

FACTFILE: GCE TECHNOLOGY & DESIGN

1.10 QUALITY AND SAFETY



Quality and Safety

Learning outcomes

Students should be able to:

- demonstrate knowledge and understanding of the use of:
 - factor of safety;
 - tolerances;
- demonstrate knowledge and understanding of the purpose of testing and inspection of components or products;
- demonstrate knowledge and understanding of the risks associated with common manufacturing and hand processes and methods used to minimise these.

Course content

Factor of Safety

Safety in manufacturing means safe design, manufacture, use and disposal of products. It is important that safety procedures are followed along with standards, regulations, and legislation checked. All of these processes are to make sure that the particular product being manufactured is safe for the consumer, the producer and the environment.

What are Tolerances?

Tolerances provide the maximum (+) and minimum (-) deviation from the actual value that is acceptable for a manufactured component (will still allow it to do its job).



Purpose of Testing and Inspection

Testing is a process in which the product is observed during operation to establish if it works properly for a set period of time.

Inspection is the action of examining the product or its components to determine if they achieve the standards set at the beginning.

For example in the automotive industry there is an inspection of a vehicle's components, usually done by a certified mechanic. Vehicles will pass the

inspection when the mechanic provides evidence for the proper working condition of the vehicle systems specified at the beginning. Inspection and testing are the working parts of quality control, arguably the most important factor to the continued existence of any manufacturing company.

Quality Control helps with:

- Factors of cost;
- Productivity;
- On-time delivery; and
- Market share.

It is important that inspection and testing are carried out through each stage of the process so that the required levels of quality (and design standards) are high.

Other reasons why a company test and inspect products and operations are:

- To avoid expensive recalls;
- To ensure the product or components are capable of doing what they were designed to do;
- To avoid bad publicity; and
- Ensure consistency/quality of product manufacture.

Risks associated with common manufacturing

When a product is being manufactured, a range of machines and hand tools will inevitably be used. It is therefore important at both the design and manufacturing stages that this work is undertaken safely and in a safe working environment.

Manufacturers have a legal responsibility to ensure the safety of their employees and that all hazards have been reduced to a minimum to remove the risk of accident.



Accidents can happen but assessing the risks beforehand helps to ensure workers can operate in safer environments. This can be done by:

- Identifying the hazard.
- Identifying who might be injured.
- Looking at the risks and decide how they can be avoided.

Type of Processes	Associated Risks	Methods to minimise
Manufacturing processes	• Dust, swarf, splinters ejected from machine.	• Use machine guards and or safety glasses. • Correct lighting and suitable ventilation.
	• Long hair, loose clothing, jewellery can get caught in the moving parts of the machine.	• Correct training given.
	• Some machines (centre lathe) may cause an electric shock. • Sharp edges of cutting tools and edges of machine parts can cause injury. • Dust can be inhaled.	• Electrical isolators to prevent electric shock to the user. • Regular safety checks and maintenance procedures.
	• Material is not held securely causing injury to the user.	• Use vices or clamps to grip material securely.
	• Running the machine at an unsuitable speed can cause material to be violently ejected from the machine.	• Extend guards down to cover drill bit when placing material for drilling.

Type of Processes	Associated Risks	Methods to minimise
Hand processes	• Injury to user.	• Always secure the material before cutting/wasting.
	• Maintenance and condition of hand tool.	• Regularly sharpen hand tools such as saws and chisels.
	• Tools falling off benches. • Tools breaking or handles falling off.	• Damaged tools should be discarded.
	• Tools slipping in the user's hand.	• Tools should not be carried in the workshop. • Correct instructions given.

? Revision Questions

- 1** For a design and manufacturing company, testing and inspecting are established procedures.
i) Give **two** main reasons why it is so important for a company to test and inspect its products.

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- 2** A report focusing on a company manufacturing and assembling school lockers and filing cabinets made reference to the following terms:
- use of tolerance
 - factor of safety
- i) Briefly explain what is meant by each of these terms.

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- 3** There are risks associated with common manufacturing processes.
- i) For a specific machine manufacturing process, briefly outline one main associated risk and one method used to minimise this risk.

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- ii) For a specific hand manufacturing process, briefly outline the one main associated risk and one method used to minimise this risk.

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