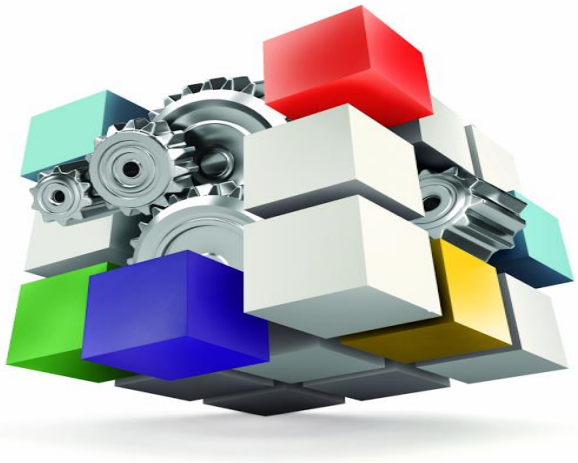
# Examiners' Report/
# Lead Examiner Feedback
# Summer 2017

## BTEC Level 3 Nationals in Engineering
## Unit 3: Engineering Product Design and Manufacture (31708H)



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**Grade Boundaries**

**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 Near Pass. The grade awarded for each unit contributes proportionately to the overall qualification grade and each unit should always be viewed in the context of its impact on the whole qualification.

**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 would not take into account that a test might be slightly easier or more difficult than any other.

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# Unit 3: Engineering Product Design and Manufacture (31708H)

| Grade | Unclassified | Near Pass | Pass | Merit | Distinction |
|---|---|---|---|---|---|
| Boundary Mark | 0 | 9 | 19 | 30 | 41 |

# Introduction

Unit 3 (Engineering Product Design and Manufacture) is a mandatory synoptic unit that requires learners to complete a set task to redesign an engineering product. There are five activities to complete for the whole task. This was the first live task for this unit and learners were required to redesign a jig.

The external assessment task is structured to address the assessment outcomes for the unit. The assessment outcomes are:
AO1: Demonstrate knowledge and understanding of engineering products and design
AO2: Apply knowledge and understanding of engineering methodologies, processes, features and procedures to iterative design
AO3: Analyse data and information and make connections between engineering concepts, processes, features, procedures, materials, standards and regulatory requirements
AO4: Evaluate engineering product design ideas, manufacturing processes and other design choices
AO5: Be able to develop and communicate reasoned design solutions with appropriate justification

There is a marking grid for each of the five activities that make up the whole task. Examiners allocate marks to the assessment evidence provided by the learners, for each of the five activities, using a holistic 'best-fit' approach. They compare the evidence for each activity to the corresponding marking grid and the bands/descriptor bullet points within.

Please note that all of the examples of learner assessment evidence provided in this report are extracts. As a result, they can only be considered to be representative of evidence that would be awarded a mark from a certain band. In reality, all of the assessment evidence for a given activity (which is generally quite extensive) must be considered when awarding a mark for that activity.

Learners are required to submit the Part B task booklet for marking. Any extra pages of assessment evidence must be headed with the appropriate activity number and securely fastened into the correct place in the task booklet using a treasury tag. Learners should not submit any of their research notes, the Part A documentation or the Part B information booklet, as none of the aforesaid are considered when marking.

# Introduction to the Overall Performance of the Unit

Pleasingly, the majority of learners appeared to find the task accessible. The examiners were able to award a full range of marks for each of the activities and across the task as a whole.

The written content provided by learners was highly varied, but many attempted to structure their responses with sub-titles for certain activities (such as Activities 2, 4 and 5) and this should be encouraged.

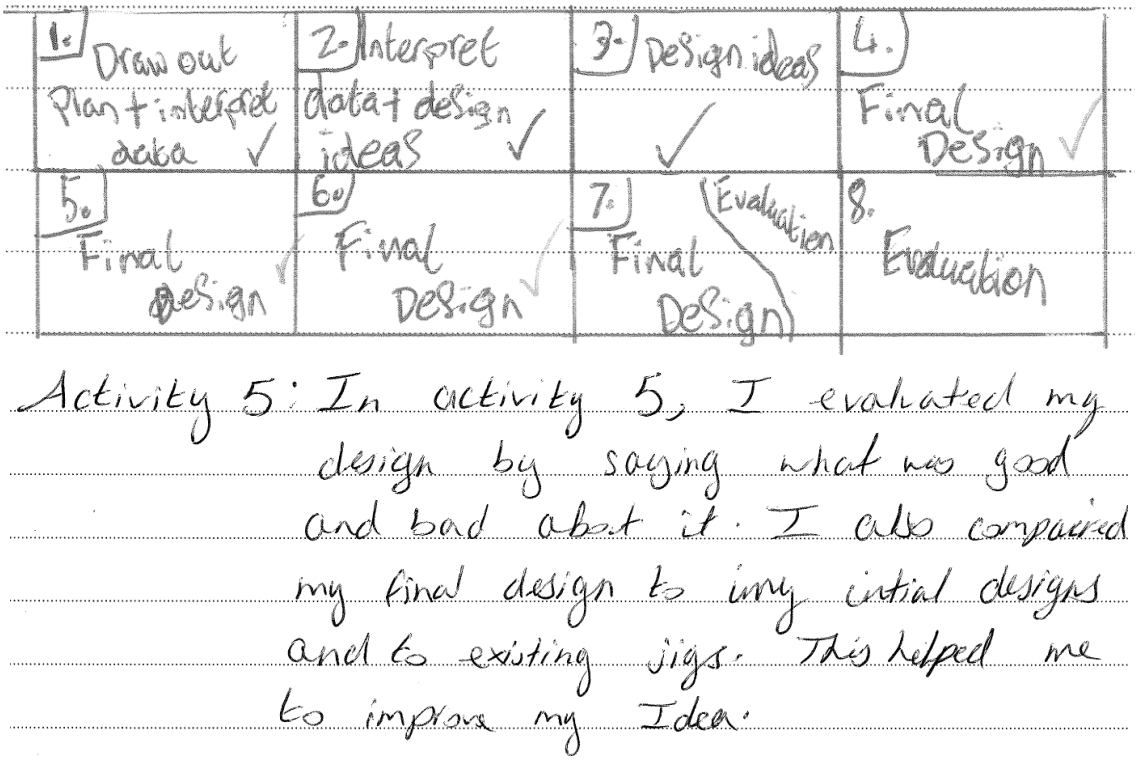
Similarly, the sketches/drawings provided by learners varied in quality; however, most were legible, drawn in three dimensions and communicated the proposals/solution to a suitable standard. In addition, most sketches were annotated with a commentary rather than labels, and again this is to be encouraged.

It was not obvious that learners had carried out appropriate research based on the Part A documentation. For example, the Part A Set Task Brief suggested that learners should research existing designs for jigs. In general, there were some comments about existing products in Activity 4, but sketches or diagrams showing how certain features had been incorporated into the learner's solution were rarely seen. In addition, it was not clear that learners had researched sustainability at all stages of the product life cycle, as many responses simply focused on recycling. Nonetheless, it was pleasing that many learners clearly did use their research when commenting on the suitability of materials and manufacturing processes in Activity 4.

In the most part, suitable responses were seen for Activities 2, 3, 4 and 5; however, many learners provided an unsuitable response for Activity 1. Learners' responses to all of the five activities that make up the whole task are considered in the next parts of this report.

# Activity 1 - Planning and design changes made during the development process

This activity is designed to test the learner's ability to forward plan and to review/justify the changes made during Activities 2 to 5, in order to fulfill the requirements of the Part B Client brief. The assessment focus is to 'Carry out an iterative development process'.
Many/most learners (including those of a higher ability) seemed to interpret this activity as simply requiring a generic plan and a retrospective diary/reflective log, which mainly resulted in marks from Band 1. For example:




To gain higher marks, learners should (please refer to the Activity 1 marking grid):

- Provide a more detailed outline time plan that refers to the product being redesigned (a jig in this case). In Extract 1, the plan is more detailed but still quite generic and therefore is still not representative of Band 3 evidence. Given that learners have a period of time to undertake research (for Part A) before they are provided with the Part B task, the initial plan should also refer to how the said research will be applied during Activities 2 to 5.

- Generate action points for the next session at the end of each session as part of Activity 1. The said action points should show forward planning that is clearly linked to the specifics of the product being redesigned, with some consideration of what happened in the previous session. Action points such as 'In the next session I will design four ideas' will not gain much credit. In Extract 2, the learner has generated a future action point for Activity 4 that relates to the Part B Client brief and their previous activities. This type of response is representative of Band 3 evidence.
- Justify the changes made throughout the development process to fulfill the requirements of the Part B Client brief. In Extract 3, the learner has provided solid reasons why an initial design was changed during Activity 3. This type of response is representative of Band 3 evidence.

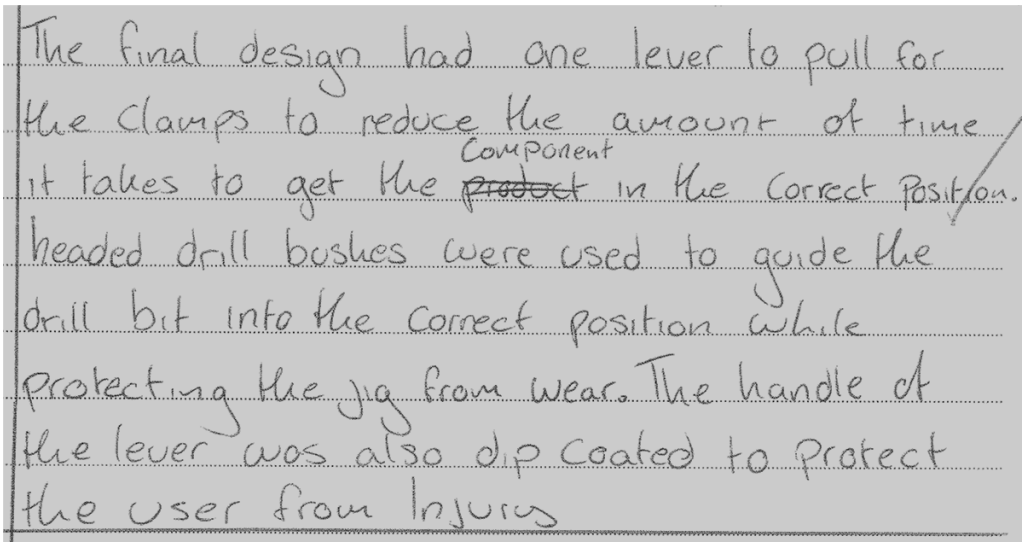
Extract 1 - An initial outline time plan

| ① 1025 - 1125 | ② 1125 - 1225 | ③ 1025 - 1125 | ④ 1125 - 1225 |
|---|---|---|---|
| • complete Time plan with timings<br>• Interprat brief and data for analysis. | • Finish data analysis.<br>• complete design Specification. | • complete first initial idea<br>• Try and complete the second initial idea | • Finish all initial ideas.<br>• Start development of one design. |
| ⑤ 1025 - 1125 | ⑥ 1125 - 1225 | ⑦ 1025 - 1125 | ⑧ 1125 - 1225 |
| • complete the first section of development. chosen idea and why. | Finish all development, including a range of drawings and information | complete the final design proposal, with relevant information. | complete the evaluation of the final design. Finish outlying work previus |

Extract 2 - An action point for an upcoming session

a) According to the brief B "the sprinkler component change in size after period of time" and analysed the data provided in the table. I have decided to reinforced the "guiding holes" with a strong materials ~~to~~ like ~~Tungsten~~ steel or High Speed Steel which is wear resistance. Unfortunatelly the bushing would add an extra cost as these materials are expensive to purchase and machie.

Extract 3 - A change made during the session


The final design had one lever to pull for the clamps to reduce the amount of time it takes to get the ~~product~~ component in the correct position. headed drill bushes were used to guide the drill bit into the correct position while protecting the jig from wear. The handle of the lever was also dip coated to protect the user from injury

The format of the evidence provided for Activity 1 varied greatly. The evidence required for Activity 1 should be provided in the following format:

- An initial outline time plan in a table
- Action points for the upcoming session
- Changes made during the session

The latter two bullet points can be repeated as many times as necessary. This type of format will allow learners to provide evidence that shows they have addressed each of the strands in the Activity 1 marking grid. As Activity 1 is worth 6 marks from 60 marks available overall, learners should provide an overall response that is succinct and pertinent.

# Activity 2 - Interpret the brief into operational requirements

The command word used in this activity is 'interpret'. Learners are required to identify clearly the key features of the Part B Client brief, and to use the aforesaid and the other information available (including the numerical data and drawings), to produce a set of suitable and cohesive operational and product requirements. In doing so, learners must also consider and make relevant comments on opportunities and constraints and key health and safety, regulatory and sustainability factors. The assessment focus is 'Interpreting brief into operational requirements'.
The vast majority of learners attempted this activity and a wide range of responses were seen, resulting in a full range of marks across Bands 1 to 3.

In this series, the following characteristics were often evident in the response from learners that gained lower marks for this activity:

- The interpretation included a lot of repetition from the Part B Client brief.
- The calculations were evident but minimal interpretation resulted from them.
- The consideration of health and safety factors was generic (not specific to the context) and referred to, for example, HASAW 74, PPE etc.

Conversely, the following characteristics were often evident in the response from learners that gained higher marks for this activity:

- The interpretation included numerous comments that extended the Part B Client brief, for example, 'it would be appropriate to use a material with a high temperature and abrasion resistance so that the jig is more durable.'
- The calculations were mainly accurate and further comments articulated how the results could be used to improve the design for the modified product, for example by noting that it would be appropriate to include coolant channels in their initial jig designs.
- Health and safety factors were commented on in context, for example 'the jig could include integral guarding to protect the operators.'

The following extracts show examples of some of the aforesaid characteristics (please refer to the Activity 2 marking grid):

- In Extract 1, the learner has interpreted the Part B Client brief and has made a comment, with some justification, about a possible opportunity/requirement that may allow the drilling process to be carried out more safely/quickly by the operators (enhanced product performance). This type of response is representative of Band 3 evidence.
- In Extract 2, the learner has used their calculations ('Table 1' - not provided here) to suggest a method/requirement that may allow the drilling process to be carried out more accurately over time by the operators (enhanced product performance). This type of response is representative of Band 3 evidence.
- In Extract 3, the learner has made comments about health and safety that have some relevance; however, the said comments are mostly generic and would apply to virtually any product. This type of response is representative of Band 1 evidence.

Extract 1

* From looking that product requirements, I can see that there is an opportunity to add a quick release mecanisum or latch to keep the sprinkler component in place. This would mean that the drilling process for each component would be ~~espe~~ decreased as less time would be spent tightening and undoing the jig. ~~There~~ Some constraints

Extract 2

• To ensure the jig doesnt fail over time, using ~~the~~ inserts where the hole will be drilled will allow the hole not be be expanded over time as we can see from table 1.

Extract 3

• The drill Jig must be made from a safe, non-toxic material that is safe to work with and use.
• The drill Jig shouldn't have ~~esd~~ any edges that could be sharp enough to cut someone's skin when using the Jig properly.

The format of the evidence provided for Activity 2 varied; nonetheless, the majority of responses that performed well on this activity:

- Extracted and then provided a list of all the issues and relevant operational requirements from the Part B Client brief
- Carried out some calculations based on the numerical data and then provided some comments/conclusions to interpret the results and suggest some product requirements

- Generated a series of comments in bullet point form under a series of sub-titles that related to product requirements, opportunities/constraints, health and safety and regulatory/sustainability factors; in addition, the said comments were mostly justified in relation to the issues and operational requirements identified from the Part B Client brief

This type of format allowed learners to provide evidence that showed they had addressed each of the strands in the Activity 2 marking grid. As Activity 2 is also worth 6 marks from 60 marks available overall, learners should again provide an overall response that is succinct and pertinent.

# Activity 3 - Produce a range of initial design ideas based on the client brief

Activity 3 requires learners to produce a range of (three or four) initial design ideas based on the Part B Client brief and their outcomes from Activity 2. The unit specification ('Key terms typically used in assessment') states that a design is 'a drawing and/or specification to communicate the form, function and/or operational workings of a product prior to it being made or maintained'. Activity 3 in the task booklet directs learners to use a combination of sketches and annotations; as a result, both must be present in order for learners to be able to achieve higher marks. The assessment focus is 'Initial design ideas'.
Again, the vast majority of learners attempted this activity and a wide range of responses were seen, resulting in a full range of marks across Bands 1 to 3.

In this series, the following characteristics were often evident in the response from learners that gained lower marks for this activity:

- The initial design ideas looked very similar to the existing jig and/or each other, with just two or three small adaptations that were minor improvements and addressed just one or two of the five bullet points at the bottom of the Part B Client brief.
- The annotation was fairly limited (but technically accurate in the main) and covered the learner's thoughts about the positives and negatives of each design idea without much reference to the five bullet points at the bottom of the Part B Client brief, for example, materials or shapes may have been a focus.

Conversely, the following characteristics were often evident in the response from learners that gained higher marks for this activity:

- The ideas were feasible/reasonably different to the existing jig and each other, when considering both form and approach, and included adaptations that were major improvements when compared to the existing jig and at least three of the five bullet points at the bottom of the Part B Client brief.
- The annotation was technically accurate and covered the learner's thoughts/rationale about each design idea with some reference to the five bullet points at the bottom of the Part B Client brief; however, some generic comments about materials, how the initial jig design ideas could be made as a one-off etc were also evident (and gained less credit).

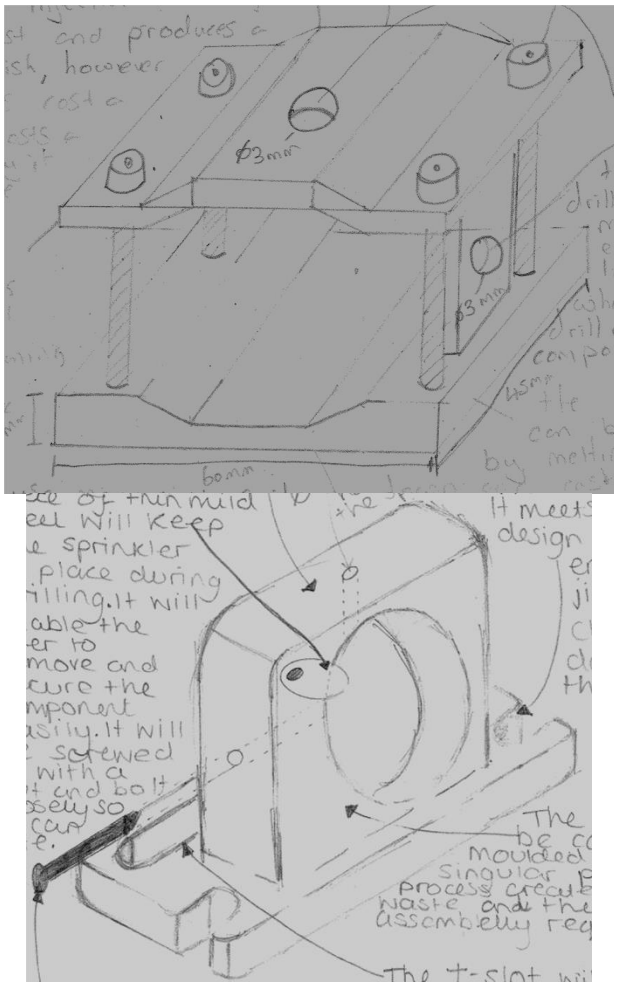
The following extracts show examples of some of the aforesaid characteristics (please refer to the Activity 3 marking grid):

In Extracts 1a and 1b, the learner has provided ideas that comprehensively address the Part B Client brief and, although they are not perfect, they both include features that are major improvements when compared to the existing jig. In addition, they are both feasible and fit for purpose, and different to the existing jig, when considering both form and approach. These types of response are representative of Band 3 evidence.

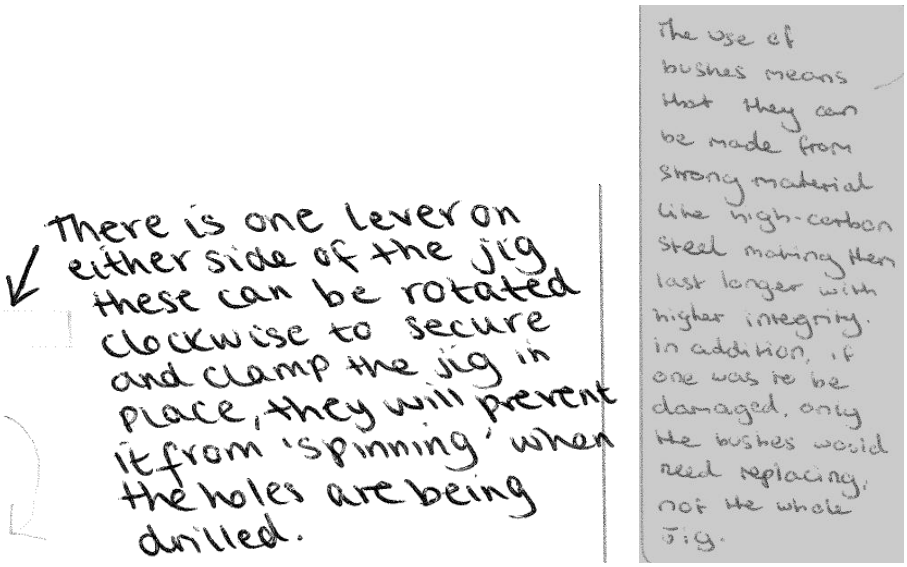
In Extracts 2a and 2b, the learner has used written text/some technical terms to communicate further detail and to explain a design idea with some reference to the five bullet points at the bottom of the Part B Client brief. These types of response are representative of Band 3 evidence.

In Extract 3, the learner has provided an idea that is similar to the existing jig; in addition, the written comments don't provide any contextual thoughts or a rationale when considering the five bullet points at the bottom of the Part B Client brief. This type of response is representative of Band 1 evidence.

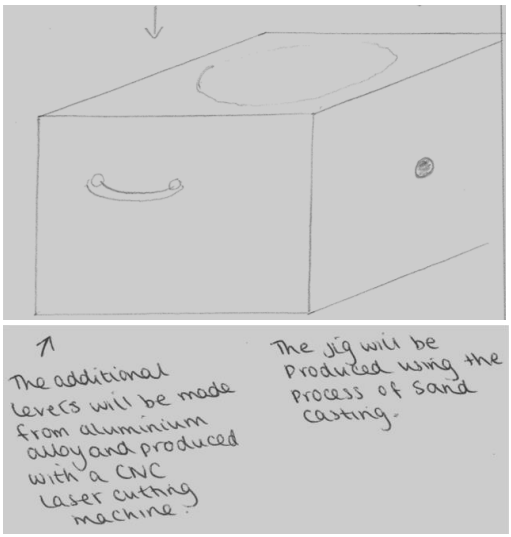
Extracts 1a and 1b




Extract 2a and 2b



Extract 3




The format of the evidence provided for Activity 3 was very similar in the most part, irrespective of the marks gained. Most learners provided:

- Sketches of ideas in isometric with some further drawn views, possibly as an explosion and/or as a side, front or plan elevation according to what the learner was trying to communicate
- Annotations (not labels) that explained the ideas, with those who gained higher marks providing comments that referenced the five bullet points at the bottom of the Part B Client brief

This type of format allowed learners to provide evidence that showed they had addressed each of the strands in the Activity 3 marking grid. As Activity 3 is worth 9 marks from 60 marks available overall, learners should provide an overall response that includes some detail.

# Activity 4 - Develop a modified product proposal with relevant design documentation

Activity 4 requires learners to develop a modified product proposal based on the Part B Client brief and their outcomes from Activities 2 and 3. There is guidance as to what is required for a fully developed proposal in the task booklet ['The proposal must include: a solution (including a final drawing), existing products, materials, manufacturing processes, sustainability, safety and other relevant factors'], and each of these should be addressed in the response in order to gain higher marks. The assessment focus is 'Develop a modified product proposal (form, materials and/or manufacturing processes)' and the subtask is 'Solution'.
Learners should include a range of relevant design documentation to support their proposal. The said documentation is exemplified in section C2 of the Unit 3 specification. As with Activity 3, learners should use appropriate sketching and graphical techniques, along with technically accurate written content, to articulate fully their modified product proposal. The assessment focus is 'Develop a modified product proposal (form, materials and/or manufacturing processes)' and the subtask is 'Design Documentation'.
Again, the vast majority of learners attempted this activity and a wide range of responses were seen, resulting in a full range of marks across Bands 1 to 4.

In this series, the following characteristics were often evident in the response from learners that gained lower marks for this activity:

- The solution chosen: a) was a fairly minor improvement on the existing jig; b) showed some variation in form (rather than approach) when compared to the existing jig and took into account, for example improved clamping (a relatively straightforward improvement); and c) was safer for the operators to use/interact with than the existing jig.
- The annotation/notes/text: a) simply referred to existing products, without providing any comments on how they were used when redesigning the jig; b) considered just one material (such as tool steel), but it was suitable and sensible reasons for its use were stated; c) considered just one or two manufacturing processes, but they were suitable and sensible reasons for their use were stated; and d) did not consider sustainability in an explicit fashion.

- Technical terminology was reasonably accurate throughout and the drawings/annotation/written text/notes would have allowed a competent third party to understand the solution, due to an appropriate level of communication in the aforesaid; for example, sub-titles were evident and the drawings were straightforward to comprehend.

Conversely, the following characteristics were often evident in the response from learners that gained higher marks for this activity:

- The solution chosen: a) was a clear improvement on the existing jig; b) showed a clear variation in form/approach when compared to the existing jig, for example it took into account, in an explicit fashion, that the second hole must be drilled accurately at 90 degrees on each sprinkler component (a relatively difficult improvement); and c) was much more safe for the operators to use/interact with than the existing jig.
- The annotation/notes/text: a) referred to existing products from research and it was evident how the features of a different existing jig were used in the chosen solution; b) considered different/appropriate materials and gave suitable reasons for their selection; c) considered different/appropriate manufacturing processes and gave suitable reasons for their selection; and d) referred to sustainability (but this may have been a weaker aspect of the response). There should be consideration of, for example, raw materials extraction, material production, production of parts, assembly, use and disposal /recycling in the context of the chosen solution.
- Accurate technical terminology was used throughout and the drawings/annotation/written text/notes would have allowed a competent third party to attempt to manufacture the solution, due to the aforesaid being 'effective'; for example, a reasonably accurate orthographic projection was evident.

The following extracts show examples of some of the aforesaid characteristics (please refer to the Activity 4 marking grid):

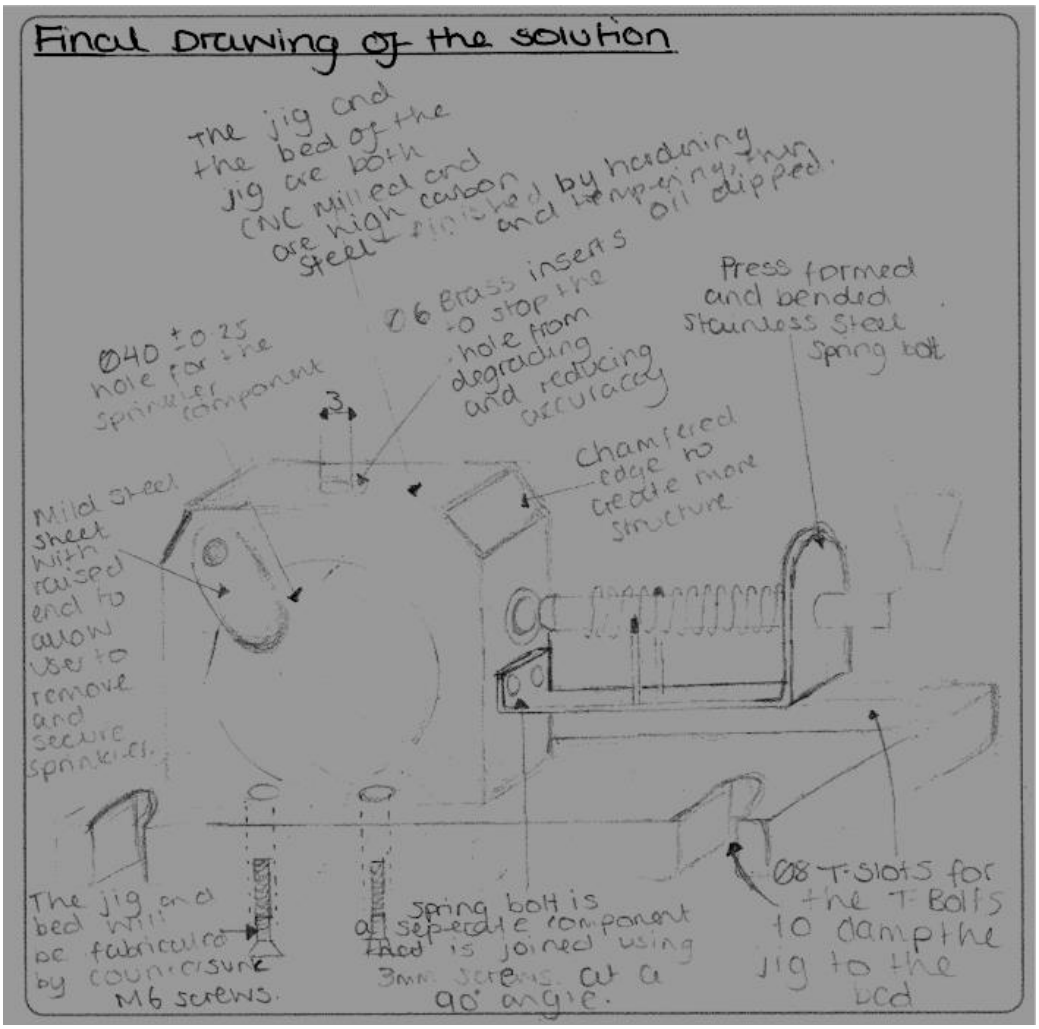
In Extract 1, the learner has provided an optimised solution with some annotated comments that justify the variation in form and approach from the existing jig. The idea has clearly 'designed out' most of the existing safety risks. This type of response is representative of Band 4 evidence.

In Extract 2, the learner has referred to existing products from their research and has commented on how they used some of the features from the aforementioned in their solution; however, the said features are fairly obvious ones, and therefore this type of response is representative of Band 3 evidence.

In Extract 3, the learner has considered suitable manufacturing processes for their solution and has justified the reason for choosing machining; however, the comments are somewhat generic in places and lack specific technical details about, for example, which machining process would be used for each feature of the solution and why etc. As a result, this type of response is representative of Band 3 evidence.

In Extracts 4a and 4b, the learner has provided effective drawings that, along with further annotation/written text/notes would allow a competent third party to attempt to manufacture the solution. This type of response is representative of Band 4 evidence.

Extract 1


Final Drawing of the solution
The jig and the bed of the jig are both CNC milled and are high carbon steel finished by hardning and tempering then oil dipped.
Ø40 ±0.25 hole for the sprinkler component
Ø6 Brass inserts to stop the hole from degrading and reducing accuracy
Press formed and bended Stainless Steel Spring bolt
3
Chamfered edge to create more structure
Mild Steel sheet with raised end to allow user to remove and secure sprinkler.
The jig and bed will be fabricated by countersunk M6 screws.
Spring bolt is a seperate component that is joined using 3mm screws. Cut a 90° angle.
Ø8 T-slots for the T-Bolts to clamp the jig to the bed

Extract 2

## Existing Products.

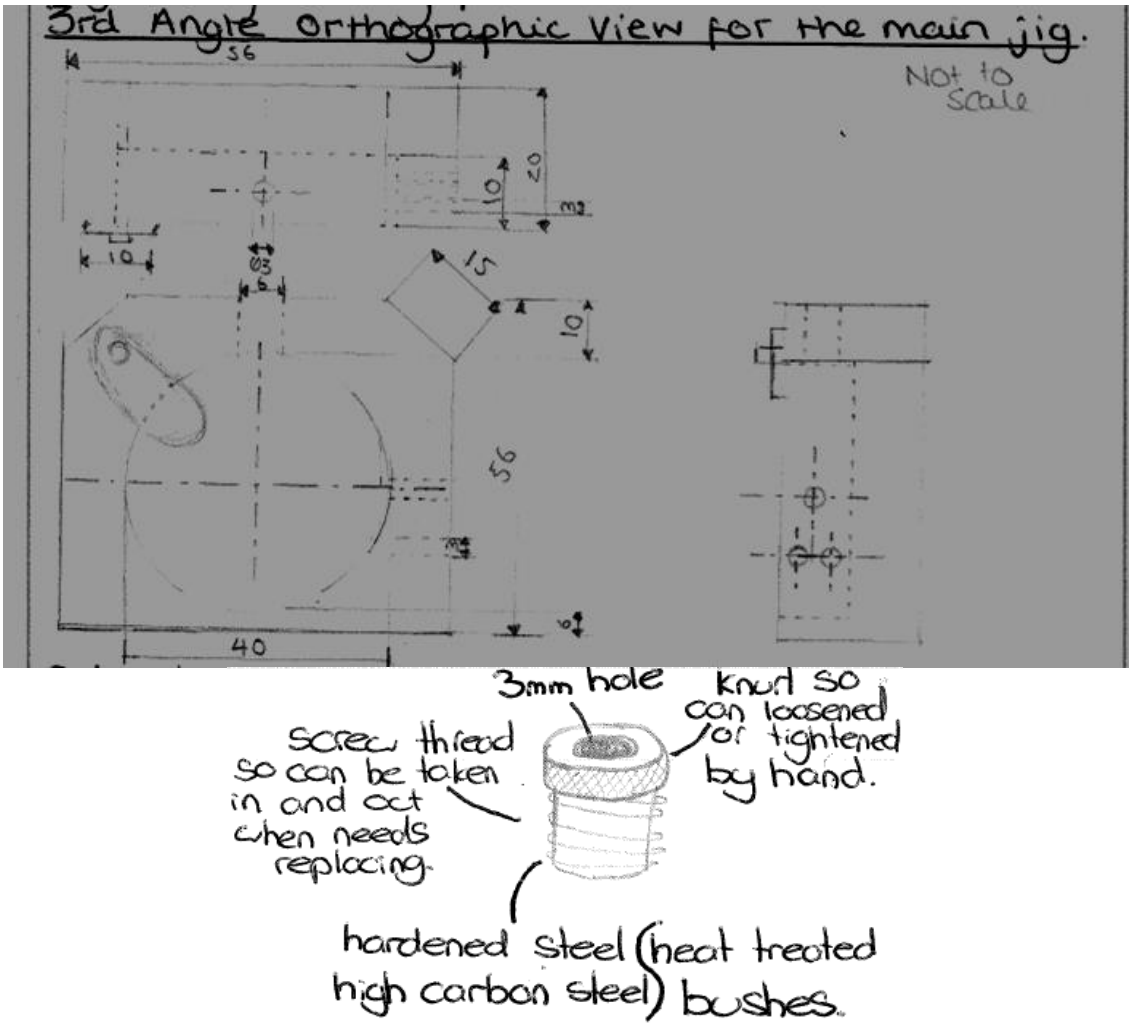
I have looked at existing products and used some features of them in my designs to improve them and make them function better. This final design of the product proposal uses slightly modified examples of a few of the existing products. I noticed that most of them used bushes/guides for where the hole was being drilled to stop the other material wearing out. Some of the more enclosed jigs had a hole in the back corner to allow waste material such as swarf to be cleaned out much easier. They are also mostly made from mild steel or aluminium alloy.

Extract 3

## Manufacturing Processes

To manufacture this design I have chosen to use machining as it is the most accurate way to make the jig with the exact measurements within the tolerance. Casting was not considered because of the complicated design that has moving parts that need to be made very accurately to function. Using a fabrication was also considered but the pieces would still need to be machined into the correct measurements and then also fabricated together. Fabrication such as brazing or welding could loose accuracy as well as increase the production time for manufacturing the jigs. Machining was the best option for manufacturing this product as it is the most precise way to garentee that the jig is the exact measurements within the tolerance. It is

Extract 4a and 4b




The format of the evidence provided for Activity 4 varied; nonetheless, the majority of responses that performed well on this activity:

- Provided a final design drawing of an optimised solution in isometric and via an orthographic projection
- Generated further drawings and detailed technical annotation (of all the drawings) as appropriate to ensure the solution was communicated effectively and would allow a competent third party to interpret how to manufacture it
- Produced a series of relevant technical comments (with justification) under a series of sub-titles that related to their consideration/use of existing products, materials selection for different parts of the solution, manufacturing process selection for different parts of the solution and sustainability at all stages of the product life cycle

This type of format allowed learners to provide evidence that showed they had addressed each of the strands in the Activity 4 marking grid (both parts).

As Activity 4 is worth 30 marks from 60 marks available overall, learners should spend more time on this activity than any of the others and must ensure that they address all of the bullet points stated in the task booklet in their response.

# Activity 5 - Evaluate the design proposal

Activity 5 requires learners to evaluate their design proposal. Learners should reflect on their own solution (from Activity 4) in relation to the Part B Client brief and the original design (in this case, a jig) and provide a rationale for why their solution is more effective. The evaluation needs to consider several factors: the success and limitations of the solution; the indirect benefits and opportunities of the solution; and any constraints related to the solution. The evaluation should also reflect on how technology-led modifications could optimise the solution suggested. The assessment focus is 'Validating the design proposal'.
Again, the vast majority of learners attempted this activity and a wide range of responses were seen, resulting in a full range of marks across Bands 1 to 3.

In this series, the following characteristics were often evident in the response from learners that gained lower marks for this activity:

- The rationale gave some appropriate reasons as to why the solution was considered more effective than the existing jig, but it was self-congratulatory in places and only referenced the five bullet points at the bottom of the Part B Client brief in an implicit fashion.
- The appraisal focused on, in an explicit fashion, why the design solution was a success and referred to some simplistic considerations, such as price. Opportunities/limitations/constraints/indirect benefits were not considered in detail, but some salient points were evident.
- Comments on some further technology-led modifications were evident but very generic, for example, they referred to the use of additive manufacturing without stating why the use of the technology would be appropriate when manufacturing the solution for a new jig.

Conversely, the following characteristics were often evident in the response from learners that gained higher marks for this activity:

- The rationale gave good reasons as to why the solution was effective and referenced some of the five bullet points at the bottom of the Part B Client brief.
- The appraisal focused on, in an explicit fashion, the opportunities, limitations and constraints of the design solution, for example 'the speed of operation would be affected by the clamping method, which would take time, and there may be an opportunity for an automatic rotation of the component through 90 degrees'.

- Contextualised comments on some further technology-led modifications were evident and referred to, for example, using electromagnets to clamp the sprinkler component into place.

The following extracts show examples of some of the aforesaid characteristics (please refer to the Activity 5 marking grid):

In Extract 1, the learner has given an appraisal of the limitations of their solution. The appraisal is particular to the solution itself and considers specific issues associated with both efficiency and safety (and therefore references the Part B Client brief). This type of response is representative of Band 3 evidence.

In Extract 2, the learner has provided an appraisal of the indirect benefits/opportunities that may result from their solution. The appraisal is particular to the solution itself and considers specific factors such as using the jig for other products or clamping in a different manner if needs be. This type of response is representative of Band 3 evidence.

In Extract 3, the learner has provided comments that refer to automated machinery when considering the opportunity for technology-led modifications; however, the said comments are mostly generic, lack technical information and would apply to virtually any process. This type of response is representative of Band 1 evidence.

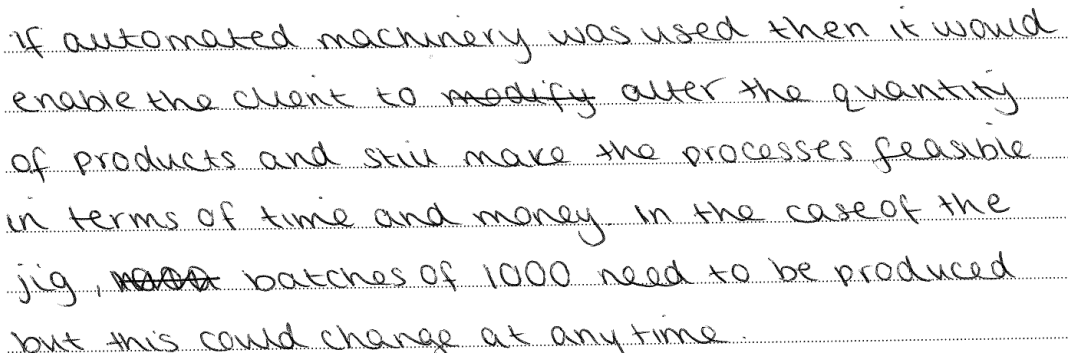
Extract 1

- A limitation of the solution would be the limitation of use. Commonly, on a pillar drill the handle to feed the chuck and toolpiece are on the right hand side, the problem that may occur with my final design is that the spring bolt is also on the right hand side which may limit efficientcy when pulling or releasing the spring bolt as it may get in the way of the pillar drills handle.
- Another limitation is that the t-slots as part of the in house clamping system can be improved. For the t-slot at the back, it may be difficult for the user to reach round the back if the jig or spring bolt is in the way.

Extract 2

The proposed design solution comes with a couple of indirect benefits/ opportunities. With the use of bushes in the drill jig, this gives the opportunity for other sized holes to be drilled. The previous drill jig restricted the operator to only Ø 3mm holes, however, if a larger or smaller hole was needed, the new jig gives them the option to change bushes and drill a different size hole. The proposed design solution also comes with two larger areas for the toggle clamps, however these areas could be used for other pieces of equipment. The extra room gives the operator the opportunity to attach different types of clamps or measuring devices onto the drill jig.

Extract 3




The format of the evidence provided for Activity 5 varied; nonetheless, the majority of responses that performed well on this activity provided a series of relevant comments (with justification) under a series of sub-titles that related to:

- The success and limitations of their solution (with reference to the Part B Client brief and/or the issues and operational requirements highlighted in Activity 2)
- The indirect benefits and opportunities resulting from their solution
- The constraints of their solution
- Further technology-led modifications

This type of format allowed learners to provide evidence that showed they had addressed each of the strands in the Activity 5 marking grid. As Activity 5 is worth 9 marks from 60 marks available overall, learners should provide an overall response that includes some detail.

# Summary

Based on the outcomes and performance of learners for this task, learners in subsequent series should:

Activity 1

- Link forward planning to the specifics of the product being redesigned, based on a consideration of what has happened in previous sessions.
- Provide explanations/justifications for the specific changes made during each session in order to fulfill the requirements of the Part B Client brief.

Activity 2

- Use their conclusions from the interpretation of numerical data to suggest some justifiable product requirements.
- Generate a series of relevant, contextualised comments in bullet point form under a series of sub-titles related to product requirements, opportunities/constraints, health and safety and regulatory/sustainability factors, and ensure they are justified in relation to the issues and operational requirements identified from the Part B Client brief.

Activity 3

- Sketch fit for purpose proposals in isometric that address all of the aspects in the Part B Client brief and provide further drawings/views dependent upon the idea being communicated.
- Use annotations (not labels) to explain the ideas, and refer to the five bullet points at the bottom of the Part B Client brief.

Activity 4

- Generate drawings and detailed technical annotation as appropriate to ensure the most suitable solution is communicated effectively and would allow a competent third party to interpret how to manufacture it.
- Produce a series of relevant, contextualised technical comments (with justification) under a series of sub-titles that relate to the consideration/use of existing products, materials selection for different parts of the solution, manufacturing process selection for different parts of the solution and sustainability at all stages of the product life cycle.

Activity 5

- Provide a series of relevant, contextualised comments (with justification) under a series of sub-titles related to the success and limitations of their solution (with reference to the Part B Client brief and/or the issues and operational requirements highlighted in Activity 2), the indirect benefits and opportunities resulting from their solution, the constraints of their solution and possible technology-led modifications.

The specifications for the 2016 Level 3 BTEC Nationals in Engineering are available from:

http://qualifications.pearson.com/en/qualifications/btec-nationals/engineering-2016.html

The Sample Assessment Materials (SAMs) for Unit 3 are available from:

http://qualifications.pearson.com/en/qualifications/btec-nationals/engineering-2016.coursematerials.html#filterQuery=Pearson-UK:Category%2FSpecification-and-sample-assessments

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