GCSE Engineering (Double Award) 1492

Assessing the Portfolio Units 4866/4867

1. General

Centres are reminded that:

- this qualification represents the equivalent of two GCSEs with 66% of the final marks coming from the two portfolio units;
- the standards set in the qualification must match those of any other GCSE and consequently the entry requirements for candidates to the course should be the same;
- the time allocation for teaching this Double Award GCSE should be twice that allocated to a single GCSE; and
- the applied nature of the course requires candidates to have first-hand experience of 'real world' engineering and to encompass industrial and commercial practices in their work.

2. The Methodology of Assessment

2.1 General issues

The nature of assessment is very different to that in a 'traditional' GCSE programme or to that in GNVQ portfolio units. Candidates should have covered all the knowledge and skills identified in the 'What you need to learn' section of each unit's specification, but the portfolio for each unit only needs to include the evidence identified in the relevant Assessment Grid.

It is quite feasible to cover the requirements for both of the portfolio units in one activity or task i.e. in Unit 2 the candidate makes the product that has been designed in Unit 1. However, this approach is fraught with danger as the same piece of evidence cannot be used twice. For example, the production plan identified in Unit 1 must be reworked completely if it is be used in Unit 2, because the focus in each unit is different. In addition the work must be separately assessed against each unit's assessment grid and the evidence referenced separately against each grid. Portfolio moderation has shown that the most successful Centres were those whose candidates presented completely separate portfolios for Unit 1 and Unit 2, with a different product for each unit. In this way, Unit 1 focuses on the work of the Design Engineer and Unit 2 on that of the Production Engineer.

The methodology of assessment for these units is that of identifying the best fit box for each strand in the assessment grid. For example, in Unit 1 the best fit might be a2, b2, c2, d3 and e1. Then within each box the assessor needs to decide which of the marks available in that box to award to the evidence in the portfolio. In box a2 for Unit 1, the evidence must show that the candidate has 'used customer feedback and associated information to produce their final design solution' in order to achieve the full 7 marks available. Customer feedback is the more important of the two

criteria and so if there was no evidence of this at best the candidate could only achieve 5 marks. However, if customer feedback had been used but there was no evidence for the use of associated information then 5 or 6 marks could be awarded. The final mark for the unit is the sum of the marks awarded for each strand.

Each portfolio assessed should have a URS attached to it. This should show clearly the distribution of marks for all strands with sub-totals and final total recorded. This form will provide a basis from which the moderator will work. To enable the final mark to be moderated there must be clear referencing to indicate how the mark for each strand has been determined. Good practice would dictate that in each box on the URS there are page references to show where the evidence is located within the portfolio. On each referenced page, annotation should show the location of the evidence, how it fits the assessment criteria and how it attracts the mark that has been awarded. However, the minimum requirement is that the URS must be completed for each candidate and sent to the Moderator with the requested sample. The Moderator requires a clear indication of how the marks have been awarded for each strand and the URS is a critical part of the moderation process; without it moderation cannot be carried out.

To ensure the effectiveness of this system, assessors must recognise that postal moderation requires **all** the evidence to be included and explicitly identified in the portfolio and not implied either through the completion of the task or through the assessor's wider knowledge of the candidate. To this end, it is important that in each Centre there is an objective system of **internal** standardisation or moderation to ensure that:

- all assessors apply the same standards in their interpretation of the assessment criteria;
- there is an unbiased opinion that the evidence is explicit in the portfolios; and
- there is a correct and justifiable rank order of candidates' marks.

2.2 Consortia

In cases where candidates from different Centres have been taught **and assessed** together, i.e. at a local college or training establishment, but where they are entered through the Centre at which they are on roll, then the Centres involved must register with OCR that they wish to be treated as a consortium. It is vital if Centres are to be treated as consortia that they register this intention in advance of the examination session on the appropriate Joint Council application form, JCQ/CCA. This form is available from the examination secretary or the Joint Council website: **www.jcgq.org.uk**

All Centres involved in the consortium must be represented during the assessment of the portfolio work to ensure effective marking and standardisation of the candidates' work, in much the same way that internal standardisation will be carried out in a single Centre. This marking and standardisation procedure should ideally be carried out at one location (the training establishment) with the work of all candidates available at the same time. This ensures that:

- all assessors apply the same standards in their interpretation of the assessment criteria;
- there is an unbiased opinion that the evidence is explicit in the portfolios; and
- there is a correct and justifiable rank order of candidates' marks across all the Centres involved.

OCR will allocate a single Moderator for the consortium and all the candidates will be treated as a single group for the purpose of moderation. To this end, all candidates' work must be available, as if from a single Centre, throughout the assessment period. The Centres concerned must nominate a consortium coordinator who will undertake to liaise with OCR on behalf of all Centres in the consortium.

2.3 Despatch of portfolios to Moderators

Centres will be notified by their Moderator of the sample of portfolios required for moderation. This sample will consist of all of the Centre's entry for up to ten candidates, plus 10% of the rest for entries of eleven candidates and above. The notification is triggered by the Moderator's receipt from the Centre of the MS1 copy and the CSF. In practice, if a Centre has up to thirteen candidates, it can send all portfolios to the Moderator with the MS1 and CSF, without waiting for sample notification; this will speed up the moderation process. Centres should be aware that the sample will not necessarily include Unit 1 and Unit 2 portfolios from the same candidates; this is best facilitated if candidates have completed separate portfolios for Unit 1 and Unit 2.

Centres are advised that, to maintain security, the sample of portfolios should be sent to the moderator by a delivery system that allows tracking. Centres are reminded that neither Proof of Posting nor Recorded Delivery allows tracking.

3. Guidance on the Interpretation of the Assessment Criteria

3.1 General issues

3.1.1 Unit 1 – Design and Graphical Communication

The specification requires the following processes to be evidenced:

- a clearly defined customer/client who provides the design brief (This cannot be the end-user of the product or the candidate);
- the candidate then works with this customer/client to develop the design brief into a design specification;
- several (three minimum) design solutions are then developed by the candidate to satisfy this design specification;
- through discussions with the customer/client, one of these design solutions is selected to be produced; and
- this final design solution is worked up in detail before being presented to the client.

In Strand a: if there is no clearly identified client the maximum score is 4.

In Strand b: access to b2 and b3 depends on the candidate matching the accuracy of their drawing techniques to the purpose for which they will be used. For example, hand drawn sketches might be appropriate in developing the design specification from the design brief, but the final design solution would include accurate engineering drawings **from which the product can be made**.

In Strand c: c1 requires Health and Safety issues to be addressed; these should be relevant to the candidate's product. c2 and c3 require the quality control procedures used in making the product to be identified. If these are not included, the c1 'default' requires the H&S issues in making and using the product (**not** H&S in **general** terms) to be identified.
If Quality Control procedures are mentioned but no H & S issues are identified then the marks available for c1 (4) will not apply.
H & S issues must be written down. They should not be referred to as a verbal report nor their use implied by the teacher's knowledge of the candidate.

In Strand d: if the design solution has not been presented to the customer/client (or if there is no clearly defined customer/client), only d1 can be awarded. d2 & d3 require modelling as well as diagrams and sketches to be used in the presentation. If modelling is not used the maximum mark is 7.

In Strand e: access to e2 and e3 require quality assurances to be identified. These must include the tolerances to which the product will be made.

3.1.2 Unit 2 – Engineered Products

Candidates must show:

- that they have used one process from each of: material removal; jointing and assembly; treatment processes; surface finishing;
- that they understand quality assurance procedures (how the product will be quality assured);
- quality control tests (the values used for quality assurance/quality control are covered in c2 and how these affect planning and scheduling in c3); and
- critical control points (these should include the outcomes of go/no go decisions and the implications of these for production planning and scheduling).

In Strand a: to access a2 and a3 there must be a production plan with associated quality control identified. If there is no quality control the maximum mark is 4. The engineering processes must relate to the categories identified in the banner i.e. material removal, jointing and assembly, treatment processes and surface finishing;

In Strand b: b2 & b3 require a schedule i.e. appropriate timescales allocated to the stages in making the product. This could be a Gant diagram which is time constrained. If no sequence is identified, and b1 is therefore the best fit, then b1 requires a description of why production planning is necessary in itself and in meeting the product specification.

In Strand c: c2 requires the quality control tests in terms of equipment, procedures and tolerances to be identified and, in c3, the impact on production planning and sequencing if these tests are not met must be explained i.e. what is the impact of 'go/no go' decisions. In c1 the default is to identify the critical control points and describe H&S issues pertinent to the production of the product (again, **not** just H&S issues in **general** terms).

In Strand d: If candidates have not used ICT in making their product they can access this strand by describing (d1) or explaining (d2) why it was **not** appropriate to use ICT in making their product. **However, to access d3 candidates MUST evaluate how ICT would have been used to make their product in 'real world' engineering.**

In Strand e: e2 requires an explanation of why the tools and equipment used were fit for purpose in the school/college workshop context and e3 requires an explanation of how and why these would be modified in real world engineering situations. e2 also requires any changes to the production plan to be identified or if no changes were made an explanation of why these were not needed. In e3 this explanation must be expanded to explain the impact of the use of real world engineering tools and equipment would have on the production plan. If there is no explanation of how tools and equipment were fit for purpose, then the maximum mark is 7.

3.2 Specific Issues Related to the Interpretation of the Assessment Criteria

3.2.1 Unit 1 – Design and Graphical Communication

Assessment Criteria: Strand a

a1. Produce a design specification from a given design brief. **0 1 2 3**	• The customer/client should be clearly identified. This should be the person or company that has commissioned the product design. • The design brief must be clearly stated, with details of any specific conditions imposed by the customer/client. • A design specification should be clearly presented with reasonable detail included. • There will be some evidence of relevant research included.
a2. Produce a design specification using customer feedback and associated information. **4 5 6**	• The design specification will contain all the relevant details to enable the proposed product to be produced, including any tolerances and sizes. • Any constraints or conditions required by the customer/client must be clearly detailed. • There should be evidence of research into relevant areas that may influence the proposed design, including possible materials, components, finishes, etc. • There **must** be evidence of communication with, and feedback from, the customer/client. • There may also be evidence of any market research that was considered necessary, and how this influenced the specification.
a3. Justify their final design specification by explaining how they used customer feedback and associated information. **7 8 9**	• The reasons for including the relevant details in the design specification should be clearly stated, and explained. • Any research that was undertaken and included should be explained and referenced to the proposed design. • The results of any market research included must be explained and their effects upon the proposed design specification clearly stated. • The details of the communication with the customer/client should be explained and it should be stated how they influenced the proposed product specification. • The specification must be correct in terms of engineering.

Assessment Criteria: Strand b

b1. Demonstrate a basic level of accuracy in drawing, using appropriate drawing standards. **0 1 2 3**	• There should be a range of drawing techniques used to convey the proposed design ideas clearly and legibly. • Types of drawings to be used could include sketches, orthographic, 3-dimensional, exploded, etc. • Any computer generated drawings included should be accompanied by relevant notes. • All drawings should be to a reasonably accurate standard. • Appropriate drawing symbols and standard conventions should be used. • Annotation should be used to help explain the details of the proposed designs.

b2. Use drawing techniques and appropriate standards accurately in developing a range of design ideas. **4 5**	• The drawings produced should demonstrate a high standard of accuracy and clarity. • A full range of drawing techniques should be evident, as suggested in the specification. • The use of computer generated drawings is strongly encouraged. • Clear annotation should be used to help clarify and explain the proposed design ideas. • Details of sizing and constructional techniques should be evident. • Standard drawing conventions and symbols must be used. • Constructional details and components proposed should be clearly understood from the drawings and notes included i.e. there must be an accurate engineering drawing of the final design solution from which the product could be made.

b3. Fully justify the use and accuracy of the drawing techniques that they have used to develop their design ideas. **6 7**	• The reasons for using the chosen drawing techniques to convey the proposed design ideas should be clearly stated e.g. sectioned and exploded drawings may help to convey a greater understanding of the proposed design ideas. • High standards of accuracy are also required. • Proposed dimensions of the design ideas should be clearly evident. • The chosen methods of showing constructional and component details should be explained

Assessment Criteria: Strand c

c1. Identify health and safety issues related to their design. **0 1 2 3 4**	• Any Health and Safety issues stated **must** relate to their proposed design solution. • General Health and Safety statements and descriptions are not acceptable. • The Health and Safety issues identified should be applied to the use of the product **and** to the making of the product. • This information could possibly be presented in the form of a detailed chart. • Health and Safety issues must be identified by the candidate and not presented as a statement by the teacher, such as: “the candidate worked with due regard to safety

c2. Identify the quality control procedures that would be used in each stage of making the product in their design solution. **5 6 7**	• Any quality control procedures that are suggested during the making of their proposed product **must** be specific to their proposed design solution. • There should be details of **specific** tests and procedures that would be applied to the proposed product during the making process. • The use of test gauges and templates etc. could be included. • Detail is essential when describing these proposed tests. • General quality control statements are **not** sufficient.

c3. Evaluate quality control, quality assurance and total quality management applied to making the product in their design solution. **8 9**	• The value and importance of quality control tests when making their proposed product should be described. • Any remedial action necessary if tests proved negative should be stated. • The complete ‘package’ of quality assurance and quality management during the manufacture of their proposed product, from start to completion, should be explained in detail. • Possible reasoning could include reference to less waste of material, and how tolerances would be applied, etc. • General quality control statements are **not** sufficient.

Assessment Criteria: Strand d

- In this strand it is the effective **presentation** of the proposed design solution to the customer/client that is assessed. (See notes in 3.1.1)

- Any evidence already marked as part of **strand b** cannot be re-marked in this strand.

- However, if any material in **strand b** forms a necessary part of the presentation, it can be referred to as part of the presentation evidence.

Assessment Criteria: Strand d

d1. Use diagrams, sketches and other appropriate methods to **present** their design solution to the customer. **0 1 2 3 4 5**	• There must be suitable evidence of how the proposed design solution was presented to the customer/client. • The methods of presentation that could have been used are also acceptable, but reasons must be given. • Clear drawings of the proposed design should be evident. • It should be possible for a third party to understand the proposed design from the evidence included. • There should be details of any suggested constructional methods, finishes, sizing, etc. • Any comments on the design by the customer/ client should be included.

d2. Use diagrams, sketches and other appropriate methods, including modelling, to **explain** their design solution to the customer. **6 7 8**	• There should be clear evidence of detailed notes and diagrams **explaining** all aspects of the proposed design solution, up to and including making it. • Computer generated diagrams and virtual modelling could be included, by means of print-outs, with suitable explanations provided. • The use of modelling in semi-resistant materials could be included, by means of photographs or fold-down structures. • There should be clear references back to the design specification. • Any customer/client feedback should be included.

d3. Use diagrams, sketches, working drawings and other appropriate methods, including modelling, to **justify** their design solution to the customer. **9 10**	• This requires all decisions relating to the proposed design solution that is presented to the customer/client to be explained in detail. • The choices of materials, finishes, etc. need to be fully reasoned. • There should be clear references back to the detailed specification of the proposed product. • The evidence should include sufficient clear detail to enable the proposed product to be made. • Any customer/client feedback should be included, with any necessary alterations to the product suggested.

Assessment Criteria: Strand e

e1. Identify the engineering processes that would be used to produce their final product. **0 1 2 3 4 5 6 7**	• There should be clear details of the engineering processes that would be used in the making of their proposed design solution. • The engineering processes identified should be referenced back to the product. • General descriptions of processes gleaned from books or the internet are not sufficient. • The use of a detailed production plan could present the required evidence clearly.

e2. Identify the stages and associated quality assurances that will be used to make their final product. **8 9 10 11**	• The stages of the making process for the proposed design solution should be clearly identified, possibly by using a chart format. • The quality assurances that would be appropriate during the making of the product should be stated. • Any remedial actions necessary should the quality assurances not be fulfilled also need to be stated. • Merely giving quality control procedures is not sufficient. • There should be some references to stated tolerances and other constraints detailed in the specification, and how these would be applied.

e3. Evaluate and justify the stages and associated quality assurances they will use to make their final product, with particular reference to 'real world' engineering. **12 13 14 15**	• There should be clear reasoning with explanations for each stage in the making process. • The details of the application of the quality assurances and their effectiveness should be given. • Any necessary alterations to the production process, and the reasons for the alterations, should be clearly stated. • A clear explanation of how the product would be manufactured in quantity using 'real world' engineering methods should be given, detailing the changes in the production processes and stages that would be required.

3.2.2 Unit 2 – Engineered Products

Assessment Criteria: Strand a

a1. Describe a simple engineering process, using ICT as appropriate. **0 1 2 3**	• There should be a clear description of an engineering process, either hand or machine. • This description should include references to ICT processes if required. • There should be some indication of how the process described relates to the engineered product. • The engineering processes must relate to the categories identified in the banner i.e. material removal, jointing and assembly, treatment processes and surface finishing.

a2. Produce a production plan that identifies the engineering processes and quality control involved in making their product. **4 5 6**	• A clear production plan should be produced detailing the engineering processes required to manufacture the engineered product. • Quality control tests that are applied to the engineered product during the making process should be stated and described in detail. • These quality control tests should be specific to the product, not just general tests. • This evidence could be presented in the form of a detailed chart.

a3. Evaluate their production plan, in relation to the engineering processes and quality control involved in making their product. **7 8 9**	• The production plan should be clearly explained and any problems during the making process should be stated, with possible alterations to the plan suggested. • Any quality control tests applied to the product should be detailed, with the reasons for applying them given. • If any of the tests were difficult to achieve or continually failed, the reasons for this should be explained in detail. • Any necessary changes to the production plan and quality control tests after the making of the product is completed should be clearly stated with reasons given.

Assessment Criteria: Strand b

b1. Describe the importance of accurate production planning and of meeting the product specification. **0 1 2 3**	• There should be a clear description of why production planning is necessary in itself, and how it would relate to the engineered product. • Details of how the product specification would be applied during the making of the engineered product should be given. • There could be references to: production stages in logical sequence; avoiding wasted time and materials; making sure parts fit correctly; checks to make sure size limits are correct; etc.

b2. Identify in their production plan the schedule for making their product. **4 5**	• This evidence could be included on the production plan produced in strand a. • There should be details of some form of actual time scale for making the engineered product. • A breakdown of the stages of production with timings could be given. • A Gant chart (or similar) could be used. • The timings given in the schedule should be as accurate as possible at this stage.

b3. Evaluate their production plan in terms of how the schedule for making their product could be improved. **6 7**	• There should be descriptions of the production process that was used to make the engineered product, with any alterations or improvements to the time schedule clearly stated. • The reasons for any alterations must also be given. • This could be in the form of a sequence of events with a detailed breakdown of the processes used, the reasons for their use, and any improvements that could be made to the sequence or processes.

Assessment Criteria: Strand c

c1. Identify key control points during the making of their product and describe the importance of health and safety. **0 1 2 3 4**	• The key control points during the making of the product should be clearly defined and stated. • These could be linked to each separate process used during the making of the engineered product. • The Health and Safety issues associated with each stage or process during the making of the product should be clearly described. • These Health and Safety issues could be presented in the form of risk assessments for each process. • The Health and Safety issues **must** be specific to the production of the product, **not just** general H & S issues.

c2. Use quality control tests and carry out work, when making their product, with due regard to health and safety, including reference to appropriate safety systems. **5 6 7**	• There should be details of the quality control tests that would be applied to the engineered product at the control points during the making of the product. • These should be linked to the proposed tests described in strand a**,** and any tolerances given in the specification included. • The tests **must** be specific, and include clear details of how they are to be carried out. • Any action to be taken if the product failed the tests should be included. • Gauges and size/shape templates could be used during the tests. • The Health and Safety procedures necessary during these tests, and during the making of the product, should be stated, with any safety systems in place clearly described.

c3. Explain and justify how the production planning and scheduling for making their product could be improved. **8 9**	• There should be a clear explanation, with appropriate reasoning, of the impact that the outcomes of the quality control tests would have on the production plan and scheduling for the product. • If any of the tests give negative results, or were difficult to achieve, details of any actions required should be given. • If any tolerances given in the specification proved difficult to apply, the reasons should be stated. • Any suggested changes to the production plan and scheduling due to the test results should be described in detail with clear reasons given.

Assessment Criteria: Strand d

d1. Describe how they used ICT in making their product. **0 1 2 3 4 5**	• There should be a clear description of how ICT has been used in the making of their product. • Describing why the use of ICT was not **appropriate** in the making of their product could also satisfy this requirement. • Any descriptions given **must** refer to their engineered product, and must not be just general descriptions of ICT processes. • The ICT processes described should be involved with the **making** of the product, **not** the designing as detailed in Unit 1.

d2. Explain why they used ICT in making their product. **6 7 8**	• There should be clear explanations why they used the stated ICT in the making processes for the product. • Explaining why the use of ICT was not **appropriate** in the making of their product could also satisfy this requirement. • General descriptions and explanations of ICT linked machinery and production methods are not sufficient. • The ICT used must relate to the making of their product.

d3. Evaluate the use of ICT in making their product. **9 10**	• There should be a detailed description of the way in which ICT was used (or would be used) in the manufacture of their product, with clear reasons stated for the use of the processes described. • Any advantages or disadvantages of using ICT should be clearly explained, again with appropriate reasons given.

Assessment Criteria: Strand e

- The evidence for this strand could be presented using a combination of notes, charts and photographs, preferably from a digital camera, for ease of inclusion in the portfolio.

- **It is NOT required to include the candidate's face in the photographs.**

- Any photographs should show the tools and equipment being used in the processes of manufacture of the product. Explanatory notes should accompany any photographs.

Assessment Criteria: Strand e

e1. Describe how they produced their product using appropriate tools and equipment. **0 1 2 3 4 5 6 7**	• There should be a reasonably detailed description of how the product was made. • This should include details of the tools and equipment used to make the product. • The reasons for using the particular tools and equipment should be stated. • There should be some relationship with the production plan produced in strand a.
e2. Explain why the tools and equipment used when making their product were appropriate to the task and identify any changes they have made to their production plan. **8 9 10 11**	• There should be clear explanations of why the tools and equipment used in the making of their product were appropriate for the purpose. • The reasoning and descriptions may well be influenced by where the product was actually produced. • Any changes to the proposed production plan should be described, with the reasons for the changes clearly stated.
e3. Evaluate their product in terms of the tools, equipment and processes they have used in making it and comment on how these would be modified in 'real world' engineering. **12 13 14 15**	• Clear reasoning why the tools and equipment used in the making of the product should be given. • Any constraints or alterations to the production plan due to the tools and equipment available should be detailed, with possible solutions suggested. • A clear explanation of how the product would be produced in quantity using the tools and equipment available in a 'real world' engineering situation should be given, detailing the changes in the production plan that would be required.