SEMPEO206

Producing mechanical assemblies

Overview

This standard covers a broad range of basic mechanical assembly competences that will prepare you for entry into the engineering or manufacturing sector, creating a progression between education and employment, or that will provide a basis for the development of additional skills and occupational competencies in the working environment.

You will be expected to prepare for the assembly activities by obtaining all the necessary information, documentation, tools and equipment required, and to plan how you intend to carry out the required assembly activities and the sequence of operations you intend to use. You will be required to select the appropriate equipment to use, based on the operations to be carried out and the type of components to be assembled.

In carrying out the assembly operations, you will be required to follow specified assembly techniques, in order to produce the required mechanical assembly. The assembly activities will also include making all necessary checks and adjustments, to ensure that components are correctly orientated, positioned and aligned, that moving parts have the correct working clearances, that all fasteners are tightened to the correct torque, and that the assembled parts are checked for completeness and they function as per the specification.

Your responsibilities will require you to comply with health and safety requirements and organisational policy and procedures for the assembly activities undertaken. You will need to take account of any potential difficulties or problems that may arise with the assembly activities, and to seek appropriate help and advice in determining and implementing a suitable solution. You will work under a high level of supervision, whilst taking responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide an understanding of your work, and will enable you to apply appropriate assembly techniques safely. You will understand the assembly process, and its application, and will know about the mechanical equipment being assembled, the components, tools and consumables used, to the required depth to provide a sound basis for carrying out the activities to the required specification.

You will understand the safety precautions required when carrying out the assembly

activities, and when using assembly tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Specific Standard Requirements

In order to prove your ability to combine different assembly operations, at least one of the assemblies produced must be of a significant nature, and must contain a minimum of **six** of the components listed in scope 3.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation, regulations, directives and other relevant guidelines
2. plan the assembly activities before you start them
3. obtain and prepare the appropriate components, tools and equipment
4. use the appropriate methods and techniques to assemble the components in their correct positions
5. secure the components using the specified connectors and securing devices
6. produce the required mechanical assembly
7. check the completed assembly to ensure that all operations have been completed and that the finished assembly meets the required specification
8. deal promptly and effectively with problems within your control and seek help and guidance from the relevant people if you have problems that you cannot resolve
9. leave the work area in a safe and tidy condition on completion of the assembly activities

Knowledge and understanding

You need to know and understand:

1. the health and safety requirements, and safe working practices and procedures required for the assembly activities undertaken
2. the importance of wearing appropriate protective clothing and equipment (PPE), and of keeping the work area safe and tidy
3. the hazards associated with the assembly activities (such as use of power tools, trailing leads or air hoses, damaged or badly maintained tools and equipment, lifting and handling heavy items), and how they can be minimised
4. the procedure for obtaining the required drawings, job instructions and other related specifications
5. how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken
6. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
7. how to prepare the components in readiness for the assembly activities (such as visually checking for defects, cleaning the components, removing burrs and sharp edges)
8. the general principles of mechanical assembly, and the purpose and function of the components and materials used (including component identification systems such as codes and component orientation indicators)
9. the assembly/joining methods, techniques and procedures to be used, and the importance of adhering to these procedures
10. how the components are to be aligned, adjusted and positioned prior to securing, and the tools and equipment to be used for this
11. the various mechanical fastening devices that are used (such as nuts, bolts, machine screws, cap screws, clips, pins, locking and retaining devices)
12. the importance of using the specified components and joining devices for the assembly, and why you must not use substitutes
13. where appropriate, the application of sealants and adhesives within the assembly activities, and the precautions that must be taken when working with them
14. how to conduct any necessary checks to ensure the accuracy, position, security, function and completeness of the assembly (such as checking for correct

operation where the assembly has moving parts, checking the torque figures to which critical fastenings have been tightened, checking the end float on shafts, checking operating clearance on actuating mechanisms)

15. how to detect assembly defects, and what to do to rectify them (such as ineffective joining techniques, foreign objects, component damage)

16. the methods and equipment used to transport, lift and handle components and assemblies

17. how to check that the tools and equipment to be used are correctly calibrated and are in a safe and serviceable condition

18. the importance of ensuring that all tools are used correctly and within their permitted operating range

19. the importance of ensuring that all tools, equipment and components are accounted for and returned to their correct location on completion of the assembly activities

20. problems that could occur with the assembly operations, and the importance of informing appropriate people of non-conformances

21. when to act on your own initiative and when to seek help and advice from others

22. leaving the work area in a safe and clean condition on completion of the assembly activities (such as removing and storing power leads, returning hand tools and equipment to the designated location, cleaning the work area and removing and disposing of waste)

Scope/range related to performance criteria

1.

Carry out **all** of the following during the assembly activities:

1.1 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations
1.2 follow job instructions, assembly drawings and procedures
1.3 ensure that all power tool cables, extension leads or air supply hoses are in a safe, tested and serviceable condition
1.4 check that tools and measuring instruments to be used are within calibration date
1.5 use lifting and slinging equipment in accordance with health and safety guidelines and procedures (where appropriate)
1.6 ensure that the components used are free from foreign objects, dirt or other contamination
1.7 return all tools and equipment to the correct locations on completion of the assembly activities

2.

Produce assemblies using **six** of the following methods and techniques:

2.1 assembling of components by expansion/contraction
2.2 applying sealants/adhesives
2.3 fitting (such as filing, scraping, lapping or polishing)
2.4 electrical bonding of components
2.5 securing by using mechanical fasteners/threaded devices
2.6 assembling of products by pressure
2.7 setting and adjusting
2.8 applying bolt locking methods
2.9 aligning components
2.10 drilling
2.11 shimming and packing
2.12 riveting
2.13 pinning
2.14 reaming
2.15 blue-bedding of components
2.16 torque setting
2.17 balancing components

3.

Assemble products to meet the required specification, using **nine** of the following types of component:

3.1 assembly structure (framework, support, casings, panels)
3.2 pre-machined components
3.3 shafts
3.4 levers/linkages

3.5 springs
3.6 fabricated components
3.7 chains
3.8 keys
3.9 belts
3.10 bearings
3.11 couplings
3.12 pulleys
3.13 gaskets
3.14 seals
3.15 sprockets
3.16 gears
3.17 pipework/hoses
3.18 bushes
3.19 cams and followers
3.20 other specific component

4.

Secure the components using **both** of the following categories of fastening devices:

4.1 threaded fasteners (such as nuts, bolts, machine screws, cap screws)
4.2 locking and retaining devices (such as tab washers, locking nuts, wire locks, special purpose types)

Plus **one** more from the following:

3. pins (such as parallel/dowels, hollow/roll, tapered, split)
4. spring clips (such as external circlips, internal circlips, special clips)
5. rivets (such as countersunk, roundhead, blind, special purpose types)

1.

Assemble products using **two** of the following assembly aids and equipment:

1.1 workholding devices
1.2 shims and packing
1.3 lifting and moving equipment
1.4 rollers or wedges
1.5 specialised assembly tools/equipment
1.6 supporting equipment
1.7 jigs and fixtures

2.

Carry out the required quality checks, to include **eight** from the following, using appropriate equipment:

2.1 positional accuracy
2.2 alignment
2.3 freedom of movement
2.4 function
2.5 component security
2.6 bearing/shaft end float

2.7 completeness
2.8 operating/working clearances
2.9 dimensions
2.10 freedom from damage or foreign objects
2.11 orientation
2.12 torque settings

3.

Produce mechanical assemblies which comply with **all** of the following:

3.1 all components are correctly assembled and aligned in accordance with the specification
3.2 moving parts are correctly adjusted and have appropriate clearances
3.3 where appropriate, assemblies meet required geometric tolerances (such as square, straight, angles free from twists)
3.4 all fastenings have appropriate washers and are tightened to the required torque
3.5 where appropriate, bolt locking methods are applied

Behaviours

Additional Information

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

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