

Examiners' Report

January 2011

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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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Principal Learning

OCR Level 2 Principal Learning in Engineering H810

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Chief Examiner's Report

General Introduction

Most centres are systematic in their approach to this diploma. 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.

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 will help the development of units within the scheme. All presenters are encouraged to attend one of a number of opportunities that are available for training.

When a disc is being submitted attention needs to be paid to the labelling of files. In future each learners file must 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 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 novel assessment.

The following points need to be considered:

- In the information for presenters it clearly states that the digital video recorder in use must be able to store at least fifteen minutes of recording. In some cases, the presenter must ensure that most of the time is used even if the questions are repeated and appropriate prompts are given.
- A number of centres did not provide a quiet enough room in which to conduct the viva-voce. At one centre there was a lot of background noise on some recordings which meant that it was difficult to hear what the learner was saying. It is strongly recommended that sound levels are checked for quality and any necessary action taken before the examination starts.
- In the information for presenters it clearly states that the profiles of the learner and presenter must be clearly visible on camera. In one centre this did not take place.
- 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 workbook 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 cases reading did take place, this must be discouraged.
- A number of learners spent a lot of time flicking forwards and backwards through their workbook. It is suggested that a contents page with page numbers is placed at the front of their workbook. This should assist learners in finding information that they want in order to answer a question.
- In future sessions it would be useful to the examiners 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 learner requests 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 two minutes left. In a number of cases the presenter did not follow this instruction.
- More attention needs to be paid to the labelling of files. In future each learners file must be named according to the following instructions:
Centre number_Candidate number_Unit number_Series.
- 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 backup copy of the evidence until the results are published.

Question One

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

Most learners identified an engineering achievement that they had researched. Some learners wasted time by giving times and dates of achievements which had no bearing on the answer to this part of the question. Many learners included several correct clear and logical examples of the social effects that had resulted from this chosen achievement. Other learners gave a limited explanation of a single social effect.

Question two

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

Some learners could not talk about the human issues that had driven the development of the engineering achievement that they had chosen. Some learners did not appreciate that human issues means issues that involve people. It is suggested that centre's read the unit specification assessment criteria 1.4. This state's "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 human issues.

Question three

Please tell me what you have found out about a specific engineering professional body.

Most learners correctly identified a specific engineering professional body and gave an adequate explanation of the work it does and some merits of professional body membership with at least one relevant example. Other learners had little idea of the membership merits of a professional body or what a professional body is. Learners are encouraged to consider the major institution in the UK which is the Institution of Engineering and Technology (IET). Learners can access a range of knowledge, services, events, profession support, news, views and topics from five sectors e.g. Built Environment, Design & Production, Energy, Information & Communications and Transport.

Question four

- (a) Now, please tell me the two engineering sectors you have studied.
- (b) Describe the job of a craft person within one of these engineering sectors.

Most learners correctly identified two engineering sectors they had studied. Some learners gave a detailed explanation about the job role of a craft person. Other learners did not know very much about the job of a craft person. There is still some confusion about the job of a craftsman as compared to the job of a technician. Many learners need to concentrate on the job and not go into pay and holiday entitlement.

Question five

For the two sectors you have studied tell me about an environmental effect and its cause.

A few learners gave an adequate explanation of an environmental effect and cause for two sectors with at least one example that demonstrated depth or breadth of knowledge. Presenters are reminded about learning outcome 4 and the assessment criteria 4.1 and the exemplification which states: the learner should understand the environmental effects of different industries such as gas emissions, chemical use in processes and agriculture, building, mining, quarrying and landfill operations.

Question six (the workplace scenario)

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

In some case marks were awarded for a detailed explanation of the duties of an employee in paid employment which included logical and relevant supporting examples including reference to legislation. Other learners 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. Presenters are encouraged to look at the reference www.direct.gov.uk

Unit F549 Engineering design

The unit was marked by centres and moderated by OCR

The following points need to be considered:

- Care needs to be taken when the Unit Recording Sheet is filled in. Some centres' could provide more teacher comments in the panel provided.
- Most learners presented work in a neat and tidy fashion but the use of a contents list with page numbers is to be encouraged.
- It was encouraging to see learners presenting their work in clearly defined chapters/sections relating to assessment criteria.
- 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 but the opportunity to do this was missed by some learners
- This model assignment allows for easy access to a suitable product to both disassemble and compare strengths and weaknesses.
- Developing your own design brief gives centres/learners the ability to tailor schemes of work to their particular facilities, specialities and abilities.
- It was encouraging to see learners choosing to improve the function rather than just the aesthetics of a desk lamp. By choosing the function of the lamp, the learner can investigate mechanisms, electrical/electronic circuits and/or structures. This gave learners access to a much wider range of possible communication and modelling techniques such as circuit diagrams, flow diagrams, overlays, 2D/3D mechanical models and structural diagrams/models.

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.

Few learners described in detail the manufacturing processes involved in making their chosen product, without this they cannot access the higher mark band.

Strengths and weaknesses comparison of similar products was not evident in some of the work and where it was more detail was still needed .

A useful method of presenting analysis of strengths and weaknesses of a product and comparison to a range of similar products 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. This could include reference to the risk from burning, electrical earth, toxic materials and pinch points.

Assessment Criteria 3

Most design briefs 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. Some 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 could take the form of a chart of techniques giving uses and advantages. A range of communication techniques was lacking in some learners work. The desk lamp allows for circuit diagrams, exploded views as well as the more obvious communication technique.

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. Learners could use some of the tests outlined in Unit 545 Introduction to engineering materials. Few learners produced clear meaningful conclusions from their test results.

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.
- The purpose of this unit is to allow learners the opportunity to have the experience of producing practical solutions to simple engineering problems.
- The unit requires the learners to produce a comprehensive plan for the manufacture of an engineering solution from a set of engineering drawings and instructions provided by the centre. These must be detailed enough to allow the learners to work unaided.
- The chosen engineered product should include several components to allow the learners to demonstrate a range of engineering skills and processes.
- Learners must independently select suitable materials, manufactured parts/components and select tools, equipment and processes.
- The learners must independently make a quality engineered solution using their own plan in a safe, effective and efficient manner.
- During production the learner will need to review their own progress, adapt to circumstances as they change and undertake appropriate quality checks and this must be evidenced
- Learners must be aware that these activities should be carried out in the context of production, maintenance, installation and commissioning.

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 made any necessary modifications to this process and risk assessment.

Assessment Criteria 3

Learners must produce more 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.

The following points need to be considered:

- Marks must be put in the mark boxes at the end of each task and entered in ink not pencil.
- 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 but centres must ensure that the photographs are securely glued into their workbooks. Photographs must be annotated to allow learners to gain full credit. There is provision for learners to add extra photographs, to support tasks, at the end of the workbook.
- Centres are reminded that they are permitted to devise their own Design Challenge, or present more than one Design Challenge. This could be useful where the centre has 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.

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 a little 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 both 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 worked. The use of complex calculations to predict circuit test data was lacking in the majority of learners work. Some learners were unable to use their test results to identify circuit modifications to

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enable correct operation. Some were also unable to use complex calculations to prove the use of alternative components or failed to suggest circuit changes based on findings from their data.

Unit F553 Manufacturing engineering

The unit was marked by centres and moderated by OCR.

The following points need to be considered:

- Most learners presented work in a neat and tidy fashion but the use of a contents list with page numbers is to be encouraged.
- Some use was made of photographs; this and the use of other similar types of media are to be encouraged.
- It is recommended that learners should 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 showed the same type of presentation with use of material common to the centre. In general terms, the centre should be empowering individual 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; 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 1.1

To access the higher mark bands learners needed to:

- explain in detail how they had made a significant contribution to the detailed plan of manufacture of the product.
- explain, in depth, how the team had made a significant contribution to a detailed plan of manufacture by including in the plan;
 - Preparation, processing and assembly stages
 - Sequence and timing of stages
 - Critical production and quality control points
 - Production and quality control procedures
 - Allocation of roles and responsibilities.

In addition learners should have provided much more evidence concerning additional and/or alternative methods of manufacture and fully justified the correct procedures to be adopted. A high proportion of learners used the same descriptions, the same flow charts and the same images for this area of work.

Assessment Criteria 1.2

In some cases it was not clear how the individual learner had been instrumental in ensuring the success of the team.

To obtain higher marks learners needed to explain in depth, how an effective team can be built by:

- allocating roles and responsibilities, based on the strengths and weaknesses of team members
- setting and agreeing individual and team targets
- ensuring good communication between team members
- ensuring team members are motivated
- creating an appropriate working environment
- considering health and safety in relation to the practical activity.

Learners could have provided more detailed visual evidence to support this activity.

Assessment Criteria 2.1

To obtain higher marks learners needed to:

- show fully detailed appropriate quality control checks using actual and statistical testing methods
- describe, in depth how they selected and used six different quality checks for the manufacture of the product using a CNC machine; some learners, only used the measurement of length and diameter. It is also customary to state a tolerance as a \pm value, not just a numerical value
- state how they inspected and compared samples of the product materials at the critical control points specified in the plan
- show how they intended to use statistical testing methods. Little evidence, if any could be found concerning this matter. There did not seem to be any awareness of statistical testing

Learners could have provided more detailed visual evidence to support this activity.

Assessment Criteria 3.1/2/4/5

To obtain higher marks learners needed to:

- explain in detail procedures and detailed sequences of setting up a complex machining operation; more digital evidence would have been useful
- explain how they reviewed the machining process on screen and how they acted on the outcomes
- show how they recorded details of the machining process; again digital evidence would have been useful
- show how they considered health and safety in the planning and execution of the machining procedures; again digital evidence needed to be provided.

Most learners produced a limited risk assessment document. To gain higher marks more detail and analysis was needed. Learners needed to understand that risk is defined as the probability of an event occurring 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 missed the opportunity to demonstrate that they had independently produced five components; more digital evidence would have been useful.

Assessment Criteria 2.1 and 3.3

Most reports needed greater detail for both the findings from the quality tests and analysis/ interpretation of the data. Few learners made use of the simplest statistics such as a mean, mode or median value for the data gained. Any interpretation or analysis of the data was at a low level and did not give learners the opportunity to comment upon the performance of the machining operation.

Unit F554 Maintenance

The unit was marked by centres and moderated by OCR.

The following points need to be considered:

- All learners entered for this module chose to use the Model Assignment based on the maintenance of bicycles.
This choice gave the learners easy access to a product that they were all familiar with. In addition it allowed the tasks to be undertaken in the centre.
- There is scope for centres and learners to choose their own product to maintain. Allowing learners to choose their own product to maintain gives the opportunity to tailor schemes of work to their own facilities, specialities and ability levels.
- Centres are reminded that they can use more than one product for learners to maintain, which could be useful where centres have wide ability ranges. For example, some learners could maintain a child's single speed bicycle and some could maintain a sophisticated mountain bike with multiple gears and suspension.

The following points need to be considered:

- Learners must choose a different product to examine for task two.
- The nature of failure and failure trends was very centre lead which did not allow learners to work independently and gain access to the higher mark band.

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; the most effective way of achieving this is with annotated photographs rather than a written statement. Learners must not complete this task as part of a team. Some 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. Many learners failed to address the requirement to modify and re-test where necessary.

Assessment Criteria 2

Learners need to choose a different product from the same company to study. It was evident that some centres failed to adhere to this requirement allowing learners to use bicycles again in this section. A number of learners overcame this by choosing a robot arm that could be used in the manufacturing of the bicycle. Most learners were able to give detailed information on the nature and cause of failure. However, to gain marks in the higher band they also need to consider the implications and impact of this on both user and manufacturer.

Assessment Criteria 3

Centres found it difficult to access suitable data for their learners to use when analysing failure trends. To overcome this problem centres devised their own statistics and data for learners to use; this was quite acceptable.

Motor and plant manufacturers could be a good source for this information. Some learners chose to present their findings as a simple statement. Some used graphs and charts which proved a very effective method of presenting this information. Few learners went on to include a planned maintenance schedule in their report.

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 the work presented and requires that learners experience real events and work alongside people in a 'sector' context.
- Learners need access to specialist equipment to demonstrate their skills along with extended periods of time to apply their knowledge. This was not evident in some of the work presented.
- Learners are required to complete a research assignment based on a specific product.
- Learners should record all their research, findings, observations, analysis and individual conclusions in a workbook.
- Learners should have the workbook available for the duration of the unit and are permitted to return to and add information to earlier sections in the light of any new discoveries.
- When there is a need to illustrate a particular point, photographs, sketches, drawings and other presentation methods may be used.
- Presenters should note that the assessment criteria are accessed solely by the learner's completion of their individual workbook, which should be fully evidenced for all assessment criteria.
- It was evident that in some cases the work was undertaken as a classroom internet research exercise and the opportunity for real time sector experience was denied to the learners.

Assessment Criteria 1

Learners must use a wide range of information sources to investigate their chosen product with regard to innovation and creativity. To gain marks in the higher band they must fully justify their use of information.

Assessment Criteria 2

Learners must use a wide range of sources of information to investigate the chosen product with regard to innovation and creativity. To gain marks in the higher band they must fully justify their use of information. The report must detail how protection of the design idea has been achieved and what this means in real terms, e.g. intellectual property.

Assessment Criteria 3

Learners must outline research activities and developmental work in detail. To gain marks in the higher band they must fully justify the financial decisions which have been made. They must also refer to specific details of the research, development and how finance is raised when developing new products.

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