Moderators' Report/
Principal Moderator Feedback

Summer 2014

Pearson Edexcel GCSE in Engineering

5EG02 Paper 01

Engineered Products

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2014
Publications Code UG038618

Unit 5EG02

Engineered Products

Introduction

This Principal Moderator's report provides comment on centre and student performance in the 2014 assessment, following moderation of the assessed student portfolios for 5EG02, the Engineered Products Unit 2 of the 2EG02 specification for GCSE Engineering, submitted to Pearson Edexcel. It can again be reported that centre approaches to the delivery and assessment are generally appropriate. There is still a tendency towards leniency in centre assessment arising from leniency at particular criteria and centre assessors are advised to revisit the detail of the assessment criteria for the unit, the detail of the Assessment Information at Section 3 of the Teacher Support Book for Controlled Assessment of the qualification, and read these in conjunction with this report and the detail of the particular report provided by their 2014 moderator.

Much of the general comment set out in this section deliberately repeats that provided previously, to guide centres and centre assessors new to the qualification, and to remind centres that the specification and its requirements have not changed.

Centre assessors do appear to appreciate the role of witness testimony to support student evidence presented, especially in differentiation between the middle and upper mark range discrimination between 'with limited support and guidance' and 'independent and confident use', or similar wording, at six of the criteria. Some assessors add further witness testimony to support the Inspection Sheets and 'level of skill and accuracy' at criterion g).

For 5EG02 students are provided with a full set of drawings and product specification, importantly including performance expectations for the completed product, for the manufacture of an engineered product to inspection and performance-testing stages of an assembled product. To prompt evidence of an early student overview of complete requirements, assessment criterion a) requires the interpretation of specification and drawings. Production plans (two criteria) are required to include information about resources, processing requirements, production details and constraints. This pre-planning should include details of electronics work, assembly, inspection procedures and performance testing.

Thereafter, students are rewarded for the identification, preparation and use of materials and components, including bought-in components, with safety and skill, and accuracy, at the upper mark range. Independence in these activities is evidenced by witness testimony.

The additional 'selection' criterion f) is an appropriate addition for processes, tools and equipment, linking with the earlier planning of the

sequence of selected process activities, leading to reward for safe use, with skill and accuracy. It is such application of selection and use of processes, tools and equipment that can give access to the eight marks at this criterion.

At criterion g) a completed product, assembled and finished and ready for test is rewarded, the expectation being for students to produce an Inspection Sheet, inspecting made dimensions against drawings and tolerances, often signed-off by the assessor as proxy Quality Inspector. Appropriate Inspection Sheets for any electronics/electrical or pneumatics work should be devised for inspection of circuit-building quality. The assembled product should be performance-tested at criterion h) against the performance requirements specified at the outset. The 'evaluation' referred to at criterion h) is of the product, not of the student performance.

Centres are able to choose their own product to be made and tested and all of the work for the unit is produced under controlled conditions (33 hours max).

The quality of written communication (QWC) demonstrated by students is a progressively assessed component in three of the criteria: b), c) and h). The eight-mark criterion f) is for the safe and skillful use of processes and can be seen as the reward for the demonstration of safe and accurate practical skills.

A wide range of 'engineered product' projects continue to be used for this unit: wind power generators, model engines, model cars, various alarmed devices/artefacts, water sprinklers, steady hand game, desk lamps, coach lamps, screw jacks, radio-kits, clocks electro-mechanical buggy/robots, tool boxes with/without alarms, solar panel demonstration units, multi-purpose handsaws, surveillance cameras, electronic dice, portable MP3 amplifiers, car park barrier models.

Bought-in kits have the tendency to be non-challenging to the most able, although being suitable vehicles, with their pre-set pro-formas, to lead most students through the necessary criteria. Some of these pro-formas have not yet been updated to cover the new (published 2009) criteria, while some of these kits have minimum machining content and it is a concern voiced by moderators that tolerances for this unit generally are often set quite loosely for the level of the qualification.

The quality of written communication (QWC) demonstrated by students has less prominence in this unit, being directly assessed at only three criteria (the two planning criteria and the product evaluation one at the end).

Assessment Criteria

The product to be engineered is centre-chosen/devised within the parameters set by Pearson Edexcel about the use of the processes listed in the specification: material removal, shaping/manipulation, joining/assembly, heat/chemical treatment, surface finishing. Where centres use some newer technologies of CAD/CAM for the purposes of this unit eg

the use of CAD files for laser cutting or other software for CNC programming, these modern approaches can be incorporated into 5EG02 criteria, with appropriate planning detail at criteria (b) and (c) and evidence of 'selection and use' at criterion (f). The CAD aspects can, of course, be a distraction in the time available for this unit, in which CAD is not rewarded.

A listing of eight bullet-points produced in previous Principal Moderator Reports, that describe the general requirements arising from the specification and assessment criteria are re-produced again here, for the benefit of all assessors, but perhaps particularly for those assessors new to assessment of Unit 2:

- the requirement for witness testimony to 'support/guidance' given or 'independence', at six of the eight criteria
- production plans at (b) and (c) now emphasise range of planning, not depth of description/justification of planning, as previously
- 'selection' is no longer required in the present specification at criteria (d) and (e), the focus now being on preparation and safe use of materials and components with skill. The 'identification' referred to is a reference to 'picking out' from presented stock items. Thus research work and presentations on materials and components, and why they would be 'selected', only serves to use up valuable controlled assessment time.
- 'selection' of processes, tools and equipment does remain at (f) and ties in with production plans where students indicate their selected choice of processes and sequence to make the product and the 'use' of these processes safely with skill is rewarded
- 'safe use' of processes with skill to complete the assembled and finished product is further rewarded at (g)
- better marks at (g) require an assembled, finished, completed product and evidence of accuracy of component manufacture and assembly through Inspection Sheets
- criterion (h) requires test data on the performance of the completed product, tested against the specified performance requirement of the product as stated at the outset.
- The use of materials, parts and components and of processes, tools and equipment, with skill and accuracy is rewarded at Upper Mark Range at criteria d), e) f) and again at g), and there is an expectation of witness testimony to support student evidence of high quality completion

Thus some coherence of marks should be expected across criteria (a) (d) (e) (f) (g) and (h) and if these are all accomplished it is likely to have been because of good planning at (b) and (c). These would be the characteristics of a good 'practical engineer who can communicate' using appropriate standards of QWC (assessed at three criteria) as detailed in the Teacher Support Book, Section 3 'Expected Evidence'.

Centre Assessment

There is a continuing tendency in centre assessment towards lenient assessment against the criteria where one or more dimensions of the detail of criteria requirements is omitted in student evidence, but rewarded in marks given at the centre assessment stage.

Criterion a) - Centres can view this criterion as a limited pre-practical one, unrelated to overall completion of the product, with no reward here for completion safely and accurately. Upper mark range marks are not however appropriate unless the student shows 'competent' interpretation of the 'main details' and this requires more of a post-hoc overview in centre marking of how far and well the student progressed overall. The 'basic details' and 'main details' at all mark ranges should include all aspects of the specification. Similar to previous series, centres still appear to neglect electronics in all interpretive work at the front end, and neglect at the beginning to cast an eye to the performance requirements that will need testing at the end, and marking can be too lenient as a result.

Criteria b) and c) - Production planning is now well-established, but many still neglect to demonstrate pre-planning of electronics work, and tools and equipment for that, and of assembly and inspection and test stages, and tools and equipment for these. Most of the work appears to be completed and evidenced, so there is a concern as to why there is so little evidence of its pre-planning. At criterion c) the main weakness remains the production details at machining: speeds, tools; and at heat processing and electronics: temperature settings, solders. Thus centre marking can be lenient here. Gantt chart sequencing of the wide range of separate operations planned serves to capture well the general constraints imposed by time and equipment. For these criteria b) and c) it is the breadth of coverage of the planning of the range of processes needed to reach the final assembled product, ready for testing, that needs to be identified, not depth of explanation. However, QWC is rewarded at these two criteria, so that simple lists, whilst adequate, do not attract the highest reward.
Some centres still seem to encourage the inclusion of pages of generic engineering information about manufacturing processes, but this is work that does not earn reward for these criteria or this unit.

Criteria d), e) and f) - centres and students undoubtedly do well for the use of tools, equipment and processes on materials and components and there is often good witness to this, as 'independent' or otherwise. However, upper mark range marks cannot be agreed at moderation in the absence of student evidence for these criteria. The best portfolios do impress with the quality of photo-narrative provided to show the student's hard work with materials, components and processes, tools and equipment. Upper mark range marks should then be awarded when such photo-narrative is supplemented with witness 'to independence', but such marks cannot be sanctioned if there is little more than the witness testimony present.

The 'selection' of processes to make the product is a further part of criterion f) but this selection really occurs at criteria b) and c), at the planning stage.

There are typical shortfalls in coverage at b) and c) of electronics processes, and assembly, inspection and test, and the presentation of these at f) can also be omitted. However, evidence presented at criterion f) as photo-narrative does tend to be the strongest offered by students, with 'use of materials' at d) and 'use of components' at e) being rather more implied from the 'process' photo-narrative offered at f). Marks at moderation for all three criteria reflect the complexity of evidence presented for f) and indirectly and directly presented for d) and e). Moderators can only make judgments based on what is presented in the portfolios submitted, and, in spite of witness testimony, centre assessment does tend towards the lenient for what is actually presented.

Criterion g) - the evidence presented for this criterion also helps the whole picture. Inspection Sheets showing 'in-tolerance' dimensions of made components with 'Pass' decisions for these components, comprise good evidence, but centres are often over-lenient here because the electronics work, or other work, shows no evidence of inspection.

There still seems to be much confusion too, between the requirements for inspection of component parts at g) and successful testing of the assembled whole product at h), with its higher marks for 'objective testing' against requirements, with good QWC. Some students still also evaluate their own performance in this section of work, not that of the product. A first starting point for centres should be to ensure that the chosen product, when completed, has performance expectations that students can measure and objectively test at criterion (h).

Overall, the moderation process does its best to take a holistic view of the evidence presented (especially where portfolios are disjointed or disorganised) but the best portfolios rely on a thorough and explicit presentation of evidence at all appropriate stages, including a good quality of written communication at the criteria where this is particularly required.

Students are again congratulated in 2014 for their work done towards the completion and testing of their engineered products. There was the typical range of success, rewarded appropriately after moderation, and student photo-narratives showed application, attention to safety and again some pride. Portfolios again gave an impression of the enjoyment of a worthwhile engineering experience and it can be hoped that this will be built on in progression opportunities, which are also likely to require a blend of practical and communication skills measured against criteria.

Administration

Given that in 2014, under Linear Assessment, centres presented both 5EG01 and 5EG02 units simultaneously, the administrative issues that were noted were largely similar for both units. The section presented here is therefore more or less identical to that presented for 5EG01.

Centres and students do gather their work into portfolios and deliver them for moderation in good time and in good order, for the most part, including the highest and lowest scores where these were not pre-selected for

sampling. Centres again responded well, as usual, to moderator requests over detailed issues.

Centres will have been advised in their particular moderator report as to which of the following 'administrative issues' applied in their case:

- Inaccurate/missing totals of scores, and/or errors in transposition between Tracking Sheets/Record Sheets and OPTEMS record, in some cases.
- Also in some cases, lack of student Authentication evidence. The Controlled Assessment Record Sheet (see 2EG02 Specification document) will suffice for this purpose
- The lack of use of the Pearson Edexcel format Tracking Sheet/Record Sheet, in some cases. Centre should note that these have an 'Edexcel Use' column which is used by moderators and for moderation quality assurance processes. In a few cases, centres drew up their own Tracking Sheet, without such 'moderator use' columns.
- The other helpful use of the Tracking Sheet, for centre annotation and page numbering guidance, was then also absent.

Occasionally, the centre top-copy of the OPTEMS sheet was included with portfolios. It is possible that the centres concerned had already entered their centre marks electronically but this was not clear so that the top-copy was sent on to the intended Pearson Edexcel address.

A4/A3 formats with single treasury tag, or similar, connection remain the ideal format for portfolio presentation at assessment and moderation stages, with student-identification and assessment documentation attached, allowing for ease of handling and of photo-copying, where required for Awarding or other purposes. Where centres in 2014 submitted electronic versions of portfolios in disc format it was most helpful to the moderation process when the identification and assessment documentation was submitted by centres alongside in hard copy.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

Pearson Education Limited. Registered company number 872828
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE