GCSE

Design and Technology: Industrial Technology

General Certificate of Secondary Education **J304**

OCR Report to Centres June 2017

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This report on the examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

OCR will not enter into any discussion or correspondence in connection with this report.

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General Certificate of Secondary Education

Design and Technology: Industrial Technology (J304)

OCR REPORT TO CENTRES

A541 Introduction to designing and making

It is recommended that this report should be read in conjunction with the report for A543, as there are overlaps in the work and requirements of both specifications. Included again this year is a summary of what successful candidates demonstrated in each section of their portfolios.

General Comments:

As this specification draws to a close in its penultimate year, entry numbers have again fallen, although one new centre submitted work for the first time. All centres still choose to submit the work of their candidates as hard copy or ePortfolios on CD or memory stick. No entries were made on the Repository. All centres submitted work for moderation promptly when requested to do so. In some instances, other missing paperwork took longer to obtain.

Centres are reminded that candidate cover sheets can be sent electronically to the moderator if submitting ePortfolios, but they are perfectly acceptable as hard copies, sent in the post, even if the associated candidate work is submitted in an electronic format.

There is still a wide interpretation on the use of the cover sheet. Some centres use this correctly by filling in marks awarded during the internal marking/moderation process, together with useful comments to support why specific marks have been awarded for that section. This is useful to the examiner when moderating. The use of single word comments here however is unhelpful. Fewer administrative errors were encountered this year, but there were centres that failed to supply CSF forms containing the mark breakdown for all candidates. Whilst the moderator can view marks for the moderated sample on the cover sheets, marks for candidates not in the sample cannot be checked for addition and transcription errors etc. unless the CSF form is included and contains the full candidate entry marks.

Generally, there appears to be some confusion over the paperwork to send with the moderation samples, particularly with the recent changes to mark submission. In summary, along with the moderation sample portfolios and cover sheets for those candidates, the centre should also supply a CSF form showing the mark breakdown for **all** candidates together with a printed copy of the marks (IMS1) that will have been submitted to OCR via Interchange.

All centres are reminded that the Centre Authentication Form (CCS160) is **not** to be sent to moderators, but kept within the centre unless requested.

The quality and size of digital images again varies across the entry. Often the images are far too small when embedded in an A4 format portfolio. Also, photographing a dark object against a very light background causes issues as the camera reacts to the background and produces a dark image which a moderator can have difficulty in interpreting. Images of the final piece of work are also more appropriate if included within the portfolio of the candidate, whether this is a hard copy or ePortfolio. It is time consuming for the moderator when the images of the final outcome are all supplied as a separate file. The moderator then has to search through to pick out the work that matches the portfolio being moderated at the time.

Candidates need to avoid stretching digital images on one axis only in order to fit spaces within their portfolio and thus introducing distortion to the image.

It is unfortunate that many centres still only offer a single task to their candidates. This was never the intention of this specification. It was always presumed that the whole range of tasks would be offered at each centre and candidates then allowed to choose which task to attempt. Evidence would suggest that many centres are treating this as a taught unit of work with

candidates' producing work of the same content and format year on year. Centres are reminded that they should not be teaching for the Controlled Assessment Task, or marking and correcting work as it progresses, or offering feedback on how work can be improved. Clearly many centres are only offering one task to their candidates in order to facilitate steering the progress of the Controlled Assessment task.

Over marking of work has been less evident this year. However, the interpretation of what constitutes 'quality' still varies tremendously across the centres. The continual avoidance, by some centres, of using 'appropriate engineering material' suitable to use in this unit also weakens candidates ability to access higher band marks.

Centres are again reminded this year that this unit is an 'Introduction to Designing and Making' and this Controlled Assessment should represent 20 hours of work. Several centres appear to be exceeding this amount of time. There should be an effective monitoring system of the time spent on the Controlled Assessment task at each centre.

Creativity

Creativity continues to cause confusion within the marking scheme. Too often marks are simply awarded for producing a collection of research that is often only superficially analysed. Candidates who do well in this section thoroughly analyse their findings and identify common strands that they then use to formulate a Design Specification and inform their design thinking and ideas. Too often the Design Specification and the production and recording of their ideas bear little resemblance to the work (or findings) in their research. There needs to be clear evidence to show they have identified strands of good design and have identified these in the existing products that they have looked at. This becomes difficult when centres provide samples of the previous years Controlled Assessment work as examples of existing products to analyse. Evidence should then show clearly that the candidate has used these findings to inform their own design thinking.

- **Candidates who did well in this section-**:Clearly identified the chosen problem
- Recorded their conclusions from investigations and research
- Thoroughly analysed two existing products
- Identified common features of good design and explained the trends they had recognised in these products
- Used this work to produce a Design Brief that clearly indicated the problem, intended users and situation
- Indicated sources of information.

Designing

Design specifications often appear without any relationship to what has been researched or established prior to designing.

There is a growing tendency to be over reliant on CAD produced images in the preliminary designing stages. Whilst many of these drawings submitted are extremely well done and show high levels of skill, it is felt that CAD is not the best medium to use to get ideas down quickly in the initial thought process. Candidates do tend to use a range of techniques during the design process as a whole, but standards from centre to centre are very variable.

Rarely is a clear and reasoned selection made from a range of preliminary ideas. Evidence of the development of a design is becoming a rarity. More and more candidates' progress from initial ideas to the making without showing any evidence of the processes that should be in between these stages. The demonstration of freehand sketching skills, unfortunately, appears to be becoming a thing of the past.

Gantt charts appear in profusion, but usually in isolation and without commentary or reference.

CAD is now used to good effect by some centres to develop and finalise designs. Exceptional quality was seen in CAD produced 2D and 3D drawings of proposed designs together with quality Orthographic working drawings.

The quality of the materials and techniques used in modelling continues to let many candidates down. Modelling was often completed with such poor quality materials and skills that the resulting models would prove little, if anything, in the design process. They are submitted it appears simply to 'tick the box'. Many candidates show modelling, but provide no evidence of conclusions made as a result of the modelling process.

Candidates who did well in this section-:

- Used their analysis of research to produce an effective, clear and objective design specification
- Then produced a range of well presented, annotated and evaluated ideas using a variety of techniques
- Developed a design effectively and used ICT where appropriate to aid their designing.
- Used modelling to good effect to develop a design or aid design thinking
- Produced a good quality dimensioned working drawing in a recognized format.

Making

The recording of the making diary is generally well done with most candidates providing both written explanations of the processes being used as well as competent photographic evidence. Correct terminology of tools, materials and processes however is not always so well accomplished in this section.

The recording of technical problems is still an issue with many candidates. As they are aware that marks are available for this, they are including evidence to cover this strand that it is often inappropriate, trivial and irrelevant. Too many candidates are simply listing the mistakes that occurred as problems and then going on to explain how they solved this by 'doing it again'.

It remains the best practice for showing this evidence in a separate headed section within the portfolio, or as an added feedback section in the planning stages.

Practical outcomes covered the usual range of quality and processes. Although this is a prototype being produced in this unit of work, the selection of a suitable material to use is crucial to a successful outcome if conclusions are to be made.

Overall quality appears to be diminishing year on year. There were some quality pieces of work seen during the moderation process. Not all, but many outcomes however showed a lack of finesse. The little touches to finish by removing machine marks, rounding sharp corners, and applying a suitable quality finish make a difference. The selection of poor quality and inappropriate pre-manufactured components for the task (such as temporary and permanent fastening devices like machine screws etc.), often let down the overall quality of the finished outcome.

Most centres are much more familiar now with the process of marking and internally moderating work and there were far fewer instances seen where marks had been awarded for work that was not evident.

Candidates who did well in this section:

- Planned their making effectively recording process, resources, time and safety issues
- Had evidence of what problems had arisen during the making and how these had been overcome. Candidates sometimes combined this with forward planning to good effect
- Recorded the work in progress with annotated photographic images
- Produced an effective, feasible, good quality prototype.

Critical Evaluation

Evaluations continue to improve and fewer candidates are evaluating the final outcome in this unit as opposed to evaluating the designing and making processes. There are however some centres that continued to lead their candidates into completing evaluations of the final outcome and how it performs or can be improved. If candidates have evaluated the processes as required, there is no need to evaluate and test the final outcome. No credit will be achieved for the extra time spent in doing this.

Centres are reminded that marks (up to 3) can be awarded in this section for the quality of written communication and the correct use of technical terms throughout the portfolio. It is possible therefore that a candidate could achieve a mark in this section without any evidence at an attempt at the final evaluation, provided that the quality of written communication was high in the rest candidate's submission.

The use of specialist technical terms, at even the most basic levels, is still not well attempted by many candidates.

Candidates who did well in this section:

- Effectively evaluated the designing and making process
- In so doing, were able to identify how the designing, modelling and planning stages could have been improved
- Used correct specialist terms throughout their portfolio
- Used spelling, punctuation and grammar correctly throughout their portfolio, to show they had a good command over the quality of their written communication.

The overall organisation and presentation of portfolios continues to be good, with CAD providing some startling visual input.

A543 Making quality products

It is recommended that this report should be read in conjunction with the report for Unit A541, as there are overlaps in the work requirements and commentary for both specifications.

General Comments:

There have been some changes to the requirements for the paperwork to accompany the moderation sample this year, which not all centres are aware of. All Centres are reminded that they are now **not** required to send the CCS160 form to the moderator. It should be kept on file at the centre unless sent for. A printout of all the marks sent to OCR via Interchange however is required, together with a CSF mark breakdown form for **all** candidates, not just those selected in the moderation sample.

Centres are again reminded that it is essential to read their own Centre Report, together with the Principal Moderator's Report for the June sitting from the previous year on this unit, before commencing the Controlled Assessment with their candidates. These reports offer specific recommendations and observations to the Centre, as well as general comments on how work can be improved, the things to avoid and what evidence the examiners are looking for.

Some centres are not always providing large clear images of the completed work. Images that are embedded in A4 portfolios are often too small to be clear enough to convey the quality of the work. If using an A4 format, images of the completed work should be high definition of at least A5 in size.

Centres should be offering their candidates the full range of controlled assessment themes. Many centres are submitting work for moderation that only covers one theme. There is growing evidence that this unit, along with A541, are becoming 'taught' units. Centres are repeating the same single theme year on year, candidates are presenting the same research materials and product outcomes are similar and make use of the same materials and constructions as in previous years.

When marking and internally moderating work there must be evidence within the portfolio to support the awarding of the given mark.

Designing

Candidates are still producing far too much research in this unit, much of which is irrelevant and not required. This research is often of the 'theory notes' type. Research in this unit should be precise and focused. Looking at the mark scheme, only 4 marks are available here, which includes the Design Specification. The quantity of marks available in this section, or any other, should guide candidates into how much depth they should go into within the section.

Candidates must make clear conclusions from their research work. Often, no link is made between their research or findings and the designing stages that follow. The research work should inform the designing and the evidence that this has occurred, should be clear in the portfolio. Too often it is obvious that the two stages have been completed as separate and unrelated tasks.

Candidates are using CAD to great effect to facilitate their design process in a range of ways that include 2D and 3D designing, 2D and 3D modelling and the proficient use of working

drawings in Orthographic Projection. All of this however appears to be at a price. This price is the continuing decline in standards of freehand sketching that are being seen year on year.

More thorough approaches to development were seen in this unit when compared with A541, but many candidates often show little evidence of development of design or consideration of materials, suitable processes or dimensions before embarking on making. There were some excellent examples of development work seen using CAD.

Traditional modelling, using card and resistant materials continues to be very mixed. Many poor quality models using the most basic of reclaimed materials were seen. These were of a type and standard that they would not have enabled any worthwhile facts and conclusions to be made about a design proposal.

Making

Centres are again reminded that this unit is titled 'Making Quality Products'.

The complexity, the materials used and the quality of the outcome should reflect this aim. It should be a step up from the type and quality of work produced in Unit A541.

However, this was not always the case. Some very simple outcomes were seen this year for this unit. These were really too simplistic for an A543 submission. They demonstrated few constructional skills and processes and were often of a standard that would let down the performance of the product in the task it was designed for. In some cases, the 'prototypes' in A541 were of a better standard than the 'quality products' in this unit.

Although the recommended time for this unit is the same as it is for A541 at 20 hours, with the greater age and experience of the candidates, the quality and depth of the work should reflect this higher demand.

Candidates are competent at recording their making and use notes and images well to show this as it progressed. The recording of problems encountered with the making however, is less well done and the comments made in A541 apply here also. This is becoming a section where candidates record trivial issues and problems with too often the usual solution being - 'I made it again'. The original requirement in this strand was that candidates would record and discuss more major issues that occurred with their work during the making. For example, they may have to redesign a component to make it work in the situation or they may have to explore alternative construction process to achieve their goal.

When recording their making procedures, this often highlighted a lack of knowledge regarding correct process and tooling terminology.

Critical Evaluation

Presumably, due to historical reasons, candidates remain much more at ease with the type of evaluation required in A543, in comparison with the requirements of A541. Evaluations in this unit continue to improve year on year.

Excellent evaluations against the design specification and detailed evaluations of the outcome were seen. These evaluations explained what was good and successful and what could have been improved. Centres are reminded that in order to achieve the higher marks in this strand, candidates must fully test their product and record and analyse their results. Candidates often refer to doing this, but include no evidence within the portfolio. Evidence of this testing must be included as part of their evaluation. It could include digital images of the testing taking place or an example put into the portfolio of an outcome that has been produced. A punched metal strip, or an embossed sample of card are examples of physical evidence which could be included for

some of the themes. Physical evidence however is not always possible to include, depending on the task selected, but where it is, good use should be made of the opportunity to do so.

The quality of written communication continues, as expected, to vary widely across the cohort. What perhaps is disappointing is the often poor or incorrect use of terminology that is basic to the subject.

No apology is offered for including below a summary of the good practice listed last year.

Candidates who did well in this unit exhibited the following elements within their work:

- Produced focused, concise research from which conclusions were made that helped to formulate a sensible, achievable and objective Design Specification.
- Produced a range of well-drawn ideas, using a variety of methods.
- Developed and modelled their design effectively.
- Had a comprehensive working drawing.
- Included a sensible work plan that suggested a logical order for the making and also recorded tools and processes.
- Recorded appropriate problems with the making and how these were overcome.
- Effectively recorded the making process.
- Produced a completed and quality outcome, using appropriate engineering materials.
- Evaluated and tested their outcome in detail, including showing results of the testing procedure(s).

A545 Sustainability and technical aspects of designing and making

General Comments:

The majority of candidates attempted all of the questions on the examination paper and a number of good responses were seen by examiners. It was evident, however, that candidates had not always read questions carefully, resulting in inaccurate or inappropriate responses. It is most important that candidates take time to read through the question paper thoroughly before attempting to answer questions, in order to avoid basic errors.

Section A was generally well answered by most candidates and sound knowledge of general sustainability issues was demonstrated in many of the responses seen. This was not always the case in questions relating to recycling however. There seemed to be some confusion over what can and cannot be recycled, and also a certain amount of uncertainty regarding primary recycling.

In Section B, candidates' knowledge of the use of basic hand tools showed considerable improvement over previous sessions, but this was not the case in relation to processes used in the manufacture of products. There was also some confusion relating to the properties and characteristics of materials.

Sketches produced for responses to the design questions were generally of rather poor quality. It is most important that sketches are clear, and that suitable annotation is provided, as examiners must be able to readily interpret a candidate's design ideas in order to award marks appropriately.

Comments on Individual Questions:

Section A

These one-mark questions were mostly answered correctly, with the following notable exceptions:-

Q1 The acronym for the Ethical Trading Initiative was not well known and a number of candidates appeared to have used guesswork to make their response to this question. All four of the multiple-choice suggestions were seen by examiners in candidates' responses.

Q7 A number of different plastics were seen in responses to this question including PVC and Polystyrene. Just over half of the candidates gave the correct response of Polypropylene, although often spelt somewhat inventively.

Q8 Knowledge of anthropometrics was rather limited, with less than half of the candidates answering this question correctly. A number of alternative meanings of the word were suggested, including 'metric sizes' and 'accurate'.

Q10 Very few candidates gave the correct response of primary recycling for this question, with most suggesting re-use, and some simply repeating 'second hand' from the question.

Q12 It was somewhat disappointing to see that a significant number of candidates thought that mild steel could not be recycled.

Q16(a)(i) Most candidates knew that the symbol shown related to something European, but only a very small number correctly named it as the European eco-label. 'European standards' and 'safety approval' were frequently given in the responses seen.

Q16(a)(ii) This question was not well answered generally, but some candidates did gain marks by partially relating their response to the limited environmental impact element of the symbol's meaning.

Q16(b) Most candidates scored two marks or more on this question, with many making reference to the fact that aluminium alloy is lighter than steel. Corrosion resistance and the ease of forming aluminium alloy compared with steel were also quite frequently mentioned, but marks were often lost by candidates failing to justify the simple points made.

Q16(c) This question was well answered by most candidates, with many scoring two marks or more on it. The ease of recycling the parts of the bicycle appeared in all responses, but only the higher achieving candidates scored full marks by also making reference to the safe disposal of some parts and materials.

Q16(d)* In-depth knowledge of carbon footprint was rather limited and few candidates scored more than three of the six marks available for this question. Most responses consisted of simple, unjustified references to factors including the extraction of raw materials and manufacturing processes using large amounts of energy, but lengthy responses were often rather disjointed.

Quality of Written Communication (QWC) marks were awarded for responses that were presented well despite technical content being rather limited.

Q16(e) The standard of sketching in this design question was generally quite low, but most candidates managed to score marks for their solution. Marks were awarded based on the design meeting the specification points given, and one mark for each of the two points was the most common outcome. The higher marks were only awarded where the design presented a viable solution, and only a limited number of candidates gained the full four marks for the question.

Section B

Q17(a) All candidates attempted this question and most scored well on it. A few weaker candidates were only able to name one or two of the tools shown, but most correctly named three or more. The only tools that caused some candidates problems were the tap and the centre drill, and very occasionally the engineer's try square was referred to as a carpenter's square.

Q17(b) Application of the tools was rather less well known than the names of the tools themselves, and marks across the whole range of one to four were awarded for responses to this question.

Q17(c)(i) A significant number of candidates did not attempt this question, but most of those who did correctly named engineer's / marking blue as the fluid brushed onto metal before marking out. Occasionally the mark was lost by suggesting that varnish or ink would be used.

Q17(c)(ii) Responses to this question were very varied and only the more able candidates gave sufficient detail to gain the full three marks on it. Most candidates referred to the measuring and marking of the 10mm position of the lines required, and many

suggested the use of odd-legged callipers, but very few mentioned the need to use a try square to ensure accurate marking of the lines shown as vertical on the diagram.

Q17(d) It was pleasing to see that almost all candidates were aware of the need to mark the position of a hole with a centre punch before drilling.

Q18 The various parts of this question were poorly answered and indicated candidates' lack of knowledge and understanding of processes used to manufacture products. There were instances where some candidates scored no marks at all on the whole of the question.

Q18(a)(i)&(ii)
Knowledge of the sand casting process was very limited and most candidates scored no marks on either of the two parts. The occasional acceptable response appeared in part (i), but very little was known about the important features of a sand casting mould as asked for in part (ii).

Q18(b) Only the higher achieving candidates gave the correct response of die casting for this question. Injection moulding was often given as appropriate to the manufacture of aluminium alloy castings, and machining processes were also occasionally seen.

Q18(c)(i) This question was answered slightly better than those relating to casting, but less than half of the candidates scored any marks on it. The expense of making the moulds was mentioned by some candidates, but this was rarely justified to qualify for a second mark. Only a very small number of candidates gained the full three marks on the question.

Q18(c)(ii) A significant number of candidates did not attempt this question, and many were unable to name more than one or two other plastic moulding processes. Marks were lost were processes such as laser cutting were suggested, and where candidates had repeated injection moulding in their responses.

Q18(d) Many of the reasons given in response to this question were overly simplistic, such as 'lighter' and 'cheaper', and marks awarded ranged from zero to the full four marks. Only a limited number of candidates scored more than one or two marks for the question overall.

Q19(a)(i) This question was quite well answered generally and most candidate scored two marks or more on it. Most explanations were based on the strength of the mild steel in relation to its use to support a hanging basket, and its suitability for welding was also seen. Some candidates referred to the fact that mild steel can be surface finished to protect against corrosion, but others were of the opinion that mild steel does not rust. A small number of candidates gained full marks for a clear and justified explanation.

Q19(a)(ii) Most candidates scored full marks on this question by explaining that a ferrous alloy is a mixture of metals that contains iron. Where marks were lost, this was normally for omitting the reference to 'mixture'.

Q19(b) A number of candidates did not attempt this question, and very few scored good marks on it. Design solutions presented were on the whole unviable, and the only marks awarded were for meeting the requirements of one or more of the specification points, albeit rather tentatively. The quality of sketches produced by candidates was generally quite poor.

Q19(c)* Most candidates attempted this question, and some good responses were seen from the higher achieving candidates. Issues discussed were normally those of cost of equipment and loss/training of staff, but a few more detailed responses also mentioned the need to ensure sufficient sales to justify the expense of changing from one-off to high-volume production methods.

Quality of Written Communication (QWC) marks were awarded for responses that were presented well despite technical content being rather limited.

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