

CAMBRIDGE NATIONALS

Moderators' report



ENGINEERING MANUFACTURE


J832, J842

R110, R111, R112 Summer 2019 series

Version 1

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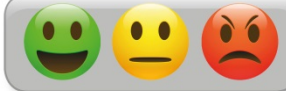


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Introduction

Our Moderators' reports are produced to offer constructive feedback on centres' assessment of moderated work, based on what has been observed by our moderation team. These reports include a general commentary of accuracy of internal assessment judgements; identify good practice in relation to evidence collation and presentation and comments on the quality of centre assessment decisions against individual Learning Objectives. This report also highlights areas where requirements have been misinterpreted and provides guidance to centre assessors on requirements for accessing higher mark bands. Where appropriate, the report will also signpost to other sources of information that centre assessors will find helpful.

OCR completes moderation of centre-assessed work in order to quality assure the internal assessment judgements made by assessors within a centre. Where OCR cannot confirm the centre's marks, we may adjust them in order to align them to the national standard. Any adjustments to centre marks are detailed on the Moderation Adjustments report, which can be downloaded from Interchange when results are issued. Centres should also refer to their individual centre report provided after moderation has been completed. In combination, these centre-specific documents and this overall report should help to support centres' internal assessment and moderation practice for future series.

General overview

It is important for moderators to receive candidate work from centres by the deadline date. Delayed submission of samples slows down the moderation process, and the resolution of issues should they arise during moderation.

Centres should check carefully what sample work is being requested for moderation and make sure that the correct sample of candidates is sent to the moderator.

A completed Unit Recording Sheet (URS) is required for each candidate in the requested sample. Without a correctly completed URS for each candidate moderation cannot take place and will be delayed.

Please make sure that all candidates are correctly identified on their paperwork with the correct candidate number. This includes in the naming of electronic files.

Clerical errors

Please check carefully the addition of marks on the URS and their transcription to Interchange. If they are incorrectly totalled or transcribed, we will need to reconfirm them with centres at moderation. This introduces delay to the moderation process.

A copy of the IMS1 mark sheet generated by Interchange should be sent along with the sample to your moderator so they can check the sample received is correct.

Marker comments on the URS

Marker commentary on the URS, along with clear indication of how the mark given is derived, helps greatly with the moderation process. Page numbers of where evidence can be found in the candidate evidence is also extremely useful. Candidate work can also be directly annotated showing where each LO and mark band is being addressed.

Centres are reminded that work cannot be double-counted, and if used as evidence for one Learning Outcome (LO), it should not be used for others. This is also the case for work that overlaps with more than one LO or Unit within the qualification. Work that is double-counted might be discounted if found during moderation, thereby disadvantaging the candidate.

Internal standardisation

If more than one internal marker is marking a cohort of work, it is crucial to standardise marking across markers. Internal standardisation ensures that the marks presented are accurate and consistent, and that the rank order of marks is maintained. If there was only one marker, it is still sensible to have another qualified member of staff within the centre to look over the marking. Rank order errors are referred back to the centre by the moderator and often require the centre to remark work, thereby delaying the moderation process.

Photographic evidence should be annotated by the candidate to explain what is being presented. It should also clearly identify the candidate using their candidate number.

Authentication

It is essential that candidate work is authentic. This means that it is individually undertaken by that candidate, and that sources of information are referenced. This is not only good practice but avoids the risk of penalties being applied. Moderators check for authenticity during moderation, referring any suspected cases to OCR for further investigation. This will delay moderation and may have serious consequences for the centre and candidate.

Centres are encouraged to use the witness statements included with the Live Assessments to support and corroborated candidate-generated evidence. They can also be used to support any other LOs as appropriate, and centres are permitted to modify them to suit their own needs.

Witness statements

Witness statements are used to support and corroborate evidence produced by candidates and are useful where this evidence is difficult to show directly. Examples include working independently, working safely and producing high quality finished items. They cannot be used as a direct source of evidence when the candidate is able to produce evidence themselves. Through moderation marks will be altered to take account of witness statements that are not used appropriately, where there is no candidate evidence to support the related internal marks.

Full guidance on how to use witness statements correctly can be found in Appendix A of the Specification Handbook, with further guidance on the OCR website.

Unit R110 General overview

In this unit it was evident that candidates were able to plan for manufacturing of a pre-production product using hand and manual machining processes. Their evidence was sometimes let down by lack of step-by-step evidence of each stage of the manufacturing process. There were also some shortcomings in modifying the plan for scale production.



Comments by Learning Outcome

LO1 – Be able to plan for the making of a pre-production product

For LO1a candidates need to show clear evidence of interpreting both 2D and 3D drawings in preparation to produce a plan. More successful candidates took the supplied 2D and 3D drawings and annotated these to show dimensions and key features. In a few cases only several dimensions were identified. This LO specifically requires candidates to demonstrate they understand drawing conventions – so being able to identify additional information on the drawing is essential (e.g. tolerances, surface finish, details such as hidden features, information shown in the drawing title block, etc.)

It is not required in this LO for candidates to produce any drawings themselves – rather interpret ones supplied by the centre.

LO1b requires candidates to produce a production plan. Various styles of plan were presented including tables and flow charts. The more successful plans tended to be those that were tabulated, and which included: sequence number, description of operation, tools and materials required, health and safety considerations, timings and QC checks. Plans need to include sufficient step-by-step detail.

	AfL	2D and 3D drawings: Refer to the Marking Criteria for this LO. Interpretation of both 2D and 3D drawings is required to satisfy this fully.
	AfL	Planning: Candidates could be provided with a blank planning template or table with suggested headings for them to complete. This is an acceptable method that does not constitute a writing frame.

LO2 – Be able to use processes, tools and equipment safely to make a pre-production product

LO2a requires candidates to clearly demonstrate the safe use of hand tools and manual machines to produce their pre-production product. They should demonstrate that they are following their plan. Note that the intention of this LO is to use hand tools and machines and not to use CNC machines or rapid prototyping.


Please note from the Assessment Guidance in Appendix B of the Specification Handbook that a minimum of three different processes must be demonstrated.

Health and safety can be addressed using simple risk assessments. Step-by-step evidence could be presented using annotated photographs showing hand tools being used, and machines being set up and operated correctly. Please note correct use of the witness statement.

For LO2a candidates are required to review the quality of their finished product using quality control techniques. Again, step-by-step photographic evidence is an effective way to show this. Measurement readings should be clearly identifiable, and compared with those expected from the drawing. A good way

to present these is as a table of actual and expected values. The final part of this LO is to provide a review commentary on the quality of the finished pre-production product. This final review was often omitted.

Please remember that candidates need to clearly demonstrate how they have drawn on skills, knowledge and understanding from other units in the specification for this LO.


	OCR support	<p>Witness statements:</p> <p>Full guidance on how to use witness statements can be found in Appendix A of the Specification Handbook.</p> <p>It is important to remember that they cannot be used as a substitute for direct evidence that the candidate can produce. They should only be used to support and corroborate things like independent and safe working, or the quality of a finished product.</p>
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LO3 – Be able to modify a production plan for different scales of production

The final LO in this unit was perhaps the weakest, and open to misinterpretation. For this LO candidates are required to return to their original plan and to make modification suitable for scale production.

There was evidence of quite generic responses to the LO, with descriptions of different scales of production (one-off, batch and mass) without direct modification to the original plan.

Examples of modifications that could be made to the plan include: batching operations, running operations in parallel, using standard size stock material, using standard components, using jigs and fixtures, using different QC techniques (e.g. gauges, sampling). Specifying that the component could be made using a CNC machine was not a satisfactory response.

	Misconception	<p>Candidates should return to their original plan and provide modifications suitable for scale production. There is no need to provide generic descriptions of different scales of production. It is not the intention of this LO for candidates to specify the use of CNC machines.</p>
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Unit R111 General overview

Whilst candidates made a very good attempt at this unit, their presentations were sometimes let down by lack of step-by-step evidence of setting up and operating the CNC machine being used. Exploration of the applications of computer-controlled processes was often quite detailed. There was however some misconception of relating specific processes to the scale of production for which they are most suitable.

Comments by LO

LO1 – Be able to plan the production of components on Computer Numerical Control (CNC) machines

Like Unit R110, candidates are required to produce a plan for manufacturing components using a CNC machine. Again, a range of styles of plan were presented including traditional tables, and flow charts. The more successful and easier to follow plans tended to be tabulated with headings: sequence number, description of operation, tools and materials required, health and safety considerations, timings and QC checks. Plans do need to include sufficient step-by-step detail.

	AfL	<p>Planning:</p> <p>Candidates could be provided with a blank planning template or table with suggested headings for them to complete. This is an acceptable method that does not constitute a writing frame.</p>
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LO2 – Be able to interpret information from Computer Aided Design (CAD) to manufacture components on CNC equipment

It is not strictly required, for this LO, for candidates to produce a program for a CNC machine; they can interpret one supplied by the centre.


If candidates do produce their own program (or more often graphical programming with simulation) then step-by-step detail of how the program is produced and modified is required. This can be done using annotated screen shots. They also need to consider all other factors of how their program will command the machine (e.g. tool selection, tool offsets, spindle speed, use of coolant, etc.).

Please remember that candidates need to clearly demonstrate how they have drawn on skills, knowledge and understanding from other units in the specification for this LO.

LO3 – Be able to set up and use CNC equipment to manufacture components

For LO3a and b candidates need to demonstrate that they can safely set up and operate the CNC machine. An effective way to address health and safety is with risk assessments. Step-by-step annotated photographs showing set up and operation of the machine are an effective way of providing evidence for this LO. Please note the correct use of the witness statement.

LO3c requires candidates to provide a comparison between manual and CNC manufactured components. Candidates could use the components made in R110 and R111 as the basis for their comparison, including the points identified in the Unit Specification (visual, dimensional, cycle time, consistency). This comparison was often not convincingly presented.


	OCR support	<p>Witness statements:</p> <p>Full guidance on how to use witness statements can be found in Appendix A of the Specification Handbook.</p> <p>It is important to remember that they cannot be used as a substitute for direct evidence that the candidate can produce. They should only be used to support and corroborate things like independent and safe working, or the quality of a finished product.</p>
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LO4 – Know about applications of computer control processes used to manufacture products

The final LO in this unit was often well attempted, with candidates demonstrating excellent research skills to investigate a range of different computer-controlled processes.

Please refer to the Unit Specification for examples.

One slight misconception for this LO is that the computer-controlled processes need relating to the scale of production for which they are most suitable. Often candidates provided generic descriptions of different scales of production without relating these to a process. Examples include rapid prototyping for one-off production, CNC machines for batch production, and robotics for mass production.

	AfL	<p>Referencing:</p> <p>This LO provides excellent opportunity for candidates to reference the information they have found whilst researching.</p> <p>Referencing is important to avoid potential plagiarism, and further guidance on referencing is available on the OCR website.</p>
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Unit R112 General overview

Most candidates were able to respond fully to all the requirements of this unit, especially the descriptive parts. Where more detail is sometimes required is for the practical part of LO2 where clear step-by-step evidence of quality control being performed and evaluated is required.


Comments by LO

LO1 – Understand the importance of quality control

LO1 was often well attempted with candidates clearly being able to describe reasons for implementing quality control in production, along with quality procedures used.

Please refer to the Unit Specification for details of reasons and procedures.

There was some good evidence of candidates being taken on industrial visits to see quality control in action.

	AfL	<p>Referencing:</p> <p>This LO provides excellent opportunity for candidates to reference the information they have found whilst researching.</p> <p>Referencing is important to avoid potential plagiarism, and further guidance on referencing is available on the OCR website.</p>
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LO2 – Be able to assess product quality from inspection and quality control techniques

The first part of this LO requires candidates to describe quality control techniques and inspection checks used in stages of production. Candidates often missed this part of the LO before moving straight onto performing practical checks on components. Please refer to the Unit Specification for details of key points that candidate should cover in this first part.

When candidates are performing practical quality control checks they should show clear step-by-step evidence of this being done. An effective way to do this is with annotated photographs. Health and safety should also be considered (e.g. using a risk assessment). A more convincing response requires candidates to use several QC techniques (e.g. visual inspection, rule, Vernier caliper, micrometre, gap gauge, etc.). Results should be clearly presented (e.g. tabulated) and be accompanied by an evaluation. Often candidates omit the evaluation part of this activity.

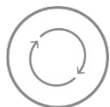
It should be noted that candidates need to show clear evidence of them undertaking practical work, and that a witness statement cannot be used as a substitute for this.

Please remember that candidates need to clearly demonstrate how they have drawn on skills, knowledge and understanding from other units in the specification for this LO.

	OCR support	<p>Witness statements:</p> <p>Full guidance on how to use witness statements can be found in Appendix A of the Specification Handbook.</p> <p>It is important to remember that they cannot be used as a substitute for direct evidence that the candidate can produce. They should only be used to support and corroborate things like independent and safe working, or the quality of a finished product.</p>
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LO3 – Know how modern technologies can be used in quality control

LO3 requires descriptions of the application of modern technologies used in quality control. Whilst there was some good evidence of this, some candidates misinterpreted this and provided a description of the application of modern technologies in manufacturing rather than their application in quality control. Suitable examples are highlighted in the Unit Specification and include computer visual inspection, co-ordinate measurement and automated test equipment (ATE), etc. Further techniques include advanced NDT methods such as ultrasonic testing and X-Ray crack detection.

	<p>AfL</p>	<p>Referencing:</p> <p>This LO provides excellent opportunity for candidates to reference the information they have found whilst researching.</p> <p>Referencing is important to avoid potential plagiarism, and further guidance on referencing is available on the OCR website.</p>
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LO4 – Know the principles of lean manufacturing

For LO4 candidates are required to provide a description of the categories of waste and methods used to reduce waste in lean manufacturing. Most candidates could identify each area of TIMWOOD and explore them in detail, and understood the principles of lean manufacturing. Some were able to extend this by exploring methods for waste reduction i.e. Design for Manufacturing Assembly (DFMA) and sustainable design, which secures access to the higher mark bands.

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