
Overview

This standard identifies the competences you need to restore motorsport mechanical components to usable condition by repair, in accordance with approved procedures. You will be required to restore a range of motorsport components and equipment to operational condition, by repairing assemblies/sub-assemblies and components, by reforming, reworking the surface, replacing threads or the manufacture and replacement of worn parts. You will also be required to select the appropriate equipment to use, based on the nature of the repair, the operations that will need to be carried out and the accuracy to be achieved.

In producing the components, you will be expected to use a range of hand tools, machine tools, portable power tools, and shaping and fitting techniques, that are appropriate to the type of material and repair being performed. These activities will include such processes as sawing (hand, machine), drilling, reaming, grinding (hand or machine), filing, scraping or lapping, threading (internal or external), turning, milling, fabricating and thermal processes. Materials to be used will include ferrous, non-ferrous, non-metallic and composites, which may be in sheet form, bar sections (such as square/rectangular, round, angle), and part-machined components.

Your responsibilities will require you to comply with organisational policy and procedures for the repairing activities undertaken, and to report any problems with these activities or with the tools, equipment or materials used, that you cannot personally resolve or that are outside your permitted authority, to the relevant people. You will be expected to work as members of a team, with a minimum of supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you carry out. Where team working is involved, you must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to applying motorsport component repair procedures. You will understand the function and operating conditions of the components being repaired, in sufficient depth to determine a suitable repair sequence and to ensure that the repairs carried out are safe and practical in operation. You will also understand the organisational policy on repairing components, and its application.

You will understand the safety precautions required when carrying out the repair activities, especially those involving the use of machinery. You will also understand your responsibilities for safety and the importance of taking the necessary safeguards to protect yourself and others in the workplace.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. follow the relevant specifications for the component to be repaired
3. prepare the component for repair
4. carry out the repairs within agreed timescale, using approved materials , components, methods and procedures
5. check that the repaired component meets the specified operating conditions
6. deal promptly and effectively with problems within your control and report those that cannot be solved
7. ensure that work records are completed, stored securely and available to others, as per organisational requirements
8. leave the work area in a safe condition on completion of the activities, as per organisational and legal requirements

Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken whilst carrying out the activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)
2. the health and safety requirements of the work area and the activities, and the responsibility these requirements place on you
3. the hazards associated with the activities, and how to minimise them and reduce risks
4. the personal protective equipment and clothing (PPE) to be worn during the activities
5. where to obtain, and how to interpret drawings, specifications, manuals, and other relevant documents
6. the methods, techniques and company procedures to be followed for repairing the motorsport components
7. the types of repairs that can be made to components in order to prolong their useful life (bushing worn holes, fitting thread inserts, building up surfaces by thermal process or metal spraying, making stepped keys, cutting new keyways, making stepped/oversize dowels or studs, fabricating components, skimming brake discs, drums, fly wheels, cylinder heads)
8. the factors to be taken into account when deciding if a repair is practical and possible (is a replacement component available, cost of replacing, safety of repair, age and condition of equipment)
9. the need to liaise with other departments in order to have specialised operations carried out on the components (thermal processes, metal spraying)
10. how to use filing, scraping and lapping to achieve the required surface finish (types of files/scrapers, checking that file/scrapper handles are in good condition, the range of lapping mediums)
11. how to cut internal and external threads (using hand dies and taps, machine cutting)
12. how to produce a sliding or mating fit, and the techniques to be adopted
13. how to select saw blades (for different materials and different operations)
14. the types and application of portable power tools that can be used for the fitting operations
15. how to check that portable power tools and extension cables are in a safe, tested and usable condition
16. how to use hand power tools and specialist equipment correctly (electrical, pneumatic, lifting equipment)
17. how to use cutting, bending and forming equipment for the fabrication of motorsport components

18. the operating requirements of the machine tools and accessories being used (guards, work holding devices, taper turning attachments, steadies, dividing heads, specific statutory work equipment regulations)
19. the various shapes and types of tooling that can be used (such as solid high-speed tooling, brazed tip tooling, interchangeable tipped tooling)
20. how to handle and store tools and equipment safely and correctly
21. factors which affect the selection of cutting feeds and speeds, and the depth of cut that can be taken (workpiece rigidity, machine condition, type of tooling being used, material type, finish and tolerance required)
22. the application of cutting fluids with regard to a range of different materials and processes
23. the techniques and implications of clamping of a workpiece in a chuck/work holding device (safely secured for the process, causing distortion in the finished components)
24. how to recognise machining faults, and how to identify when tools need re-sharpening/dressing
25. the methods that can be used to position the workpiece in relation to the cutting tools
26. the company recording procedures to be used following repair and how to apply them
27. the problems associated with the repair and how to resolve them
28. the extent of your own authority and to whom you should report if you have problems that you cannot resolve
29. how to access, use and maintain information to comply with organisational requirements and legislation

Scope/range related to performance criteria

1. Carry out all of the following during the repair activity:
 1. obtain and use the appropriate documentation (such as job instructions, drawings, quality control documentation)
 2. adhere to procedures or systems in place for risk assessment, hazardous substances, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
 3. provide safe access and working arrangements for the maintenance area and ensure any appropriate environmental conditions can be met
 4. ensure that the work area is suitably prepared for the repair activities to take place
 5. carry out the repair activities using appropriate techniques and procedures
 6. record the repair using appropriate methods or documentation
 7. apply safe working practices and procedures at all times
 8. leave the work area in a safe and appropriate condition and free from foreign object debris
 9. return all tools and equipment to the correct location on completion of the activities
 10. dispose of waste items in a safe and environmentally acceptable manner
2. Repair components for one of the following types of motorsport vehicle:
 1. single seater
 2. sports car
 3. historic vehicle
 4. rallying
 5. kart
 6. other specific approved competition vehicle
3. Use appropriate techniques to carry out eight of the following types of repair:
 1. reforming component surface by adding metal
 2. replacement of internal thread (inserts)
 3. recondition unit by replacement of worn components
 4. rework fit (shimming)
 5. rework surface finish (using techniques such as filing, scraping, grinding)
 6. making new or stepped keys

-
7. plugging holes
 8. sleeving worn components
 9. stopping cracks running and filling them
 10. making stepped dowels or studs
 11. skimming brake discs
 12. cutting new keyways
 13. grinding cylinder heads
 14. make temporary fix
 15. producing new components
 16. bushing worn holes
 17. manufacturing fabricated components
 18. other specific repair procedures
4. Use a range of methods and techniques to repair components, to include six of the following:
 1. sawing (such as hand, machine)
 2. filing
 3. turning
 4. drilling
 5. scraping or lapping
 6. milling
 7. reaming
 8. threading external
 9. thermal processes (such as metal spraying)
 10. grinding (hand or machine)
 11. threading internal
 12. bending and forming
 5. Repair motorsport components made from different types of material, to include two from the following:
 1. low carbon steel
 2. aluminium
 3. plastic/synthetic
 4. high carbon steel
 5. brass/bronze
 6. composite
 7. cast iron
 8. stainless steel
 6. Check repairs to motorsport vehicle mechanical equipment comply with one of the following:
 1. race associations
 2. industry repair standards, codes of practice and procedures
 3. vehicle manufacturers specification
 4. team/company standards and procedures
 5. specific vehicle requirements

SEMAUT3070

Restoring motorsport mechanical components to usable condition by repair



Developed by	Enginuity
Version Number	2
Date Approved	30 Mar 2020
Indicative Review Date	31 Mar 2023
Validity	Current
Status	Original
Originating Organisation	Semta
Original URN	SEMAUT3070
Relevant Occupations	Engineering, Engineering and Manufacturing Technologies, Science and Engineering Technicians, Vehicle Trades
Suite	Automotive Engineering Suite 3
Keywords	Engineering; automotive; manufacturing; restoring; motorsport; mechanical; assemblies; sub-assemblies; components; vehicles; repair; equipment