

A LEVEL

Delivery Guide

DESIGN AND TECHNOLOGY

H404, H405, H406

For first teaching in 2017

Topic Area 9:

Health and safety – Design Engineering

Version 1

TOPIC AREA 9: HEALTH AND SAFETY – DESIGN ENGINEERING

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A LEVEL **DESIGN AND TECHNOLOGY**

A guide to approaching the teaching of the content related to Topic Area 9: Health and safety – Design Engineering

Delivery guides are designed to represent a body of knowledge about teaching a particular topic and contain:

- **Content:** A clear outline of the content covered by the delivery guide;
- **Thinking Conceptually:** Expert guidance on the key concepts involved, common difficulties learners may have, approaches to teaching that can help learners understand these concepts and how this topic links conceptually to other areas of the subject;
- **Thinking Contextually:** A range of suggested teaching activities using a variety of themes so that different activities can be selected which best suit particular classes, learning styles or teaching approaches.

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Link to qualification:

<http://www.ocr.org.uk/qualifications/as-a-level-gce-design-and-technology-h004-h006-h404-h406-from-2017/>

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Sub Topic 1: Working safely in workshop environments

Exam content

9.1 How can safety be ensured when working with materials in a workshop environment?

- a. Demonstrate an understanding of safe working practices in the workshop situation, including:
 - i. understanding the need for risk assessments
 - ii. identifying hazards and implementing control measures to minimise risks.
- b. Demonstrate an understanding of how to work safely with specialist tools, techniques, processes, equipment and machinery during the design and manufacture of products.

NEA content

- a. Be able to identify relevant hazards when creating prototypes and apply safe working practices when creating designs and prototypes, applying appropriate risk assessments.

General approaches:

In order to approach the topic of health and safety, it will be important for learners to have a standard and repeatable approach method where they will be able to assess and respond to any and all differing workshop and industry activities. Learners will need to be able to equally assess the risk to simple activities such as soldering, through to more complex activities such as production lines where risks and working practices change and evolve along the production line.

begin with, learners will need exemplifications of risk assessments, their place and use in industry, which can be delivered through exemplar documents used in recognisable work places, or by simply referring to documentation used in a school environment. They will need to understand the purpose of the document, each element of the document, and the nature of only ever minimising risk as opposed to completely removing risk. Hazard identification can be delivered in a number of ways, including images where learners spot issues, or through role play or an active visit to a site or environment. In each instance, learners will need to be able to work with employees or users to enhance their ability to identify risk and respond accordingly.

Once learners have established the nature of risk assessment and minimisation, they will be suitably prepared to critique their own practice and that of their peers in a workshop environment, and be able to not only risk assess, but identify and propose their own counter measures to reduce risk in their working environments. Learners would benefit from hands-on experience and role play in the workshop environment to enhance their understanding of risk assessment using senses, such as hearing and touch to add a depth of critique not afforded by still images of case study examples. This will help learners use broader skills and develop awareness beyond visual clues to identify risk.

Once learners have fully established areas of risk assessment, they will be able to evidence this in their NEA work. This can be recorded in visual form, through a range of media and support the process of manufacturing a prototype. Learners will want to be in a position to plan for risk before commencing manufacture, in order to subsequently use the risk assessments during their 'make' activities. Learners would also benefit from reflecting on these documents after making and updating them as part of their evidence of evaluation.

Common misconceptions or difficulties learners may have:

Risk assessment is commonly considered to remove all potential risk. This is false, and should be addressed with clear examples. For instance, by introducing speed bumps, a speed limit and road layout to slow cars driving on it, through and off a school site, there could be the expectation that there is no risk of a car hitting a pedestrian. However, depending on many factors, including human error, the risk will still remain, but be reduced or minimised to the person being injured.

Risk assessment and working with risk assessment documentation is not a single activity, it should be considered a cyclical activity, reflected on periodically, and used to constantly improve approaches. This does not need to only happen when an accident occurs, and can be an activity that allows for improvement on an on-going basis without a trigger.

Conceptual links to other areas of the specification – useful ways to approach this topic to set learners up for topics later in the course:

Risk assessment can help learners engage with the learning of processes and practical activities, particularly those involving heat or producing fumes and waste. A typical lesson on soldering a circuit should include reference to risk assessment. Learners will also recognise that there are strong links for risk assessment and health and safety in industrial practices, including work ethics and moral codes of conduct. Learners might benefit from a discussion into the broader industries where employees benefit from appropriate health and safety considerations, and risk assessment as a tool for on-going improvement. This is similar to quality assurance, where data is used to fuel changes in production to improve the final product.

Learners completing a series of lessons, or taking part in extended time periods to manufacture a product, or learning practical skills, could engage with risk assessment and allow it to form a regular feature of the activity of learning about processes.

How to conduct a risk assessment

In this activity, learners will analyse the individual elements of a risk assessment document. Each will be explained by the teacher, and its inclusion in the document justified relating to the other elements around it. This can be a walk and talk-through activity in which learners annotate a blank risk assessment.

Learners can then go through with the teacher the role play of a practical task, such as making a cup of tea or similar shared experience. Learners can fill in the risk assessment as a group, discussing as the document progresses. Each subjective entry into the risk assessment, such as how highly graded a specific activity should be, will need to be discussed and a decision validated by the teacher. For example, on a scale of 1-5, how would you grade the risk to a person of spilling of boiled water onto their skin? If the group consensus is 4 out of 5, other examples of differing severity can be discussed until the group are happy with the grading.

Once a walk and talk approach has been completed, learners can be released into identifying and risk assessing their own choice of activities. This could be done in many ways:

- on site visit
- in a workshop environment full of equipment
- using visuals such as videos or photographs of processes
- descriptive text about a process
- a guest speaker or speakers talking about tasks or processes.

Emotive videos

In this activity, learners watch videos about accidents or incidents where the outcome can be seen and heard about. These can be self-filmed by other learners or staff, or sourced online using examples such as car accident adverts produced by the DVLA. Learners are tasked with watching the video, and noting down what they feel the risks are, and how to reduce them. While many learners will then go onto come up with comparable results in their risk assessment such as the grading of a car crash or similar, the shared experience can be reflected on as a group, where learners can propose both product and environment improvements to minimise risk. For example, changing approaches in the car users' actions or changing the design of the road environment would both have an impact on minimising risk. Learners can debate the best course of action where different learners propose different solutions.

Stop Stand Still

In this activity, learners are asked to act out a dry run activity working with a process. For example vacuum forming a piece of HIPS onto a mould, or soldering a circuit using a soldering iron. For this activity to work, a volunteer learner can act out the task of doing the process from start to finish. The learners can be pre-prepared for this activity, have knowledge of the activity beforehand or have no prior knowledge. Some level of preparation will improve the outcomes of this type of learning.

As the learner acts-out the task, the group can shout "Stop! Standstill!" making the learner freeze. At this point, the group have to identify the risk, and take action to change the outcome. This can include intervening to put an apron, goggles or gloves on the learner. When the learner recommences the role play, they will be suitably improved through this intervention, until they reach the next risk, where the group will pause the demonstration again, in order to intervene.

Title	Organisation/ Company	Web link	Summary description	Relevant chapter (i.e. Content, Thinking Conceptually, Thinking Contextually)	Mapping to specification level
How to conduct a risk assessment	HSE	http://www.hse.gov.uk/ risk/controlling-risks.htm	This website gives a simple 5 step process to conducting risk assessment. Learners can read the instructions, and apply these to any context or activity they choose. This resource, supported by a risk assessment document will help learners engage with RA.	Thinking contextually, Content	2e 9.1, 9.2 2h, 9a

How to conduct a risk assessment

Introduction

For this activity, you are going to complete a risk assessment for processes and activities you are familiar with in the workshop. This will require you to identify the risk, consider and grade the likelihood and severity of the risk and propose methods to reduce the risk, followed by a re-evaluation of the new level of risk.

The activity

With the help of your teacher, complete the risk assessment form below for a range of different workshop activities.

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Extension activities/questions:

How could you apply this to activities such as systems design, environment design, or similar?

Sub Topic 2: Health and Safety considerations in industry

Exam content

9.2 What are the implications of health and safety legislation on product manufacture?

- a. Demonstrate an understanding of how the regulatory and legislative framework in the Health and Safety at Work Act (HASAW) sets out duties of employers and employees in the product manufacturing industries, including:
 - i. Control of Substances Hazardous to Health (COSHH)
 - ii. Personal Protective Equipment at Work Regulations (PPE)
 - iii. Ensuring machinery is well maintained.
- b. The responsibility of manufacturers to appropriately label products and offer warranties to their consumers to deliver the correct levels of product assurance related to safety.

General approaches:

For this topic, the Health and Safety Work Act of 1974 will provide challenging reading for many learners, but can be discussed and simplified through careful learning activities to help learners see how employers and employees act because of its requirements. The context of these discussions can vary depending on the element being discussed, and learners will benefit from some examples being discussed in environments they know well, such as the school, and talked through environments that they do not know, such as manufacturing factories making mobile phones or similar.

With the Design and Technology/Engineering department as the potential focus again, there are a number of opportunities for learners to review, analyse and potentially critique the approaches taken by departments in their work also with COSHH, PPE and machine maintenance. The nature of all three being of consideration to any department delivering a D&T curriculum will provide learners with first-hand and personal experience of these areas of study, including how they have been actioned for the school environment.

COSHH provides learners with an opportunity to not only review the materials used in the department, but to also reflect on their own personal approach and use of these materials in their practical lessons. An example might be of hazardous adhesives which provide ample documentation to ensure that, if followed, users will be safe. Learners might benefit from reviewing their working environment, taking note of features such as COSHH cupboards, the location and content of signage, and the departments documentation and their reference to it when using materials that have a COSHH document to support it.

In a similar fashion, PPE is a very common term within departments, where learners might be personally responsible for their own PPE, or the school for providing PPE to learners. This can be analysed through many different approaches, from role play in the workshop through to industry case studies of much more hazardous activities. Learners will benefit from the very black and white nature of PPE use, with supporting issues such as hard hats and steel-toe cap boots being a possible future requirement on the PPE expectations for a school workshop.

For machine maintenance, the logs held by departments (technicians or otherwise) will bring into focus the regularity of this activity. It is common for departments to check equipment weekly or more, and this log, including identified issues and actions subsequently taken, will help learners see “behind the scenes” of the department and how machine inspection operates. The learners could then have this extended into industry, with examples and case studies discussed to support a broader understanding of its requirement.

Linking well to the work on COSHH, learners will want to have an active and exploratory approach to learning about labelling of products, how to identify them using supporting documentation, and finally how these approaches to communication, result in product assurances to customers and users. There is a strong opportunity here for learners to use existing low and high risk products and resources to learn about both COSHH and product

labelling, and learn about these across multiple industries to support their ability to refer to examples in an exam situation. The better learners can exemplify labelling with specific examples, the stronger they will be able to recall this information and apply it in new contexts.

Common misconceptions or difficulties learners may have:

Within this topic, there will be a lack of understanding at the scope and breadth of health and safety across different jobs, industries and workplaces. It is important that learners see that the topic will apply across all industries, from those where there is obvious risk from machinery, down to a typical supermarket which will apply equal stringent measures to ensure legal requirements are met. Much of the learners’ experience of the areas of health and safety will be in the context of a workshop, but application of this learning to other industries will be important and add opportunity to apply learning in new contexts.

Conceptual links to other areas of the specification – useful ways to approach this topic to set learners up for topics later in the course:

The topic of COSHH will overlap well within the area of techniques for joining materials, the use of substances in other processes or to finish materials, and will be a core element of practical workshop activity.

COSHH and labelling will play a part in the consideration of the environment, sustainability and eco-design, where materials and substances pose a risk in these situations.

In working with compliant materials, or the broad spectrum of other material areas such as polymers, learners will need to understand this topic in order to be able to apply learning in context.

Identify the PPE

Using a series of photographs of different work place situations, learners are challenged with identifying the type of PPE a worker/employee would be required to wear. This would require careful selection of images that communicate a situation where the following might be required:

- goggles
- overalls
- safety boots
- ear defenders
- loves
- heat retardant clothing
- mouth guard.

Learners are tasked with circling the hazard or labelling the image, and identifying the PPE requirement. learners looking to advance their learning can go into writing justification statements and link these to risk assessment work.

Dissecting COSHH

Using existing COSHH documentation (from purchased substances in the department) learners are tasked with proposing an action plan for using it in a lesson activity. Their task is to be a "teacher" and outline in a written proposal how they will use the substance, actions they will take, and considerations they would make during the activity. This could be, for instance, using a substance like an adhesive that is quite aggressive, and learners planning for its use over a prolonged lesson activity. For safety, learners would only have to present their approach rather than deliver this outcome practically, but being able to present their approach in a workshop environment would be beneficial to provide context to their ideas.

The Health and Safety Work Act of 1974 analysis

Using a printed or web-based copy of the Health and Safety work act, learners are tasked with the following activity.

In groups learners must prepare a presentation to the class on how the act would affect the actions of:

1. Employers
2. Employees
3. The H&S Commission Executive
4. Inspectors.

A fifth group would be challenged with reviewing and presenting on the expectations and requirements of a code of practice.

The sixth group would be able to review and present on the fire precautions act.

Each group would be required to prepare a presentation using as little language or written word as possible, using as many images to convey information, and in as few slides as possible.

The groups at the end of the lesson would be required to print and share with the other groups these summary documents for revision/study purposes.

Title	Organisation/ Company	Web link	Summary description	Relevant chapter (i.e. Content, Thinking Conceptually, Thinking Contextually)	Mapping to specification level
The Health and Safety Work Act of 1974 analysis	HSE	http://www.hse.gov.uk/legislation/hswa.htm	In sub-groups, the class is tasked with summarising the work act for specific individuals or outcomes, and use this information to create a succinct presentation to the rest of their group.	Content	9.2 a, b
COSHH documentation review	Technology Supplies	https://www.technologysupplies.co.uk/downloads/msds/SDS0156.pdf	Using this, or another online COSHH document, learners are tasked with proposing how they would set up a workshop activity using the material or substance that was hazardous, and demonstrate the setup in the workshop context.	Content	9.2 ai



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