

Examiners' Report/ Lead Examiner Feedback

January 2016

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	Level 2 Merit	Level 2 Distinction
Boundary Mark	0	11	21	31	41

General Comments on Exam

This was the fifth examination for this unit and there appears to be a gradual improvement of responses as the series continues and an increasing number of learners sitting this examination. 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, and it was pleasing to see learners continuing 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 centres had not covered the unit content in its widest sense as many learners struggled to gain marks for areas related to welding drawings, weld procedures specifications and control charts when given an engineering context. It was pleasing to see learners were completing the multiple choice questions correctly.

Question 1

This question was aimed at a range of aspects relating to interpreting drawings and drawing information.

Targeted Specification Area: Learning Aim A.1

Q1(a): The majority of learners correctly identified at least one of the two types of graphical representations. Learners were more likely to get 'sketches' correct rather than 'flow charts'.

Q1(b)(i): Likewise, the majority of the learners were able to match at least one of the linetypes to the correct names. Learners were more likely to get 'visible outline' correct rather than 'centreline'.

Q1(b)(ii): Many learners were able to score at least one mark here by giving a reason for using different linetypes on engineering drawings. Typical correct responses related to linetypes being 'universally recognised by engineers' or 'easy to understand'. Some learners also mentioned using specific linetypes such as 'hidden detail' and 'centrelines' which were both valid responses. Incorrect responses included 'to show what needs to be cut out' and 'to identify different linetypes'.

2 mark response:

(ii) Give **two** reasons for using different linetypes on engineering drawings. (2) Q01bii

1. to ~~easier~~ easily show detail, even hidden detail/more detail

2. make it easier to understand/read.

Question 2

This question was aimed at a range of aspects relating to interpreting drawing and other information.

Targeted Specification Area: Learning Aim A.2

Q2(a)(i) & (ii): Most learners were able to identify the correct symbols for both the 'battery' and the 'push switch'.

Q2(a)(iii): However, it was surprising to see that many learners failed to identify the circuit symbol as a 'motor'. Many learners gave an incorrect response of 'multimeter' or simply did not make a response.

Targeted Specification Area: Learning Aim A.3

Q2(b)(i): Again, the majority of learners were unable to identify the missing colour using the resistor colour code chart. Those learners that had been taught about resistor colour codes were able to identify that the 'green' band was missing as this represents the number 5 in the 3500 ohm resistor. There was no real methodology behind the incorrect responses as random colours throughout the spectrum were given.

Q2(b)(ii): Many learners were able to score at least one mark here by giving a reason why engineers use a colour code system when working with resistors. Typical responses included 'resistors are too small to put values on', 'ease of memorising colours' and 'obtaining a resistors value with ease'. Some learners gave inappropriate responses such as 'different colours give different values'.

2 mark response:

(ii) Give **two** reasons why engineers use a colour code system when working with resistors. (2) Q02bii

1. So they can easily identify how much resistance a certain resistor has in ohms.

2. It is easily visible on a small component like a resistor.

Question 3

This question was aimed at testing knowledge of interpreting drawing information.

Targeted Specification Area: Learning Aim A.2

Q3(a): The majority of learners correctly identified the two types of dimensional detail on a working drawing as 'scale' and 'fixed reference points'.

Q3(b): However, the majority of learners found this question quite challenging. Many learners were only able to identify a reason why tolerances are used on working drawings. Typical responses focused on 'working with a size range'. Often learners gave actual tolerances such '+/- 0.5' which were accepted. For learners to achieve both marks there needed to be linked explanations such as 'to reduce costs as unnecessary tight tolerances make parts more expensive to make'. Incorrect responses could also be seen here such as 'tolerances are used so they know how much they can withstand' or 'this is how accurate the drawing is'.

1 mark response:

(b) Explain **one** reason why tolerances are used on working drawings when manufacturing engineered products.

(2) 1 Q03b

Tolerances are used so the product will be accurate, and so engineers don't have to because tolerance make it so the dimension are within a certain range.

2 mark response:

(b) Explain **one** reason why tolerances are used on working drawings when manufacturing engineered products.

(2) 2 Q03b

As it is more expensive to work with a greater accuracy so a tolerance is provided in order to provide a small range which the component can be made to where it will still work in an assembly. (cheaper).

Question 4

This question was contextualised around a company that specialises in welding and repairing customized one-off bicycle frames. This context gave learners an opportunity to apply their knowledge and understanding about this previously explored area of the unit content.

Targeted Specification Area: Learning Aim A.2

Q4(a)(i): Many learners correctly selected 'square butt' as being one type of weld symbol.

Q4(a)(ii): The majority of learners did not score any marks here as they could not identify the weld symbol shown as being 'fillet weld'. Many learner simply used one of the four options from the previous question which included 'voltage', 'oblique' and 'third angle'. Also, due to the

triangular shape of the symbol, there were many incorrect responses centred around 'right angle triangle'.

Targeted Specification Area: Learning Aim A.1

Q4(a)(iii): This question proved challenging for many learners. Some learners were only able to identify one advantage of using welding drawings in the context of the question. Typical responses seen here included 'so the operator can put parts of the frame in the right position' or 'allows the welder to choose the correct process'. Learners were not able to produce linked responses such as 'drawings can be shown to customers to allow them to choose specific weld features'. There were many responses that only attracted one mark, whilst other learners simply gave incorrect responses attracting no marks.

One mark response:

NP11 Fabricators use welding drawings to produce customised one-off bicycle frames for a range of customers.

(iii) Explain **one** advantage of using welding drawings in this situation.

(2) 1 Q4aiii

It allows the engineer that is making the weld on the bike frame to place the weld in the exact position and correct position with the correct size of weld and type of weld.

Targeted Specification Area: Learning Aim B.2

Q4(b)(i): A number of learners were unable to gain the mark for this question as they could not identify the heading within the Weld Procedure Specification as being 'Joint type/weld type' or similar despite the joint type of 'Double Bevel tee Butt' being present in the same row.

Q4(b)(ii): Also a significant number of learners were unable to gain the mark for this question as they could not identify the correct material thickness for the joint design as being '8-25mm'; however, there were a range of acceptable responses where learners had stated exact sizes within that range such as '16mm' or '12mm'. Some learners misread the question and stated the weld gap of '0-3mm' which was incorrect.

Q4(b)(iii): This question again proved quite challenging for the majority of learners. Those that did score well were only able to identify advantages of using weld procedure specifications in the context of the question. Typical responses could be seen here such as 'welds are produced to the original specification' or 'making best use of the resources available'. A small number of learners were able to produce linked responses such as 'by using

the specification they can plan what tools they will need in advance which will save time'. There were again far too many incorrect responses that focused on the repair of the bicycle frames relating to quality and not advantages of using weld procedure specifications in this situation.

Two mark linked response:

NP11 Fabricators use a mobile workshop to repair customised one-off bicycle frames for professional cycling teams within a day.

(iii) Explain **two** advantages of using weld procedure specifications in this situation.

(4) 2

1 Engineers will be travelling away from the workshop, by using the specification they can plan what tools they will need in advance which will save time.

Question 5

This question was contextualised around an engineering company that has a large number of employees that use machines and need to be aware of what safety signs mean. Again, this context gave learners an opportunity to apply their knowledge and understanding to these questions.

Targeted Specification Area: Learning Aim A.4
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Q5(a): Almost all of the learners were able to score both marks here for matching the two correct safety signs, 'high voltage' and 'slipper surfaces'.

Q5(b): Most learners were able to achieve at least one mark here for identifying an implication such as 'employees could be injured or killed'. There were some learners who were able to offer linked responses to achieve both marks. Typical extensions to the above response included 'as employees did not know what risk the machine had' or 'leading to compensation claims'. A number of learners identified more than one implication but only achieved one mark as the question clearly asked for an explanation of one.

Two mark linked response:

(b) Explain **one** implication for BX23 Engineering of not displaying mandatory signs on machines.

(2)2 Q05b

If an employee was to damage their hearing for example, BX23 Engineering would be held liable because they did not state ear protection had to be worn. This could cost the company lots of money and their reputation.

One mark response:

(b) Explain **one** implication for BX23 Engineering of not displaying mandatory signs on machines.

(2)1 Q05b

could lead to major injuries or even death

Question 6

This question was contextualised around a company that manufactures specialist containers for the chemical industry. This context gave learners an opportunity to apply their knowledge and understanding to a range of questions.

Targeted Specification Area: Learning Aim B.2

Q6(a)(i): A number of learners did not select 'capacity' as being an example of related documentation used when scheduling.

Q6(a)(ii): The majority of learners struggled with this question as they were unable to give a characteristic of a critical path analysis. Those that were correct stated responses such as 'shows the quickest way to complete a project' or 'shows the latest start time of an activity'. There were also a number of responses such as 'shows the longest path to complete a project', whilst this is a correct statement it was not awardable unless it could be justified.

One mark response:

(ii) Give **one** characteristic of a critical path analysis.

(1) 1

Shows the sequence of operation that the product should be made in the shortest time.

Q6(a)(iii): This proved to be a challenging question for the majority of learners as they could not explain advantages of using a Gantt chart with specific milestones in the context of the question. Those that did score well were only able to identify advantages. Typical responses could be seen here such as 'able to share with suppliers' or 'allows for project reviews'. A minority of learners were able to produce linked responses such as 'allowing you to keep track of whether the product is meeting deadlines so that the company can put preventative action in place to stop fines'. There were many incorrect responses that focused on the characteristics of a Gantt chart which although were true, were not awardable in the context of this question.

Two mark linked response:

(iii) NW34 Engineering has to manufacture a large complex container to be delivered by 31 January 2017 or it will receive a large fine. It will use several suppliers to produce sub-assemblies for the container.

Other than avoiding a large fine, explain **two** advantages to NW34 Engineering of using a Gantt chart with specific milestones in this situation.

(4) 2

1 It allows you to keep track whether the product been produced is early/on time/or late. This allows the company to put preventative actions in place to stop the company from getting a fine.

Four mark response:

(iii) NW34 Engineering has to manufacture a large complex container to be delivered by 31 January 2017 or it will receive a large fine. It will use several suppliers to produce sub-assemblies for the container.

Other than avoiding a large fine, explain **two** advantages to NW34 Engineering of using a Gantt chart with specific milestones in this situation.

(4) 4 Q6aiii

- 1 NW34 Engineering will ~~now~~ know exactly when production of the sub-assemblies will finish therefore meaning they could predict exactly when the production of the container will finish.
- 2 ~~With~~ If a problem occurs ~~they~~ whilst producing the sub-assemblies for the container with one supplier NW34 Engineering could depend on another ~~supplier~~ ~~supp~~ ~~supp~~ supplier to ~~work~~ work on the sub-assembly without affecting the time of production (they will be able to use the gantt chart to know exactly when the problem occurred and when the other supplier started to work on the sub-assembly.)

Targeted Specification Area: Learning Aim B.3

Q6(b): The majority of learners struggled with this question which was surprising as this is clearly signposted under Topic B.3 of the unit content. Many responses related to products being late or not completed by a deadline which was incorrect. This question was about documentation not having an issue or amendment date and its implications. Where learners did score was when they responded with answers such as 'don't know when the drawing was first created' or 'don't know if the drawing had been altered'.

Two mark response:

(b) NW34 Engineering has a document control policy that requires all documentation to have an issue and amendment date.

Give **two** implications for NW34 Engineering of documentation not having an issue or amendment date.

(2) 2 Q06b

- 1 NW34 will not know when ~~the~~ the document was created
- 2 NW34 will not know if the document is a first draft or ~~first draft~~ final draft.

One mark response:

(b) NW34 Engineering has a document control policy that requires all documentation to have an issue and amendment date.

Give **two** implications for NW34 Engineering of documentation not having an issue or amendment date.

(2) Q06b

1. The company will be able to tell in the documentation is the latest version

Question 7

This question was contextualised around a company manufacturing a large number of bolts for the marine industry at several different sites. Again, this context gave learners an opportunity to apply their knowledge and understanding to these questions.

The majority of learners sitting the examination paper completed the final questions. This was again pleasing as it is good examination technique for learners to at least attempt all questions.

Targeted Specification Area: Learning Aim B.2

Q7(a): The majority of learners scored at least two marks here with typical responses centred around 'workers at each site are familiar with the operation sheet layout' or 'operations can be transferred to other sites with ease'. Typical extensions to the above responses included 'leading to increased bolt production' and 'just in case there are problems with production' respectively.

Four mark response:

(a) Explain **two** advantages to ST24 Engineering of using the same operation sheet when manufacturing a bolt at several different sites.

(4) 4 Q07a

- 1 If a worker needed to change site to give some extra help for example, they could start working straight away as they have seen the operation sheet before and therefore understand it, which saves time and man hours by another worker not having to explain it.
- 2 If things were to change at one site, which meant changing the way it operated, to make it more efficient, this could be done across all sites at the same time because they all carry out the same operation, this would lead to less mistakes being made as the problem is solved quickly.

Two mark response:

(a) Explain **two** advantages to ST24 Engineering of using the same operation sheet when manufacturing a bolt at several different sites.

(4) 2 Q07a

- 1 It means the quality is kept the same or similar on all different sites as they are all following the same production process.
- 2 Among the sites the operation sheet becomes standardised and therefore information can be easily conveyed between locations as they are all working towards the same specification.

Q7(b): It was pleasing to see the majority of learners attempted this question again this year. There were obvious advantages mentioned with regard to 'reducing sampling inspection size' or 'improving consistency across bolts sizes'. This led onto issues with defective products being manufactured and the reputation of the company being at stake. The learners providing these responses showed limited knowledge of the use of quality control information.

The more able learners achieved higher marks by providing a range of advantages associated with using quality control information. Some learners showed a good or developed understanding of this topic with a range of points described but not always clear. These learners provided the less obvious advantages such as 'allowing standards to be applied across all sites' or 'patterns forming through consistent errors'. Also the points made were relevant to the situation in the question; however, there were far too many responses related to physical quality control techniques and not the documentation itself. It was again pleasing to see that a number of learners had completed some kind of drafting during the exam prior to writing this final question as there were bullet pointed notes written above the final response which shows good planning; however, centres need to be aware that the majority of credit is given for the extended writing response (please refer to the mark bands at the bottom of Q7b mark scheme).

Mark band level 3 response: 7 marks

(b) Discuss the advantages to ST24 Engineering of using quality control information when manufacturing large numbers of bolts.

(8/7) Q07b

- Quality control allows the product to be made or keeps the product within a given specification. If checks take place it allows weaknesses to be spotted within the manufacturing process if a repeated mistake is made whether its due to a machine type which has faults or accuracy or ~~or~~ an employee.

If the products are standardised and kept to the same quality it means less complains are made and products sent back so the company reputation gets better. If the bolts are all made to the same high standard/quality it means they function better and more effectively as part of an assembly. ~~It is~~

It also lowers ~~the~~ costs as less wasted products are made and faults can be ~~be~~ easily spotted and resolved without the issue affecting a large amount of bolts. A sample can be made if a bolt is mass produced and can be compared on a control chart to estimate whether the production is going to stay within its desired limits in the future in comparison to its minimum and maximum standards. So the product works better within a time set, the reputation is not damaged by faulty products so the products work better and more people buy from the company if the are reliable.

Mark band level 2 response: 5 marks

(b) Discuss the advantages to ST24 Engineering of using quality control information when manufacturing large numbers of bolts.

(8) Q076

ST24 Engineering using quality control information means that they will have more ~~reliable~~ consistent standards of their bolts. By using quality control information ST24 Engineering can check that ~~the~~^{their} products are functioning at the required standard. Random checking means only a tiny proportion of the bolts are checked but an accurate representation of all the bolts is found; this means smaller issues are noticed faster but if the bolt is correct by chance the issue could also go unnoticed. Regulating control will mean fewer bolts are faulty as problems are found quicker, resulting in fewer complaints and higher sales. It is vital the fault can be found quickly as large numbers of bolts can be ~~found~~ manufactured with fault and are not usable so the company will ~~lose~~ ~~not~~ profit - ~~lose~~ lose money. The information is also important to work out if the process ~~needs~~ for manufacture needs changing or if it was a 'one-off' problem with a particular bolt. The information is also transferable between different plants so if an issue is found it is resolved over the whole company and its plants at once.

Mark band level 2 response: 6 marks

(b) Discuss the advantages to ST24 Engineering of using quality control information when manufacturing large numbers of bolts.

(8/6 Q076

The advantages of ST24 Engineering using quality control information is that they can prove to the buyer of the bolts that their product has been manufactured accurately and within tolerance. By producing quality control information it will allow the company to see if anything is wrong with the bolts and if so, where improvements and changes can be made. They can take a small amount of bolts from the large batch and analyse their threads and make sure the bolts are to the right shape and tolerance. If any aren't they can find out the reason why and go back through the larger batch to check if it was just a few that aren't correct or if it was most of the batch. By using the quality control information it will help the company to improve on the production of their bolts and make it more reliable. This would have a positive effect on the company and allow their bolts to be consistently produced to a high quality standard.

Mark band level 1 response: 2 marks

(b) Discuss the advantages to ST24 Engineering of using quality control information when manufacturing large numbers of bolts.

(8) Q07b

The main advantages of using quality control information is that when the manufacture needs to produce a batch of bolts the quality control information can be used as a guide to producing the bolts as all the operations are clearly shown. Also the quality control information can be used to make sure that the bolts are produced correctly and accurately therefore reducing the amount of inaccurate bolts. Also the quality control check contains important measurements such as tolerance and how much is turn in mm. Quality control information also shows what date the product was produced, this is important when dispatching the bolts.

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