T Level Technical Qualification in Design and Development for Engineering and Manufacturing (Level 3)

Electrical and Electronic Engineering Occupational Specialism (8714-322)

Practical Assignment

Candidate Pack (Sample)

September 2025 Version 3.0

Contents

Version and date	Change detail	Section
V1.0 January 2023	Approved version	n/a
2.0 February 2024	Assessment theme weightings have been revised (typographic error)	Assessment themes
V3.0 September 2025	Refinement of layout and formatting Removal of any duplicated information Candidate guidance, Brief and Tasks amalgamated into one document	All

1. Assessment

This assessment is for the Structural Engineering Occupational Specialism component of the Technical Qualification. This pack consists of a practical assignment brief, including drawings and diagrams as necessary, that you will need to use to complete your assessment tasks.

2. Candidate guidance

General guidance

This is a formal assessment that you will be marked and graded on. You will be marked on the quality and accuracy of the work you produce. It is therefore important that you carry your work out to the highest standard you can.

Health and safety

You must always work safely, in particular while you are carrying out practical tasks.

You must always follow any relevant health and safety regulations, risk assessments and codes of practice in line with centre requirements.

If your assessor sees you working in a way that is unsafe for yourself or others, they will highlight the issue and ask you to stop the task immediately.

Plagiarism

Plagiarism is the failure to acknowledge sources properly and/or the submission of another person's work as if it were your own. Plagiarism is not allowed in this assignment.

This assignment is an assessment of your abilities, so the work submitted must be all your own and carried out under the conditions stated. You will be asked to sign a declaration that you have not had any help with the assignment. Your assessor is allowed to give you general advice, such as, clarification of the task instructions. However, general advice will not include:

- any specific advice on how to improve work to meet the required standard
- feedback on anything missing from your work
- any intervention that improves the standard or presentation of work

If there is a need to provide more than general advice your assessor will need to record the advice, they have given and take it into account when marking the submitted work.

Where research is allowed, your assessor must be able to identify which parts of the work you have done yourself, and what you have found from other sources. It is therefore important to make sure you acknowledge the sources you used and clearly reference any information taken from them (e.g. providing as a minimum a list of web addresses, books, articles etc that you used).

Use of Artificial Intelligence (AI)

AI may only be used as a source where the use of the internet is allowed for a research task. Where you use AI, you must acknowledge its use and show clearly how you have used it. Please be aware that how you have decided to use it may impact on the overall mark you are allocated.

Guidance and feedback

There are some rules around how much guidance and feedback your assessor can provide as part of completing the assignment. Your assessor is allowed to give you some help in understanding the task instructions if necessary. However, if significant clarification and guidance is provided by your assessor this will be recorded and considered as part of the marking process and may reduce your mark. Your assessor will make it clear if any guidance given may reduce your mark before it is given, so that you understand this when asking for guidance.

Timings and planning
You are advised to study the details of the assessment before starting.

You should check with your assessor that you have all the relevant materials, equipment and information/data sources that you need before starting the assessment.

You should take care when planning to make sure you have appropriately divided the time available between parts of the assignment tasks. Timings for tasks are provided within this pack to support with planning and time allocation.

If you have a good reason for needing more time, you will need to explain the reasons to your assessor and agree a new time for the assessment to take place. Any changes will be at the discretion of the assessor and agreed to by City & Guilds.

Word counts
Typical word counts, where indicated, are to be used as approximates for guidance to support the production of sufficient evidence. The marking will relate to the quality of the evidence produced and not whether the word count has been met.

Submission of evidence
Your work will be submitted as final at the end of each assessment session. You will not have an opportunity to rework any of your evidence once the assessment session ends. However, if through other tasks within the project, you develop your ideas or build on earlier tasks, then you should continue to build on these and should use your evaluation to outline the reasons why this happened.

Presentation of work
The presentation of your work must be neat, legible and appropriate to the task and evidence required for submission.

You should make sure that each piece of evidence, including any forms, are clearly labelled with your name and the task reference.

All electronic files must be given a clear file name that allows your assessor to identify it as your work.

Written work may be digital or handwritten unless stated otherwise.

All sketches and drawings should be neat, tidy and annotated.

Calculations should be set out clearly, showing all working and any assumptions you made. You should use appropriate units at all times, consistent with the requirements of the assignment.

Instructions for this assignment
Ensure you read all the provided assessment information issued by the assessor

You must work independently and not share your work with any other candidates in these supervised assessment sessions.

Your work will be kept secure during any supervised breaks that are taken.

Internet access is **not** allowed, unless otherwise stated in the task.

You will not be permitted any additional notes, such as printed resources and textbooks, unless otherwise stated in the conditions for assessment.

You must complete all the tasks and present all evidence that is detailed in each task.

This assessment booklet contains the assignment brief.

The tasks have been separated into individual documents which will be handed to you at the start of each task.

Any additional documents/templates needed for the task will be provided to you by the assessor.

Within each task you will find the following:

- **Conditions of assessment:** This will tell you the duration and rules you must follow when completing a task.
- **Controlled conditions:** This will tell you the rules you must follow when completing each task. For example, you must not share or discuss your work with other candidates.
- **What must be produced for marking:** This describes the evidence you must submit when the task is completed. Be aware that failure to submit any evidence requested can adversely affect your overall mark for the assessment.
- **Additional evidence for this task:** This describes other forms of evidence that will be collected by the assessor to support the marking of your performance. This will often include but is not limited to, photographic and video evidence.
- **Resources:** Provides a list of equipment, documents or tools that you will have access to, to complete the task/sub task.

3. Assignment brief

You are an electrical engineer employed by a company that sells a variety of products online. The company operates from large warehouses, each storing a range of products. When an order is received, human workers put the items in boxes and place the boxes on a conveyor belt to the despatch area. Depending upon the size of each box, it is then allocated to one of two couriers who will deliver it.

Due to a growth in sales, the company wants to automate the sorting activity in the despatch area. You have been asked to design, build and test a prototype for a circuit that will sort and allocate the boxes.

Figure 1 shows a plan view of the despatch area.

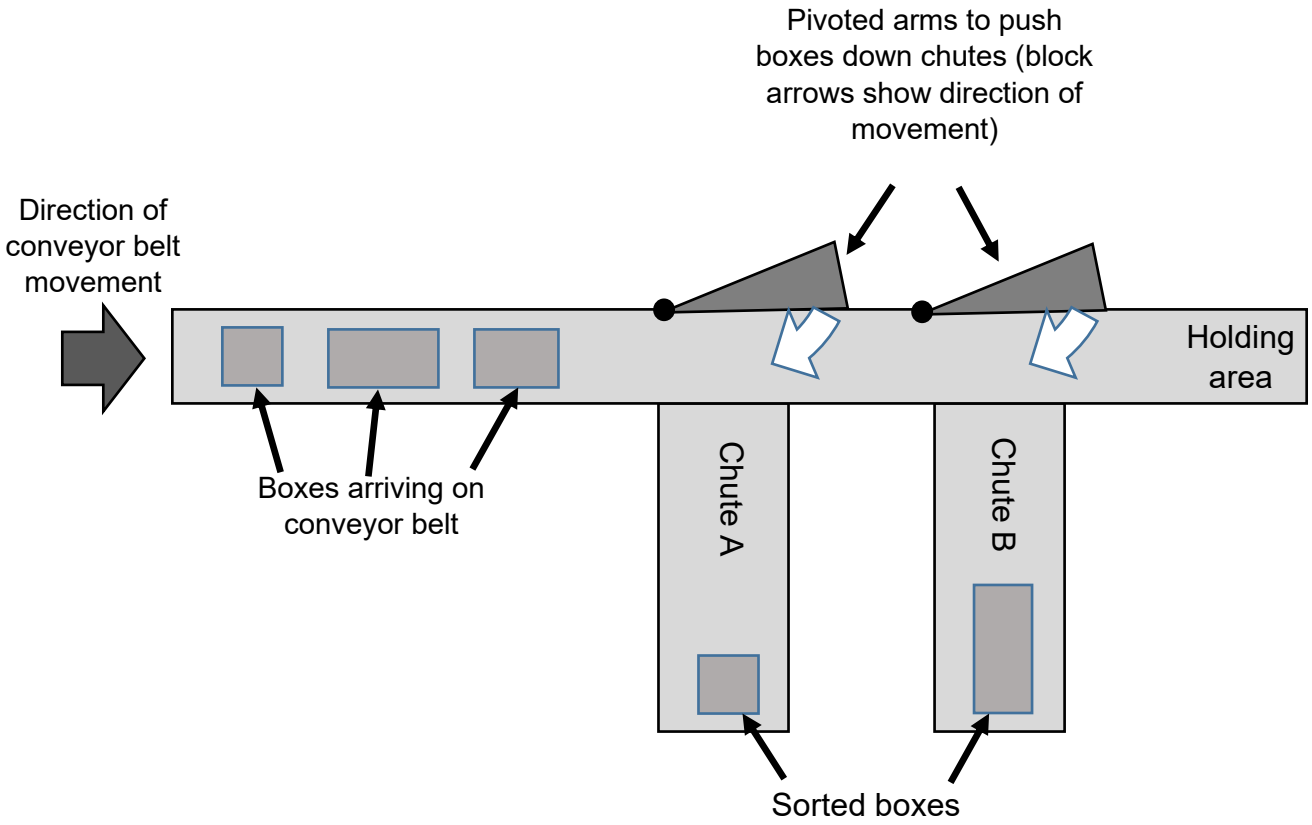

Figure 1

The boxes will arrive on a conveyor belt that travels at a constant speed.

All boxes are cuboid in shape, with a standard width of 250 mm.

If the box is less than 200 mm high and 300 mm long, it must be directed down chute A. If it is larger than these sizes, it must be directed down chute B. The required accuracy of the device must be within a tolerance of 10% of the parameters stated here.

The boxes are directed down the chutes by pivoted arms. These are powered by servo motors.

If, for some reason, a box passes the chutes and arrives in the holding area a warning light and buzzer must activate, to alert human operators that attention is needed.

Design Criteria

The design criteria for this application are:

- the circuitry must detect when the height of a box is less than 200 mm
- the circuitry must detect when the length of a box is more than 300 mm
- the required accuracy of detection is within 10% tolerance of the parameters stated
- the maximum weight of the box is 2 kg
- if the box is less than 200 mm high and 300 mm long, it must be directed down chute A. If it is larger than these sizes, it must be directed down chute B
- the inputs to the circuitry must include:
  - a method to turn the system on and off
  - appropriate sensors to detect the required dimensions
  - a sensor to detect when a product reaches the holding area
- the outputs from the circuitry must include:
  - a visual indicator (light) to indicate when a product should be directed down chute A
  - a visual indicator (light) to indicate when a product should be directed down chute B
  - appropriate output signals to operate the servo motors for the pivot arms, to both direct the boxes down the chute and to return to the start position as appropriate for the next box
  - a visual indicator (light) and audible output to indicate when a product is in the holding area
- the input and output devices should be connected to the circuitry.

This assignment has a time allocation of **34 hours**.

4. Tasks

Task 1 - Design

You must:

a) produce a design specification that builds on the design criteria for the circuitry, including any references to research used

b) generate a suitable design for the circuitry, including:
- selection of appropriate sensors with justifications
- calculations of the values required for successful operation, including the power required by the circuitry and the motors, timings and values for at least two different types of component
- configuration of the circuitry including a circuit diagram and wiring diagram.
- printed circuitry board (PCB) layout for the circuitry

c) simulate the performance of the proposed design using CAD software

d) assemble a physical model of the circuitry and test its functionality

e) produce a bill of materials (BoM) listing all of the parts required in your final design proposal.

Conditions of assessment:

- the time allocated for this task is **14 hours**
- you must carry out the task on your own, under **controlled conditions**.

Controlled conditions:

- you must only work on the tasks in the allocated times
- assessment evidence must be handed in at the end of each session for secure storage which cannot be accessed
- you must not share or discuss your work with other candidates
- you are not permitted to bring any materials into the assessment session.

What must be produced for marking:

- design specification
- design calculations, including all workings
- justifications of design options for the sensors
- circuit diagram and wiring diagram
- PCB layout
- outcomes of the virtual modelling of the proposed circuit design, either as screen captures or printouts
- record of outcome of testing the functionality of the physical model of the circuit and any changes if necessary
- bill of materials.

Additional evidence

- any notes produced of research undertaken including citation of sources and internet search history must be submitted to ensure the authenticity of evidence produced.

Resources:

- access to internet
- access to PCB software

- access to appropriate CAD software suitable for circuit design and simulation
- manufacturer's datasheets (for electronic components)
- scientific calculator for design calculations
- basic electronic components including: capacitors, resistors, sensor components, integrated and discrete components, cables, connectors and cable terminations
- access to appropriate circuit modelling methods
- DC power supply unit.

Task 2 – Manufacture and test

You must:

a) produce risk assessments for the production of the PCB and the construction of the soldered prototype
b) produce the PCB for the design
c) build a soldered prototype working circuitry from your design
d) test the operation of the circuitry.

Conditions of assessment:

- the time allocated for this task is **13 hours**
- you must carry out the task on your own, under **controlled conditions**.

Controlled conditions:

- you must only work on the tasks in the allocated times
- assessment evidence must be handed in at the end of each session for secure storage which cannot be accessed
- you must not share or discuss your work with other candidates
- you are not permitted to bring any materials into the assessment session.

What must be produced for marking:

- risk assessments
- test records for the results of testing the circuitry
- PCB
- prototype.

Additional evidence for this task:

- assessor observation of:
  - the production of the PCB
  - building of the soldered prototype
  - testing of the circuitry.

To support the comments made within the Practical Observation, the assessor must capture the following photographs and videos that must be submitted as supporting evidence for each candidate.

Photographic evidence which shows:

- unassembled PCB clearly showing the track layout
- back of the assembled PCB showing all soldered joints
- front of the assembled PCB showing positioning and fitting of components.

Video evidence which shows:

- functionality of the prototype.

Resources:

- copies of completed documentation from Task 1
- PCB production facilities
- basic electronic components including; capacitors, resistors, sensor components, integrated and discrete components, cables, connectors and cable terminations
- DC power supply unit
- diagnostic equipment, including multimeters, logic probes etc
- tools for the electronic assembly, for example: soldering iron, side cutters, snip nose pliers, wire strippers, stripboard cutter (if used), PCB/stripboard holder, solder extraction units (portable or fixed)
- if required, programmable system software and hardware upload facilities.

Task 3 – Peer review

As part of the development and design process it is critical that engineers can work constructively with others and consider feedback to inform designs to ensure they meet their purpose and requirements.

The assessor will set up the groups and make sure that you have access to copies of your design. You will present your design.

a) Prepare to present your design verbally using annotated sketches and diagrams.
b) Present and explain your design.
c) Peer reviewers will now have time to reflect on your design.
d) Discuss feedback from the group on your design presented in part b).
e) Peer reviewers will now complete the peer review feedback form.

Conditions of assessment:

- the time allocated for this task is **60 minutes**. This broken down for the above tasks below:
  a) 10 minutes to prepare to present designs
  b) 10 minutes to present and explain designs
  c) 10 minutes for the peer review group to discuss and reflect on the design before providing feedback
  d) 15 minutes for the peer review group to discuss the design with you and ask you questions
  e) 15 minutes for the peer review group to provide collective feedback on the peer review form to submit to the assessor for approval
- the task must be supervised at all times
- you must use the feedback record form to make any notes and record any feedback to questions asked as part of the discussion. The peer group will also provide you with a peer review form with feedback, which will have been checked for appropriateness by the assessor before being shared.

Controlled conditions

- you must only work on the tasks in the allocated times
- assessment evidence must be handed in at the end of each session for secure storage which cannot be accessed by candidates
- you must not share or discuss your work or the work of others outside the assessment time
- you are not permitted to bring any materials into the assessment session.

For parts a), b) and d) **you** must:

- proactively participate in the discussion
- manage your time
- seek any clarity in the feedback given and be prepared to ask questions
- record any feedback notes on the feedback record form provided.

For parts c), d) and e) **peer reviewers** must:

- proactively engage in the discussion
- respond constructively and fairly
- ensure the peer review feedback form is completed fully and handed to the assessor.

What must be submitted:

- feedback record form
- peer review feedback form.

Task 4 – Evaluation and implementation

You must:

a) produce a virtual model of the design using appropriate software incorporating any changes you have decided to make in response to feedback or as a result of manufacturing and testing

b) produce a revision control document or report that is typically 500 words justifying why changes were made or not made as a result of the peer review feedback

c) produce a report evaluating the proposed design. The report should typically be 800 words. This must include:

- an explanation of the test methods used, reasons for their use and their limitations
- a summary of the capabilities of the circuitry
- an evaluation of the fitness for purpose of the design proposal and its conformance to the design criteria and specification
- the information necessary for a third party to implement the prototype
- an outline of any additional factors that may need to be considered during the implementation, including:
  - cable types to be used to connect the sensors to the circuitry, if appropriate
  - health and safety considerations
  - applicable requirements from wiring regulations
- any improvements or adaptions required to the prototype, including any reasoning and justifications if adaptions or improvements are not required.

Conditions of assessment:

- the time allocated for this task is **6 hours**
- you must carry out the task on your own, under **controlled conditions.**

Controlled conditions:

- you must only work on the tasks in the allocated times
- assessment evidence must be handed in at the end of each session for secure storage which cannot be accessed
- you must not share or discuss your work with other candidates
- you are not permitted to bring any materials into the assessment session.

What must be produced for marking:

- outcomes of virtual modelling
- revision control document
- evaluation and implementation report.

Resources:

- copies of completed documentation from tasks 1 and 2
- feedback record form and peer review form from task 3
- access to the internet for research (e.g. costs, component data and production information)
- manufacturer's datasheets (for electronic components)
- wiring regulations.

End of assessment

The T Level is a qualification approved and managed by the Institute for Apprenticeships and Technical Education.