HM Government

T-LEVELS

T Level Technical Qualification in Design and Development for Engineering and Manufacturing

Structural Engineering Occupational Specialism (8714-324)

Practical Assignment

SAMPLE Assessor Pack

September 2025 Version 4.0

City & Guilds

Version and date	Change detail	Section
1.0 September 2022	First Published Version	
2.0 February 2024	Resources section added to Task 3 for clarity	Task 3 – Resources
	Photographic evidence requirements	Task 3 – Photographic evidence
	Minor amendment to wording	Task specific guidance – overview
	Resources	Task 4
	What must be produced for marking guidance	Task 1 - What must be produced for marking
3.0 February 2025	Minor amendment to wording	Task specific guidance, assessor guidance
4.0 September 2025	Refinement of layout and formatting Removal of duplicated guidance information	All 1. Assessment 2. Tasks

Contents

1. Assessment

The assessment for Structural Engineering Occupational Specialism component consists of a practical assignment that includes a brief assignment and then a number of tasks for the candidate to complete. Tasks are assessed by assessment themes that cover a range of knowledge and skills from the performance outcomes.
They are designed to allow judgement of the candidate to be made across different categories of performance.

The assessment for this component has been allocated a set number of marks against each assessment theme, based on weightings recommended by stakeholders of the qualification. This mark allocation remains the same for all versions of the assessments, ensuring consistency across assessment versions and over time.

The live Occupational Specialism assessment materials must be used in conjunction with the 'TQ Occupational Specialism assessment process guide', this is available on the T Levels Resource Hub.

Performance outcomes

The weightings for each performance outcome will remain the same for every version of the practical assignment. This ensures the appropriate depth and breadth of knowledge and skills for each specialism can be reliably assessed in every version and meets the needs of industry while keeping comparability between each assessment over time.

Performance outcome	Typical knowledge and skills	Weighting
PO2 Analyse and interpret control and instrumentation engineering and manufacturing requirements, systems, processes, technical drawings and specifications.	Analyse and interpret engineering and manufacturing requirements, systems, processes, technical drawings, diagrams and specifications.	16%
PO3 Evaluate systems, designs, components and processes, managing and integrating design information, proposals and specifications, to develop and improve control and instrumentation-related engineering and manufacturing proposals and solutions.	Evaluate systems, designs, components and processes, managing and integrating design information, proposals and specifications, to develop and improve control and instrumentation engineering and manufacturing proposals and solutions.	22%
PO4 Propose and design control and instrumentation-related engineering and manufacturing systems, products, components, processes and solutions, considering requirements, constraints and context.	Design and model control and instrumentation concepts, systems and diagrams. Use CAD software to produce diagrams, models and simulations. Use tools safely and effectively for specific purposes. Safely carry out engineering processes and activities.	23%
PO5 Collaborate to help manage, develop, test and quality assure control and instrumentation related engineering and manufacturing design information, systems, processes and outcomes.	Work in accordance with professional standards, work-place policies, health and safety requirements and regulations. Complete detailed risk analysis. Respond to feedback from others to inform design decisions. Develop and test models and prototypes.	26%
PO6 Communicate proposals, design information and solutions, producing, recording and explaining engineering and manufacturing representations, systems, processes, outcomes, design specifications and technical drawings.	Use methods to communicate proposals, design ideas and solutions. Produce technical documentation using industry conventions.	13%

2. Task guidance

General task guidance

Read **ALL** the information carefully before the assessment.

The following documents, available on the City & Guilds website, provide essential generic guidance for providers delivering T level Technical Qualifications (TQs) and **must** be referred to alongside this guidance:

- **T level Technical Qualifications – teaching, learning and assessment guide**
- **TQ Occupational Specialism assessment process guide**

Ensure you are familiar with the following documentation before you undertake the assessment of candidates:

- Practical Observation (PO) template
- Peer review (PR) form (where applicable)
- Templates provided for tasks (where applicable)
- Marking grids

All work carried out should be to industry standards, undertaken in a safe manner and compliant with relevant regulations. If a candidate fails to carry out the activities in a safe manner, the assignment should be suspended until this aspect is corrected.

This assignment is designed to require the candidate to make use of their knowledge, understanding and the practical skills they have built up over the course of their learning to tackle tasks/problems/challenges. This approach to assessment emphasises to candidates the importance and applicability of the full range of their learning to practice in their industry area and supports them in learning to take responsibility for transferring their knowledge, understanding and skills to the practical situation, fostering independence, autonomy and confidence.

During the learning programme, it is expected that tutors will have taken the opportunity to set shorter, formative tasks that allow candidates to be supported to independently use the learning they have so far covered, drawing this together in a similar way, so they are familiar with the format, conditions and expectations of the assessment.

Candidates should be made aware during learning what the assessment themes are and how they are implemented in marking the assignment, so they will understand the level of performance that will achieve them high marks.

Candidates should not be entered for the assessment until the end of the course of learning for the qualification, so they are in a position to complete the assessment successfully.

Health and safety
Candidates must not be entered for assessment without being clear of the importance of working safely and having attended sufficient practical training to be able to work safely. The assessor must immediately stop an assessment if a candidate works unsafely. At the discretion of the assessor, depending on the severity of the incident, the candidate may be given a warning. If they continue to work unsafely, risking the safety of themselves or others however, their assessment must be ended, and they must retake the assessment in a future series after significant further training has taken place. Any warnings issued to a candidate must be considered as part of the marking process and recorded on the candidate record form (CRF). Any actions that have led to that warning must be detailed on the CRF so they can be considered along with the other evidence when applying the descriptors in the mark scheme.

Compliance with timings
Due to the nature of this assessment, the maximum time allowances provided must be adhered to. They refer directly to assessment time, not any additional setting up times the provider needs to create an appropriate assessment environment.

It is the provider's responsibility to plan sufficient assessment sessions as stated in each of the tasks, under the appropriate conditions, within the assessment window, to allow candidates reasonable time to complete the assessment tasks.

Where candidates are required to plan their work, they should have their plans confirmed for appropriateness in relation to the time allocated for each task, to ensure their planning has not left them with too short a time to complete the tasks safely. Any planning that is not appropriate must be recorded on the candidate record form (CRF) as part of the marking process.

Candidates should be allowed sufficient time to fully demonstrate the range of their skills, however this also needs to be reasonable and practicable. Candidates should be allowed to overrun their own planned timings in order for evidence of a range of their skills to be captured. If, however, the time required exceeds the maximum time allowance for the task, the provider must stop the assessment and base the marking on the evidence up to that point.

Assessor candidate ratios
Where the tutor/assessor is required to carry out observation of performance, detailed, descriptive notes must be recorded on the practical observation (PO) form provided. The provider has the flexibility to adapt the form to suit local requirements (e.g. to use electronic and hand-written formats) as long as this does not change or restrict the type of evidence collected.

The number of candidates an assessor will be able to observe at one time will vary depending on local conditions relating to:

- monitoring and maintaining safety during assessment
    - any specific hazards related to the task that pose a risk of harm in relation to the competence of the candidates
    - availability of supervisory staff to support the assessor
- the practicalities of collecting evidence
    - the complexity of evidence collection for the task
    - whether there are any peak times where there is a lot of evidence to collect that will need additional support or any that are quieter which may be eased through staggered starts etc
    - local conditions e.g.
        - layout of the assessment environment and sufficient assessor line of sight to task activity throughout the assessment period
        - amount of additional support available (e.g. to capture image/video evidence)
        - availability of suitable workspaces/bays or of shared resources and equipment.

Providers are advised to trial the planned arrangements during formative assessment, reviewing the quality of evidence captured and manageability. It is expected that for straight forward observations, with favourable local conditions and support, (and unless otherwise specified) no more than six candidates will be observed by a single assessor at one time, and the number will usually be fewer than this maximum. The key factors to consider are the logistics of collecting sufficient evidence and ability to remain working safely in the assessment environment.

A timetable of assessments and layout of the workspaces must be available for the moderator on request. This should detail:

- the candidates being assessed at each workstation,
- the assessor(s) and
- support staff present

Time

The time allocated for the completion of the tasks and production of evidence for this assessment is **34 hours**. Timings for completion of specific tasks are outlined below.

- Task 1 – 14 hours
- Task 2 – 13 hours
- Task 3 – 1 hour
- Task 4 – 6 hours.

General task requirements

- The assignment brief and any associated documents should be released to candidates at the start of the first scheduled task assessment. Candidates should be provided with 30 minutes of non-assessed time at the start of this session to read and review the brief, before being provided with the first task. It must be made clear to candidates when the 30 minutes of non-assessed reading and review time starts and ends.
- Each task **must** only be released to candidates at the start of the scheduled assessment session for that individual task.
- Each task will provide details of what evidence must be submitted on the completion of the task. Additional evidence which must also be submitted will be detailed within the task.
- Candidates should be advised that approximate word counts, or page lengths have been given within the task guidance to act as a guide to support the completion of the tasks. These are provided as a guide only, and there will be no penalisation of marking based on if the word count or page length is above or below the indicative guidance provided.
- Candidates are not permitted to bring any existing notes or materials completed prior to the assessment into any of the assessment sessions.
- Candidates must be reminded that their work submitted, including drawings, sketches and calculations, are legible and appropriately labelled with name and task, evidence can either be word processed or handwritten. Any electronic evidence produced must have a clear file name and easily identifiable to the task and candidate.
- Candidates are permitted to have copies of their final evidence from previous tasks in subsequent assessment sessions. The use of this evidence is solely to support candidates to refer to previous work. The purpose of only providing copies is to ensure that candidates are unable to rework any of their previous responses.
- When working under supervised conditions for longer sessions, breaks can be facilitated outside of the controlled conditions, ensuring the room is locked and all candidates have vacated once the break begins. All materials must be kept securely during the break.
- If the task completion runs over more than one session, candidates must be reminded that no assessment information can be shared or discussed with other candidates.
- Candidates must be made aware that plagiarism is not allowed.
- Candidates must be made aware of City & Guilds position on the use of Artificial Intelligence (AI) Position Statement on AI | City & Guilds
- Where evidence is created using software which has the potential for cloud-based retrieval or sharing this feature should be disabled where possible (e.g. in software settings or through restriction of internet connection). Where not possible, candidates must be reminded that the evidence submitted for the tasks can only be generated within the scheduled assessment times and also of the implications of sharing or plagiarising content from cloud-based content.
- After the production of evidence, both the assessor and candidate must sign declarations of authenticity.
- Where the candidate or assessor is unable to or does not confirm authenticity through signing a declaration form, the work will not be accepted and a mark of zero will be given. If any question of authenticity arises, the Provider may be contacted for justification of authentication

Task specific guidance

Each task should be administered separately and in order unless instructions state otherwise, and each task should be completed and submitted by all candidates before moving onto the next.

Where a candidate is required to update or refer to a document from a previous task, the document provided to them should be a copy of the original submitted evidence. This can be a hard copy or electronic. Candidates must not be permitted access to their original document from previous tasks; this is to prevent candidates reworking submitted evidence. Any annotations or amendments to the copy should be made in a different colour text or tracked electronically (e.g. tracked changes) for marking and moderation purposes and saved in a secure location with an appropriate file name.

Providers are not permitted to supply candidates with templates e.g. risk assessment for any task unless specified.

Task 1

Assessor guidance

- Evidence of virtual modelling should be captured using annotated screen captures or printouts.
- Candidates must have access to the workshop to be able to select from the available resources to support their design decisions.
- Candidates should show all working for design calculations that they have completed, including any formulae used or equations produced.
- Candidates should determine the order they complete the task; it does not need to be completed in alphabetical order.
- Where candidates are required to plan their work, they should have their plans confirmed for appropriateness in relation to the time allocated for each task, to ensure their planning has not left them with too short a time to complete the tasks safely. Any planning that is not appropriate must be recorded on the candidate record form (CRF) as part of the marking process.

Evidence

- Design specification
- Up to three annotated sketches
- Justification of the choice of one design for further development
- Justification of the selection of the materials and components
- Design calculations, including all workings
- Engineering drawings of the proposed design
- Outcomes of the virtual modelling of the proposed design, either as screen captures or printouts
- Bill of materials
- 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

- Consumables and fixings – nuts, bolts, screws, rivets, bonding agents (metal and non-metal)
- Machines – drill (bench/pillar), lathe, milling machine, radial arm saw, laser cutter,
- Testing and measurement equipment – Schmidt hammer, crack monitoring gauge, laser alignment, rules, measuring tape, protractors, callipers (vernier, digital), micrometres (internal, external, depth) gauges (Go-NoGo, slip, plug), compression and flexural testing machine, tensile testing machine, shear testing machine, weigh machine, drying and weighing

equipment, set squares, spirit level, dye penetrant test kit, particle powder and magnets, impact testing (Izod, Charpy), wind tunnel

- Finishing equipment – anti-corrosion paint

Task 2

Assessor guidance

- For part d, you must provide candidates with a fully scaled sample piece of the relevant material in order for them to carry out the material strength testing.
- The work area must be representative of normal centre practice prior to any practical activities taking place for candidates to complete their work area preparation.
- As part of the testing within this task (2c, 2d), candidates are required to clearly capture and record their findings in an appropriate format, such as a table.
- Candidates must have access to appropriate materials, tools, equipment and machinery in order for them to manufacture their scaled prototype.
- Candidates must be provided with a fully scaled piece of relevant material in order for them to carry out the material strength testing.
- Assessor observations must be carried out within the assessor to candidate ratio stipulated by City and Guilds.

Evidence

- Risk assessment
- Test records
- Scaled prototype
- Video evidence which shows functionality of the scaled prototype.
- Assessor observations:
  - development of scaled prototype
  - testing

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

Photographic evidence which shows:

- Sequence of photographs during the manufacture of the scaled prototype to include:
  - results of tool selection and usage
  - cutting and preparation of model components
  - connecting of model components
  - arrangement of model components in plan, elevation and detail
  - 3D view of the final scaled prototype.

Resources

- Copies of completed documentation from Task 1
- Material strength testing and measuring equipment
- Hand tools
- Modelling materials and components.

Task 3

Assessor guidance

Task 3 should take place in a single assessment session on the same day.

The assessor must ensure the following requirements are met:

- organise candidates into groups (recommend three candidates per group) for the discussions. Where this is not possible i.e. candidate absence group sizes may be flexed but should be closely monitored by the assessor to ensure a comparable experience is achieved for all candidates
- ensure access to candidate resources as directed in the task information
- the task should be candidate led but the assessor may facilitate through prompting to support the level of engagement and feedback gained for candidates
- monitor timings as directed by the task
- the discussion takes place in an appropriate environment where candidates are unlikely to be disturbed
- check all completed peer review forms for appropriateness before sharing with the candidate whose evidence is being reviewed
- further guidance is provided within Task 3 ‘guidance to assessor’ section.
- following tasks, copies of the final submitted evidence from preceding tasks should be saved securely for return to candidates for use in future tasks within this assessment. This could be facilitated through the use of memory sticks or a specific location on a secure drive for work to be saved on.

Evidence

- Feedback record form
- Peer review feedback form.

Resources

- Copies of completed documentation from Task 1
- Feedback record form
- Peer review feedback form(s).

Task 4

Assessor guidance

- Candidates must have access to the workshop to be able to select from the available resources to support their design model
- Candidates must carry out the task on their own, under controlled conditions
- Candidates must only work on their tasks in the allocated times

Evidence

- 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.
- Internet access for research (e.g. costs, component data and production information)
- Manufacturer's datasheets (for materials and components)
- Scientific calculator.

3. Marking

Guidance on marking

Please refer to the **TQ Occupational Specialism Assessment process guide** document for further information on gathering evidence suitable for marking and moderation, and on using the marking grid and forms.

The Candidate Record Form (CRF) is used to record:

- details of any guidance or the level of prompting the candidate has received during the assessment period
- rough notes bringing together relevant evidence from across tasks during marking
- summary justifications when holistically coming to an overall judgement of the mark for each performance objective and overall
- if an assessment has to be stopped on the grounds of Health and Safety or if a candidate has been working in an unsafe manner.

The Practical Observation form (PO) is used to record:

- descriptive information and evidence of candidate performance during an observation.

4. Marking grid

There is a marking grid for each assessment theme that must be assessed as part of this occupational specialism assessment. The individual statements within the band descriptors should be treated together to make one whole descriptor and not separately.

Assessment theme – Health and Safety

Guidance for markers
The following evidence from Tasks 1, 2 and 4 should be used to assess performance against this assessment theme.

Task 1

- Design specification.

Task 2

- Completed risk assessment
- Assessor observations:
  - development of scaled prototype
  - testing.
- Photographic evidence which shows:
  sequence of photographs during the manufacture of the prototype to include:
  - results of tool selection and usage
  - cutting and preparation of prototype components
  - connecting of prototype components
  - arrangement of prototype components in plan, elevation and detail
  - 3D view of the final prototype.
- Video evidence which shows:
  - functionality of the scaled prototype.

Task 4

- Evaluation and implementation report.

Note: where there is insufficient evidence to award a mark, a zero mark may be given

Indicative content

Completion of a comprehensive risk assessment, including:

- identification of risks and hazards that if not controlled could cause injury to themselves or others, that may include:
  - low risk – slips, trips and falls
  - medium risk – flying debris, personal injury from use of tools, lifting injuries
  - high risk – electric shock
- analysis of risk with appropriate mitigation and control measures prepared against hazards for planned tasks, includingPPE, extraction, isolation
- assessment of risk as part planning and preparing for manufacturing and testing activities, including health and safetypreparatory checks on tools and equipment and the work area.

Manufacture and testing of prototype.

- Correct preparation of tools, prototype manufacture and assembly equipment and PPE for the proposed design:
  - work area to be kept tidy throughout the tasks
  - wearing the correct PPE at all times, as identified in their risk assessment
  - following safe work practices throughout the manufacture, development and testing of the suspension bridge e.g. safe use of tools and equipment, using guards as necessary.

Completion of a design specification for the suspension bridge to include consideration to:

- buildability of the suspension bridge.
- safe erection of the suspension bridge using material handling equipment.
- lifting points on structural member of the suspension bridge
- formation of connections.
- limitation of activities that require extensive periods of working at height
- health and safety legislations and regulations and local workplace procedures (use of tools and equipment,measurement, working at height, LOLER, PUWER).

Completion of an evaluation and implementation report to consideration of:

- health and safety legislations and regulations (working at height, LOLER, PUWER)
- wider implications of both the construction and operation of the suspension bridge
- measures required to work on cables.

Assessment theme: Health and safety	**Band 1 descriptor**	**Band 2 descriptor**	**Band 3 descriptor**	**Total marks for sub-assessment theme**	**Total marks for assessment theme**
Marks per band	**1-4**	**5-8**	**9-12**	**N/A**	**12**
	Risk assessment covers the **majority** of risk factors and **some** control measures have been identified. Likelihood or severity has been considered for **some** risks and hazards. Risk mitigation methods are **limited**.	Risk assessment covers a **good** range of risk factors, including risk control measures identified for **most** of the potential risks and hazards. Likelihood and severity have been considered for **most** risks and hazards. Risk mitigation methods have been identified for **some** of the potential risks, **but not all**.	Risk assessment is detailed and clearly identifies **all** of the associated risk factors, risk control measures and have been clearly identified for **all** potential risks and hazards. Likelihood and severity have been considered for **all** risks and hazards. Risk mitigation methods are detailed and have been clearly identified for **all** potential risks.		
	Health and safety is followed during preparation and throughout the tasks so that all work is completed safely. **Some** risks and hazards that occur during the tasks are mitigated against as they arise.	Health and safety is followed during preparationand throughout tasks and all work completed safely. **Most** risks and hazards that occur during the tasks are correctly mitigated against as they arise.	Health and safety is followed during preparationand throughout tasks and all work completed safely. **All** risks and hazards that occur during the tasks are correctly mitigated against as they arise.		
	Minimal health and safety considerations have been included as part of the design and evaluation/ implementation.	A **good** range of health and safety considerations havebeen included as part of the design and evaluation/ implementation.	A **comprehensive** range of health and safety considerations have been considered as part of the design and evaluation/ implementation.		

Assessment theme – Design and Planning

Guidance for markers

The following evidence from Tasks 1 and 4 should be used to assess performance against this assessment theme.

Task 1

- Design specification
- Up to three annotated sketches
- Justification of the choice of one design for further development
- Justification of the selection of the materials and components
- Design calculations, including all workings
- Bill of materials
- Engineering drawings of the design proposal
- Outcomes of the virtual modelling of the proposed design, either as screen captures or printouts.

Task 4

- Outcomes of virtual modelling.

Note: where there is insufficient evidence to award a mark, a zero mark may be given

Indicative content

Documents

Completion of a design specification to include:

- the type, size/dimensions and quantity of materials required to construct the suspension bridge, including the specification of material finishes to the conditions set in the brief and design requirements
- measures to ensure that the suspension bridge's final design is suitable for wind load/speed of 50 m/s
- measures to ensure that the suspension bridge's final design is suitable for permanent load of 12.52 kN/m2
- measures to ensure that the suspension bridge's final design is suitable for variable load of 21.1 kN/m2
- the design should be such that the minimum design life of the bridge should be 100 years
- measures to ensure that the suspension bridge is resilient in all weather conditions
- design calculations for components relevant to candidate's design of suspension bridge (such as beams, trusses, frames, rods and ties).
- maths and Scientific principles could include bending, stress, stiffness, strain, torsion, Young's modulus, compressive and tensile strengths and

Euler buckling formula in relation to materials and design calculations relevant to the design.

Drawings and diagrams
Completion of engineering diagrams and representations. Sketches and CAD drawings will include:

- initial design sketches – to illustrate the form, function and structural arrangement of the suspension bridge
- design sketches should be capturing different ideas in response to the brief and avoiding design fixation.
- orthographic sketch or drawings.
- general arrangement of principal parts of the suspension bridge
- elevations.
- connection details (as appropriate).
- industry standard conventions and annotations.

Candidates will not be penalised if they do not hand in three designs but should be marked on the quality of what is produced.References to 'up to three designs' are instructed in the task as an optimal number to allow candidates to show the depth andbreadth of their knowledge and understanding in response to a brief.

Virtual modelling

- use of virtual modelling tools or CAD to prepare a virtual model of the suspension bridge
- use the virtual model to complete simulation of function and setting of the suspension bridge e.g. the construction sequence, suitability for use in a rural and urban landscape.

Assessment theme: Design and planning	**Band 1 descriptor**	**Band 2 descriptor**	**Band 3 descriptor**	**Total marks for sub-assessment theme**	**Total marks for assessment theme**
Marks per band	**1-4**	**5-8**	**9-12**	**12**	**33**
Documents	Specification is **brief** with **minor inaccuracies** in technical knowledge. **Most** points have been analysed, considered and elaborated on.	Specification is **clear** with **minor inaccuracies** in technical knowledge. **All** points have been analysed, considered and **most** have been elaborated on.	Specification is **detailed and thorough** with **accurate** technical knowledge throughout. **All** points have been analysed, considered and elaborated on.		

	Some key materials and quantities to meet the brief have been identified.	**Most** key materials, quantities required to meet the brief have been identified.	**All** materials and quantities required to meet the brief have been identified.		
	No reasoning provided to justify choices made for selection of materials.	**Some** reasoning provided to justify choices made for selection of materials.	**Clear and detailed** reasoning provided to justify choices made for selection of materials.		
	Some design calculations are accurate. **Some** correct methodology applied.	**Most** design calculations are accurate. **Most** correct methodology applied.	**All** design calculations are accurate. Methodology **correctly applied throughout** and reference to industry standards annotated.		
Marks per band	**1-4**	**5-8**	**9-12**	**12**	
Drawings and diagrams	Drawings/diagrams are produced using **some** correct conventions.	Drawings/diagrams are produced using **most** correct conventions.	Drawings/diagrams produced with **fully** compliant and correct conventions.		
	Drawings/diagrams are clear and contain **some** of the appropriate information needed in order for a third party to reproduce them.	Drawings/diagrams are clear and contain **most** of the appropriate information needed in order for a third party to reproduce them.	Drawings/diagrams are clear and well presented and contain **all** of the appropriate information needed in order for a third party to reproduce them.		
	Sketches are **simple or underdeveloped** and show **some clear gaps** in knowledge and understanding by a **lack** of proposed solutions in response to requirements.	Sketches are **developed** and include **some detail** that demonstrates **good** knowledge and understanding through proposed solutions in response to requirements.	Sketches are **developed** in **comprehensive detail** that demonstrates **excellent** knowledge and understanding through proposed solutions in response to requirements.		
Marks per band	**1-3**	**4-6**	**7-9**	**9**	
Virtual modelling	Use of virtual modelling tools is **basic**.	Use of virtual modelling tools is **good**.	Use of virtual modelling tools is **comprehensive**.		
	Virtual model(s) is functional	Virtual model(s) is functional	Virtual model(s) is functional		

	and meets **some** of the requirements of the design criteria.	meets **most** of the requirements of the design criteria.	meets **all** requirements of the design criteria, including any changes or modifications if required.		

Assessment theme – Manufacturing

Guidance for markers

The following evidence from Task 2 should be used to assess performance against this assessment theme.

Task 2

- Test records
- Assessor observations:
  - development of the scaled prototype
  - testing.
- Photographic evidence which shows:
  - sequence of photographs during the manufacture of the prototype to include:
    - results of tool selection and usage
    - cutting and preparation of prototype components
    - connecting of prototype components
    - arrangement of prototype components in plan, elevation and detail
    - 3D view of the final prototype.
- Video evidence which shows:
  - functionality of the scaled prototype.

Note: where there is insufficient evidence to award a mark, a zero mark may be given

Indicative content

Developing the prototype/model

- The appropriate selection and use of components, materials, tools and equipment that can include drill press, lathe, radialarm saw, vice and tools (hammer, saws, plyers, chisels, rasps and files, screwdrivers, hammers and mallets, hand planes, scissors and snips)
- Skills to model/prototype and manufacture scaled prototype of the main body of a suspension bridge
- Measuring and cutting of components and materials using appropriate tools and equipment
- Use of glue, screws, bolts and other fixing mechanisms to assemble the scaled suspension bridge
- Members are aligned and joined through centroids, surface finishes, edges smoothed off, members are joined so gapsbetween them are not visible.

Tests from the range below:

- Use of compression testing to complete compressive strength and buckling measurements
- Use of flexural testing machine to complete flexural strength measurements
- Use of appropriate measurement equipment and testing processes – manual and automated
- Use of appropriate materials testing methods.

Assessment theme: Manufacturing	**Band 1 descriptor**	**Band 2 descriptor**	**Band 3 descriptor**	**Total marks for sub-assessment theme**	**Total marks for assessment theme**
Marks per band	**1-3**	**4-6**	**7-9**	**9**	**27**
Prototype/ model	The prototype/model is **mainly appropriate** but may require **some** modifications.	The prototype/model is **mainly appropriate** but may require **some minor** modifications.	The prototype/model is **functional without modification**.		
	The prototype/model meets **some** of the requirements of the design criteria.	The prototype/model meets **most** of the requirements of the design criteria.	The prototype/model meets **all** of the requirements of the design criteria.		
Marks per band	**1-2**	**3-4**	**5-6**	**6**	
Developing	Selection of tools, equipment and processes is **not always appropriate** to the task.	Selection of tools, equipment and processes is **mostly appropriate** to the task.	Selection of tools, equipment and processes is **always appropriate** to the task.		
	Use of tools, equipment and processes is **basic**, resulting in a finish that is of **poor quality**.	Use of tools, equipment and processes is **good** resulting in a finish that is of **adequate quality**.	Use of tools, equipment and processes is **excellent**, resulting in a finish that is of **high-quality**.		
Marks per band	**1-4**	**5-8**	**9-12**	**12**	
Testing	**Some** understanding shown through selection of tests, **some** appropriate tests carried out in order to check the prototype/model functionality meets the design criteria.	**Good** understanding shown through selection of tests, **most** appropriate tests carried out in order to check the prototype/ model functionality meets the design criteria.	**Comprehensive** understanding shown through selection of tests, **all** appropriate tests carried out in order to check the prototype/model functionality meets the design criteria.		
	The model/prototype has been	The model/prototype has been	The model/prototype has been		

	tested against **some** of the design criteria and meets **some** of the requirements.	tested against **most** of the design criteria and meets **most** of the requirements.	tested against **all** of the design criteria and meets **all** of the requirements.		
	Selection and use of testing and measurement equipment is **mostly** appropriate and carried out with **some errors** in accuracy.	Selection and use of testing and measurement equipment is **mostly** appropriate and carried out **accurately**.	Selection and use of testing and measurement equipment is **always** appropriate to the task and carried out with a **high degree** of accuracy.		

Assessment theme – Reports

Guidance for markers

The following evidence from Tasks 2, 3 and 4 should be used to assess performance against this assessment theme.

Task 2

- Test records.

Task 3 – for consideration only

- Candidate notes on the candidate feedback record form
- Peer review feedback form.

Task 4

- Evaluation and implementation report
- Revision control document
- Outcomes of virtual modelling.

Note: where there is insufficient evidence to award a mark, a zero mark may be given

Indicative content

Implementation

Completion of an evaluation and implementation report to include:

- engineering drawings standards e.g. BS8888
- any adaptions or modifications and improvements with justifications
- revision control document with justifications
- conformance to design requirements and functionality. Providing access for cranes/ plant and machinery to the site of the suspension bridge
- requirements of long-term maintenance
- minimising operational maintenance e.g. selecting material finishes which do not require routine painting (galvanised steel).

Records/reports

Completion of test records and reports to include:

- material strengths tests using compressive, flexural and buckling
- stability tests
- descriptions of methods and processes

- consideration of accuracy and sources of any errors
- use of technical language and terminology
- any limitations or challenges to methods used.

Assessment theme: Reports	**Band 1 descriptor**	**Band 2 descriptor**	**Band 3 descriptor**	**Total marks for sub-assessment theme**	**Total marks for assessment theme**
Marks per band	**1-4**	**5-8**	**9-12**	**12**	**18**
Implementation	Contains **some basic** information, **some minor** details missing that could impact on a third party familiar with the design being able to reproduce it.	Contains **good** information that would allow a third party that is familiar with the design to reproduce it.	Contains **detailed** information that would allow a third party to reproduce it.		
	Evaluation of the design is **basic** and identifies a **brief** list of improvements with **no justification.**	Evaluation of the design is **good** and identifies a **range** of improvements with **some justification**.	Evaluation of the design is **thorough** and identifies a **comprehensive range** of improvements with **clear and detailed justification**.		
	Where no improvements or adaptions are needed, this is supported with **brief** reasoning and justifications to why.	Where no improvements or adaptions are needed, this is supported with **good** reasoning and justifications to why.	Where no improvements or adaptions are needed, this is supported with **detailed and thorough** reasoning and justifications to why.		
	Changes or no changes to the design as a result of manufacturing, testing or feedback are **not always suitable** and **lack reasoning**.	Changes or no changes to the design as a result of manufacturing, testing or feedback are **suitable** with **some reasoning**.	Changes or no changes to the design as a result of manufacturing, testing or feedback are **suitable** with **detailed reasoning**.		

Marks per band	1-2	3-4	5-6	6	
Records/reports	Reports are **partially completed brief** in content with **some** incorrect technical and industry terminology.	Reports are **completed** in a **clear** format with only **minor** details missing. Content and technical and industry terminology is **mostly** accurate.	Reports are **detailed and accurate** with correct technical and industry terminology **throughout**.		
	Test records include **some** of the appropriate information.	Test records include **most** of the appropriate information.	Test records are **detailed** and include **all** appropriate information.		
	Some inaccuracies in recording of test outputs and measurements.	**Some minor** inaccuracies in recording of test outputs and measurements.	**All** test outputs and measurements are accurate.		

5. Links to Maths, English and Digital Skills

The table below indicates where each of the General Maths, English and Digital Competencies have been integrated into the assignment tasks.

Task	Skills
1	EC1, EC2, EC3, MC2, MC8, MC10, DC1, DC2
2	EC1, EC3, MC1, MC10
3	EC1, EC2, EC3, EC4, EC6, MC2
4	EC1, EC2, EC3, EC4, MC10, DC1, DC2