

Moderators' Report/
Principal Moderator Feedback

Summer 2013

GCSE Engineering

5EG02 Paper 01

Engineered Products

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Unit 5EG02

Engineered Products

2013 was the third assessment of the 5EG02 Engineered Products unit of the 2EG02 specification for the Edexcel GCSE Engineering qualification. This Principal Moderator's report provides comment on centre and student performance in the 2013 assessment, following moderation of the assessed student portfolios for the unit, submitted to Edexcel. It is pleasing to report that, by this third assessment, the standard for this specification is now well embedded and the transitional issues encountered previously are being addressed in centres.

For 5EG02 students are provided with a full set of drawings and product specification, including performance expectations, for the manufacture of an engineered product to inspection and performance-testing stage 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 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' is appropriate at criterion (f) 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/pneumatics etc 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.

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), (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 are in use 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, electro-mechanical buggy/robots.

Bought-in kits have the tendency to be non-challenging to the most able, although being suitable vehicles, with their pre-set pro-formas, for the leading of most students

through the necessary criteria, though not always all of them. Some of these proformas have not been updated to cover the criteria for this specification, while some of these kits have minimum machining content and it is a criticism of moderators that tolerances are often set quite loosely for the level of the qualification.

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. There is still some laxity at centres in the application of all these parameters explicitly in the making of the product. For 5EG02, all students need to have the same robust and standard, starting point.

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.

It is pleasing to note that the general requirements arising out of the specification and assessment criteria, detailed in the 2012 Principal Moderator's Report for this unit as a listing of eight bullet points to note, do seem now to be better appreciated. These eight bullet points are re-iterated 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 emphasize 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. Thus research work and presentations on materials and components 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 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 through Inspection Sheets.
- criterion (h) requires test data on the performance of the completed product, tested against the specified performance requirement of the product.
- 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).

Centre Assessment

There is a tendency in centre assessment towards lenient assessment against the criteria because 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. And the basic and 'main details' at all mark ranges should include all aspects of the specification. Too often, centres 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 do not demonstrate pre-planning of electronics work, and tools and equipment for that, and of assembly and inspection and test stages, and tools and equipment. Most of this work gets done and evidenced, and should also be pre-planned. If it is, this needs to be evidenced. At criterion (c) the main weakness remains the production details at machining: speeds, tools; and at heat processing and electronics: temperature settings, solders.

Single words, short lists, remain an issue for the demonstration of QWC at criteria (b) and (c), contributing again to the leniency of centre marks.

Centres and students undoubtedly do well at criteria (d), (e) and (f) for the use of tools, equipment and processes on materials and components and there is often good witness to this, as 'independence' or otherwise. However, upper mark range marks cannot be agreed at moderation in the absence of student evidence for these criteria. The best students do impress with the quality of photo-narrative provided to show their 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 agreed if there is little more than the witness testimony present.

Criterion (g) evidence also helps the whole picture. Inspection Sheets showing 'intolerance' made components for the completed product, with 'Pass' decisions for components are good evidence (though some tolerances are noted by moderators as being very slack for this level), but centres are often over-lenient here because the other electronics work, or other work, shows no evidence of inspection.

There appears to be some confusion still, 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).

Students are congratulated in 2013 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, all of which will also require a blend of practical and communication skills measured against criteria.

Administration

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

Small numbers of calculation errors do continue, as do some errors of transposition and entry. The Authentication Statement at the bottom of the unit Controlled Assessment Record Sheet is normally signed and included, and the Controlled Assessment Tracking Sheet is put to good use by centres.

Some centres included the top copy of the OPTEMS sheet with the portfolios. Centres should note that these top sheets should be sent to Pearson (see the Pearson, Hellaby, Rotherham, address at the left-hand margin).

A range of portfolio formats continue to be used.

A4/A3 formats with single treasury tag connection remain the ideal format for portfolio presentation at assessment and moderation stages, with student-identification and assessment documentation attached, allowing ease of handling and of photo-copying, where required for training and awarding purposes.

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