

# Sample Assignment Brief

AQA Level 3 Technical Level Design Engineering  
Advanced Design for Manufacture

<b>Tutor/Assessor name</b>			
<b>Assignment Title</b>			
<b>Date assignment issued</b>		<b>Submission Date</b>	

<b>Task number</b>	<b>Grading criteria to be evidenced in the task</b>
Task 1	P1, P2, M1, D1
Task 2	P3, P4, M2, D2
Task 3	P5, P6, P7, P8, P9, P11, P12, M3, M4, M5, D3, D4, D6
Task 4	P10, M6, D5
Task 5	P13

<b>Learner Authentication</b>	
I confirm that the work and/or the evidence I have submitted for this assignment is my own. I have referenced any sources in my evidence (such as websites, text books). I understand that if I don't do this, it will be considered as a deliberate deception and action will be taken.	
<b>Learner Signature</b>	<b>Date</b>
<b>Tutor/Assessor Signature</b>	<b>Date</b>

# WHO ARE PRACTICAL ACTION?

Practical Action is an international non-governmental organisation (NGO) that uses technology to challenge poverty in developing countries. It works with local communities to find practical solutions to the problems that they face. It primarily focuses on areas such as energy access, food and agriculture, urban waste, and water and disaster risk reduction. The organisation currently has over 100 projects in progress worldwide. Since 2012, over 3.2 million men and women living in developing countries have benefited from access to technology that has improved their lives.

Many of the projects undertaken by Practical Action involve engineering activities. For example, increasing access to and providing the ability for people in developing countries to shape markets. Projects have included the development of lagoon fisheries in Sri Lanka, investigating the problems with and reforming livestock markets in Zimbabwe and improving production methods of hibiscus in Sudan. Supporting the development and access to both local and international markets is crucial to helping poor countries to develop.



*A bicycle trailer being used by a villager in a developing country*



*A bicycle trailer being used to transport people*

One of the key issues with access to markets is transport. If people cannot get their goods and produce to markets then they are not able to participate in the buying and selling that is crucial to its success. In addition, access to medical care is severely restricted in remote areas. Many people living in developing countries rely on simple bicycle based transport. Whilst excellent for personal use this has some obvious limitations when it comes to moving even small amounts of goods. One solution to this is to design and manufacture bicycle trailers that villagers can use. These are designed to be lightweight, durable and in some cases even able to act as makeshift ambulances.

## TASK OVERVIEW

In this task you will use modelling to carry out the optimisation of a design for a bicycle trailer, then consider the technologies that could be used to make it and plan its manufacture. You must also consider its environmental impact, both during manufacture and across the product life.

You will also need to demonstrate written communication skills.

# Design of the Bicycle Trailer

## Task 1: PO1 Carry Out Design Optimisation (P1, P2, M1, D1)

In this task you will evaluate and undertake optimisation of the given design for the bicycle trailer.

You will need to:

- Use appropriate optimisation techniques and software to carry out a design optimisation analysis, covering calculations of the forces and loads on the structure of the bicycle trailer.
- Describe the limitations of the solutions obtained from the optimisation exercise undertaken.

Your evidence must include:

- A report detailing the results from the design optimisation analysis that you have undertaken for the bicycle trailer and including all appropriate calculations, diagrams and drawings.
- A description of both the application and limitations of the design optimisation process undertaken.

You could also include stress, deformation and deflection in the design optimisation analysis, and carry out iterative changes to the designs during the optimisation process.

## Task 2: PO2 - Use advanced manufacturing technology to improve product manufacture and concept development (P3, P4, M2, D2)

Following the design optimisation exercise you have undertaken, you have now been asked to consider new manufacturing technologies that could be used for the manufacture of the bicycle trailer.

You will need to:

- Research advanced manufacturing technologies relevant to the bicycle trailer, including their advantages and disadvantages. The research should include, but not be limited to:
  - 3D Printing.
  - integrated CAD/CAM systems.
  - Cloud technology.
  - Integrated mechanical/ electronic and control systems.

Your evidence must include:

- A description of different advanced manufacturing technologies. You could also explain the advantages and disadvantages of each compared to traditional methods.
- An explanation as to how these technologies improve the product design at different stages of the design process, such as concept development, prototyping and final manufacture.

You could also justify the use of advanced manufacturing technologies for the design.

## Task 3: PO3 - Produce product designs for manufacture and assembly (P5, P6, P7, P8, P9, P11, P12, M3, M4, M5, D3, D4, D6)

The manufacturing team are now ready to start the manufacture of the bicycle trailer. In this task you have been asked to produce a detailed final build plan for the best method to manufacture the bicycle trailer.

Your evidence must include:

- A description as to how design for manufacture (DFM) principles in engineering have been applied to the bicycle trailer.
- Drawings of the bicycle trailer which include limits and fits and surface finish symbols. These could also include manufacturing process nomenclature.

- A build plan that complies with all relevant regulations and guidelines including health and safety, and that includes an estimate of the costs of manufacturing, including:
  - Parts.
  - Materials.
  - Fabrication.
  - Assembly.
- A description as to how design for assembly (DFA) principles in engineering have been applied to the bicycle trailer.
- A procedure outlining how the product will be assembled.

You could also:

- Identify potential risks to health and safety that could occur during implementation of the product manufacture, with recommendations on how to mitigate for them
- Estimate the costs of manufacturing the design relating to the following:
  - Testing.
  - Maintenance.
  - Delivery.
  - Quality and reliability.
  - Regulatory compliance.
- Explain how the assembly method can be altered for machine assembly.

In addition, you could:

- Optimise the design to reduce manufacturing costs.
- Review the impact of automated machine assembly on the produce design.
- Apply GDT to the design to reflect manufacturing capabilities and component assembly.

## Task 4: PO3 - Produce product designs for manufacture and assembly (P10, M6, D5)

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The company is keen to demonstrate that they have considered the environmental impact of the bicycle trailer. You have been asked to produce a report on its sustainability.

You will need to investigate the environmental impact of:

- The chosen materials.
- The manufacturing processes.
- Maintenance during the product life.

You could also analyse the product life cycle and end of life aspects of the design.

Your evidence must include

- A sustainability report for the bicycle trailer.

This could also include recommendations or changes that could be implemented to make the product more sustainable, and analysis of the impact of those changes.

## Task 5: PO4 - Produce technical reports to communicate design information (P13)

Following the optimisation of the design, the product design specification needs to be updated to reflect the final design of the bicycle trailer.

You will need to write a technical report that includes:

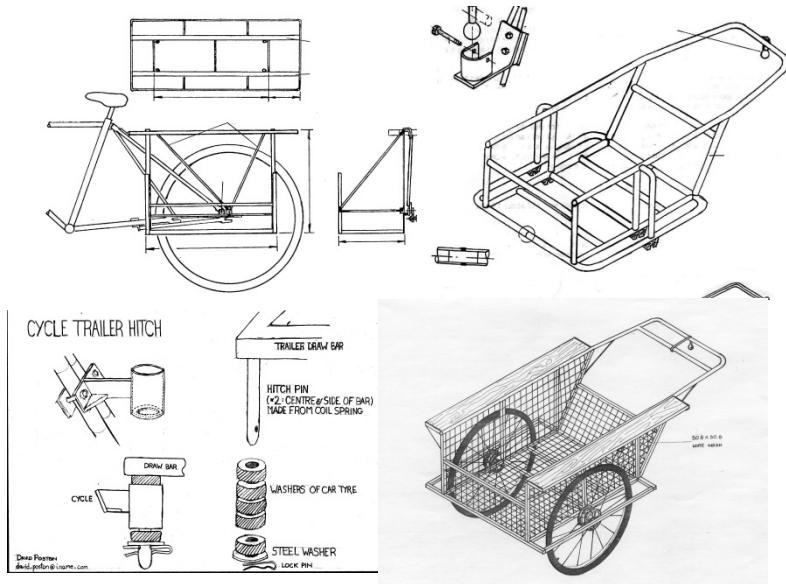
- An updated product design specification
- A justification of the final design proposal, including how the original design evolved and which design factors influenced the final design.

Submission Checklist (please insert the items the learner should hand in)	Confirm submission
Report detailing the results from the design optimisation analysis	
Description of both the application and limitations of the design optimisation process undertaken.	
Description of different advanced manufacturing technologies.	
Explanation as to how advanced manufacturing technologies improve the product design at different stages of the design process.	
Final build plan for the method to manufacture the bicycle trailer	
A sustainability report for the bicycle trailer.	
Updated product design specification	
Justification of the final design proposal	
<b>Learner - please confirm that you have proofread your submission</b>	

# ADDITIONAL NOTES FOR TEACHERS

There is a comprehensive collection of technical information to support this assignment activity on the Practical Action website at <http://practicalaction.org/technical-briefs-schools-transport>. There are three separate relevant documents, each of which can be downloaded free: Bicycles, Bicycle Trailers and Bicycle Ambulance. As well as extensive background information and context, these include:

- Alternative designs of bicycle trailers
- Component requirements
- Methods of attachment
- Dimensions
- Web links for further investigation



Images of a range of different designs can also be found on flickr: <https://www.flickr.com/photos/practicalaction/sets/72157624432210497>

This unit could also be linked to the Production and Manufacturing unit, where candidates could manufacture the bicycle trailers.

## Transferable Skills

When completing this assignment, learners will be working towards the transferable skill of communication – see Appendix A of the specification document and the following area for more information about the standards and how they should be evidenced.

For this assignment the transferable skills can be evidenced in the following tasks:

### Written Communication

<b>CW1</b>	Select appropriate formats for presenting information as a report	1.1 Decide on the most appropriate format for the technical report 1.2 Plan the structure of the technical report 1.3 Make use of any appropriate supporting materials and prepare any other resources needed for the technical report	Assignment task 5  Grading criteria:  P13 Produce a <b>technical report</b> for an updated product design specification in a form to permit manufacture.
<b>CW2</b>	Select and use an appropriate style and tone to suit your audience	2.1 Use appropriate language and vocabulary 2.2 Structure the technical report to help the audience follow the sequence of the main points and ideas 2.3 Use tone and style appropriate to the intended recipient(s)	
<b>CW3</b>	Organise material coherently, to suit the length, complexity and purpose of your technical report, proof-read, and where necessary re-draft documents	3.1 Spell, punctuate and use grammar accurately 3.2 Make your meaning clear 3.2 Use relevant images from appropriate sources to illustrate key points 3.3 Proof-read their technical report 3.4 Obtain feedback and amend technical report accordingly	