

# Examiners' Report/ Lead Examiner Feedback

January 2017

NQF BTEC Level 1/Level 2 Firsts in  
Engineering

Unit 9: Interpreting and Using  
Engineering Information (21174E)

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## **Introduction**

This report has been written by the Lead Examiner for BTEC Engineering Unit 9 – Interpreting and Using Engineering Information. It is designed to help you understand how learners performed overall in the exam. For each question, there is a brief analysis of learner responses. You will also find some example learner responses for some questions. We hope this will help you to prepare your learners for future examination series.

## **Grade Boundaries**

### **Introducing external assessment**

The new suite of 'next generation' NQF BTECs now include an element of external assessment. The external assessments for NQF BTEC Construction are timetabled paper-based examinations.

### **What is a grade boundary?**

A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade (Distinction, Merit, Pass and Level 1 fallback).

### **Setting grade boundaries**

When we set grade boundaries, we look at the performance of every learner who took the assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark should be for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

### **Variations in external assessments**

Each test we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each test, because then it wouldn't take into account that a test might be slightly easier or more difficult than any other.

## Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

<http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx>

Grade	Unclassified	Level 1 Pass	Level 2		
			Pass	Merit	Distinction
Boundary Mark	0	12	21	30	40

## **General Comments on Exam**

This was the seventh examination for this unit and the responses seen this year were comparable with that of the previous January series of 2016. Lower ability learners are still giving inaccurate and/or simplistic responses to questions and therefore gaining limited marks. The more demanding questions provided learners with an opportunity to apply their knowledge in response to a range of engineering scenarios; however, most learners were not able to give extended answers that focused on the vocational context. Learners would, however, continue to benefit from being taught examination skills and techniques as some continued to misread the questions and consequently they were not answered using an appropriate methodology. It was still evident that some Centre's had not covered the Unit Content in its widest sense as many learners struggled to gain marks for areas related to 'Zeus Charts', 'process documentation' and 'test reports' when given an engineering context.

Many learners struggled to complete a number of the multiple choice questions correctly which was surprising as many aspects had been seen in previous series.

## Question 1

This question was aimed at a range of features and drawing types to show information effectively.

**Targeted Specification Area: Learning Aim A.2**

**Q1(a):** The majority of learners correctly identified both types of electronic circuit characteristics shown on drawings as being 'Current' and 'Voltage'.

**Targeted Specification Area: Learning Aim A.1**

**Q1(b)(i):** The majority of the learners were unable to state a type of 'graphical representation' but those that were correct typically gave 'schematic diagram, 'sketches' or 'flow charts' as a response.

**Q1(b)(ii):** The majority of learners were, however, able to state a type of working drawing. Typical responses included 'orthographic', 'isometric', 'circuit diagram' and 'assembly drawing'

**Q1(c):** The majority of learners were also able to identify at least one reason why technicians produce drawing to meet international drawing standards. Typical responses focused around engineers from different countries being able to read the same drawing and preventing drawing misinterpretation.

1 mark response:

(c) Give **two** reasons why technicians produce drawings that meet international drawing standards.

(2) 1 Q01c

1 To be transferred to other companies in the same  
Sector to avoid any misconceptions.

## Question 2

This question looked at the use of engineering drawings by engineers to explain the features of components and types of working instructions.

<b>Targeted Specification Area: Learning Aim A.2</b>
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**Q2(a)(i) & (ii):** The majority of learners were able to identify the meaning of each of the symbols found on the extract from an engineering drawing as being 'radius' and 'diameter' respectively.

**Q2(b)(i):** Learners struggled to determine the correct width for **X**. There were a number of distractors that saw learners giving incorrect answers of 180 or 190 whereas the correct response was 188.

**Q2(b)(ii):** More often than not, learner were able to state the width of **Y** as being 131.

<b>Targeted Specification Area: Learning Aim B.2</b>
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**Q2(c):** Most learners were able to identify at least one type of working instruction. 'Operation sheets' was the most popular response but a number of learners also correctly identified 'test schedule' as the other.

### Question 3

This question was aimed at the use of signs and documentation to highlight health and safety.

**Targeted Specification Area: Learning Aim A.4**

**Q3(a)(i):** Again, most learners were able to give an example of a health and safety warning sign such as 'high voltage', flammable' and 'slippery surface' being the most popular correct responses. Learners who gave incorrect responses often gave 'mandatory' or 'safe conditioning' signs such as 'wear eye protection' or 'assembly point' respectively.

1 mark response:

**3** Engineering organisations use signs and documentation to highlight health and safety.

(a) (i) Give **one** example of a health and safety **warning** sign.

(1) 1 Q03e

*Danger high voltage*

**Q3(a)(ii):** The majority of learners failed to identify this mandatory sign. This was a concern as this is clearly identified in the specification. The correct response was 'use of guards' or 'guarding required'. Many learners gave responses associated with 'heavy machinery' or 'moving parts' which were both incorrect. Often this question was left blank.

**Q3(b):** Learners responded quite well to this question and achieved at least one mark with responses that focused on the ease of recognition of the signs and that they have specific meanings. To achieve both marks, there needed to be a linked response.

1 mark response:

(b) Explain **one** reason why health and safety signs are designed using a limited range of colours and outline shapes.

(2) 1 Q03b

*One reason is so that it doesn't get confusing as if there were loads of different ones it would be hard to learn and overall unconvincing.*

2 mark response:

(b) Explain **one** reason why health and safety signs are designed using a limited range of colours and outline shapes.

(2) Q03b

They are designed in a range of colours and outline shapes because it is easier to identify what the instruction is so that people all over the world will know what to do.

**Targeted Specification Area: Learning Aim B.2**

**Q3(c):** Again, learners responded quite well to this question and were able to give a response relating to awareness of potential risks. Again, for learners to achieve both marks there needed to be a linked response.

1 mark response:

(c) Production plans for engineering operations normally include references to health and safety.

Explain **one** advantage for technicians of including health and safety information in a production plan.

(2) Q03c

The advantage of this is to have less injuries when producing your product and to make sure nothing goes wrong.

2 mark response:

(c) Production plans for engineering operations normally include references to health and safety.

Explain **one** advantage for technicians of including health and safety information in a production plan.

(2) Q03c

The technicians will be more aware on what danger they are more at risk on, so they can be more cautious and will prevent reduce the risk of getting injured.

#### Question 4

This question was contextualised around a company that carries out a range of machining and fabrication activities to make batches of parts for customers.

**Targeted Specification Area: Learning Aim A.2**

**Q4(a):** The majority of learners correctly identified at least one of the two details that could be added to the drawings so that the parts can be made correctly. Learners were more likely to get 'fixed reference points' correct rather than 'surface textures'.

**Targeted Specification Area: Learning Aim B.2**

**Q4(b):** Learners who had been taught about job cards were able to gain at least one mark here for responses relating to 'batch completion dates can be identified' or 'identifies the order quantity for the batch'. Many learners gave incorrect responses about being to find faults with the batch or detailing all the manufacturing requirements of each part.

**Q4(c):** Gantt charts have been used extensively through the previous series and learners were able to answer this question quite well and often achieved two marks for two responses such as 'engineers can identify milestones' and 'it visually shows how long it will take to complete the project'. Some learners, however, continue to state 'that it is easy to understand' when clearly a Gantt chart holds complex information that needs interpreting by trained staff.

## Question 5

This question was contextualised around a company that produces electronic circuit boards that are fitted into soft drink vending machines. This context gave learners an opportunity to apply their knowledge and understanding to these questions.

**Targeted Specification Area: Learning Aim A.1**

**Q5(a):** Most learners were able to identify two features that would be found on a company standardised layout for a working drawing. Typical correct responses were 'scale', 'company name', 'title block' and 'parts list'. Incorrect responses saw learners state actual drawing features for on the drawing such as 'centre lines', 'hidden detail' and 'dimensions'.

**Targeted Specification Area: Learning Aim A.2**

**Q5(b):** The majority of earners failed to identify the correct electronic component symbols as being a transistor and capacitor. This was very surprising as they are common symbols used in schools and are clearly identified in the unit specification. Many learners thought the capacitor was a battery and the transistor was a diode.

**Targeted Specification Area: Learning Aim B.1**

**Q5(c):** Many learners were able to score one mark here by identifying an advantage of an engineer completing a detailed test report for each circuit board. Typical responses included 'test reports will confirm the boards are working' and 'helps with circuit board traceability'. Some learners gave linked explanations that were awarded both marks.

1 mark response:

(c) DT88 Engineering performs tests on each circuit board when they are finished and before they are sent to the vending machine assembly company. The vending machine assembly company receives a copy of each test report.

Explain **one** advantage to the vending machine assembly company of DT88 Engineering completing a detailed test report for each circuit board.

(2) Q05c

By completing a test report it allows you to understand how well it performed without having to watch it for a period of time.

2 mark response:

(c) DT88 Engineering performs tests on each circuit board when they are finished and before they are sent to the vending machine assembly company. The vending machine assembly company receives a copy of each test report.

Explain **one** advantage to the vending machine assembly company of DT88 Engineering completing a detailed test report for each circuit board.

(2) Q05c

The test report will show that the circuit board functions correctly as intended. This gives the vending machine manufacturer peace of mind because they know that the circuit board will work correctly when installed.

Targeted Specification Area: Learning Aim B.3

**Q5(d):** The majority of learners were able to access this question as this part of the specification had been tested on many previous occasions. Typical responses included linked responses such as 'difficult to lose drawings reducing the costs to the company of printing and distribution of drawings' or 'working drawings can be password protected restricting access to employees only'.

2 mark response:

(d) DT88 Engineering does not repair faulty circuit boards. Circuit board repairs are carried out by technicians that work for other engineering companies.

Explain **two** advantages for DT88 Engineering of storing working drawings using a secure online system in this situation.

(4) Q05d

- 1 One advantage is that by them storing it online there is minimum risk of the drawing getting damaged as it is not a physical drawing.
- 2 ~~It~~ takes up hardly any physical space so another advantage is that it would be more convenient to send and share between companies.

4 marked response:

(d) DT88 Engineering does not repair faulty circuit boards. Circuit board repairs are carried out by technicians that work for other engineering companies.

Explain **two** advantages for DT88 Engineering of storing working drawings using a secure online system in this situation.

(4) Q05d

- 1 Anyone can access a online data base inside the company provided that they have the permission too. This means that the technician will no have to bother going through sales but instead quickly use the drawings.
- 2 Having the drawings on a online system means they can't get damaged like paper documents can and the company can easily make duplicates as work drawing is more than one is needed to make a part.

### Question 6

This question was contextualised around a company that manufactures custom made mounting plates. Again, this context gave learners an opportunity to apply their knowledge and understanding to a range of questions.

<b>Targeted Specification Area: Learning Aim A.3</b>
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**Q6(a):** The majority of learners found this question very challenging, consequently this question was often left blank. It was clear that many learners had not been taught about Zeus Charts which again was surprising as they are clearly identified in the unit specification. Those that had been taught about them could respond with answers associated with tapping drill sizes but this was very limited. Incorrect responses related to the Zeus Charts providing detailed information to manufacture the mounting plates.

1 mark response:

- (a) Technicians at M34 Engineering consult Zeus charts when carrying out machining operations on the mounting plates.

Explain **two** reasons why technicians at M34 Engineering would use Zeus charts in this situation.

(4) 1 Q06a

1 Tells them how big the screws  
holes need to be to allow the  
shafts or fastenings to go on easily.

4 mark response:

- (a) Technicians at M34 Engineering consult Zeus charts when carrying out machining operations on the mounting plates.

Explain **two** reasons why technicians at M34 Engineering would use Zeus charts in this situation.

(4) 4 Q06a

1 The technicians at M34 would use Zeus charts when ~~machining~~ <sup>Machining</sup> the plates because they state the correct limits and fits for the holes. This means that the customer can specify what tolerance they want (e.g. H8) and all M34 have to do is look at the table for the correct ~~tolerance~~ <sup>tolerance</sup>.

2 Another reason they <sup>would</sup> use Zeus charts is because they show the correct <sup>size</sup> holes for tapping threads. This means that they know exactly what size to drill the hole for tapping, to get the correct thread without it being too tight or slack.

- (a) Technicians at M34 Engineering consult Zeus charts when carrying out machining operations on the mounting plates.

Explain **two** reasons why technicians at M34 Engineering would use Zeus charts in this situation.

(4) 4. Q06a  
Marking  
~~1~~ The technicians at M34 would use Zeus charts when ~~marking~~ marking plates because they state the correct limits and fits for the holes. This means that the customer can specify what tolerance they want (e.g. H8) and all M34 have to do is look at the table for the correct tolerances.  
2 Another reason they would use Zeus charts is because they show the correct <sup>size</sup> holes for tapping threads. This means that they know exactly what size to drill the hole for tapping, to get the correct thread without it being too tight or slack.

### Targeted Specification Area: Learning Aim B.1

**Q6(b):** The majority of learners found this question very challenging as this part of the specification had not been tested on previous occasions. Many learners misread the question and gave responses relating to product manufacture rather than assembly or installation. Occasional linked responses could be seen such as 'documentation ensures structures are being assembled correctly preventing further failure of the structure' or 'documentation details safe working practices/instructions ensuring customers are protected from injury'. It is pleasing to see learners underlining key words to focus their answers too.

Two mark response:

- (b) M34 Engineering supplies its customers with process documentation to be used during the assembly of structures that include the mounting plates.

Explain **two** advantages to a customer of M34 Engineering providing process documentation in this situation.

(4) 2 Q06b  
1 Process documentation in this situation is used to help structure the assembly of the mounting plates and how to process this assembled product so that it fits its purpose.

## Question 7

This question was contextualised around a company that manufactures customized high performance car gearboxes and the range of drawings used during their manufacture. Again, this context gave learners an opportunity to apply their knowledge and understanding to a range of questions.

<b>Targeted Specification Area: Learning Aim B.1</b>
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**Q7:** The majority of learners were able to gain marks in this question. Typical correct responses gave basic description of drawing types such as orthographic projections and assembly drawings. Often these types would not be mentioned but implicit within the description such as 'drawings show dimensions' and 'allows you to put the gearbox together'. Many learners misinterpreted the question and gave positive and negative reasons for the range of drawings given. For learners to achieve higher marks here, there needed to be a detailed consideration of the range used and their applications.

Mark band 1 response:

- 7 SY16 Engineering manufacture customised high performance car gearboxes. Technicians at SY16 Engineering produce all of the individual components including machined gears, bearings and cast gearbox housings. SY16 Engineering then assemble the individual components into complete gearboxes.

3 Q07

Discuss the reasons why technicians at SY16 Engineering are given a range of different types of drawing in this situation.

There are many factors ~~and~~ pro and cons of given a range of different drawings. The pros are that ~~you~~ you will have different type of drawings, so therefore you can see different ~~one~~ angles and different views of it, <sup>which</sup> which means it will be easy for the engineer to assembly all the ~~parts~~ <sup>parts</sup> together.

Another pro is that ~~you~~ when you have different drawings, ~~you~~ you will be able to have them side by side, which means you ~~can~~ can compare them and ~~check~~ check if any changes ~~are~~ <sup>that</sup> need to be made.

The first con is that it ~~can~~ <sup>can</sup> get confusing, this is because there is ~~no~~ <sup>which means</sup> a lot of things going on, also there will be different drawings, ~~and~~ it will show a lot of annotations, ~~which~~

Another con is that different drawings shows ~~different~~ different symbols, so it will be hard ~~to~~ to understand, as the engineer will have to remember the special symbols which also means that ~~mistake~~ mistakes can easily be made.

Mark band 2 response:

- 7 SY16 Engineering manufacture customised high performance car gearboxes. Technicians at SY16 Engineering produce all of the individual components including machined gears, bearings and cast gearbox housings. SY16 Engineering then assemble the individual components into complete gearboxes.

6 Q07

Discuss the reasons why technicians at SY16 Engineering are given a range of different types of drawing in this situation.

• For the assembly of the gearbox an exploded diagram will be shown to see how it all fits together. This includes all of the components and bits like nuts and bolts and how they all fit into the gear box.

• To create an individual component a work drawing will be required showing all the lengths and dimensions required to make the part.

• An orthographic drawing will show what the component or final gearbox will look like from different perspectives. This can be used to check the gearbox at the end of the manufacturing process.

• All these different drawings will be used to give the worker knowledge on what it will look like, the order in which it will be put together and the dimensions of each individual component which is all required to make the final gearbox to a high quality depending on the tolerances shown as well.

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