

# Unit 28: Motorsport Vehicle Preparation and Inspection

NQF level 3: BTEC National

Guided learning hours: 60

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## Unit abstract

The preparation and inspection of motorsport vehicles plays a vital part in their overall safety, performance and reliability. Any motorsport vehicle must be prepared to withstand the forces it is subjected to, the environment that it is used in and to conform to relevant standards.

The correct preparation of a vehicle's structure, brakes, engine and transmission is imperative if it is going to perform at its best. Preparation is also a vital aspect in maintaining the safety requirements of a vehicle involved in competitive activities.

Each form of motorsport requires specific types of preparation but there are also aspects of preparation that span the whole spectrum of the sport. Vehicle inspection is a critical part of the process, ensuring conformity to both set standards and safety requirements. It also goes a long way in ensuring a vehicle's reliability, which is an extremely important factor for any motorsport vehicle. Inspections should be carried out post build, pre-competition, during competition and post competition.

This unit focuses on both the technical and practical aspects of preparation and inspection. It will enable learners to gain the skills required of a competent member of a motorsport team. The areas covered will include preparing a motorsport vehicle to a given standard and ensuring that the correct documentation has been gathered and completed, during the inspection process. It will also cover the documentation required by the sports' governing bodies.

## Learning outcomes

On completion of this unit a learner should:

- 1 Understand the vehicle and competitor documentation required to compete at a motorsports event
- 2 Be able to prepare a competition vehicle to a recognised specification
- 3 Be able to carry out inspections before, during and after a motorsports event.

## Unit content

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### 1 Understand the vehicle and competitor documentation required to compete at a motorsports event

*Vehicle documentation:* ministry of transport (MOT) test (if required); motorsports association (MSA) logbooks; road tax; vehicle and competition insurance; driver and vehicle licensing agency (DVLA) log books, pre-inspection documentation, set-up sheets; collation of competition data eg from DVLA, MSA, manufacturer

*Competitor documentation:* club/membership cards; MSA licences eg clubman, national A, international, race, rally, speed medical certificate; doctor's medical report; collation of competition data eg entry applications and acceptances, final instructions, road books, circuit diagrams

*Motorsports events documentation:* eg MSA permits, insurance waivers, land registry, final instructions, regulations (race/rally)

### 2 Be able to prepare a competition vehicle to a recognised specification

*Competition vehicle preparation:* tool use eg spanners, sockets, screwdrivers, torque wrenches, pressure gauges; specialist tools eg camber, caster, tracking, spring compression gauges, gas analysers; equipment use eg hoists and stands, auxiliary engine starting devices; safe operation of tools and equipment eg serviceable condition, correctly stored and accounted for (shadow boards, tool control methods), correct tool/equipment used in an appropriate manner; preparation routines eg conformation of class, scrutineering

*Specifications:* MSA blue book requirements eg technical regulations, competitor safety (cage mountings, cage design, fire extinguishers); yellow book eg technical regulation, homologation (type of vehicle, year of make); single make and class regulations eg engine cubic capacity (cc), design type

### 3 Be able to carry out inspections before, during and after a motorsports event

*Health and safety:* safe use and handling of lubricants/fluids eg fuel, oil, solvents, grease; safe use of lifting equipment and handling techniques eg tested and calibrated lifting equipment, manual handling regulations; safe working practices eg motorsport specific applications of regulations and legislation (Health and Safety at Work Act 1974, Control of Substances Hazardous to Health (COSHH) Regulations 2002, Provision and Use of Work Equipment Regulations (PUWER) 1998; safe disposal of waste materials and components eg cleaning cloths, hydraulic fluids, contaminated fuel, scrap components (tyres, brake and clutch linings)

*Personal protective equipment (PPE):* overalls, safety-shoes, gloves, specialist motorsports equipment eg fire protection, hearing and eye protection, communications equipment

*Pre-competition inspection:* scrutineering; security of fastenings using a torque wrench eg nuts, bolts, critical securing devices; fuelling vehicle eg correct capacity, type of fuel; tyres eg suitability, condition, pressures; lubrication and coolant system levels and pressures eg warm up, operating temperature; testing throttle settings and operation eg idle, full throttle; hydraulic fluid system levels, check for leaks and operation eg for clutch, steering, brakes; vehicle brake balance settings; setting suspension dampers to suit event; transmission system operation eg function of clutch and gearbox through all gears; electrical system

operation; running gear eg spherical bearings, wheel bearings; reporting of faults eg loss of fluid, abnormal pressure, excessive wear

*Pre-competition set-up:* event analysis eg data from previous event, analysed set-up of car, gearing and suspension, ride height set-up sheets; corner weightings; steering geometry; gearing

*Inspections during an event:* scheduling of inspections; types of inspections eg routine service, check lists, spanner checks, suspension checks

*Post-competition inspection:* initial post-competition assessment, parts requisitions, set-down sheet, planning and scheduling of vehicle preparation for next event

*Post-competition vehicle rectification:* type of rectification eg repair, adjustment, replacement; estimation of repair costs; invoicing for accidental damage

## Grading grid

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all of the learning outcomes for the unit. The criteria for a pass grade describe the level of achievement required to pass this unit.

Grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 identify, record and collate vehicle, competitor and event documentation for a motorsport event P2 select and use tools and equipment to prepare a competition vehicle to a given specification P3 describe the health and safety procedures to be followed when inspecting a motorsports vehicle P4 select and use personal protective equipment P5 carry out pre-competition vehicle inspection and set-up P6 carry out vehicle inspections during a motorsports event P7 carry out a post-competition inspection following a motorsports event P8 identify and record vehicle rectification work required.	M1 compare the specifications required between two different classes of motorsport events M2 carry out a survey of a service/pit area and identify strengths and threats to the health and safety of self and others M3 produce a 'set-down' schedule and checklist for post-competition inspection and rectification.	D1 analyse and compare the differences in the tools and equipment used in a motorsports workshop against those used at a competitive event D2 evaluate your own and your team's performance after a motorsports event and recommend an improvement strategy.

## Essential guidance for tutors

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### Delivery

Delivery of this unit will need to focus on learners' understanding of the varied event structures and their documentation processes. The importance of meticulous preparation will need to be emphasised, along with interpreting relevant regulations and standards.

The ultimate focus of the unit will be a real motorsports event where all the knowledge and skills learned will be put to use. This may be through learners' own participation in an event, through working with an established motorsports team or through the centre's own motorsports activities.

Attendance at a number of different events (initially just to observe and eventually in an active role) is highly recommended. Supervised workshop sessions and practise of routines is vital in ensuring that learners gain the required skills and knowledge of procedures. In particular, learners need to adhere to relevant health and safety requirements and demonstrate that they can competently apply their skills in a real motorsports situation.

Centres will need to ensure that learners have experience (through controlled simulation, if necessary) of all aspects of the unit content. Careful consideration will need to be given as to how to best cover post-event evaluations and critical evaluation of whole events.

Note that the use of 'eg' in the content is to give an indication and illustration of the breadth and depth of the area or topic. As such, not all content that follows an 'eg' needs to be taught or assessed.

### Assessment

Assessment of the unit should predominantly focus on learners demonstrating their skills and knowledge during motorsports events. It is expected that each learner will prepare their own portfolio of evidence to cover all the assessment criteria through participation in real motorsport activities. Centres will need to consider how this can be supported and managed on an individual basis. Some simulation may be appropriate for assessment purposes, although this should be kept to an absolute minimum wherever possible.

The three learning outcomes cover documentation, pre-motorsport activity vehicle preparation and pre/during/post event inspection. Assessment is likely to follow this order although this is not essential. It should be noted that learning outcomes 1 and 2 only have one related pass criterion each, with the bulk of assessment relating to learning outcome 3, with six pass criteria.

For learning outcome 1, learners must be able to identify, record and collate vehicle, competitor and event documentation for a motorsport event (P1). It is important that this criterion is not fragmented and that the assessment activity that is used allows learners to collect all the required documentation at one event. The actual documentation will very much depend upon the nature/type of event used, but centres must ensure that the chosen event provides sufficient coverage of the unit content for the assessment to be valid and reliable.

Learning outcome 2 requires learners to select and use tools and equipment to prepare a competition vehicle to a given specification (P2). This is one of the criteria that could be simulated. However, whether simulation is used or the

vehicle is actually being prepared for an event, learners must be able to demonstrate their ability to select appropriate general tools, specialist tools and equipment and use them safely following a given specification. Evidence for this criterion is likely to be in several forms. Firstly, a tutor observation record of the learner's selection and use of tools and equipment, plus a logbook record (maintained by the learner) of the work carried out together with any data/information gathered. Finally, it is likely that the tutor will carry out an observation/inspection of the success of the vehicle's preparation against the specification together with the use of oral questioning of the learner.

Merit criterion M1 can be effectively linked to P2. One of the specifications used for the comparison is likely to be that used for the vehicle preparation undertaken for P2. A second, and quite different specification should be used to add depth and breadth to the learner's assessment evidence.

All the remaining pass criteria relate to learning outcome 3. The pass criteria P3 and P4 could be simulated in the centre's own workshops but it is expected that P5, P6, P7 and P8 will be undertaken and assessed under actual motorsport activity conditions.

To achieve P3 learners must describe the health and safety procedures to be followed when inspecting a motorsports vehicle. This must include safe use and handling of lubricants/fluids, safe use of lifting equipment and handling techniques, safe working practices and safe disposal of waste materials and components. Examples of each of these are given in the unit content but it is the actual task(s) undertaken that will determine which of these examples is most appropriate. It is for the centre to determine sufficiency of evidence but clearly, the task(s) used will need to be chosen carefully to include opportunities to meet all the requirements of the unit content. Since this is a descriptive criterion, a paper-based response could be used, although it might be more appropriate for evidence to be gathered through oral questioning of learners as they carry out relevant tasks.

M2 is related to P3 and provides an opportunity for learners to demonstrate and apply the knowledge. The evidence for M2 could be a written report of the learner's findings or feedback from their survey in the form of a briefing. The tutor will need to ensure that there are a number of typical health and safety issues (specifically created for the purpose of assessment if necessary) for learners to report back on under the heading 'threats'.

For P4, learners should be observed selecting and using the range of equipment listed in the unit content. With respect to the specialist equipment, it would not be unreasonable to expect all the examples to be used but as a minimum learners should select and use at least two under the appropriate conditions.

It is expected that P5, P6, P7 and P8 will be assessed during an actual motorsport activity. Ideally, the criteria should not be fragmented and should all be covered at one event. Once again, the assessment evidence for all of these criteria will be a mix of tutor observation and logbook records and data collection. It is essential for the achievement of P8 that the motorsport vehicle requires rectification. For this reason, it may be that this criterion can not be assessed at the same event as the others. Although it is likely that some rectification will be required following an event, the question for the tutor will be one of sufficiency for the learner's achievement of P8.

M3 could be linked to the work of P7 and P8. The 'set down' schedule must cover the post-competition inspection and rectification and is expected to include timetables, check lists, job cards, parts requisitions and invoicing/costing information.

It is likely that the evidence for D1 and D2 will come from the overview that the learner has gained during their work towards P5, P6, P7 and P8. Although D1 could be covered at the same event as that used at pass, it is more likely that a completely different event is used when learners are less involved and can stand back and take a broader view of the event. It is intended that the evidence for D1 will come from an analytical exercise that allows learners to compare motorsport workshop equipment to the types of tools and equipment used in the field during an event. Typically, this would include lists of the types of tools and equipment used and the related costs, safety and security considerations. It should also include an evaluation of which tools can double up for both purposes and the reasons behind the choices.

Finally, for D2, learners should carry out a full evaluation of their team's performance following an event. The evaluation might include the learner's reflection on the team's preparation, inventories, scheduling, loading lists, movements and individual personal performance. The evaluation must include a strategy for how the team can do things better and this is likely to touch on cost efficiencies that can be made.

### **Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications**

This unit contributes towards the knowledge and understanding needed for the SEMTA level 3 National Occupational Standards in Automotive Engineering, particularly:

- Unit 59: Carrying out Motorsports Vehicle Inspections During a Competition
- Unit 67: Carrying out Fault Diagnosis and Rectification Activities on Motorsports Vehicles During a Competition.

It also supports the following unit from the Automotive Skills Level 3 National Occupational Standards in Vehicle Maintenance and Repair:

- Unit MR06: Inspect Vehicles.

### **Essential resources**

Learners will need to have access to actual motorsport activities and events. In addition, centres will need to provide a realistic motorsport vehicle preparation and inspection area, including relevant tools and equipment. Relevant health and safety documentation and regulations relating to motorsport activities will also need to be available.

### **Indicative reading for learners**

Hillier V and Coombes P – *Hillier's Fundamentals of Motor Vehicle Technology* (Nelson Thornes, 2004) ISBN 0748780823

Nunney M J – *Light and Heavy Vehicle Technology* (Butterworth-Heinemann, 2006) ISBN 0750680377

## Key skills

Achievement of key skills is not a requirement of this qualification but it is encouraged. Suggestions of opportunities for the generation of level 3 key skill evidence are given here. Staff should check that learners have produced all the evidence required by part B of the key skills specifications when assessing this evidence. Learners may need to develop additional evidence elsewhere to fully meet the requirements of the key skills specifications.

Communication Level 3	
When learners are:	They should be able to develop the following key skills evidence:
<ul style="list-style-type: none"> <li>preparing for vehicle inspections, eg reading specifications, regulations and health and safety guidance</li> <li>writing vehicle inspection reports and collating relevant evidence of vehicle/driver records.</li> </ul>	<p>C3.2 Read and synthesise information from at least <b>two</b> documents about the same subject. Each document must be a minimum of 1000 words long.</p> <p>C3.3 <i>Write two different types of documents each one giving different information about complex subjects. One document must be at least 1000 words long.</i></p>
Information and communication technology Level 3	
When learners are:	They should be able to develop the following key skills evidence:
<ul style="list-style-type: none"> <li>researching information on vehicle documentation, health and safety and relevant regulations</li> <li>preparing and presenting assessment evidence including inspection report write-ups.</li> </ul>	<p>ICT3.1 Search for information, using different sources, and multiple search criteria in at least one case.</p> <p>ICT3.2 <i>Enter and develop the information and derive new information.</i></p> <p>ICT3.3 Present combined information such as text with image, text with number, image with number.</p>