



Faculty of Engineering

Workshop Safety Guidelines

**FSAE
TEST DAY SAFETY MANUAL**

Student Name: _____

1. OH&S Induction Acknowledgement.

- Taking one of the FSAE vehicles on to the test track is an integral part of the FSAE program, and a requirement for commissioning vehicles, training drivers and preparing for the competition. It is also an activity that introduces additional risks and hazards for team members, and hence must be undertaken with care and an attitude aimed to eliminating any incidents.
 - This activity is governed by the same rules and regulations as the University Engineering workshops
 - It is a requirement that students wishing to participate in test day activities undertake this *Safety Induction* and be trained on the appropriate equipment before commencing activities in the workshop. Students seeking approval can contact either Steve Selby, Coniston B Ph:42 252373, Dr Oliver Kennedy, Bld 8.109 Ph:42 213 357 or Dr Weihua Li, Bld 8.110 PH 42213490
 - The test day safety guidelines must be read and signed before any work is carried out.
1. I have read, and understand this document. I agree to follow all the guidelines set out in this document.
 2. I have completed the required induction/s for the FSAE test day.
 3. I have received instruction and identified risks involved when using tools and equipment:

Student/Staff Name: _____ Student/Staff Number: _____

Student/Staff Signature: _____ Date: _____

Induction Date: _____ Trainer's Name: _____

Trainer's Signature: _____

Academic Supervisor's Name: _____ Date: _____

Academic Supervisor's Signature: _____

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2. Introduction

The test day activity contains many potential safety hazards. However, with proper control these hazards can be eliminated. This manual is intended to outline the basic safety requirements that must be followed.

2.1 Upon arriving and leaving

Students and visitors will need to sign in and out of the Test Day Attendance Book.

2.2 Staff and Students

All students who undertake work in the workshop must take reasonable care of their own health and safety and the health and safety of others by:

- Taking action to avoid, eliminate or minimise hazards of which they are aware;
- Complying with all occupational health and safety instructions, policies, and procedures including departmental safety manuals;
- Making proper use of all safety devices and personal protective equipment (PPE)
- Complying with the instructions given by emergency response personnel such as emergency wardens and first aiders
- Not willfully placing at risk the health and safety of any other person
- Seeking information or advice where necessary before carrying out new or unfamiliar work
- Maintaining dress standards appropriate for the work being done. Appropriate protective clothing and footwear must be worn at all times
- Being familiar with emergency and evacuation procedures and the location of, and if appropriately trained, in the use of, emergency equipment
- Reporting all incidents, hazards and 'near miss' incidents to their supervisor.

3. Safe Conduct

The following recommendations detail the standard behavior for all personnel working within the workshop.

- (a) Never adopt a casual attitude at the test day, and always be conscious of the potential hazards.
- (b) Ensure that personal clothing is suitable for the pit area conditions, e.g. Safety footwear with steel capping. Thongs or open footwear **MUST** not be worn in the workshop area. Singlets, tank tops or similar clothing are not suitable for wearing in the workshop.
- (c) Always wear eye protection in pit area when undertaking physical work, operating equipment or being in the vicinity of equipment operating.
- (d) Use protective clothing and devices appropriate to the type of operation being carried out, giving due consideration to the work being carried out in the vicinity.

- (e) Never indulge in reckless behavior at the test day venue.
- (f) Always exercise care when moving around the pit area or test track.
- (g) Smoking is prohibited anywhere in the vicinity of the pit area and track.
- (h) Regard all substances as hazardous unless there is definite information to the contrary.
- (i) Before any work is carried out on the car, permission must be obtained from group leaders or team leader in charge. Never undertake any work unless the potential hazards of the operation are known as precisely as possible, and the appropriate safety precautions are adopted. Any arc or flame producing activity is not to commence until the immediate area has been cleared of dusts. Many materials, which are nonflammable in a lump state, become quite volatile when in powdered or dust cloud form.
- (j) Take additional care when carrying or moving any potentially hazardous material or substance.
- (k) Label all safety equipment and maintain it in good operating condition. Check and inspect safety equipment for correct operation in accordance with the manufacturer's instructions and report, to supervisor immediately, any requirement for maintenance.
- (l) Ensure that all safety equipment remains accessible to the team personnel at all times.
- (m) Keep safety information and emergency procedures prominently displayed at all times. Include in the safety information, the telephone numbers of:

Fire brigade	000
Ambulance	000
Faculty OHS Officer	Wayne Ireland 4221 4724
Hospital	42 298233. (Casualty)
Police	000
Wollongong Police Station	4226 7899
UoW Security.	4221 4555
Alternate Emergency	IOH Wollongong – 32 Swan St 4229 6111

THE FIRST AID BOX IS TO BE LOCATED IN THE TRAILER

4. Car Check Lists

Before a car is to be taken to a test day it is to be checked and passed for use through the completion of the team CHECKLISTS.

These check lists set out the inspection requirements for all the critical sections on the car, as outlined below:

- Engine
- Brakes
- Suspension
- Drive Train
- Chassis
- Electrical
- Steering

These checklists are of the “use once” and store variety. The inspector for a particular section is to sign off on the sheet after all items have been identified as being in a satisfactory condition. The completed checklist is to be stored in an appropriately designated folder in the FSAE office area at the Coniston workshop.

Team members conducting the checklists are to be instructed / inducted by the team leaders for the relevant section, and a record of accredited checklist Inspectors is to be kept with the checklist record.

5. Pit Area Requirements

The test day activity will consist of utilising a test track for driving the vehicle, and a pit area for parking and working on the car in between track sessions.

Safety Issues for the pit area include:

- Having a clearly designated area, with obvious entry and exit areas for the driver.
- Pit crew should generally remain within the designated pit area. Anyone moving outside that area must be aware that the driver will be concentrating on their own tasks and may not correctly anticipate someone else's movements. Any movement outside the pit area must be with the prior approval of the team leaders at the event.
- The pit area is to be a NO SMOKING zone.
- All team personnel at the test day in the pit area must wear high visibility vests in order for the driver and other team members to have clear vision of all persons in potential risk areas.
- Arrange for the entry and exit points for the car to be free of potential crash objects (for example team trailers and support vehicles).
- Ensure that flammable items (for example fuel containers) are a minimum of 5 metres from the vehicle traffic region in the pit.
- The following **Refuelling Procedures** are to be followed: **1.** Refueller must be wearing a fire resistant driver's suit or approved fire retardant clothing. **2.** The engine is to be stopped. **3.** The driver is to be out of the car. **4.** A team member is to be on standby with a CO₂ fire extinguisher during the refuelling operation. **5.** Any fuel spillage is to be avoided – if any spillage occurs the car is to be moved 3 metres from that location and the spillage cleaned up before the car is restarted.
- **Have a Carbon Dioxide fire extinguisher [CO₂] - colour coded red with a black band – on hand in the pit area at all times. When the car is in the pit, this fire extinguisher is to be manned by a team member competent in its use.**
- Have suitable PPE available for use by the pit crew – including hearing protection, safety glasses and gloves.
- Have a first aid kit on hand, including a fire blanket.
- The team must have a trained senior first aid person in attendance at all test days.

Safe operating procedures must be followed at all times – particularly when the engine is running in the pit area. These include:

- A driver is to be in the car whenever the engine is running.
- No personnel to stand in front of the car whenever the engine is running.

6. Car on Track

The Team must be alert for any hazardous incidents whenever the car is on track. It is mandatory that any person driving the car be inducted into the operation of the car, and that all required driver safety equipment be in use. This includes:

- A safety helmet that meets the FSAE requirements, with the visor down whenever the car is in motion
- Driver suit
- Gloves
- Driving shoes
- 5 point safety harness

A second Carbon Dioxide extinguisher [CO₂] is to be deployed at a safe point at a distant point on the test track, and manned by a team member competent in its use.

Critical issues arising with the operation of the car may not be apparent to the driver. It is vital that the pit crew and driver have a clear understanding of the signs that will be used to communicate with the driver. In particular it is necessary to effectively communicate emergency situations to the driver that require immediate shut down of the vehicle, and immediate driver egress. The Communication Protocol set out in section 6.1 is to be followed.

Each time the car enters the pit area team members must review critical vehicle systems – fuel, brakes, steering, wheels and tyres, safety harness. Any leaks found must be identified, and where possible rectified. If they are from critical systems (fuel, brakes) the test session must cease until they are rectified, and the relevant check list performed on that system.

6.1 Pit to Driver Communication Protocol

Purpose:

This protocol is intended to ensure clear and unambiguous communication between the Pit Crew / Track Marshals and the Driver in the car.

The communication is to be via FLAGS that will be clearly visible to the driver on the course. The flags are to be in a minimum of two locations around the track – one at the pit area and one with the track marshal manning the fire extinguisher station at the “remote” track location. The locations of these two positions are to be determined by the designated Safety Officer for that track day.

FOUR FLAGS are to be used:

1. GREEN FLAG – indicates NO PROBLEMS, continue driving as per test day plan
2. YELLOW FLAG – indicates RETURN TO PIT
3. RED FLAG – indicates STOP VEHICLE IMMEDIATELY. SHUT DOWN ENGINE and EXIT VEHICLE
4. CHECKERED FLAG - indicates end of session, return to the pit area in a safe and controlled manner.

7. Driver Requirements

Any person driving one of the FSAE vehicles must have either a current road licence or a current Confederation of Australian Motor Sport [CAMS] licence.

All persons driving one of the FSAE vehicles must be inducted into the required driving systems by an approved instructor. This induction is to include:

- Operation of the safety harness employed in the car.
- Egress procedures required for the vehicle, including removal of steering wheel to effect egress.

- Specifics for the operation of the particular vehicle (brakes, clutch, gear change procedures, throttle operation).
- The procedure for starting the vehicle.
- The emergency shut down procedure for the vehicle.
- The pit to driver communication protocol that will be used.

The induction procedure is to include competency tests for all elements listed above, not simply an instruction process. A record of driver inductions is to be maintained with the checklist records.

8. Designated Safety Officer

Maintaining a safe operation during the test day is a responsibility for all team members at that event. Any team member identifying unsafe situations or practices must bring this to the attention of the team leaders at the event. Due to the importance of safety issues, a Safety Officer is to be appointed for each test day. This person should be a senior member of the team, as the responsibility is significant.

The primary role of the Safety Officer is to maintain an overview of the event, and ensure that all required safety procedures and arrangements are followed. The Safety Officer will be identified by wearing a yellow hi-vis vest. Team members present at the test day must comply with directions made by the Safety Officer in the course of carrying out this responsibility. Failure to comply with these directions by participants is a serious matter – and any incidents must be reviewed by the Team Leadership group and the Faculty Advisor. It may lead to exclusion from Test Days and/or suspension/expulsion from the UoW FSAE team.

Responsibilities of the Safety Officer include preparatory matters such as:

- Confirm that vehicle check lists have been completed prior to any vehicle operation
- Confirm that all team members present have been inducted into test day procedures
- Confirm that all drivers have been inducted into driving of the vehicle.
- Ensure all team members are wearing hi-vis vests.
- Confirm that flags for the pit to driver protocol communication system are available.
- Ensure that fire extinguishers are manned at remote point around the track and at the pit area
- Confirm that that the First Aid Kit and Fire Blanket are available
- Identify a qualified first aider
- Confirm that safety equipment required on the test vehicle (in particular: emergency stop switch, safety harness and body work shielding driver cockpit from fuel system) is in place and functioning.
- Confirm that driver/s is equipped with necessary safety gear (suit, helmet, gloves, boots).

During running of the test day the Safety Officer is responsible for overseeing particular activities, such as:

- Refuelling
- Lifting the car in/out of the trailer.
- Ensuring that driver safety equipment (suit, boots, gloves, helmet) is in place each time a driver prepares to leave the pit, that the safety harness and wrist restraints are on and that the driver's visor is down.
- The pit to driver communication protocol is adhered to
- The pit area is maintained in a safe condition (fuel storage, trip hazards minimized etc)
- Potential collision hazards (other vehicle, trailers etc) are not placed in dangerous locations for the test vehicle
- Safe location/behaviour of team personnel during vehicle running

- Safe location of non-test day accredited attendees at test day (including nomination of a safe area)

The Designated safety officer is to maintain a safety record for the event, which is to be filed with the checklist record.

The safety record is to provide check boxes to record that the following items have been complied with:

1. All system check lists have been completed satisfactorily before the event.
2. Relevant group leaders or their nominees have approved the car for use.
3. Initial Critical Systems Checks before first run have carried out, i.e.
 - a) Jack up front of car and confirm operation of front brakes.
 - b) Repeat for rear of car and rear brakes.
 - c) Confirm that driver cockpit is shielded from fuel system (as per FSAE rules).
 - d) Operation of steering wheel.
 - e) Throttle operation (in particular throttle return) is satisfactory.
 - f) The emergency engine shut off switch is operational.
4. Critical Driver Issues are satisfactory:
 - a) Driver has been inducted into the car.
 - b) Driver has demonstrated the ability to complete a 5 second egress.
 - c) Safety harness is in operation.
 - d) Driver safety equipment is in use (helmet with visor down when driving, driver suit, gloves, shoes).
5. Pit and Track Issues:
 - a) Fuel storage is arranged in a safe location.
 - b) Car entry and exit paths are safely arranged (no hazardous crash obstacles present).
 - c) Pit crew wearing high visibility vests.
 - d) Carbon Dioxide [CO₂] fire extinguishers present and manned (one in pit area, one at a safe remote point on the track).
 - e) PPE is available for use by the pit crew.
 - f) First aid kit and Fire Blanket is available.
 - g) First Aider is present.

In addition, the designated safety officer is to maintain an attendance record for the test day and to report any incident, hazard or “near miss” incident that may occur to their supervisor.

9. Program Review

As part of a continuous improvement system, this program shall be reviewed on a regular basis or upon recommendation of the Faculty of Engineering workplace advisory committee [WAC].