

**A LEVEL**

Moderators' report

**DESIGN AND  
TECHNOLOGY:  
DESIGN  
ENGINEERING**

**H404**

For first teaching in 2017

**H404/03/04 Summer 2023 series**

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## Introduction

Our moderators' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

## Online courses

We have created online courses to build your confidence in delivering, marking and administering internal assessment for our qualifications. Courses are available for Cambridge Nationals, GCSE, A Level and Cambridge Technicals (2016).

### Cambridge Nationals

All teachers delivering our redeveloped Cambridge Nationals suite from September 2022 are asked to complete the Essentials for the NEA course, which describes how to guide and support your students. You'll receive a certificate which you should retain.

Following this you can also complete a subject-specific Focus on Internal Assessment course for your individual Cambridge Nationals qualification, covering marking and delivery.

### GCSE, A Level and Cambridge Technicals (2016)

We recommend all teachers complete the introductory module Building your Confidence in Internal Assessment, which covers key internal assessment and standardisation principles.

Following this you will find a subject-specific course for your individual qualification, covering marking criteria with examples and commentary, along with interactive marking practice.

### Accessing our online courses

You can access all our online courses from our teacher support website [Teach Cambridge](#).

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## General overview

In the first series with no amendments to the mark scheme since the disruptions of Covid19 we received and moderated some outstanding examples of iterative design in the development of a product, within the Design Engineering endorsed specification.

A gentle reminder to centres that electronic portfolios are a **mandatory requirement**, with A4/A3 style paper portfolios no longer accepted. Most centres either sent work via USB drive or uploaded work and associated forms directly to the repository. Both of these works well, with PowerPoint utilised to very good effect.

Unencrypted USB drives are very helpful; if there is a need for a password, please choose a short clear password that does not have letters and numbers that can easily be mistaken for each other, such as 1 or l, o or 0 for example.

Excessive file sizes can however be a problem. Complex presentations that take a long time to load are counterproductive. Please would centres **compress all electronic work** before uploading; this is a fundamental piece of work that centres should seek to undertake.

Interactive dialogue is a vital component within the philosophy of this specification. However, there is **absolutely no requirement** for a presentation to have upwards of 15/20 videos embedded. We would not expect a centre to have more than ten and there is no requirement to have numerous videos on a single portfolio.

Many centres provided a separate folder containing '**clearly labelled**' videos, enabling most moderators to view all video files. It is preferable however that this facility is used as a **backup**, as viewing videos in context is a far more valuable exercise. Where videos cannot be embedded within a portfolio, it would be helpful for them to be directly hyperlinked to the source. Several centres made effective use of externally hosted media within candidate portfolios to demonstrate stakeholder interaction, testing and other primary evidence. This reduced the number of excessive file sizes, keeping them manageable and easy to access and upload to the repository. However, centres should be mindful that the moderator will need full access permissions for any externally hosted media as 'access was denied' on several occasions.

Centres should be aware that unless work is required for archiving or awarding purposes, it is our intention to return **all work** that is sent at the end of the moderation series.

**Please do not upload individual videos to the repository.**

### NEA forms and administration

Centres should be aware that there are only two forms that are required alongside the students work: the Candidate Record Form (**CRF**) and the Candidate Declaration Form (**CDF**).

The CDF must be signed by the respective **student and teacher**.

The CRF is an **interactive form** that **correctly totals** candidate marks for each strand avoiding clerical errors. This form **should not** be completed in pencil or pen. Colleagues are urged to use this **digital** form as it saves the moderation team many hours in chasing up on clerical errors that slow the moderation process. Please do not convert this form into other formats such as Word documents.

The CCS160 (Centre Authentication Form) **should not be sent** in with the sample. It should signed by all teachers involved and retained within the centre as required by JCQ.

Observations and comments on the Candidate Record Forms (**CRF**) can be **very helpful**, particularly in indicating where levels had been met and criteria reached.

### Management of Portfolio by candidates

Candidates often used headings to manage the design process successfully, with simple explanations of what each page contained, as well as lessons learnt or next steps as they moved through the iterative process. This is an **extremely useful** strategy for them to use.

Marks must be uploaded by **15 May** at the latest. Work must be sent or uploaded within three days of receipt of the sample request email. It remains a frustration following up on work/forms not received in the week following this date and slows the moderation process unnecessarily. The support of colleagues within centres is appreciated in addressing this in 2024 please.

### Key points

The purpose of the moderation process is to make sure that centre assessments are in line with a common national standard. This is achieved by adjusting any centre assessment where the moderation process indicates that this is necessary, based on the sample of work viewed. Centres receive a **detailed report** following moderation which identifies specific areas of the assessment criteria which need attention, when applicable.

In internally assessed units where the assessment contains many sections such as these ones, erring on the side of generosity in the assessment of some areas can have a **significant** cumulative effect.

### Misconception – Iterative design v linear approach



Some centres are still using the mark scheme to create the slide titles and therefore seemingly being encouraged to follow a linear approach as seen in the traditional style of research, design specification, design, develop, prototype and evaluate.

The philosophy at the very heart of this specification is that of iterative design. For example, while undertaking design ideas, candidates are encouraged to further explore by discussing concepts with their user or stakeholder or investigating materials, components, or mechanisms to further their design and knowledge. Explore, create, and evaluate is cyclical. Evidence is often apparent throughout a candidate's portfolio and Criteria 1.6 for instance, would not expect to appear until after the final design solution is finalised.

## Strand by strand guidance on H404/5/6 03/04 product development requirements

This is not an exhaustive list, and these comments relate directly to the A Level Specification which can be found on the OCR website. Chapter 10 NEA Product Development of the OCR A/AS Level Design and Technology textbook is particularly informative and is extremely detailed.

**Please do use this resource as it has been compiled with numerous examples to aid delivery of the NEA.**

This Product Development carries 100 marks.

### Strand 1 - Explore

OCR suggests approximately 60 hours for completion of this non-exam assessment. This does not present a limit, but it is important to recognise that if candidates are producing excessive work, it becomes irrelevant to the context and brief and is not concise. This is counterproductive and ultimately does not add to the experience or the ethos of the specification.

The use of primary users or stakeholders is **fundamental** within this endorsed title. Candidates should continually revert to and have **direct** contact with their primary user or stakeholders in their explorations. Use of a peer taking on the persona of a user is helpful if a user is not available. These interactions should be clearly evidenced within a candidate's portfolio. **Direct** contact should be in the form of real time/first-hand interactions so that the candidates can gain as much insight as possible.

A broad range or contrast when exploring possible contexts offers candidates an opportunity to gain valuable insights and further understanding. Involving users or stakeholders in discussions at this stage can also be very useful.

Investigations that explore existing products are much more useful when products are analysed first-hand; disassembly of a broken or old product can be immensely helpful to candidates and is particularly useful to aid understanding within this endorsement.

The exploration of materials is best employed within the iterative design process and linked or related directly to the ideas and developments that are taking shape. Standalone slides on a list of **generic** materials that bear little relevance to the product chosen are of limited value.

#### Misconception – Iterative design



Centres should not lead candidates through the project with generic slide layouts and a formulaic approach to the design process.

This approach can stifle candidates' innovation and creativity.

### Misconception – Iterative design



There appeared to be some misunderstanding of the technical specification. This should offer sufficient clarity for manufacture of the intended design solution to a third party, so they are able to make a prototype of it themselves. Despite it being termed section 1.6, it is just before manufacture. Working drawings are fundamental to this, as are details of bought in items and the choice of materials.

## Strand 2 – Create: Design thinking.

OCR overtly encourages creative and innovative product developments that not only demonstrate a progressive (iterative) design process, but also take into consideration the feedback and requirements of primary users and other stakeholders. It may not always be possible for candidates to work with external people but working with a member of staff or peer who can offer a realistic persona of the stakeholder is extremely important to offer sufficient feedback and support to the design process.

There were a significant number of candidates that simply fixated on a single idea and did not explore other ideas that may well have led to a more creative and educational experience for them. A wide range (we suggest 10) of different ideas being presented offers candidates the opportunity to develop their ideas innovatively and with an open mind, in keeping with the iterative philosophy.

Where centres clearly support the iterative design approach, this allows freedom to be creative and, with several progressive developments of either a whole idea or components within, then the outcomes are often exceptional, meeting the expectation for MB5 with ease. Three-dimensional development can be extremely useful. Several centres also made effective use of web-based Computer Aided Engineering (CAE) programs allowing candidates to demonstrate and test functionality of electronic circuits before developing a breadboard or soldering their components.

The use of technical language and understanding is expected when iteratively designing. Simply exploring the use of shapes without any understanding of how the structure behind a given shape is derived or constructed is a missed opportunity at this level.

When developing programmed code throughout the iterative design process it is recommended that candidates include each iteration of their code within their portfolio to support development marks.

## Strand 3 – Create: Design communication.

Different methods of communication and presentation should be encouraged. There is no expectation that an idea will begin its iterative journey as a sketch, although many candidates find this helpful. The start point is purposely fluid with sketch modelling and CAD being examples of well used techniques that are utilised.

It is essential that for all evidence to be fully considered through moderation that centres are following the submission guidelines set out in the specification; that file sizes are compacted wherever possible, and all videos and audio files are tested to make sure they are accessible from external devices.

The **real time** capture of findings and decision making is a crucial element of the NEA and impacts on several key aspects of the marking criteria.

## Strand 4 – Create: Final Prototype(s)

### Misconception – Planning for marking



Planning should occur before the making process begins and cover all requirements and safety considerations identified from the technical specification. It should be relevant to making in a centre workshop. Timescales for the various processes are a helpful addition.

If evidencing the use of hand tools, machinery, digital design and/or digital manufacture throughout the project is limited, then centres should be marking in MB1 for 'Use of specialist tools and equipment'. If they have not evidenced one method and the rest of their work is strong then marks cannot be given above MB2 for this statement. CAD/CAM is a **mandatory** element of this specification. It is also important to note that to achieve MB4 and beyond for Criteria 4.3 and 4.4 candidates should demonstrate effective and appropriate use. There were a significant number of impressive outcomes this year that demonstrated a high level of skill and accuracy from candidates. CAD was used effectively across centres to clearly present final design solutions and technical specifications.

There should be sufficient video and photographic evidence of the final prototype(s) to assess or evaluate its quality, viability and/or success. Moderators must be able to view the final prototype with clarity. The quality of photographs, particularly of close-up work, is important. Where it has been deemed appropriate for a candidate to produce a scaled model as their final prototype, appropriately scaled testing methods should be conducted to support marks given in the higher mark bands, to determine the solutions viability and feasibility.

Moderators should also be able to clearly **see evidence** to suggest how the product could be viable for the intended market.

## Strand 5 - Evaluation

Designing iteratively requires that ongoing analysis and evaluation of ideas and solutions is fundamental to candidates' success. Centres should try to encourage **continual** refinement toward the most appropriate and advanced solution for the market and the opportunity being designed for, within the facilities and resources available.

The views from primary users or stakeholders in real time, and the evaluations of others' opinions in order to inform the next steps of the design process, should be evident.

Wider issues such as life cycle assessment (LCA) and the broad impacts of the product are often overlooked.

Risk assessments had a very broad range of responses. Please do consider health and safety throughout the project. A risk assessment of the prototype product as it would be expected to be used is a very useful piece of work, which can also highlight inadequacies that can be addressed as part of the further improvements that form part of section 5.5. Candidates often overlook this important area within the actual use of their product.

Testing and analysis should be rigorous and objective. **Evidence** of the planning and implementation of this should be clearly presented. User or stakeholder testing should always be encouraged with feedback in **real time** wherever possible. Testing should, wherever possible, be undertaken in the intended environment for use.

Testing against technical and non-technical requirements is also very useful in identifying strengths and weaknesses offering opportunity for future modifications.

Further modifications and any opportunities to improve design optimisation are expected within this strand.



## Final points

Centre and candidate name and number must be on all work that is presented.

Slides need to be numbered to aid navigation for centre and moderation process.

Staff or peers acting in the role of user/stakeholder persona is a useful tactic, but this must be clearly explained and referenced within the portfolio. All work undertaken **must** be by the candidate.

Acknowledging sources or assistance with a bibliography is very helpful. Candidates also made effective use of referencing external sources by hyperlinking any external images or data tables they had used as reference materials.

The overall ethos for this specification is based on 'real time recording' of events as they happen. Interactive dialogue involves discussing the selected product, comparative products, iterative development, ongoing analysis, evaluation, and testing with others and responding to suggestions made. Evidence of interaction should be recorded in real time with the active comments of those involved recorded first-hand and not retrospectively.

**Re-typing of first-hand comments is totally counterproductive and should be avoided.**

Design Engineering (H406) focuses on engineered and electronic products and systems and their analysis in respect of:

- Function, operation, components, and materials to understand their application and uses in engineered products/systems that have commercial viability.

While it is not a mandatory requirement, it is expected that candidates studying this qualification will include a combination of electronics, programming and/or mechanisms within their portfolio. When candidates can apply their studies to the NEA and include these elements within their prototypes, their understanding of the application of such topics greatly develops. This will particularly support the examined components of this specification.

It is strongly recommended that centres visit the OCR [Professional Development web page](#) or call the Customer Contact Centre to take advantage of the support that can be offered in making informed choices or when marking this component.

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