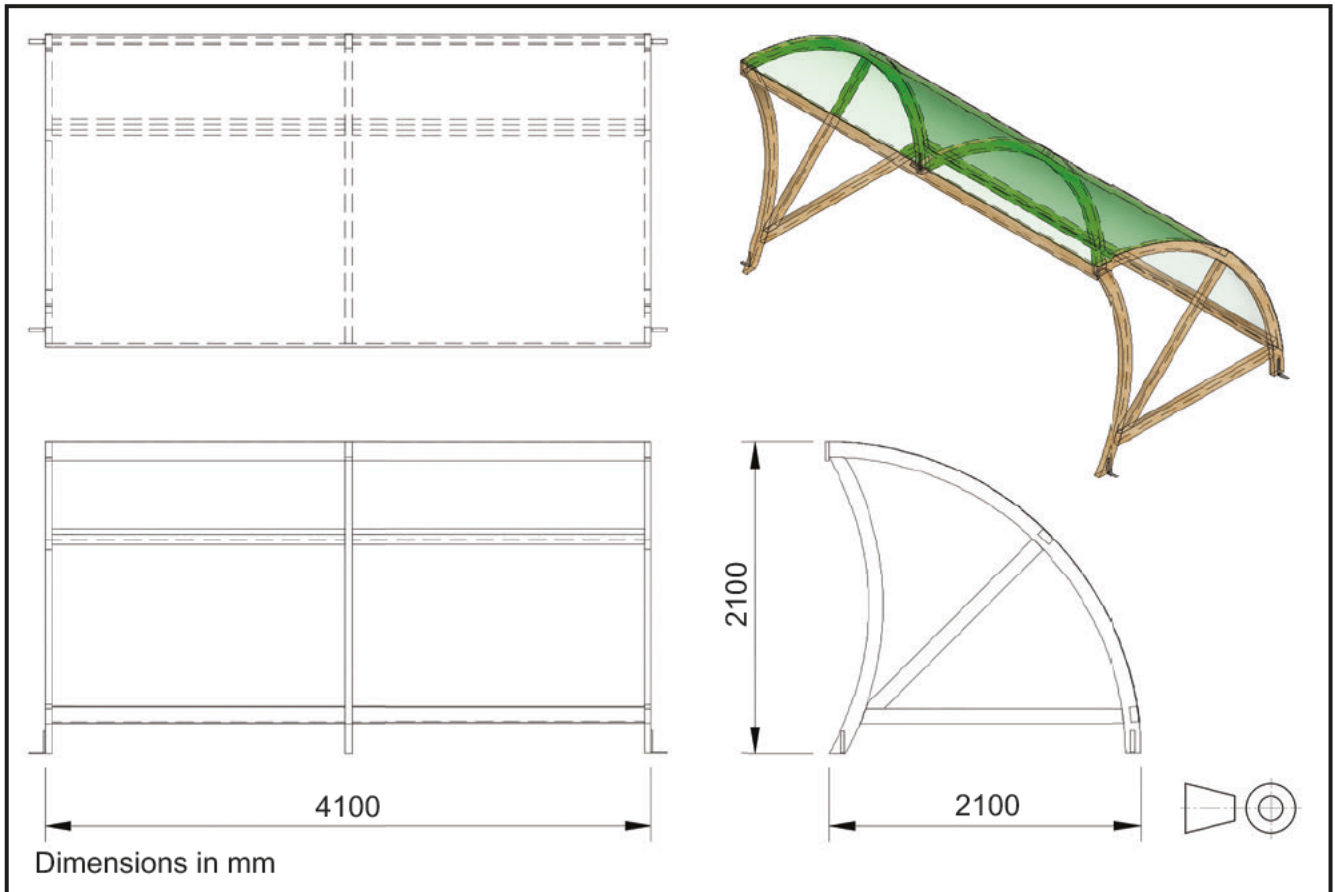


Fig. 11
(not to scale)

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