

## **Report on the Units**

---

**June 2010**

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of pupils of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support which keep pace with the changing needs of today's society.

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.

© OCR 2010

Any enquiries about publications should be addressed to:

OCR Publications  
PO Box 5050  
Annesley  
NOTTINGHAM  
NG15 0DL

Telephone: 0870 770 6622  
Facsimile: 01223 552610  
E-mail: [publications@ocr.org.uk](mailto:publications@ocr.org.uk)

## CONTENTS

### Principal Learning

#### OCR Level 2 Principal Learning in Engineering H810

### REPORTS ON THE UNITS

<b>Unit/Content</b>	<b>Page</b>
Chief Examiner's Report	1
Unit F548 The engineered world	2
Unit F549 Engineering design	4
Unit 550 Engineering application of computers	6
Unit F551 Producing engineering solutions	7
Unit F552 Construct electronic and electrical systems	8
Unit F553 Manufacturing engineering	10
Unit F554 Maintenance	11
Unit F555 Innovation, enterprise and technological advance	12

# **Chief Examiner's Report**

## **General Introduction**

This is the second year of assessment, for the Principal Learning units within the Diploma in Engineering.

The opportunities for presenters to attend INSET, to use the excellent support materials provided and make their views known on the delivery and assessment of units has helped the development of many of the units within the scheme. All presenters are encouraged to attend one of a number of opportunities that are available for training.

Centres are to be congratulated on their efficient administration and prompt delivery of paperwork and compact discs. All centres submitted the Attendance Register, Centre Authentication Form CCS 160 and examination papers correctly filled in and on time.

There is evidence that some centres are becoming systematic in their approach to this diploma. With this systematic approach in mind centres should consider the learners' complete learning experience when designing learning programmes. This is particularly important in relation to learners studying part time alongside real work commitments where they may bring with them a wealth of experience that should be utilised to maximum effect by presenters.

When there are a number of centres in the consortium it is essential that an internal standardisation system is implemented. This would ensure consistent assessment decisions and is a key to good practice.

When a disc is being submitted attention needs to be paid to the labelling of files. In future each learners file should be named according to the following instructions:  
Centre number\_Candidate number\_Unit number\_Series.

## Unit F548 The engineered world

It was a pleasure to listen to and watch some well presented and clearly presented responses to the questions from learners who had clearly developed a sound understanding of the principles and techniques required for this type of assessment.

The following points need to be considered:

- A number of centres did not provide a quiet enough room in which to conduct the viva-voce. It is strongly recommended that after the first learners recording it is checked for quality and any necessary remedial action taken.
- The presenter may ask for further clarification if the learner's initial utterance is ambiguous, incomplete or too inaccurate. However, in some cases the prompt included statements that gave the learner clues to enable them to answer a question correctly. This type of prompting is not permitted.
- The presenter must read out the exact question and not change any of the words or meanings because there must be consistency for every learner.
- For the viva-voce learners may take into the preparation room and examination room a work book that has been compiled for use during the viva-voce. The learner can refer to the work book but must not be allowed to read out prepared material during the viva-voce. In a few case reading did take place, this must be discouraged.
- A number of learners spent a lot of time flicking forwards and backwards through their work book. It is suggested that a contents page with page numbers is placed at the front of their booklet. This should assist learners in finding information that they want in order to answer a question.
- In future years it would be useful to the markers if all centres could have in view, for each learner, a card with their centre number, candidate number and name printed on it.
- Presenters are reminded that during the recording of the viva-voce it is in order for them to go back over questions if there is time available and if the learners request it.
- In question six, the workplace scenario, the question states 'Finally, I am going to give you a workplace scenario'. The presenter is then instructed to hand to the learner a printed copy of the scenario and read it out. In a number of cases the scenario was not handed out.
- There is a maximum of 15 minutes for the viva-voce. The presenter is instructed to let the learner know when there are 2 minutes left. In a number of cases the presenter did not follow this instruction.
- Presenters are instructed to read out a number of instructions. One instruction is 'While you are speaking I might be making brief notes of what you say in this booklet' All notes must be made on the booklet provided.
- Centres are reminded that compact discs or digitally submitted evidence will not be returned. A copy of the evidence must be made and stored under secure conditions as a back up copy of the evidence until the results are published.

### Question One

- (a) Please identify an engineering achievement that you have researched.  
(b) Explain any human effects which have resulted from this engineering achievement.

All learners correctly identified an engineering achievement that they had researched. High scoring candidates included several correct clear and logical examples of the human effects that had resulted from this chosen achievement. Weaker learners gave only a limited explanation of a single human effect.

### Question two

Please tell me about any economic issues which may have driven the development of the engineering achievement you have researched.

A low scoring question. The majority of learners could not talk about the economic issues that had driven the development of the engineering achievement that they had chosen. It is suggested that centre's read the unit specification assessment criteria 1.4. This states "Identify and assess the social, human, economic and political issues that drove the achievement". To obtain high marks the learner needed to include logical and relevant supporting evidence that demonstrated depth and breadth of knowledge regarding economic issues.

**Question three**

Now, for two sectors you have studied, please tell me about the products and services that they provide.

Most learners correctly identified two engineering sectors they had studied. The good learners gave a detailed explanation about the products and services that each sector provided including logical and relevant supporting examples. The weaker learner did not know what products and services meant.

**Question four**

Now, for one of the sectors you have studied, please tell me about the duties of an employer regarding holiday entitlement.

A low scoring question. In some cases it was difficult to understand what sector the learner had chosen. Most learners had little idea that all workers have a right to paid annual leave and that includes part time workers. Most learners did not consider that the employer can control when you take your holiday and that Bank and Public holidays can be included in your minimum entitlement. Learners could have mentioned that there is a government provided formula for calculating holiday entitlement. The answer to this question could also have included the duties of an employer regarding agency workers, shift workers and part time workers. Presenters are encouraged to look at the reference [www.direct.gov.uk](http://www.direct.gov.uk)

**Question five**

Now explain to me the difference between renewable and non-renewable resources, giving an example of each resource.

Most learners identified one renewable resource and one non-renewable resource and gave a reasonable explanation of how they are different. The weaker learner had very little idea of the difference between these two types of resource and could not support their answer with logical or relevant examples.

**Question six**

What would you, in this circumstance, advise Ian about his rights as an employee.

A low scoring question. The good learner received marks for a detailed explanation of the duties of an employee which included logical and relevant supporting examples including reference to legislation. The weaker learner gave a basic answer which did not make reference to the employee seeking a further interview with the employer, visiting a Citizens Advice Bureau or similar organisation for advice or any reference to trade union support or seeking advice from an employment tribunal.

## Unit F549 Engineering design

The unit was marked by centres and moderated by OCR

The following points need to be considered:

- More care needs to be taken when the Unit Recording Sheet is filled in. Most centres' could provide more teacher comments in the panel provided.
- Most learners presented work in a logical order but the use of a contents list with page numbers is to be encouraged.
- It is recommended that for some learners they might find it useful to divide their folders into sections that follow the assessment criteria. Detailed information can be found in the specification for each section. It also ensures that all sections are covered.
- Marks must not be entered in pencil.
- A number of folders followed the same type of presentation with a similar use of some material. In general terms, the centre should be empowering learners to take charge of their own learning and development. There is scope within the tasks for centres/learners to chose their own product and devise their own design brief.

### Assessment Criteria 1

It would be helpful if learners presented their key criteria in sections i.e. needs of the user and needs of the manufacturer. It is important that learners disassemble their chosen product in real time and support this with photographic evidence.

Very few learners described in detail the manufacturing processes involved in making the desk lamp. Without this they cannot access the higher mark band.

The analysis of the strengths and weaknesses of the product and similar products has improved but more detail is still needed. A useful method of presenting their analysis is in chart form.

Meaningful and objective conclusions must be drawn from this comparison if the higher mark band is to be accessed.

### Assessment Criteria 2

Most learners gave a limited response to legislation stating only the more obvious issues.

Photographs of labels showing CE and Kite Marks were as far as many learners went in showing an understanding of legislation. To access the higher mark band learners must show a detailed understanding of the implications of the standards relevant to their selected product.

From this understanding, learners should draw conclusions as to the implications for their chosen product.

### Assessment Criteria 3

Most design briefs for the improved product were very simplistic with learners making statements such as "I am going to improve the lamp shade" and "I am going to add a component". Design briefs should relate to an improvement which learners have identified in their disassembly of the product. Specifications needed detailed and reasoned justification to access the higher mark band. Many specifications were too generic and lacked justification.

### Assessment Criteria 4

To access the higher level mark band learners should independently select the most appropriate communication techniques. There must be evidence of this in their work and this could take the form of a chart of techniques giving uses and advantages.

A range of communication techniques was lacking in most learners work. The desk lamp allows for circuit diagrams, exploded views as well as the more obvious communication techniques. A wide range of presentation styles and techniques should include sketching, orthographic projections, isometric projections, exploded views, circuit diagrams, CAD and 2D/3D modelling. Modelling would be a good way of demonstrating structural issues and mechanisms. In many cases drawings lacked clarity and accuracy which is essential for learners to gain the higher band marks.

**Assessment Criteria 5**

Tests should be done in real time with photographic evidence supporting this.

Questionnaires and subjective surveys do not give learners the opportunity to do scientific tests and mathematical analysis. This denies them access to the higher level mark band. A good way of ensuring these are covered could be to use some of the tests outlined in Unit 545 Introduction to engineering materials. Few learners produced clear meaningful conclusions from their test results.

## Unit 550 Engineering application of computers

The unit was marked by centres and moderated by OCR

The following points need to be considered:

- Learners must be aware that an expert system is a computer program that contains some of the subject-specific knowledge of one or more human experts. The most common form of expert systems is a program made up of a set of rules that analyse information (usually supplied by the user of the system) about a specific class of problems, as well as providing mathematical analysis of the problem(s).
- Problems involving expert and control systems should be presented in real-life contexts with an emphasis on the application rather than systems theory.

### Assessment Criteria 1

Most learners needed to show how they independently investigated and thoroughly examined a modern domestic product to gain marks in the higher band. More detail was needed from learners to demonstrate a thorough understanding of how computers are used in a work setting to design new parts for production, process control, stock control, finance control and maintenance. Much more evidence could have been provided by digital images that have been annotated.

### Assessment Criteria 2

More details was needed to show that learners had developed a thorough understanding of simple computer control systems and had simulated complex control functions of their chosen modern domestic product. This could be evidenced with screen shots and annotated photographic evidence.

### Assessment Criteria 3

More detail was needed to show that learners had gained an understanding of simple expert systems for problem solving and maintenance operations for their chosen product. To gain higher marks, learners needed to give a more detailed explanation of the methods used to input appropriate data into an expert system. More detail was needed to show how learners had interpreted results and used them to modify engineering features.

### Assessment Criteria 4

To gain marks in the higher band learners needed to demonstrate that they could independently identify and explain the use of computer-based communication systems used to exchange data during the design and manufacturing and maintenance of their chosen modern domestic product. More evidence was needed to show the use of (a) laptop computers to access and communicate information (b) personal digital assistants to record digital images, annotations and dialogue in real time as it happened (c) third generation mobile phones to record information in real time as it happens (d) down-loading and transferring information from communications devices in a form that is usable and accessible for engineering reports and portfolios (e) Bluetooth and (f) SMS multi media messages.

## **Unit F551 Producing engineering solutions**

The unit was marked by centres and moderated by OCR

The following points need to be considered:

It is advised that this assignment should link directly with the sector in which the learner has most experience.

Some use was made of photographs. This and other similar types of media are to be encouraged together with much more use of ICT.

### **Assessment Criteria 1**

Most learners produced a detailed plan for making, installing, commissioning and maintaining their selected product from a given engineering drawing and a set of instructions. More detail was needed on how learners had selected suitable materials and how they used standard components and processes. More detail was needed on how learners had related their plan to health and safety issues, including a risk assessment of procedures for processing the materials and components.

### **Assessment Criteria 2**

Many learners produced a high-quality and accurate product that was detailed enough to allow them to demonstrate their use of a range of making skills. Learners needed to produce a more detailed record of their progress during making and showing how they adapted ideas as circumstances changed. More evidence was needed to show that alterations had been made to the production plan including modifications to risk assessment procedures. More digital annotated images could have been used as evidence. They must also produce evidence to show how they checked the performance of their risk assessment and make any necessary modifications to this process and risk assessment.

### **Assessment Criteria 3**

Learners must produce evidence that they used quality control checks in their making, installation, commissioning and maintenance of their product.

## Unit F552 Construct electronic and electrical systems

The unit was marked by centres and moderated by OCR

It was evident that learners found navigation through the workbook straight forward. All learners were able to complete all sections of the Design Challenge within the time allowed. From the work submitted it was evident that learners had undertaken a number of teaching and learning activities to develop their knowledge and understanding of electronic and electrical systems prior to undertaking the Design Challenge. Centres are to be congratulated on this.

Photographic evidence was adequate in all cases. Every centre used the Land-Rover Warning Design Challenge and all candidates were able to design working solutions to this. Centres are reminded that they are permitted to devise their own Design Challenge. It is even permitted for centres to present more than one Design Challenge. This could be useful where centre/consortium have wide ability ranges.

Based on the evidence of the prototypes and final solutions all centres were able to provide learners with access to a full range of components and equipment.

The following points need to be considered:

- Marks should be entered in the mark boxes at the end of each task in ink and not in pencil.
- Photographs must be annotated to allow learners to gain full credit and centres must ensure they are securely glued into their workbooks.
- There is the provision for learners to add extra photographs to support tasks at the back of the workbook.

### Assessment Criteria 1

In response to the Design Challenge all learners were able to apply their knowledge of electronic and electrical principles when choosing and designing their circuits to varying degrees of sophistication.

Learners needed to provide more evidence to show that they had identified safe working procedures for all types of tools, equipment and manufacturing processes appropriate to their selected proposed circuit. A number of learners did not consider the needs and safety of others.

### Assessment Criteria 2

All learners were able to describe the properties of at least three components but a larger range is required to gain access to the higher band marks. More able learners were able to justify their selection based upon their properties.

A number of learners needed to use calculations to independently identify and select component values and to justify their selection of component values and component types. All learners were able to produce an initial circuit diagram to varying levels of sophistication.

### Assessment Criteria 3

It was encouraging to see all learners using a range of prototyping techniques to develop their final solution. It was evident that centres supplied their learners with a full range of tools, components and equipment to allow them successfully to complete this task.

The use of circuit design software was evident in many learners work and this should be encouraged. Producing the PCB between tasks did not seem to cause any problems for centres. A number of learners needed to take more good quality annotated photographs throughout these tasks.

Learners are to be congratulated on the quality of their final outcomes in most cases.

**Assessment Criteria 4**

Learners were supplied with a suitable range of test equipment which they used with varying degrees of success. Most were able to devise a simple test to confirm the device measured showed tilt. The use of complex calculations to predict circuit test data was lacking in the majority of learners work. Most learners were unable to use their test results to identify circuit modifications to enable correct operation. Most were also unable to use complex calculations to prove the use of alternative components. The majority also failed to suggest circuit change based on their data findings.

## Unit F553 Manufacturing engineering

The unit was marked by centres and moderated by OCR

The following points need to be considered:

- More care needs to be taken when the Unit Recording Sheet is filled in. Incorrect candidate numbers are being quoted and in some cases the candidate number is missing altogether. Centres need to provide more teacher comments in the appropriate panel.
- Most learners presented work in a logical order but the use of a contents list with page numbers is to be encouraged.
- Some use was made of photographs. This and other similar types of media are to be encouraged together with more use of ICT.
- It is recommended that for some learners they might find it useful to divide their folders into sections that follow the assessment criteria. Detailed information can then be found in the specification for each section. It also ensures that all sections are covered.
- A number of folders followed the same type of presentation with a similar use of some material. In general terms, the centre should be empowering learners to take charge of their own learning and development.
- In some cases, learners need to be shown how to interpret more carefully the evidence requirements for each mark band and it was difficult to find a real progression across the mark bands.
- Presenters and markers are reminded that progression across the bands is characterised by (i) increasing breadth and depth of understanding (ii) increasing coherence, evaluation and analysis (iii) increasing independence and originality.

### Assessment Criteria 1

A product was chosen from the prescribed list and as part of a team, most learners made some contribution to producing the production plan. In most cases alternative methods of manufacture and processes had been considered.

All learners made an input into the planning of the team and worked out what they could be responsible for. Strengths and weaknesses were considered when deciding on a job role. A number of teams presented a diary of events which proved to be quite useful evidence for moderation.

### Assessment Criteria 2

In a number of cases a detailed list of the quality control checks could not be found. There was not much evidence that showed an understanding of statistical testing methods.

### Assessment Criteria 3

A high proportion of learners gave adequate explanations of the procedures and sequencing for setting up a CNC machining operation. In some cases higher marks could have been obtained by learners if they had fully explained the procedures and detailed sequences of setting up a complex machining operation.

In many cases, learners did not understand or produce a useful risk assessment plan. Learners need to understand that risk is defined as the probability of an event and its consequences. From this the learner could consider that risk management is the practice of using processes, methods and tools for managing these risks.

Most learners produced independently five manufactured products/components. More digital evidence would have been useful to the moderator.

Most reports needed much more detail giving the findings from the quality tests and much more detail was needed from the analysis and interpretation of the data relating to the performance of the machining operation.

## Unit F554 Maintenance

The unit was marked by centres and moderated by OCR

All learners chose to use the Model Assignment based on the maintenance of “off road” cycles. This choice gave the learners easy access to a product that they were all familiar with and one which allowed for the tasks to be undertaken in the centre.

All learners need to be congratulated on the quality of their presentations and it was obvious from these that it was a well received unit.

There is scope for centre /learners to choose their own product to maintain but this option was not taken up by any centre. When centres choose their own product to maintain it gives the opportunity for centres to tailor schemes of work to their own facilities, specialist areas and ability levels.

Centres are reminded that they can use more than one product for their learners to maintain which could be useful where centres/consortiums have wide ability ranges.

For example some learners could maintain a child’s single speed cycle and some could maintain a sophisticated mountain bike with multiple gears and suspension.

All learners chose a different product to examine for task two as required.

Centres found it difficult to find suitable data for their learners to use in task two .To overcome this they devised their product data for their learners to use, which is quite acceptable.

### Assessment Criteria 1

To gain marks in the higher band learners must independently select information from manufacturers and prioritise what is needed.

Learners must undertake complex routine maintenance procedures such as on bearings, cranks and gear systems to gain marks in the higher band.

There should be evidence of learners using tools and equipment safely this, could be in the form of annotated photographs or a written statement describing this.

There should also be clear evidence of learners using appropriate tools and equipment effectively. Most centres verified this with photographic evidence.

The majority of learners chose to produce a maintenance manual as evidence of how they devised procedures for an engineered product. This proved a very effective method of demonstrating this requirement.

An area that does need to be addressed by most learners is the requirement to modify and re-test where necessary.

### Assessment Criteria 2

As the model assignment focussed on a specialist supplier of “off road” cycles it was difficult for learners to choose a different product from the company to study.

This was overcome by learners choosing a product from the automotive field which is a logical step from cycles. This was quite acceptable.

Most learners were able to give detailed information on the nature of failure and what caused it. However to gain marks in the higher band they also needed to consider both the implications and impact of this on both the user and manufacturer.

### Assessment Criteria 3

Centres found it difficult to access suitable data for their learners to use to analyse failure trends. To overcome this centres devised their own statistics and data for learners to use and this was quite acceptable. Motor and plant manufacturers could be a good source of this information.

Most learners chose to present their findings as a simple statement. The use of graphs and charts would be a more appropriate method of presenting this information.

Few learners went on to include a planned maintenance schedule in their findings.

## Unit F555 Innovation, enterprise and technological advance

The unit was marked by centres and moderated by OCR

The following points need to be considered:

- Assessment of this unit should be in the context of work and requires that learners experience real events and work alongside people in a 'sector' context.
- Learners needed access to specialist equipment to demonstrate their skills and extended periods of time to apply their knowledge.

### **Assessment Criteria 1**

Most learners identified and used a range of sources of information to investigate their chosen product. More detail could have been provided, to gain marks in the higher band, to justify how creativity and innovation benefitted engineering.

### **Assessment Criteria 2**

More detail was needed from learners when explaining why the relevant protection was selected for the chosen product, including a breakdown of the costs involved.

### **Assessment Criteria 3**

Learners outlined in detail the relevance of research activities and developmental work, but to gain marks in the higher band more information was needed in the justifications of financial decisions which had been made.

### **Assessment Criteria 4**

Most learners explained and justified the use of materials and processes used in their chosen product. More details needed to be provided when learners were considering the use of alternative materials and processes.

A number of learners could not explain and evaluate, for their chosen product, the cause and effects of engineering technologies in the home, the workplace and the built environment.

### **Assessment Criteria 5**

Most learners explained, for their chosen product, the environmental and social impacts of engineering and the sustainability of resources.

**OCR (Oxford Cambridge and RSA Examinations)**  
**1 Hills Road**  
**Cambridge**  
**CB1 2EU**

**OCR Customer Contact Centre**

**14 – 19 Qualifications (General)**

Telephone: 01223 553998

Facsimile: 01223 552627

Email: [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

**[www.ocr.org.uk](http://www.ocr.org.uk)**

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

**Oxford Cambridge and RSA Examinations**  
is a Company Limited by Guarantee  
Registered in England  
Registered Office; 1 Hills Road, Cambridge, CB1 2EU  
Registered Company Number: 3484466  
OCR is an exempt Charity



**OCR (Oxford Cambridge and RSA Examinations)**  
Head office  
Telephone: 01223 552552  
Facsimile: 01223 552553