



EXAMINERS' REPORTS

LEVEL 1 / LEVEL 2 AWARD IN ENGINEERING

SUMMER 2022

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Annual Statistical Report

The annual Statistical Report (issued in the second half of the Autumn Term) gives overall outcomes of all examinations administered by WJEC.

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UNIT 1 – 9791 – ENGINEERING DESIGN

General Comments

After another difficult year for centres dealing with the impact of the pandemic, it was encouraging to see a broad spread of briefs again being developed by centres as well as the amount of new centres coming on board for the specification for the first time. It is encouraging to see the maintained growth of the course.

Looking at outcomes for both units in general, the impact of limited teaching in year 10, where skills and knowledge are generally delivered by most centres, has had an effect on outcomes this series. In general, the quality of engineering drawings in Unit 1 was reduced, as compared with pre pandemic submission; this was clearly evident in high number of samples seen.

There was also a slight increase in the number of templates used although this was more evident in newer centres and it must be pointed out that this is considered as assisting the candidate outside of the level of control and consequently, centres may be reduced accordingly. In a number of instances this series, moderators had to request the entire or grade range of the cohort from centres to allow an accurate assessment to be awarded. The use of digital uploads for samples was also undertaken well by virtually all centres and there were very few issues with uploading the work. A small number of centres had assessment documents missing but these were rectified very quickly and easily by additional uploads from the centres.

Administration Issues (applies to Unit 1 and Unit 2)

The vast majority of centres complied with the requirements of the moderation process with samples uploaded by the deadline. This allowed moderation to continue to be undertaken in a smooth and consistent way.

There are, however, a number of points which need addressing by centres with regards to uploads. These are detailed below:

- Centres need to use unique filenames for each candidate, with the candidate number being a part of the name. In some instances, candidate's files had the same names, which made downloading problematic for moderators, as each candidate required a separate folder to be created.
- Uploading candidate evidence should ideally be done using a single file. In some cases, centres uploaded upward of 17 separate files per candidate, this required 170 individual downloads for a single centre. In some situations, large numbers of files had a range of different names, which made referencing evidence problematic. Please ensure uploaded files are in the correct orientation before uploading the evidence, again, the process of rotating sheets as they are vertical, or upside down is time consuming.

It is the centres responsibility to ensure that the moderation sample is fit for purpose. Future evidence submissions may need to be returned to centres for correcting if there are excessive file numbers or work is not orientated correctly or of insufficient quality for moderators to view the work. This was particularly an issue with candidate sketches.

Comments on individual questions/sections

As mentioned, the outcomes for Unit 1 were generally well structured with a good range of briefs which in the main, allowed candidates full access to all performance bands. Established centres continued to develop and adapt their briefs whilst new centres either used the sample assessment material as published or modified it to meet their own centre's needs.

The following commentary focuses on the individual Assessment Criteria for the unit.

AC's 1.1 & 1.3 (1.2 removed in adaptations)

Many centres are now undertaking these two AC's well and candidates are identifying features and function of engineered products in an appropriate way to address the assessment criteria. For newer centres AC 1.1 requires candidates to identify the key features of the products they have been asked to produce. These can be done in a table, as pictorial references on sketch work or linked to later specifications. In the main, the candidate will need to identify features on existing products that meet the brief or from details in the information issued by the centre.

AC 1.3 then requires candidates to focus on the functional aspects of products that are similar to those being designed. Many centres do this successfully by disassembling existing products as it allows candidates to gain a higher level of insight into the product function and assembly.

There are also opportunities here for Assessing AC 3.2 where candidates can prioritise features and functions from their research by ranking them into order of importance or desirability for inclusion into their own specification and design outcomes.

AC 2.1 was clearly impacted by a lack of practice time for candidates, and this was clear in a vast range of samples. Overall, CAD was well utilised in both creating orthographic drawings to conventions and in producing visual aids which assist with assessing AC 2.2. Again, for new centres, the expectations are for higher band responses, candidates should produce an orthographic view of their final design, supported by an isometric drawing of the final product. Dimensions should be complete enough to allow a third party to be able to manufacture the product and in the distinction band, hidden detail, centre lines, full dimensions and any development or detail views needed to explain the product fully. CAD, whilst an advantage for centres, is not a requirement of the specification. Candidates can still hand draw outcomes for this AC and still access the full range of assessment. I would recommend centres to explore the free CAD packages available, many being free to educational establishments and these often being from industry leaders in CAD software. AC 2.2 was again well answered by a large number of centres, especially those who employed CAD as this offers instant rendering of the candidate's outcomes but also makes the iterative process more fluid. There was also a good range of traditional sketching evidence seen which was supported by clear annotation showing the decisions made by the candidate. In the higher responses, the annotation clearly linked to the specification but also linked back to the research undertaken in AC's 1.1 and 1.3.

AC 3.1 was not as established as A2.1 and 2.2 and there was a general lack of clear development and exploration of ideas by candidates. This can sometimes be as a result of limited initial ideas in the early stages of the design process. It is important that centres encourage candidates to develop a number of designs and links them to information again gathered from AC's 1.1 & 1.3 (and 1.2 when adaptations are not in place).

AC 3.2 showed a range of methods being used by candidates to evaluate solutions. This can be done in a range of ways including reviewing the designs against the candidate's specification, reviewing against the brief or against the information gathered from Ac's 1.1 to 1.3. Evidence can be displayed in a variety of ways including charts and tables, using a rank system or tally marks. Ultimately, the outcome should drive the candidate to select the most appropriate outcome (from development), to follow through to produce a final engineering drawing and visual representation.

AC 3.3 was well done by a number of centres but there is still a tendency to allow candidates to develop specifications, which have outcomes that are un-measurable or not related to research undertaken. Access FM and other systems are appropriate for Level 1 and 2 Passes, but more detail and individual considerations should be apparent in the higher band outcomes.

Summary of key points

In summary, centres should ensure they focus on the following key points plus any additional information in their individual moderators' reports.

- Ensuring that candidates are familiar with the conventions required for AC 2.1 and the methods for producing the required engineering drawings for this AC.
- Ensure development forms a part of the iterative process to address AC 3.1 and allow access to all performance bands, especially the distinction band
- Ensure that uploads of candidate samples are fit for purpose.
- Limit the use of templates issued to candidates and ensure that they develop their own method of presenting outcomes for the Assessment Criteria

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UNIT 2 – 9792 – PRODUCING ENGINEERING PRODUCTS

General Comments

As mentioned in the Unit 1 commentary, the impact of the pandemic has also limited the skills which are associated with the manufacturing unit of the course. It was again encouraging to see so many centres producing work of excellent quality using engineered products that fully met the criteria of the specification. A varied and appropriate range of products was sampled which in most instances allowed candidates' full access to all performance bands.

There was also an increase of template use in Unit 2, especially with the tendency to over rely on a small number of sheets to address the majority of planning Assessment Criteria.

Centres should be reminded that the specification requires candidates to develop their own method of presenting their planning stages in Unit 2 and their design stages in Unit 1.

Centres who issue prepopulated templates where candidates simply fill in the information will find it difficult to determine parity between distinction grades and level 2 passes and in this series, moderators requested whole cohorts where there was no clear distinction between the work. In these situations, outcomes will lean towards the lower end of performance bands due to the amount of assistance given by the centre, which is outside the level of control allowed for the task.

Centres must also ensure that the information given to candidates in their packs prior to commencing the Unit 2, includes sufficient information to address all areas of the task.

Information should include all of the dimensions to produce the product as well as 'a range' of technical data that should be extracted to meet AC's 1.1 to 2.2. It is important that the information has a range of data such as drilling speeds for numerous materials on a pillar drill, not just the materials candidates will use in the task. This can also include turning speeds, feed rates tapping drill sizes etc. The packs and engineering drawings must be included in the candidate sample upload Finally, centres must ensure that photographic evidence of making outcomes is of a suitable size and quality for moderators to clearly see the level of finish and accuracy on outcomes. There should be a photograph of the assembled product plus photographs of disassembled parts to again show accuracy and finish. If there is insufficient detail, moderators are permitted to ask for higher quality images to complete moderation.

Administration issues

Please ensure that photographic evidence includes a label showing the name and candidate number. This is to ensure the correct outcome is attributed to the correct candidate. Other administration issues are detailed in the Unit 1 section of the report as they apply to the uploading of sample material.

Comments on individual questions/sections

Again, as mentioned, the range of making outcomes was encouraging to see and the majority of centres provided candidates with briefs which allowed access to the full range of performance bands.

AC 1.1 was undertaken well by centres that had provided detailed information in the candidate packs prior to stating the Unit 2 task. This can be achieved in a variety of ways including candidate notes of the original engineering drawings provided to candidates or by a table of key points or a detailed written description of key points. This can include identifying areas on the drawings such as chamfers, knurled parts, keyways, etc.

AC 1.2 was also undertaken well by centres that provided detailed information in their packs. As mentioned, a range of information needs to be given out and not just the information needed to produce the parts of the given outcome. In that situation, it is also classed as leading the candidate and would result in limited access to performance bands. Ensure that there is sufficient information for candidates to identify and apply.

AC 2.1 for this AC, candidates need to identify the resources required to complete the manufacturing tasks. This was done well in many instances with candidate providing details on materials, tools, and equipment as well as information on jigs and Cam in higher performance band outcomes. This can again be evidenced using charts or tables, be included in planning sections or as stand-alone presentations. This AC also links into the 2.2 AC below.

AC 2.2 was varied in responses this series with some candidates not breaking down the manufacturing into sufficient steps of not including sufficient information to clearly show an understanding of the need to sequence production.

Higher band outcomes clearly showed a good understanding of sequencing and how certain parts need to be manufactured before others. Candidates must also consider times for each stage of production.

GANTT charts are common in these stages but there can be a tendency by candidates to use them to try and address too many AC's resulting in superficial responses, which lack detail. External factors were also weak in general in this series and should be considered in all bands. Candidates should be able to identify potential problems such as a broken item of equipment, potential illness etc. and give methods of mitigating them with alternative actions.

Assessment Criteria 3.1 & 3.2 were again done very well in the main with a wide range of outcomes being seen which challenged and stretched candidates in the production of their final outcomes. Again, as mentioned, good photographic evidence is essential to accurately moderate this section and centres are requested to ensure that photographs clearly show the level of detail achieved in the outcome plus a range of assembled and disassembled shots with the candidate number evident.

Safety should also feature in this section and centres should try and promote risk assessments where appropriate to access the higher performance bands. Statements such as tie back hair and wear goggles are lower band responses. Risk assessment does not need to be conducted for each sequence but appear in significant detail to clarify the candidates understanding of the process, three key sequences would be more than adequate to demonstrate this.

For new centres who may be considering their own briefs next series, it is essential that a minimum of eight key processes are included in making to ensure that candidates are able to extract sufficient information and sequence manufacturing in sufficient detail to meet the assessment criteria of the unit. Appropriate processes can be found in the specification under LO4 AC 4.1

AC 4.1 focuses on engineering processes including Casting, Moulding, Forming, Machining and joining. Many of these processes are evident in most centres including GRC casting and vacuum forming and acrylic form work in many lighting outcomes. This can also include brazing and riveting, milling, and turning and soldering for component parts.

New centres should also attempt to incorporate a number of these into their manufacturing tasks to allow access to the higher performance bands.

Summary of key points

Focusing on this series submissions, centres should again focus on the following key points:

- Ensuring that the centre has provided sufficient detail in the Engineering Drawings and Info Packs to allow candidates to meet all performance bands. Ensure that there is a range of information and not simply the details to complete the task.
- Ensure that there are clear and detailed photographs of the manufacturing outcome for moderators to be able to agree outcomes. This is often not possible when pictures are too small or of a low quality. Colour pictures are required, especially and now all submissions are digital.
- Again, remove the use of templates issued to candidates as this limits their access to the Merit and Distinction bands. Ensure that the candidate's work is presented in a style unique to them.
- Address external factors in AC 2.2 to enable candidates to meet the criteria of the higher assessed bands.
- As with Unit 1, ensure the submitted sample is fit for purpose.

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UNIT 3 – 9793 – SOLVING ENGINEERING PROBLEMS

General Comments

Most candidates attempted all of the questions on the paper. In a number of cases, there was evidence of candidates not having read questions carefully before answering. It is most important that candidates take the time to read the question paper before attempting to answer questions, as this can help to ensure that basic errors are avoided. Detailed knowledge of basic engineering terminology remains limited in many cases.

Comments on individual questions/sections

- Q.1**
- (a)** Most candidates were able to successfully give a reason for the use of stainless steel to manufacture the 'T' nuts.
Most candidates were able to successfully give a reason for the use of polyurethane to manufacture the hand holds/grips.
 - (b)** Most candidates were able to successfully describe one advantage of using a plastic moulding process to manufacture the blocks, with only a few able to describe two advantages.
 - (c)** Candidates showed that they could list key areas of a product for producing a specification but lacked the ability to expand on their answers and justify their comments.
 - (d)** This question showed a lack of depth of knowledge across the board, where candidates could not identify the classification of the two named plastics. Most were able to identify Aluminium as a 'non-ferrous' metal.
 - (e)** This question was not answered well, due to candidates not being able to describe the process of cutting an external thread. A high number of candidates described the process of cutting an internal thread as their answer, but this did not answer the question.
 - (f)** One of the better-answered questions, with the majority of candidates able to explain the difference between a destructive and non-destructive test.
 - (g)** This question was also answered very well. Candidates were able to explain the difference between a temporary and a permanent fixing method. The most popular example of a temporary method was 'nuts and bolts,' and the most popular example of a permanent fixing method was 'welding.'
- Q.2**
- (a)** Candidates had not trouble in explaining the need for both products shown but failed to describe the technological advancement that created the need for them. This hindered them from getting full marks for this question.

- Q.2**
- (b)** This question was answered well by most candidates. The most popular answers related to the user struggling to put their phone in their pocket, and/or taking it out of their pocket.
 - (c)** This question was answered well by most candidates. The most popular answers were that engineers can share information with each other, and also references were made to the speed of sharing information.
 - (d)** Candidates were able to discuss some environmental issues that might occur when disposing of mobile phones. Popular answers related to mobile phones being disassembled and parts re-used in future models.
 - (e)** This question was answered well across the board. Candidates had some knowledge of what the BSI's role is in approving products. Answers related to 'testing products' and 'making sure that products are safe before they are used by the general public.'
- Q.3**
- (a)**
 - (i)** Most candidates were able to describe the use of a centre punch as being a tool to mark the centre of a hole to be drilled. Far fewer candidates were able to describe the use of the outside callipers, with the most common incorrect answer being that it was 'used to pick hot things up.'
 - (ii)** This question was answered correctly by most candidates, with the three main answers related to the use of PPE, use of guards on the machine and ensuring that the work was held securely.
 - (iii)** This question was answered very well by the majority of candidates and were able to be drawn on their experiences at school to name two measuring tools and a description of how they are used. The main examples were engineer's square, steel rule, micrometre, and Vernier callipers.
 - (b)**
 - (i)** The majority of candidates successfully completed the side and plan views of the brass pin tag, along with the correct construction lines. This aspect of engineering drawing is clearly being covered well in centres.
 - (ii)** In the majority of cases, candidates were able to divide the shape into a basic rectangle and semi-circle, then calculate the area. Most candidates were able to go on and complete the rest of the calculation but was an issue for a small number of candidates.

Summary of key points

1. Ensure that candidates know the difference between the various engineering drawing techniques and that they are confident in drawing.
2. Ensure that candidates are familiar and confident in using mathematical formula to calculate area and volume of compound shapes.



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