



**GCSE**

**Design and Technology: Industrial Technology**

General Certificate of Secondary Education **J304**

**OCR Report to Centres June 2016**

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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.

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**Design and Technology: Industrial Technology (J304)**

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## 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. As last year, included again this series is a summary of what successful candidates demonstrated in each section.**

### **General Comments:**

There were a number of centres who again this year submitted work early for moderation and most of the remaining centres ensured the work was in for moderation by the deadline date of May 15<sup>th</sup>.

No entries were made on the Repository, all centres choosing to submit their candidates' work electronically using memory sticks or CDs or as traditional hard copy portfolios.

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

Centres that choose to submit work as e-portfolios this year all ensured that the folder was one complete document. The value of the cover sheet is emphasised again. The comments made by the centre on this sheet should support the award of the mark that they have given in each section. The moderator will refer to this sheet if there is doubt or disagreement with the mark awarded. It can be useful if marks have been given where the evidence is not always in the most obvious of places within the portfolio. A one-word comment such as 'good' to cover the award of a mark in one section is unhelpful. A comment made in the form of, for example, 'a range of techniques used and has included problems that occurred and how they were resolved as part of the diary of making' is more useful to the moderator. It is appreciated that this can be a time consuming exercise, particularly for a centre with large entry numbers. It is acceptable to abbreviate. The comment above could be put down in the form of 'range of techniques. Problems recorded in making diary'.

There were far fewer administrative errors this year. A few centres did not include a CSF form with the mark breakdown for all candidates. These had to be requested after the receipt of work.

The quality and size of the photographs showing the completed work were not always of the required standard. For example, if submitting work as a hard copy portfolio of A4 size, then a small image located in one corner of the sheet is inappropriate for use in making a judgement. On A4 format, an image of the final product needs to be high definition and as a minimum, take up half the A4 sheet. At least two images meeting these criteria are required.

Many centres are still only offering a single task to their candidates for the controlled assessment task. Candidates should be offered the complete range of tasks and allowed to choose. Advice from OCR however, has been taken on board and the use of writing frames has now almost disappeared completely.

Centres are reminded that they should not be teaching for the controlled assessment task, or marking and correcting work in progress, or offering feedback on how work can be improved.

The over marking of work continues to be an issue at some centres. Care should be taken when marking and close scrutiny and familiarity with the marking criteria should be established before commencing marking the work. The concept of quality varies tremendously between centres, as does what is considered to be an 'appropriate engineering material'.

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Centres are reminded that this unit is an introduction to designing and making and the controlled assessment should represent 20 hours of work. Centres should have in place an effective monitoring system of the time spent on the controlled assessment task.

Centres are reminded that work of **all** candidates should be ready to send to moderators by May 15<sup>th</sup> and within three days of receiving the email requesting the selected sample. It appears that some centres were only collating portfolios once the sample is known and were therefore unable to send the sample within the required three days. This is unacceptable as it delays the moderation process for everyone.

### **Creativity**

The creativity strand still proves to be a stumbling block for some centres and their candidates. This can be problematic, as it accounts for 10 marks.

Just producing or going through the process of completing research is not going to result in the award of a high tier mark in this strand. Candidates need to summarise their findings and clearly show evidence has been identified which indicates good design and that they have recognised common strands in existing products.

Evidence should then be in existence that clearly indicates 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 good design features 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**

Designing now tends to have ever increasing amounts of CAD content, but for many candidates freehand sketching in general remains poor. It may be a sign of the times and the reliance on Information Technology as an approach to all things, that CAD produced initial ideas are replacing the more traditional freehand sketching.

Often, the quality of the materials used in modelling, together with the quality of the production of the model, would provide little or no evidence for the advancement of a design or the ability to produce conclusions to a design proposal. Candidates often produce models but then make no conclusions on what the model shows or how it will affect their design process and thinking.

When using CAD, care must be taken to ensure an appropriate line colour and thickness is selected before commencing drawings. The work of some candidates that was submitted electronically was very difficult to see without zooming in on each individual drawing. This makes moderating the work difficult. It was far more an issue where candidates had used CAD to produce preliminary design ideas. It was less of a problem on CAD working drawings.

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Design specifications are improving, but it was unclear in many cases where their specification points had come from. This part of the portfolio should have a clear link to the creativity section. Candidates still persist in including subjective points that are not focused sufficiently to guide their designing.

Many candidates used a variety of techniques in their design sections but, as mentioned previously, freehand sketching was not always well done. This should be an inherent part of a Design and Technology course and should be a taught element in a foundation period.

Development is much less evident in this unit of work. Many candidates made the huge leap from idea to finished product with little if any development of their initial design idea.

In many cases, there were examples of sketching, modelling and CAD present which enabled centres to think that the relevant demands of the specification had been met. Centres need to look carefully at all content they are marking. There will be varying degrees of quality present, but centres must look realistically and honestly at the quality of what they are marking before arriving at a sensible judgement.

Candidates who use CAD for working drawings have a distinct advantage. There were many excellent examples of CAD produced working drawings in recognised formats such as Third Angle Orthographic Projection.

**Candidates who did well in this section-**

- Used their analysis of research to produce an effective, clear, 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 recognised format.

**Making**

As centres are becoming more aware of the need to include evidence for the recording of 'technical problems', the evidence that is actually being provided is becoming far from technical.

Candidates are now summarising every making process and simple decision as a technical problem. This is not what this strand was intended to show. What is actually required here is a summary of major issues that were encountered and how they were overcome. It may have involved a design modification to allow making to proceed, a technical issue that involved considering following a different practical process to achieve the desired result or how a catastrophe during the making was successfully overcome and allowed a satisfactory outcome to be achieved. What is not required are statements such as, 'I bent the metal too far so I bent it back again'.

Many centres have now accepted that evidence is required for this strand for a mark to be awarded. The best way of doing this is for the candidate to provide a separate headed section within the portfolio. This makes the evidence presented clear and unambiguous. However, some candidates still include this evidence in general descriptive text within another section which means it can easily be missed.

Production diaries were weak in some cases and gave the impression of work being hurriedly put together as photographs referred to in the text were missing. This section should record, using notes and digital images, the progress of work as it occurred. Therefore the use of 'library'

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images in this section is not acceptable. Images should be of the candidate's own work as it progressed.

Outcomes ranged from MDF prototypes to fully engineered products using quality metal materials. Whilst centres are reminded that for this unit the candidate is producing a 'prototype', the definition of prototype needs to be established and made clear to candidates. A prototype is not a model. It should be a functioning outcome that can prove the efficiency and worth of a design. It is therefore possible to produce a functioning can crusher using MDF but not for a hole punch that will accurately punch holes in metal strips.

There were far fewer instances this series and particularly in this section, where marks had been awarded where there was no evidence in the portfolio to support the mark given.

Where candidates had used CAD/CAM, there was still too little evidence included to support what, in some cases, was a large part of their work. They should include screen shots and digital images of the processes taking place to illustrate this and show ownership to the moderator.

### **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 are slowly improving as centres come to terms with the requirements for the evaluation in this unit. Evidence does show however, that candidates do find evaluating processes much harder to do than evaluating a product or practical outcome. Evaluations still tend to drift towards mostly descriptions of the design and making processes encountered, rather than true evaluations of those processes. What is required are evaluative comments on how successful or otherwise these processes were and how, with hindsight, they could have been improved upon. They should be able to reflect and suggest modifications to improve the design, modelling and prototyping processes.

Far too many candidates still evaluated the final outcome of this unit instead of the designing and making processes involved.

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 evaluation, provided that the quality of written communication was high in the rest of the portfolio.

The use of specialist technical terms, often very basic ones, 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

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- Used spelling, punctuation and grammar correctly throughout their portfolio, to show they had a good command over the quality of their written communication.

Overall organisation and presentation of the portfolios was good, with CAD being used to good effect. There were instances however where scanned images and photographs were too small or clear to be of use and where images were distorted by stretching on one axis only to fit spaces available on a sheet within the portfolio.



## 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.**

### **General Comments:**

All Centres are reminded that they are required to send the CCS160, MS1 or equivalent and a CSF form that includes the mark breakdown for **all** candidates, not just those selected for moderation.

If submitting work electronically, please ensure that the work of each individual candidate is included in one single (usually a PowerPoint or PDF) file. This includes any digital images of the completed outcome, which should be inserted into the candidate's portfolio at the end. The work presented as traditional paper portfolios was generally more organised this year and there were no instances of work being 'doubled up' in display folders.

Centres must be reminded 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 the 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.

Centres are still not always providing clear, large digital images of the completed work. Those 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 completed work should be high definition images of at least A5 size, but preferably a whole page in an A4 portfolio.

It is clear from the work presented again this series that both the centres and the candidates are much more at ease with the familiarity that this unit entails, compared to unit A541.

Not all centres are offering their candidates the full range of controlled assessment themes. Many centres are submitting work for moderation that only covers one theme. Candidates find it hard to submit a range of ideas under this regime as they are in constant contact with other candidates. The result is that outcomes are too often similar in concept.

The use of writing frames has now almost disappeared.

Centres are reminded that when marking work there must be physical evidence within the portfolio to justify the awarding of the mark given. Anecdotal evidence cannot be used to award marks in any section of the portfolio.

### **Designing:**

Candidates are often producing far too much research in this unit. It should be focused and relevant. Candidates should draw clear conclusions from their research. Many candidates are still producing 'theory notes' type research, which they fail to link to anything before or that occurs later, in their design process.

There is evidence that candidates are beginning to use a greater variety of media in their designing. Many candidates are using CAD to great effect to facilitate their design process. This is particularly in evidence in the production of orthographic projection working drawings and in the use of 3D designing and modelling.

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More traditional modelling, using card and resistant materials however, is not always well covered. Too many candidates are producing very rough and badly made models, often using inappropriate materials that will not help them develop a design idea because of the poor quality of the model itself.

Development work is still very mixed. Many candidates produce well thought out and executed development that is crucial to taking an idea forward. Others are clearly just going through the motions. There are still candidates who appear to jump from the initial basic design to the making, without developing ideas or even producing any form of working drawing that includes even the most rudimentary of dimensions.

**Making:**

Centres are 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. This was not always the case this series. There was evidence of candidates oversimplifying the requirements of the unit and therefore evidence seen did not meet the quality and depth of work required in this unit. Candidates were submitting outcomes that were too simple and did not cover a large enough range of skills and processes to be awarded the level of marks that they had been given. There were however, still very good examples of work presented for moderation.

Planning is usually well executed and candidates appear to be both confident and competent in presenting this aspect for assessment. Correct terminology is however not always well handled.

An issue that is occurring now is the recording of errors in the making and how these were overcome. Too many candidates are now including things in this section that are not really problems, but would be classed as normal decision making issues during the progress of the making. For example, when cutting steel, the production of a burr, which has to be removed, is not really a problem - it is a feature of a making process that is dealt with by another task or process. What is required is an account of real problems that may have involved a partial redesign or a process that had to be modified or changed completely to produce the outcome required.

Recording of the making continues to be well covered generally, although there were examples of candidates using library photographs to illustrate their making process. Centres are reminded that this section should record the making of the candidate work as and when it happened. It should be photographed in situ at the time of the making.

The recording of the making highlighted weaknesses often in the terminology used and in the knowledge of tools and processes that they had experienced.

**Critical Evaluation:**

Candidates remain much more at ease with the evaluation required in this unit compared with the requirements of A541. Many evaluate effectively against their design specification and follow on with a detailed evaluation of their outcome, explaining what is successful and what can be improved. In order to achieve the higher marks in this strand, they also need to fully test their product and discuss and record their findings accordingly. Evidence of this testing should be included as part of their evaluation. It could be 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. Physical evidence is not always possible to include depending on the task selected, but where it

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is, good use should be made of this opportunity.

As expected, the quality of written communication and use of correct terminology varies widely across the cohort.

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.
- Had a comprehensive working drawing.
- Had a sensible work plan that suggested a logical order for making and also recorded tools and processes.
- Recorded appropriate problems with the making and how these were overcome.
- Recorded effectively the making process.
- Produced a completed quality outcome, using appropriate engineering materials.
- Evaluated and tested their outcome in detail.

## 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 very good responses were presented. 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 tertiary recycling.

In Section B, candidates' knowledge of the use of basic hand tools showed some improvement over previous sessions, but this was not the case in relation to materials, where there was much confusion between the different types of materials available for use.

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

#### Question Nos 1 - 15.

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

- 6** Few candidates were able to name a thermosetting plastic and answers such as PVC, Acrylic and ABS appeared regularly.
- 7** Dismantling was a common response to this question and the correct term of 'Disassembly' was only given occasionally.
- 9** It was rather surprising to see that 'Reduce' was not given very often as the correct 6R for this question.
- 10** Planned obsolescence was the most frequently seen response for this question and the correct term of 'disposable' was only given by a small number of candidates.
- 16(a)(i)** This question was generally quite well answered, with many candidates scoring full marks on it. The most frequently seen environmental benefit of electric cars was the reduction of polluting emissions but, in some cases, this was presented as a statement rather than an explanation, resulting in a loss of one mark.

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- 16(a)(ii)** Most candidates answered this question well and the higher achieving candidates scored both marks on it. Some of the responses seen were rather too simplistic, with unjustified statements such as ‘runs out quicker’, and a number of candidates scored no marks on the question as a result.
- 16(b)** A number of candidates did not attempt this question and marks scored by others were generally on the low side. Higher achieving candidates gave clear and justified responses relating to weight reduction and fuel consumption, while some of the weaker candidates gave rather simplistic references to the recycling of aluminium. Few candidates scored more than three marks for the question overall.
- 16(c)\*** The higher achieving candidates scored well on this question, gaining four to six marks for well-structured and detailed responses. In some cases, however, candidates described a number of sustainable energy sources without offering any reasons as to why they need to be developed, and the average mark for the question was only three to four of the six marks available. Quality of Written Communication (QWC) marks were awarded for responses that were presented well despite technical content being rather limited.
- 16(d)** Although the standard of sketching was quite low, many candidates scored quite well on this design question. Marks were awarded based on the design meeting the specification points given, and on the overall standard of communication. The most frequently awarded marks were for the use of an appropriate sustainable material and the provision of a secure fixing for the bracket, but few designs showed evidence of using a minimum amount of material.
- 16(e)** This question was generally well answered, with most candidates showing good understanding of the importance of recycling symbols on products, and more than half of the candidates scoring full marks.

**Section B**

- 17(a)** Most candidates scored well on this question, although there was some evidence of the names of tools not being well known. The hand shears (tin snips) shown as tool **B** were often called scissors, and the junior hacksaw shown as tool **E** was frequently referred to as a coping saw. Where marks were lost, this was almost invariably as a result of candidates mixing up the tools used for cutting thin ABS and 3mm diameter brass rod.
- 17(b)(i) – (iii)** Knowledge of materials and their particular types was quite varied. Each part required the candidate to give two examples of the material type by selecting from the list given. It was quite apparent, from the responses seen, that in some cases candidates had chosen materials by guesswork, with some scoring only one mark out of two for each part of the question.
- 17(c)** Many candidates scored well on this question and a popular response related to the ease of forming plastics into difficult shapes by injection moulding. Where a simple statement such as ‘plastics are cheaper than metals’ was made, this was only accepted if justification was also provided in the response. In a significant number of cases a mark was lost by simply not giving the example asked for in the question.

**18(a)(i) – (iii)**

Knowledge of mechanical systems was quite limited and few candidates scored more than two marks overall for these three question parts. The only correct responses seen with any regularity were 'Rotary motion' for arrow **A** and 'Cam' for part **X**, but very few candidates knew that the gear system at **Y** was a worm and wormwheel.

**18(b)** This question was better answered and most candidates scored marks on it. A number of interesting suggestions were made as to how the operation of the mechanism could be increased, ranging from simply speeding up the motor to making quite comprehensive changes. Reducing the number of teeth on the wormwheel and adding a second lobe to the cam were quite regularly seen, but 'using a more powerful motor' was only allowed if justified by reference to speeding it up.

**18(c)(i)** Responses to this question were generally quite weak and few candidates provided a viable sequence of operations for drilling the holes in the bracket. Most candidates made reference to centre punching the positions for the holes, but this was often made Stage 2 and done before the positions had been marked out. A number of candidates simply suggested that the bracket should be bent, and only the higher achieving candidates gave a fully workable order of stages for the process.

**18(c)(ii)** Most candidates were able to give at least one reason why brass was a suitable metal for making the bracket, the most popular responses being its corrosion resistance and its suitability as a bearing material. Some candidates suggested that brass was malleable, which was only accepted if reference was made to it being softened by heat before bending.

**18(c)(iii)** Only the higher achieving candidates gave the correct answer of 'annealing' for this question, and a few gave no response at all. In many cases it appeared that candidates were aware that the process involved heat and gave brazing as their response.

**19(a)** Most candidates were able to give at least one valid reason why HIPS was a suitable material for the mixing tray, with its strength and ease of forming being the most frequently seen responses. In a number of cases, however, responses such as 'it is recyclable' were too simplistic and lacked the justification needed to qualify for a mark.

**19(b)** This design question was generally not well answered, and very few candidates scored more than two marks on it. Some candidates realised that the mould needed to be the same shape as the tray itself and simply presented a rough sketch of Fig. 6. Sketches were often poor and lacked the annotation needed to give details of the features of the mould. Only the higher achieving candidates gave visual and written evidence of draft angles and rounded corners on the mould, and smooth finishes and vent holes were very rarely seen at all.

**19(c)** Most candidates attempted this question, and many were able to give three valid benefits of using CAD. Where marks were lost, this was normally as a result of giving less than the three benefits asked for, or by relating one or more of the responses to the use of CAD/CAM in manufacturing.

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- 19(d)\*** This question was quite well answered, with a significant number of candidates scoring at least three of the six marks available by structuring their response in line with the focus of the question. In some cases, however, the responses were largely a collection of statements rather than an explanation, and needed to contain more justification of the comments to qualify for higher marks. Quality of Written Communication (QWC) marks were awarded for responses that were presented well despite technical content being rather limited.

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