Silver - Unit 24 - Additive Manufacture (3 credits)

Relevant LINKS

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Overview

Additive Manufacture at Silver Level requires the candidate to plan and create a 3D element using manufacturing equipment and best practices. As a result of reviewing their work, they will be able to identify and use automated methods or alternative ways of working to improve the finished products. Unfamiliar aspects will require support and advice from other people.

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 – Creating a simple 3D product for a local primary school.

[Support for the assessment of this award](#) [3]

[Example of typical IT work at this level](#) **[4] (coming)**

Assessor's guide to interpreting the criteria (under development)

General Information

QCF general description for Level 1 qualifications

- Achievement at QCF level 1 (EQF Level 2) reflects the ability to use relevant knowledge, skills and procedures to complete routine tasks. It includes responsibility for completing tasks and procedures subject to direction or guidance.

- Use knowledge of facts, procedures and ideas to complete well-defined, routine tasks. Be aware of information relevant to the area of study or work

- Complete well-defined routine tasks. Use relevant skills and procedures. Select and use relevant information. Identify whether actions have been effective.

- Take responsibility for completing tasks and procedures subject to direction or guidance as needed

Requirements

- Standards must be confirmed by a trained Silver Level Assessor or higher

- Assessors must at a minimum record assessment judgements as entries in the on-line 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 on-line 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 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.

- This unit should take an average level 1 learner 30 hours of work to complete.

Assessment Method

Assessors can score each of the criteria L, S, H. N indicates no evidence and is the default starting position. L indicates some capability but secure capability has not yet been achieved and some help is still required. S indicates that the candidate can match the criterion to its required specification. 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 unit. Candidates should be helped and encouraged to reference their work to the assessment criteria using assessment for learning process. e.g. IPU 1.1.2 for IPU Level 1 criterion 1.2. This will make it easier to provide the evidence required for the QA procedures when requested by the Account Manager. There is support for this from learner account profiles on the INGOT web site. PLTS is used to denote where there are opportunities to develop personal learning and thinking skills.

Expansion of the assessment criteria

1. The candidate will use a brief to design 3D objects

1.1 I can identify the need for a specified design

At the simplest level this is knowing that something needs to be made. Hopefully learners will have some notion that they can make things that do not currently exist.

Evidence: will be on web pages or documents.

Additional information and guidance

Candidates need to carry out their own investigation to find a "need". It could be something that was specified for them, though they will still need to check if it is possible. They can look at a range of small designs and see if they can either make something similar, with improvements, or make something new and valuable. It would be useful for them to see a range of objects that have been made by 3D printers to have a better sense of the possible.

1.2 I can identify design constraints

Once something is identified for design, candidates need to think about what aspects of it might be impossible or difficult and therefore stop the process.
Evidence: Directly from their web pages, day to day files and dialogue with assessor.

Additional information and guidance

Candidates should reflect on their proposed designs and begin to think about what issues may make them difficult or impossible to make. Is the constraint size or time, is it complexity. At this level all they need to do is identify what constraints they have.

1.3 I can select appropriate software to develop the design.

Candidates show evidence of choosing the right tools.

Evidence: Assessor comments or reflective journal comments.

Additional information and guidance.

In most cases, there will be recommended tools for software design for the printer itself, but printers should also deal with standard file types so any design software should be suitable and candidates can try out different packages for specific qualities: ease of use, features, flexibility, extension plug-ins etc.

1.4 I can gather information to support a design

Candidates should be able to accumulate and organise the range of items needed to complete the design.

Evidence: ePortfolios and web pages with commentary.

Additional information and guidance

This is a research criterion, of sorts, to show that candidates are aware of the holistic nature of the design process. The design will likely involve a range of people and each of these will need to be consulted and their opinions and concerns noted. Designs themselves might impact people other than the cl;ient, so these will need to be canvassed and checked. The materials could have some environmental impact, especially if the design is something that might be mass produced with a short shelf-life so end up in land fills etc.

1.5 I can create a design, starting from a template, image trace or pre-existing object

Candidates should show evidence of working with existing elements.

Evidence: Documentation of plans and processes either in web based or paper based formats.

Additional information and guidance

This criterion allows that candidates might not yet have the skills to carry out their own designs and in most cases people in industry do not always work from scratch.   Working with existing designs and templates is a legitimate way to build up a final design. If the process is turning something like a metal toy into a plastic one, then candidates will need to re-draw the object for their own creations, and this is a valuable skill set.

1.6 I can make checks to ensure the model will print

3D printing is slow and somewhat wasteful of resources, so some pre-checks are essential.
Evidence: Checking process to ensure a successful print run

Additional information and guidance

Candidates need to check for design errors. Most of these should be obvious, but it might be worth sharing designs with others and the assessor to make sure that everyone agrees the design will work.

1.7 I can amend errors and ensure design quality

Candidates need to look through their designs and look for any potential problems to eliminate them.
Evidence: Assessor feedback and reflection commentary.

Additional information and guidance

Candidates need to show that they have changed their designs in light of identified problems.

2. The candidate will enable 3D manufacture from a 3D design

2.1 I can follow instructions to export a file for additive manufacture
Devices should have specific instructions about what file types and size is required.

Evidence: Reflections on the process and the sample file.

Additional information and guidance

Most candidates should be familiar with the process of exporting files in different formats for different purposes. The process here might include additional steps and requirements and they need to follow the instructions as set out in the equipment user guides.

2.2 I can use appropriate file formats and dimensions
Candidates should be able to demonstrate their ability to work with user guides.

Evidence: Direct observation and dialogue with the assessor, reference in day to day documentation of their work in their web pages or document files.

Additional information and guidance

Precision is key in this process so candidates need to demonstrate that they can read user guides and specific instructions and act accordingly by producing the correct file types and other requirements. .

2.3 I can import files into additive manufacture software
Candidates should be confident when using external sources.

Evidence: Web pages providing the presentation of their project. Descriptions and dialogue with assessor.

Additional information and guidance

The candidate may use pre-existing designs or elements of designs in their own work and need to show competence in bringing these in and using them.

2.4 I can use the appropriate settings to create a build file
Candidates should demonstrate a good understanding of the device settings.

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Evidence: Assessor feedback and personal reflections in web pages, blogs etc.

Additional information and guidance

The candidate will need to prepare their designs for final output to the machine and will therefore need to be competent that it is set up correctly and will work as expected. There will be options in the output to a build file and they need to know which ones to use and why.

2.5 I can identify issues related to print speed, quality, size and overall outcome
Candidates should provide evidence of an awareness of some of these main issues and why they can cause problems.

Evidence: Web pages providing the presentation of their project. Descriptions in day to day documentation, dialogue with assessor.

Additional information and guidance

Candidates need to show that they understand the set-up of the device to make sure it works. They can consult the user manuals and make sure they follow the steps accurately. Some printers require very specific glue mounts to work, so this will need thorough and detailed checking and re-checking. Once they press the final print button, it is too late to stop. They need to show that they understand some of the processes at work that determine how quickly the objects are made (such as material temperature, external temperature, humidity etc). The size and quality will also be affected by external elements and if their designs are too big they may not have the desired strength not to break apart.

2.6 I can identify changes to machine settings to improve build quality
Candidates should provide evidence of understanding of the technical requirements involved.

Evidence: Web pages providing comments on settings.

Additional information and guidance

The candidate should be familiar with the process and guidance in the devices user manual to correct for issues they identify as problems . They should be able to adjust some basic settings to improve the way their final object is made.

2.7 I can use the final product to identify possible improvements
Candidates should provide evidence of build evaluation.

Evidence: Reflective journals or product overview videos.

Additional information and guidance

The candidate should be able to assess their final object in terms of quality and intended outcomes. If they identify any problems, such as poor rendering or some anomaly they didn't expect, they need to be able to say how they would fix this in future runs. They could also get 3rd party feedback for this process. It would be useful to make a short video clip of the object to display it and talk about any good and bad issues identified.

2.8 I can identify how an additive manufacture design can be used alongside or to aid existing design and manufacture processes
Candidates should provide evidence of further thinking about the process of additive manufacture.

Evidence: Reflective journals, presentations or video blogs.

Additional information and guidance

The candidate can carry out a final evaluation of their findings on the entire process and try to

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identify a wider use for their understanding of additive manufacture. Now they have experienced what the process can or can't do, what do they think would be a good application for printed objects? Can they replace other objects, or can they only be used as a cheaper alternative? What wider applications can they imagine.

Moderation/verification

The assessor should keep a record of assessment judgements made for each candidate guided by the above guidance. Criteria should be interpreted in the context of the general descriptors of QCF Level 1 qualifications. They should make notes of any significant issues for any candidate and be in a position to advise candidates on suitable routes for progression. They must be prepared to enter into dialogue with their Account Manager and provide their assessment records to the Account Manager through the on-line mark book. They should be prepared to provide evidence as a basis for their judgements through reference to candidate e-portfolios. Before authorising certification, the Account Manager must be satisfied that the assessors judgements are sound. In the event of missing evidence, the assessor will be requested to gather appropriate information before the award can be made.

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