Level 2 - Unit 2 - Product Manufacture (5 credits)

Overview

Product Manufacture at Level 2 requires the candidate to fully understand how their product fits into the overall process of manufacture and describe how it will be affected by different aspects of the process it will undertake in production. They will appreciate what the best tools are for each stage and be skilled in their use and deployment. They will display a competent level of precision and finishing skills throughout. Finally, they will present their work and their findings from the process in a semi-professional manner and act on any feedback received.

A work activity will typically be 'straightforward or routine' because:

The task or context will be familiar and involve few variable aspects. The techniques used will be familiar or commonly undertaken.

Example of context – Candidates will demonstrate a range of skills and practices in their product development.

Assessor's guide to interpreting the criteria

General Information

RQF general description for Level 2 qualifications

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- Achievement at RQF Level 2 (EQF Level 3) reflects the ability to select and use relevant knowledge, ideas, skills and procedures to complete well-defined tasks and address straightforward problems. It includes taking responsibility for completing tasks and procedures and exercising autonomy and judgement subject to overall direction or guidance.
- Use understanding of facts, procedures and ideas to complete well-defined tasks and address straightforward problems. Interpret relevant information and ideas. Be aware of the types of information that are relevant to the area of study or work.
- Complete well-defined generally routine tasks and address straight-forward problems. Select and use relevant skills and procedures. Identify, gather and use relevant information to inform actions. Identify how effective actions have been.
- Take responsibility for completing tasks and procedures.
- Exercise autonomy and judgement subject to overall direction or guidance.

Requirements

- Standards must be confirmed by a trained Level 2 Assessor or higher
- Assessors must at a minimum record assessment judgements as entries in the online mark book on the INGOTs.org certification site.
- Routine evidence of work used for judging assessment outcomes in the candidates' records of their day to day work will be available from their e-portfolios and online work. Assessors should ensure that relevant web pages are available to their Account Manager on request by supply of the URL.
- When the candidate provides evidence of matching all the criteria to the specification, subject to the guidance below, the assessor can request the award using the link on the

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certification site. The Account Manager will request a random sample of evidence from candidates' work that verifies the assessor's judgement.
- When the Account Manager is satisfied that the evidence is sufficient to safely make an award, the candidate's success will be confirmed and the unit certificate will be printable from the web site.
- Each unit at Level 2 has recommended 40 guided learning hours based on time required to complete by an average learner.

Assessment Method

Assessors can score each of the criteria N, L, S or H. N indicates no evidence and it is the default setting. L indicates some capability but some help still required to meet the standard. S indicates that the candidate can match the criterion to its required specification in keeping with the overall level descriptor. H indicates performance that goes beyond the expected in at least some aspects. Candidates are required to achieve at least S on all the criteria to achieve the full unit award. Once the candidate has satisfied all the criteria by demonstrating practical competence in realistic contexts they achieve the unit certificate.

Expansion of the assessment criteria

1. Relate a product design to its manufacture.

1.1 I can check quality in a design in preparation for manufacture.

Candidates should check their design for possible quality issues prior to manufacture.

Evidence: Documentation in portfolios, assessor observations.

Additional information and guidance

The candidate should be able to check the design systematically for any quality issues that will affect the manufacture. This could be related to precision, choice of materials, suitability for files used to automate manufacture, finish or any other attributes that need transfer from the design to manufacture.

1.2 I can work with scales and dimensions when associating plans with manufacture.

Candidates should be able to work with scales and dimensions in translating plans to the manufacture of the product.

Evidence: Documentation in portfolios, assessor observations.

Additional information and guidance

The candidate should be able to work with scales and dimensions taken from their plans. Precision should be appropriate to the manufacture of the product. For Level 2 candidates the mathematical demand in terms of shape, space and measure should be broadly in line with Level 2 expectations in mathematics. Reference the NC in mathematics and typical questions in GCSE and functional skills at Level 2.

1.3 I can prepare and document files to support the process of moving from design to manufacture.

Candidates should prepare any information needed for supporting the manufacturing process and organise them appropriately.

Evidence: Documentation in portfolios, assessor observations.

Additional information and guidance

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The candidate should be able to document the process of translating designs to products so that other people can follow the process. At Level 2 the candidate should be largely self-sufficient illustrating the process by photographs, text and diagrams.

1.4 I can make adjustments to a design as a result of feedback from the manufacturing process.

Candidates should make adjustments according to needs.

Evidence: Documentation in portfolios, assessor observations.

Additional information and guidance

The candidate should actively look for opportunities for improvement based on the evidence they have gleaned from implementing the design. Finding out what works and what doesn't should be used usefully to inform the current and future design projects.

2. Use tools and information to support the manufacturing process.

2.1 I can select the tools needed for manufacture.

The candidate will find suitable tools to manufacture the product using the specification for the design.

Evidence: Documentation in portfolios, assessor observations.

Additional information and guidance

Candidates should become familiar with a range of tools so that they can choose appropriately and based on rationale evidence. This implies significant opportunities for practice. At Level 2 they will be able to justify their choices using rationale explanation.

2.2 I can prepare and plan information for the manufacturing process.

The candidate will prepare the information to guide the manufacturing process.

Evidence: Documentation in portfolios, assessor observations.

Additional information and guidance

At Level 2 products will have multiple components and candidates will appreciate that to manufacture complex objects, good referral information makes the task easier and more reliable.

2.3 I can use manufacturing tools with appropriate precision and safety

The candidate will use a range of appropriate tools to the appropriate precision under guidance.

Evidence: Photographs of products, portfolio content and assessor observations

Additional information and guidance

The appropriate precision will depend on the particular tools and circumstances and Level 2 candidates will work to a precision that is derived from the design drawings and/or planning and the tolerances of the tools they are using. They will appreciate that nothing is absolutely precise. They will use mathematics and skills in keeping with the level.

2.4 I can fabricate a product using appropriate materials and settings.

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The candidate will end up with a product or prototype that is in keeping with the design brief.

Evidence: Series of photographs showing the steps in the manufacturing process in portfolio, assessor observations.

Additional information and guidance

Candidates will build their products and record the evidence photographically. The crucial learning is that achieved by physically manufacturing a design. At one level a student can evolve the design through identifying and eliminating errors between digital to physical modelling techniques, at a more advanced level students can use information from the physical modelling process to evolve the actual design. At Level 2 the product will involve several different skills including software design and CNC manufacture.

2.5 I can finish or assemble parts and components.

Candidates can add finish and refinements to components, prototype or product.

Evidence: Photographs of the final finished digital prototype, assessor observations, work log in portfolio.

Additional information and guidance

Physical components may need to be post processed for example sanded, painted or fixed using appropriate hand tools, fixtures and fittings as necessary. Candidates should pay particular attention to small delicate components. Final assembly might need manipulation of components. Some of these finishing techniques are likely to require practice and candidates should be given sufficient time to develop these practical skills. Assessors should encourage learners to bring in a range of items to deconstruct and discuss in groups how they are made and what some of the manufacturing issues were likley to have been. Level 2 candidates will demonstrate perseverance to achieve good standards of finish and precision.

2.6 I can explain how to correct errors and make improvements to my work.

Candidates can explain how they made adjustments that improved their work.

Evidence: Photographs illustrating changes, assessor observations, work log in portfolio.

Additional information and guidance

Candidates will explain how they planned to eliminate as much risk and uncertainty before manufacture as possible and then how they identified and fixed errors in the manufacturing process. In Smart manufacture with agile techniques flexibility needs to be recognised as a key aspect to the approach. This does not mean laissez-faire but continuous consideration of the cost benefit of any actions in terms of getting the job done. Over-planning is counter-productive as is under-planning. Rigour is about optimisation of the process to get something fit for purpose, not about over-elaborate bureaucratic procedures.

3. Present evaluations of manufacturing processes.

3.1 I can organise evidence for presenting the manufacturing process.

The candidate will prepare their presentation using the evidence gathered and collected in their portfolio.

Evidence: Portfolios, presentations, assessor observations.

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Additional information and guidance

Candidates will gather the information they need to make their presentation. This will most likely be an on-going process throughout a project or projects. Level 2 candidates should be able to organise their information with only occasional prompts. Use of digital photographs and video should be encouraged.

3.2 I can explain strengths and weaknesses in the manufacturing process including economic and environmental considerations.

The candidate will explain a range of strengths and weaknesses in the manufacturing process.

Evidence: Portfolios, presentations, assessor observations.

Additional information and guidance

Candidates should be taught to be critical of their work and to classify strengths and weaknesses both from their perspective and through peer review and asking others. Particular attention should be given to any health and safety issues arising, economic and environmental considerations. Level 2 candidates should be able to explain themselves clearly through rehearsal and input from peer review.

3.3 I can use appropriate digital and/or physical models to support a presentation of the manufacturing process.

Evidence: Portfolios, presentations, assessor observations.

Additional information and guidance

Level 2 candidates should construct their own presentation aids. Manufacture requires candidates to understand sequences and use of tools. Candidates should be aware that the first way to evaluate their final product is against the specification in the design brief taking account of any changes that have been made. Their digital and physical models should be used to demonstrate how manufacture builds on the design process and can feedback into it. If things have changed they should be able to say why. Being able to do this with minimal support is a characteristic of Level 2.

3.4 I can receive feedback from presenting a manufacturing process.

Candidates should seek and receive feedback graciously.

Evidence: Portfolios, presentations, assessor observations.

Additional information and guidance

Candidates should receive feedback graciously from any source and should consider it objectively. At level 1 this might need support and time for them to gain control over emotions and part of the purpose is to achieve a mature response to criticism even where it appears to be unjustified. Level 2 candidates should be able to control emotional responses with composure.

3.5 I can act on feedback to improve a design.

Evidence: Portfolios, presentations, assessor observations.

Additional information and guidance

Candidates should show evidence of acting on feedback even if it is in the end to do nothing because they have considered the evidence and make a judgement that any changes will be detrimental. In most cases some changes will be needed to a manufacturing process in hindsight and acting on this could be to record what to do if such circumstances arise again if it is at the end of the project and

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too late to make any direct changes to the product this time. At level 2 the proposed actions should be plausible for improvement and actions carried out with minimal support. The important thing is for candidates to demonstrate that they have thought about the feedback and used it to improve their work.

Moderation/verification

The assessor should keep a record of assessment judgements made for each candidate and make notes of any significant issues for any candidate. They must be prepared to enter into dialogue with their Account Manager and provide their assessment records to the Account Manager through the online mark book. They should be prepared to provide evidence as a basis for their judgements through reference to candidate e-portfolios and any other sources eg through signed witness statements associated with the criteria matching marks in the online mark book or internal controlled testing. Before authorizing certification, the Account Manager must be satisfied that the assessors judgements are sound.

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