2004 FORMULA ONE TECHNICAL REGULATIONS

SUMMARY

ARTICLE 1: DEFINITIONS

1.1 Formula One Car :
An automobile designed solely for speed races on circuits or closed courses.

1.2 Automobile :
A land vehicle running on at least four non-aligned complete wheels, of which at least two are used for steering and at least two for propulsion.

1.3 Land vehicle :
A locomotive device propelled by its own means, moving by constantly taking real support on the earth's surface, of which the propulsion and steering are under the control of a driver aboard the vehicle.

1.4 Bodywork :
All entirely sprung parts of the car in contact with the external air stream, except cameras and the parts definitely associated with the mechanical functioning of the engine, transmission and running gear. Airboxes, radiators and engine exhausts are considered to be part of the bodywork.

1.5 Wheel :
Flange and rim.

1.6 Complete wheel :
Wheel and inflated tyre. The complete wheel is considered part of the suspension system.

1.7 Automobile Make :
In the case of Formula racing cars, an automobile make is a complete car. When the car manufacturer fits an engine which it does not manufacture, the car shall be considered a hybrid and the name of the engine manufacturer shall be associated with that of the car manufacturer. The name of the car manufacturer must always precede that of the engine manufacturer. Should a hybrid car win a Championship Title, Cup or Trophy, this will be awarded to the manufacturer of the car.

1.8 Event :
An event shall consist of official practice and the race.

1.9 Weight :
Is the weight of the car with the driver, wearing his complete racing apparel, at all times during the event.

1.10 Racing weight :
Is the weight of the car in running order with the driver aboard and all fuel tanks full.

1.11 Cubic capacity :
The volume swept in the cylinders of the engine by the movement of the pistons. This volume shall be expressed in cubic centimetres. In calculating engine cubic capacity, the number Pi shall be 3.1416.

1.12 Supercharging :
Increasing the weight of the charge of the fuel/air mixture in the combustion chamber (over the weight induced by normal atmospheric pressure, ram effect and dynamic effects in the intake and/or exhaust system) by any means whatsoever. The injection of fuel under pressure is not considered to be supercharging.

1.13 Cockpit :
The volume which accommodates the driver.

1.14 Sprung suspension :
The means whereby all complete wheels are suspended from the body/chassis unit by a spring medium.

1.15 Survival cell :
A continuous closed structure containing the fuel tank and the cockpit.

1.16 Camera :
Television cameras the dimensions of which are defined in Drawing 6.

1.17 Camera housing :
A device which is identical in shape and weight to a camera and which is supplied by the relevant Competitor for fitting to his car in lieu of a camera.

1.18 Cockpit padding :
Non-structural parts placed within the cockpit for the sole purpose of improving driver comfort and safety. All such material must be quickly removable without the use of tools.

1.19 Brake caliper :
All parts of the braking system outside the survival cell, other than brake discs, brake pads, caliper pistons, brake hoses and fittings, which are stressed when subjected to the braking pressure. Bolts or studs which are used for attachment are not considered to be part of the braking system.

1.20 Electronically controlled :
Any command system or process that utilises semi-conductor or thermionic technology.

ARTICLE 2 : GENERAL PRINCIPLES

2.1 Role of the FIA :
The following technical regulations for Formula 1 cars are issued by the FIA.

2.2 Amendments to the regulations :
Amendments to these regulations will be made in accordance with the Concorde agreement.

2.3 Dangerous construction :
The stewards of the meeting may exclude a vehicle whose construction is deemed to be dangerous.

2.4 Compliance with the regulations :
Automobiles must comply with these regulations in their entirety at all times during an Event.
Should a competitor feel that any aspect of these regulations is unclear, clarification may be sought from the FIA Formula One Technical Department. If clarification relates to any new design or system, correspondence must include :

- a full description of the design or system ;
- drawings or schematics where appropriate ;
- the Competitor's opinion concerning the immediate implications on other parts of the car of any proposed new design ;
- the Competitor's opinion concerning any possible long term consequences or new developments which may come from using any such new designs or systems ;
- the precise way or ways in which the Competitor feels the new design or system will enhance the performance of the car.

2.5 Measurements :
All measurements must be made while the car is stationary on a flat horizontal surface.

2.6 Duty of Competitor :
It is the duty of each Competitor to satisfy the FIA technical delegate and the Stewards of the Meeting that his automobile complies with these regulations in their entirety at all times during an Event.
The design of the car, it's components and systems shall, with the exception of safety features, demonstrate their compliance with these regulations by means of physical inspection of hardware or materials. No mechanical design may rely upon software inspection as a means of ensuring its compliance.

ARTICLE 3 : BODYWORK AND DIMENSIONS

For illustrations refer to drawings 1A-5A in the Appendix to these regulations

3.1 Wheel centre line :

The centre line of any wheel shall be deemed to be half way between two straight edges, perpendicular to the surface on which the car is standing, placed against opposite sides of the complete wheel at the centre of the tyre tread.

3.2 Height measurements :
All height measurements will be taken normal to and from the reference plane.

3.3 Overall width :
The overall width of the car, including complete wheels, must not exceed 1800mm with the steered wheels in the straight ahead position. Overall width will be measured when the car is fitted with tyres inflated to 1.4 bar.

3.4 Width ahead of the rear wheel centre line :
3.4.1 Bodywork width ahead of the rear wheel centre line must not exceed 1400mm.

3.4.2 In order to prevent tyre damage to other cars, the top and forward edges of the lateral extremities of any bodywork forward of the front wheels must be at least 10mm thick with a radius of at least 5mm.

3.5 Width behind the rear wheel centre line :
Bodywork width behind the rear wheel centre line must not exceed 1000mm.

3.6 Overall height :
No part of the bodywork may be more than 950mm above the reference plane.

3.7 Front bodywork height :
All bodywork situated forward of a point lying 330mm behind the front wheel centre line, and more than 250mm from the centre line of the car, must be no less than 100mm and no more than 300mm above the reference plane.

3.8 Height in front of the rear wheels :
3.8.1 Other than the rear view mirrors, each with a maximum area in plan view of 12000mm², no bodywork situated more than 330mm behind the front wheel centre line and more than 330mm forward of the rear wheel centre line, which is more than 600mm above the reference plane, may be more than 300mm from the centre line of the car.

3.8.2 No bodywork between the rear wheel centre line and a line 800mm forward of the rear wheel centre line, which is more than 500mm from the centre line of the car, may be more than 500mm above the reference plane.

3.8.3 No bodywork between the rear wheel centre line and a line 400mm forward of the rear wheel centre line, which is more than 500mm from the centre line of the car, may be more than 300mm above the reference plane.

3.9 Bodywork between the rear wheels :
3.9.1 No bodywork more than 100 mm from the car centre line, and which is situated between the rear wheel centre line and a point lying 330mm forward of it may be more than 600mm above the reference plane.

3.9.2 No bodywork more than 50 mm from the car centre line, and which is situated between the rear wheel centre line and a point lying 150mm behind it may be more than 450mm above the reference plane.

3.10 Height behind the rear wheel centre line :
3.10.1 Any part of the car more than 150mm behind the centre line of the rear wheels must not be more than 800mm above the reference plane.

3.10.2 No bodywork behind the centre line of the rear wheels, and more than 150mm each side of the longitudinal centre line of the car, may be less than 300mm above the reference plane.

3.10.3 Any bodywork more than 150mm behind the rear wheel centre line which is more than 300mm above the reference plane, and between 75mm and 480mm from the car centre line, must lie in one of two areas when viewed from the side of the car :
The lower area is situated from 300mm to 375mm above the reference plane, and from 150mm to 500mm behind the rear wheel centre line. When viewed from the side of the car, no longitudinal cross section may have more than one closed section in the lower area.

The upper area is situated from 600mm to 800mm above the reference plane, and from 150mm to 500mm behind the rear wheel centre line. When viewed from the side of the car, no longitudinal cross section may have more than two closed sections in the upper area. Furthermore, the distance between adjacent sections at any longitudinal plane must not exceed 15mm at their closest position.

In side view, the projected area of the bodywork lying between 300mm and 800mm above the reference plane, and 150mm and 600mm behind the rear wheel centre line must be greater than 200 000 mm².

3.11 Bodywork around the front wheels :
With the exception of brake cooling ducts, in plan view, there must be no bodywork in the area formed by two longitudinal lines parallel to and 400mm and 900mm from the car centre line and two transversal lines, one 350mm forward of and one 800mm behind the front wheel centre line.

3.12 Bodywork facing the ground :
3.12.1 All sprung parts of the car situated more than 330mm behind the front wheel centre line and more than 330mm forward of the rear wheel centre line, and which are visible from underneath, must form surfaces which lie on one of two parallel planes, the reference plane or the step plane. This does not apply to any parts of rear view mirrors which are visible, provided each of these areas does not exceed 12000mm² when projected to a horizontal plane above the car. The step plane must be 50mm above the reference plane.

3.12.2 Additionally, the surface formed by all parts lying on the reference plane must :
- extend from a point lying 330mm behind the front wheel centre line to the centre line of the rear wheels;
- have minimum and maximum widths of 300mm and 500mm respectively ;
- be symmetrical about the centre line of the car ;
- have a 50mm radius (+/-2mm) on each front corner when viewed from directly beneath the car, this being applied after the surface has been defined.

3.12.3 The surface lying on the reference plane must be joined around its periphery to the surfaces lying on the step plane by a vertical transition. If there is no surface visible on the step plane vertically above any point around the periphery of the reference plane, this transition is not necessary.

3.12.4 The peripheries of the surfaces lying on the reference and step planes may be curved upwards with maximum radii of 25 and 50mm respectively. Where the vertical transition meets the surfaces on the step plane a radius, no greater than 25mm, is permitted.

A radius in this context will be considered as an arc applied perpendicular to the periphery and tangential to both surfaces.

The surface lying on the reference plane, the surfaces lying on the step plane, the vertical transitions between them and any surfaces rearward of the surfaces lying on the reference or step planes, must first be fully defined before any radius can be applied or the skid block fitted. Any radius applied is still considered part of the relevant surface.

3.12.5 All parts lying on the reference and step planes, in addition to the transition between the two planes, must produce uniform, solid, hard, continuous, rigid (no degree of freedom in relation to the body/chassis unit), impervious surfaces under all circumstances.

Fully enclosed holes are permitted in the surfaces lying on the reference and step planes provided no part of the car is visible through them when viewed from directly below.

3.12.6 To help overcome any possible manufacturing problems, and not to permit any design which may contravene any part of these regulations, dimensional tolerances are permitted on bodywork situated between a point lying 330mm behind the front wheel centre line and the rear wheel centre line. A vertical tolerance of +/- 5mm is permissible across the surfaces lying on the reference and step planes and a horizontal tolerance of 5mm is permitted when assessing whether a surface is visible from beneath the car.

3.12.7 All sprung parts of the car situated behind a point lying 330mm forward of the rear wheel centre line, which are visible from underneath and are more than 250mm from the centre line of the car**,** must be at least 50mm above the reference plane.

3.13 Skid block :

3.13.1 Beneath the surface formed by all parts lying on the reference plane, a rectangular skid block, with a 50mm radius (+/-2mm) on each front corner, must be fitted. This skid block may comprise more than one piece but must :

a) extend longitudinally from a point lying 330mm behind the front wheel centre line to the centre line of the rear wheels.
b) be made from an homogeneous material with a specific gravity between 1.3 and 1.45.
c) have a width of 300mm with a tolerance of +/- 2mm.
d) have a thickness of 10mm with a tolerance of +/- 1mm.
e) have a uniform thickness when new.
f) have no holes or cut outs other than those necessary to fit the fasteners permitted by 3.13.2 or those holes specifically mentioned in g) below.
g) have seven precisely placed holes the positions of which are detailed in Drawing 1. In order to establish the conformity of the skid block after use, it's thickness will only be measured in the four 50mm diameter holes and the two forward 80mm diameter holes.
Four further 10 mm diameter holes are permitted provided their sole purpose is to allow access to the bolts which secure the Accident Data Recorder to the survival cell.
h) be fixed symmetrically about the centre line of the car in such a way that no air may pass between it and the surface formed by the parts lying on the reference plane.

3.13.2 Fasteners used to attach the skid block to the car must :

a) have a total area no greater than 40000mm² when viewed from directly beneath the car ;
b) be no greater than 2000mm² in area individually when viewed from directly beneath the car ;
c) be fitted in order that their entire lower surfaces are visible from directly beneath the car.

When the skid block is new, ten of the fasteners may be flush with it's lower surface but the remainder may be no more than 8mm below the reference plane.

3.13.3 The lower edge of the periphery of the skid block may be chamfered at an angle of 30° to a depth of 8mm, the trailing edge however may be chamfered over a distance of 200mm to a depth of 8mm.

3.14 Overhangs :

No part of the car may be more than 600mm behind the centre line of the rear wheels or more than 1200mm in front of the centre line of the front wheels.
No part of the car less than 480mm from the centre line of the car may be more than 500mm behind the centre line of the rear wheels.
No part of the bodywork more than 200mm from the centre line of the car may be more than 900mm in front of the front wheel centre line.
All overhang measurements will be taken parallel to the reference plane.

3.15 Aerodynamic influence :

Any specific part of the car influencing its aerodynamic performance (with the exception of the cover described in Article 6.5.2 in the pit lane only) :

- Must comply with the rules relating to bodywork.
- Must be rigidly secured to the entirely sprung part of the car (rigidly secured means not having any degree of freedom).
- Must remain immobile in relation to the sprung part of the car.

Any device or construction that is designed to bridge the gap between the sprung part of the car and the ground is prohibited under all circumstances.
No part having an aerodynamic influence and no part of the bodywork, with the exception of the skid block in 3.13 above, may under any circumstances be located below the reference plane.

3.16 Upper bodywork :

3.16.1 With the exception of the opening described in Article 3.16.3, when viewed from the side, the car must have bodywork in the area bounded by four lines. One vertical 1330 mm forward of the rear wheel centre line, one horizontal 550 mm above the reference plane, one horizontal 925 mm above the reference plane and one diagonal which intersects the 925 mm horizontal at a point 1000mm forward of the rear wheel centreline and the 550mm horizontal at the rear wheel centreline
Bodywork within this area must be arranged symmetrically about the car centre line and, when measured 200mm vertically below the diagonal boundary line, must have minimum widths of 150mm and 50mm respectively at points lying 1000mm forward of the rear wheel centre line and at the rear wheel centre line. This bodywork must lie on or outside the boundary defined by a linear taper between these minimum widths.

3.16.2 Bodywork lying vertically above the upper boundary as defined in 3.16.1 may be no wider than 125mm and must be arranged symmetrically about the car centreline.

3.16.3 In order that a car may be lifted quickly in the event of it stopping on the circuit, the principal rollover structure must incorporate a clearly visible unobstructed opening designed to permit a strap, whose section measures 60mm x 30mm, to pass through it.

3.17 Bodywork flexibility :

3.17.1 Bodywork may deflect no more than 5mm vertically when a 500N load is applied vertically to it 700mm forward of the front wheel centre line and 625mm from the car centre line. The load will be applied in a downward direction using a 50mm diameter ram and an adapter 300mm long and 150mm wide. Teams must supply the latter when such a test is deemed necessary.

3.17.2 Bodywork may deflect no more than 10mm vertically when a 500N load is applied vertically to it 400mm forward of the rear wheel centre line and 650mm from the car centre line. The load will be applied in a downward direction using a 50mm diameter ram and an adapter of the same size, Teams must supply the latter when such a test is deemed necessary.

3.17.3 Bodywork may deflect by no more than one degree horizontally when a load of 1000N is applied simultaneously to its extremities in a rearward direction 780mm above the reference plane and 130mm behind the rear wheel centre line.

3.17.4 In order to ensure that the requirements of Article 3.15 are respected, the FIA reserves the right to introduce further load/deflection tests on any part of the bodywork which appears to be (or is suspected of), moving whilst the car is in motion.

ARTICLE 4 : WEIGHT

4.1 Minimum weight :
The weight of the car must not be less than 605 kg during the qualifying practice session and no less than 600 kg at all other times during the Event.

4.2 Ballast :
Ballast can be used provided it is secured in such a way that tools are required for its removal. It must be possible to fix seals if deemed necessary by the FIA technical delegate.

4.3 Adding during the race :
With the exception of fuel and compressed gases, no substance may be added to the car during the race. If it becomes necessary to replace any part of the car during the race, the new part must not weigh any more than the original part.

ARTICLE 5 : ENGINE

5.1 Engine specification :
5.1.1 Only 4-stroke engines with reciprocating pistons are permitted.

5.1.2 Engine capacity must not exceed 3000 cc.

5.1.3 Supercharging is forbidden.

5.1.4 All engines must have 10 cylinders and the normal section of each cylinder must be circular.

5.1.5 Engines may have no more than 5 valves per cylinder.

5.2 Other means of propulsion :
5.2.1 The use of any device, other than the 3 litre, four stroke engine described in 5.1 above, to power the car, is not permitted.

5.2.2 The total amount of recoverable energy stored on the car must not exceed 300kJ, any which may be recovered at a rate greater than 2kW must not exceed 20kJ.

5.3 Engine intake air :
5.3.1 Other than injection of fuel for the normal purpose of combustion in the engine, any device, system, procedure, construction or design the purpose or effect of which is any decrease in the temperature of the engine intake air is forbidden.

5.3.2 Other than engine sump breather gases and fuel for the normal purpose of combustion in the engine, the spraying of any substance into the engine intake air is forbidden.

5.4 Exhaust system :
Variable geometric length exhaust systems are forbidden.

5.5 Engine materials :
5.5.1 The basic structure of the crankshaft and camshafts must be made from steel or cast iron.

5.5.2 Pistons, cylinder heads and cylinder blocks may not be composite structures which use carbon or aramid fibre reinforcing materials.

5.6 Starting the engine :
A supplementary device temporarily connected to the car may be used to start the engine both on the grid and in the pits.

5.7 Stall prevention systems :
If a car is equipped with a stall prevention system, and in order to avoid the possibility of a car involved in an accident being left with the engine running, all such systems must be configured to stop the engine no more than ten seconds after activation.

ARTICLE 6 : FUEL SYSTEM

6.1 Fuel tanks :
6.1.1 The fuel tank must be a single rubber bladder conforming to or exceeding the specifications of FIA/FT5-1999, the fitting of foam within the tank however is not mandatory. A list of approved materials may be found in the Appendix to these regulations.

6.1.2 All the fuel stored on board the car must be situated between the front face of the engine and the driver's back when viewed in lateral projection. When establishing the front face of the engine, no parts of the fuel, oil, water or electrical systems will be considered.
Furthermore, no fuel can be stored more than 300mm forward of the highest point at which the driver's back makes contact with his seat. However, a maximum of 2 litres of fuel may be kept outside the survival cell, but only that which is necessary for the normal running of the engine.

6.1.3 Fuel must not be stored more than 400mm from the longitudinal axis of the car.

6.1.4 All rubber bladders must be made by manufacturers recognised by the FIA. In order to obtain the agreement of the FIA, the manufacturer must prove the compliance of his product with the specifications approved by the FIA. These manufacturers must undertake to deliver to their customers exclusively tanks complying to the approved standards.
A list of approved manufacturers may be found in the Appendix to these regulations.

6.1.5 All rubber bladders shall be printed with the name of the manufacturer, the specifications to which the tank has been manufactured and the date of manufacture.

6.1.6 No rubber bladders shall be used more than 5 years after the date of manufacture.

6.2 Fittings and piping :
6.2.1 All apertures in the fuel tank must be closed by hatches or fittings which are secured to metallic or composite bolt rings bonded to the inside of the bladder.
Bolt hole edges must be no less than 5mm from the edge of the bolt ring, hatch or fitting.

6.2.2 All fuel lines between the fuel tank and the engine must have a self sealing breakaway valve. This valve must separate at less than 50% of the load required to break the fuel line fitting or to pull it out of the fuel tank.

6.2.3 No lines containing fuel may pass through the cockpit.

6.2.4 All lines must be fitted in such a way that any leakage cannot result in the accumulation of fuel in the cockpit.

6.3 Crushable structure :

The fuel tank must be completely surrounded by a crushable structure, which is an integral part of the survival cell and must be able to withstand the loads required by the tests in Articles 18.2.1 and 18.3.

6.4 Fuel tank fillers :

Fuel tank fillers must not protrude beyond the bodywork. Any breather pipe connecting the fuel tank to the atmosphere must be designed to avoid liquid leakage when the car is running and its outlet must not be less than 250mm from the cockpit opening.
All fuel tank fillers and breathers must be designed to ensure an efficient locking action which reduces the risk of an accidental opening following a crash impact or incomplete locking after refuelling.

6.5 Refuelling :

6.5.1 All refuelling during the race must be carried out at a rate no greater than 12.1 litres per second and by using equipment which has been supplied by the FIA designated manufacturer, details concerning the manufacturer may be found in the Appendix to these regulations. This manufacturer will be required to supply identical refuelling systems, the complete specification of which will be available from the FIA no later than one month prior to the first Championship Event.
Any modifications to the manufacturer's specification may only be made following written consent from the FIA.

6.5.2 A cover must be fitted over the car connector at all times when the car is running on the track. The cover and it's attachments must be sufficiently strong to avoid accidental opening in the event of an accident.

6.5.3 Before refuelling commences, the car connector must be connected electrically to earth.
All metal parts of the refuelling system from the coupling to the supply tank must also be connected to earth.

6.5.4 Refuelling the car on the grid may only be carried out by using an unpressurised container which is no more than 2 metres above the ground.

6.5.5 No fuel on board the car may be more than ten degrees centigrade below ambient temperature.

6.5.6 The use of any device on board the car to decrease the temperature of the fuel is forbidden.

6.6 Fuel sampling :

6.6.1 Competitors must ensure that a one litre sample of fuel may be taken from the car at any time during the Event.

6.6.2 All cars must be fitted with a –2 'Symetrics' male fitting in order to facilitate fuel sampling. If an electric pump on board the car cannot be used to remove the fuel an externally connected one may be used provided it is evident that a representative fuel sample is being taken. If an external pump is used it must be possible to connect the FIA sampling hose to it and any hose between the car and pump must be -3 in diameter and not exceed 2m in length. Details of the fuel sampling hose may be found in the Appendix to these regulations.

6.6.3 The sampling procedure must not necessitate starting the engine or the removal of bodywork (other than the cover over the refuelling connector).

ARTICLE 7 : OIL AND COOLANT SYSTEMS

7.1 Location of oil tanks :

All oil storage tanks must be situated between the front wheel axis and the rearmost gearbox casing longitudinally, and must be no further than the lateral extremities of the survival cell are from the longitudinal axis of the car.

7.2 Longitudinal location of oil system :

No other part of the car containing oil may be situated behind the complete rear wheels.

7.3 Catch tank :

In order to avoid the possibility of oil being deposited on the track, the engine sump breather must vent into the main engine air intake system.

7.4 Transversal location of oil system :

No part of the car containing oil may be more than 700mm from the longitudinal centre line of the car.

7.5 Coolant header tank :

The coolant header tank on the car must be fitted with an FIA approved pressure relief valve which is set to a maximum of 3.75 bar gauge pressure, details of the relief valve may be found in the Appendix to these regulations. If the car is not fitted with a header tank, an alternative position must be approved by the FIA.

7.6 Cooling systems :

The cooling systems of the engine must not intentionally make use of the latent heat of vaporisation of any fluid.

7.7 Oil and coolant lines :

7.7.1 No lines containing coolant or lubricating oil may pass through the cockpit.

7.7.2 All lines must be fitted in such a way that any leakage cannot result in the accumulation of fluid in the cockpit.

7.7.3 No hydraulic fluid lines may have removable connectors inside the cockpit.

ARTICLE 8 : ELECTRICAL SYSTEMS

8.1 Software and electronics inspection :

8.1.1 Prior to the start of each season the complete electrical system on the car must be examined and all on board and communications software must be inspected by the FIA Technical Department.
The FIA must be notified of any changes prior to the Event at which such changes are intended to be implemented.

8.1.2 All re-programmable microprocessors must have a mechanism that allows the FIA to accurately identify the software version loaded.

8.1.3 All electronic units containing a programmable device, and which are intended for use at an Event, must be presented to the FIA before each Event in order that they can be identified.

8.1.4 All on-car software versions must be registered with the FIA before use.

8.1.5 The FIA must be able to test the operation of any compulsory electronic safety systems at any time during an Event.

8.2 Start systems :

8.2.1 Any system, the purpose and/or effect of which is to detect when a race start signal is given, is not permitted.

8.2.2 Whichever driver input device is used to initiate the propulsion of the car during the start of a race, a verifiable signal must be provided which indicates it's instant of operation.

8.3 Accident data recorders :

The recorder must be fitted and operated :

- by being rigidly attached to the survival cell using the four 7mm diameter holes provided ;
- in accordance with the instructions of the FIA ;
- symmetrically about the car centre line and with its top facing upwards ;
- with each of its 12 edges parallel to an axis of the car ;
- less than 50mm above the reference plane ;
- in a position which is normally accessible at the start and finish of an Event ;
- in order that the entire unit lies between 40% and 60% of the wheelbase of the car ;
- with its main connector facing forwards ;
- in order that its status light is visible when the driver is in the cockpit ;
- in order that the download connector is easily accessible without the need to remove bodywork.

8.4 Marshal information display :
All cars must be fitted with red, blue and yellow cockpit lights the purpose of which are to give drivers information concerning track signals or conditions. The lights must be LEDs each with a minimum diameter of 5mm and which are fitted in order that they are directly in the driver's normal line of sight. Details of the light control system, which must be fitted to every car, may be found in the Appendix to these regulations.

ARTICLE 9 : TRANSMISSION SYSTEM

9.1 Transmission types :
No transmission system may permit more than two wheels to be driven.

9.2 Clutch control :
All cars must be fitted with a means of disengaging the clutch for a minimum of fifteen minutes in the event of the car coming to rest with the engine stopped. This system must be in working order throughout the Event even if the main hydraulic, pneumatic or electrical systems on the car have failed.
In order that the driver or a marshal may activate the system in less than five seconds, the switch or button which operates it must :
- face upwards and be positioned on the survival cell no more than 150mm from the car centre line ;
- be designed in order that a marshal is unable to accidentally re-engage the clutch ;
- be less than 150mm from the front of the cockpit opening ;
- be marked with a letter "N" in red inside a white circle of at least 50mm diameter with a red edge.

9.3 Gear ratios :
9.3.1 The minimum number of forward gear ratios is 4 and the maximum is 7.

9.3.2 Continuously variable transmission systems are not permitted.

9.4 Reverse gear :
All cars must have a reverse gear operable any time during the Event by the driver when the engine is running.

9.5 Torque transfer systems :
Any system or device the design of which is capable of transferring or diverting torque from a slower to a faster rotating wheel is not permitted.

ARTICLE 10 : SUSPENSION AND STEERING SYSTEMS

10.1 Sprung suspension :
Cars must be fitted with sprung suspension. The springing medium must not consist solely of bolts located through flexible bushes or mountings.
There must be movement of the wheels to give suspension travel in excess of any flexibility in the attachments.
The suspension system must be so arranged that its response is consistent at all times and results only from changes in vertical load applied to the wheels save only for movement permitted by inherent and fixed physical properties.

10.2 Suspension geometry :
10.2.1 Suspension geometry must remain fixed at all times.

10.2.2 Any powered device which is capable of altering the configuration or affecting the performance of any part of the suspension system is forbidden.

10.2.3 No adjustment may be made to the suspension system while the car is in motion.

10.3 Suspension members :
10.3.1 The cross-sections of each member of every suspension component must have an aspect ratio no greater than 3.5:1 and be symmetrical about its major axis. All suspension components may however have sections with an aspect ratio greater than 3.5:1, and be non-symmetrical, provided these are adjacent to their inner and outer attachments and form no more than 25% of the total distance between the attachments of the relevant member.
All measurements will be made perpendicular to a line drawn between the inner and outer attachments of the relevant member.

10.3.2 No major axis of a cross section of a suspension member may subtend an angle greater than 5° to the reference plane when measured parallel to the centre line of the car.

10.3.3 Non-structural parts of suspension members are considered bodywork.

10.3.4 In order to help prevent a wheel becoming separated in the event of all suspension members connecting it to the car failing, two cables, each with separate attachments, must be fitted to connect each wheel/upright assembly to the main structure of the car. The cables and their attachments must be designed in order to help prevent a wheel making contact with the driver's head during an accident.
The length of each cable should be no longer than that required to allow normal suspension movement.
Each complete cable restraint system, including their attachments, must :
- have a minimum tensile strength of 70kN ;
- utilise flexible cables each with a diameter greater than 9.5 mm

Each cable must also be capable of absorbing more than 900 J.
However, when fitted to a car utilising a survival cell the type of which was used at an Event during the 2003 Championship season, the tensile strength of the inner and outer attachments may comply with the 2003 Technical Regulations.

10.4 Steering :
10.4.1 Any steering system which permits the re-alignment of more than two wheels is not permitted.

10.4.2 Power assisted steering systems may not be electronically controlled or electrically powered. No such system may carry out any function other than reduce the physical effort required to steer the car.

10.4.3 No part of the steering wheel or column, nor any part fitted to them, may be closer to the driver than a plane formed by the entire rear edge of the steering wheel rim.

10.4.4 The steering wheel, steering column and steering rack assembly must pass an impact test, details of the test procedure may be found in Article 16.5.

ARTICLE 11 : BRAKE SYSTEM

11.1 Brake circuits and pressure distribution :

11.1.1 All cars must be equipped with only one brake system. This system must comprise solely of two separate hydraulic circuits operated by one pedal, one circuit operating on the two front wheels and the other on the two rear wheels. This system must be designed so that if a failure occurs in one circuit the pedal will still operate the brakes in the other.

11.1.2 The brake system must be designed in order that the force exerted on the brake pads within each circuit are the same at all times.

11.1.3 Any powered device which is capable of altering the configuration or affecting the performance of any part of the brake system is forbidden.

11.1.4 Any change to, or modulation of, the brake system whilst the car is moving must be made by the drivers direct physical input, may not be pre-set and must be under his complete control at all times.

11.2 Brake calipers :

11.2.1 All brake calipers must be made from aluminium materials with a modulus of elasticity no greater than 80Gpa.

11.2.2 No more than two attachments may be used to secure each brake caliper to the car.

11.2.3 No more than one caliper, with a maximum of six pistons, is permitted on each wheel.

11.2.4 The section of each caliper piston must be circular.

11.3 Brake discs :

11.3.1 No more than one brake disc is permitted on each wheel.

11.3.2 All discs must have a maximum thickness of 28mm and a maximum outside diameter of 278mm.

11.3.3 No more than two brake pads are permitted on each wheel.

11.4 Air ducts :

Air ducts for the purpose of cooling the front and rear brakes shall not protrude beyond :

- a plane parallel to the ground situated at a distance of 160mm above the horizontal centre line of the wheel ;
- a plane parallel to the ground situated at a distance of 160mm below the horizontal centre line of the wheel ;
- a vertical plane parallel to the inner face of the wheel rim and displaced from it by 120mm toward the centre line of the car.

Furthermore, when viewed from the side the ducts must not protrude forwards beyond the periphery of the tyre or backwards beyond the wheel rim.

11.5 Brake pressure modulation :

11.5.1 No braking system may be designed to prevent wheels from locking when the driver applies pressure to the brake pedal.

11.5.2 No braking system may be designed to increase the pressure in the brake calipers above that achievable by the driver applying pressure to the pedal under static conditions.

11.6 Liquid cooling :

Liquid cooling of the brakes is forbidden.

ARTICLE 12 : WHEELS AND TYRES

12.1 Location :

Wheels must be external to the bodywork in plan view, with the rear aerodynamic device removed.

12.2 Number of wheels :

The number of wheels is fixed at four.

12.3 Wheel material :

All wheels must be made from an homogeneous metallic material.

12.4 Wheel dimensions :

12.4.1 Complete wheel width must lie between 305 and 355mm when fitted to the front of the car and between 365 and 380mm when fitted to the rear.

12.4.2 Complete wheel diameter must not exceed 660mm when fitted with dry-weather tyres or 670mm when fitted with wet-weather tyres.

12.4.3 Complete wheel width and diameter will be measured horizontally at axle height when fitted with new tyres inflated to 1.4 bar.

12.4.4 Wheel bead diameter must lie between 328 and 332mm.

ARTICLE 13 : COCKPIT

13.1 Cockpit opening :

13.1.1 In order to ensure that the opening giving access to the cockpit is of adequate size, the template shown in Drawing 2 will be inserted into the survival cell and bodywork.
During this test the steering wheel, steering column, seat and all padding required by Articles 14.6.1-6 (including fixings), may be removed and :

- the template must be held horizontal and lowered vertically from above the car until its lower edge is 525mm above the reference plane ;
- referring to Drawing 2, the edge of the template which lies on the line d-e must be no less than 1800mm behind the line A-A shown in Drawing 5.

Any measurements made from the cockpit entry template (when referred to in Articles 13.1.3, 14.3.3, 15.2.2, 15.4.5, 15.4.6, 15.5.4, 16.3 and 18.4), must also be made whilst the template is held in this position.

13.1.2 The forward extremity of the cockpit opening, even if structural and part of the survival cell, must be at least 50mm in front of the steering wheel.

13.1.3 The driver must be able to enter and get out of the cockpit without it being necessary to open a door or remove any part of the car other than the steering wheel. When seated normally, the driver must be facing forwards and the rearmost part of his crash helmet may be no more than 125mm forward of the rear edge of the cockpit entry template.

13.1.4 From his normal seating position, with all seat belts fastened and whilst wearing his usual driving equipment, the driver must be able to remove the steering wheel and get out of the car within 5 seconds and then replace the steering wheel in a total of 10 seconds.

For this test, the position of the steered wheels will be determined by the FIA technical delegate and after the steering wheel has been replaced steering control must be maintained.

13.2 Steering wheel :

The steering wheel must be fitted with a quick release mechanism operated by pulling a concentric flange installed on the steering column behind the wheel.

13.3 Internal cross section :

13.3.1 A free vertical cross section, which allows the outer template shown in Drawing 3 to be passed vertically through the cockpit to a point 100mm behind the face of the rearmost pedal when in the inoperative position, must be maintained over its entire length.

The only things which may encroach on this area are the steering wheel and any padding that is required by Article 14.6.7.

13.3.2 A free vertical cross section, which allows the inner template shown in Drawing 3 to be passed vertically through the cockpit to a point 100mm behind the face of rearmost pedal when in the inoperative position, must be maintained over its entire length.
The only thing which may encroach on this area is the steering wheel.

13.3.3 The driver, seated normally with his seat belts fastened and with the steering wheel removed must be able to raise both legs together so that his knees are past the plane of the steering wheel in the rearward direction. This action must not be prevented by any part of the car.

13.4 Position of the driver's feet :

13.4.1 The survival cell must extend from behind the fuel tank in a rearward direction to a point at least 300mm in front of the driver's feet, with his feet resting on the pedals and the pedals in the inoperative position.

13.4.2 When he is seated normally, the soles of the driver's feet, resting on the pedals in the inoperative position, must not be situated forward of the front wheel centre line.

ARTICLE 14 : SAFETY EQUIPMENT

14.1 Fire extinguishers :

14.1.1 All cars must be fitted with a fire extinguishing system which will discharge into the cockpit and into the engine compartment.

14.1.2 Any extinguishant listed in the Appendix to the regulations is permitted.

14.1.3 The quantity of extinguishant may vary according to the type of extinguishant used, a list of quantities may be found in the Appendix to these regulations.

14.1.4 When operated, the fire extinguishing system must discharge 95% of its contents at a constant pressure in no less than 10 seconds and no more than 30 seconds.
If more than one container with extinguishant is fitted, they must be released simultaneously.

14.1.5 Each pressure vessel must be equipped with a means of checking its pressure which may vary according to the type of extinguishant used. A list of pressures may be found in the Appendix to the regulations.

14.1.6 The following information must be visible on each container with extinguishant :

a) Type of extinguishant
b) Weight or volume of the extinguishant
c) Date the container must be checked which must be no more than two years after the date of filling.

14.1.7 All parts of the extinguishing system must be situated within the survival cell and all extinguishing equipment must withstand fire.

14.1.8 Any triggering system having its own source of energy is permitted, provided it is possible to operate all extinguishers should the main electrical circuits of the car fail.
The driver must be able to trigger the extinguishing system manually when seated normally with his safety belts fastened and the steering wheel in place.
Furthermore, a means of triggering from the outside must be combined with the circuit breaker switch described in Article 14.2.2. It must be marked with a letter "E" in red inside a white circle of at least 100mm diameter with a red edge.

14.1.9 The system must work in any position, even when the car is inverted.

14.1.10 All extinguisher nozzles must be suitable for the extinguishant and be installed in such a way that they are not directly pointed at the driver.

14.2 Master switch :

14.2.1 The driver, when seated normally with the safety belts fastened and the steering wheel in place, must be able to cut off the electrical circuits to the ignition, all fuel pumps and the rear light by means of a spark proof circuit breaker switch.
This switch must be located on the dashboard and must be clearly marked by a symbol showing a red spark in a white edged blue triangle.

14.2.2 There must also be an exterior switch, with a horizontal handle, which is capable of being operated from a distance by a hook. This switch must be situated at the base of the main roll over structure on the right hand side.

14.3 Rear view mirrors :

14.3.1 All cars must have at least two mirrors mounted so that the driver has visibility to the rear and both sides of the car.

14.3.2 The reflective surface of each mirror must be at least 150mm wide, this being maintained over a height of at least 50mm. Additionally, each corner may have a radius no greater than 10mm.

14.3.3 No part of the reflective surface may be less than 250mm from the car centre line or more than 750mm from the rear of the cockpit entry template.

14.3.4 The FIA technical delegate must be satisfied by a practical demonstration that the driver, when seated normally, can clearly define following vehicles.
For this purpose, the driver shall be required to identify any letter or number, 150mm high and 100mm wide, placed anywhere on boards behind the car, the positions of which are detailed below :

Height	:	From 400mm to 1000mm from the ground.
Width	:	2000mm either side of the centre line of the car.
Position	:	10m behind the rear axle line of the car.

14.4 Safety belts :

It is mandatory to wear two shoulder straps, one abdominal strap and two straps between the legs. These straps must be securely fixed to the car and must comply with FIA standard 8853/98.

14.5 Rear light :

All cars must have a red light in working order throughout the Event which :

- has been manufactured as specified in the Appendix to these regulations ;
- faces rearwards at 90° to the car centre line and the reference plane ;
- is clearly visible from the rear ;
- is not mounted more than 100mm from the car centre line ;
- is mounted between 325mm and 400mm above the reference plane ;
- is no less than 450mm behind the rear wheel centre line measured parallel to the reference plane ;
- can be switched on by the driver when seated normally in the car.

The three measurements above will be taken to the centre of the rear face of the light unit.

14.6 Headrests and head protection :

14.6.1 All cars must be equipped with three areas of padding for the driver's head which :

- are so arranged that they can be removed from the car as one part ;

- are located by two horizontal pegs behind the driver' head and two fixings, which are clearly indicated and easily removable without tools, at the front corners ;
- are made from a material which is suitable for the relevant ambient air temperature, details of approved materials and the temperature bands in which they should be used may be found in the Appendix to these regulations ;
- are covered, in all areas where the driver's head is likely to make contact, with two plies of Aramid fibre/epoxy resin composite pre-preg material in plain weave 60gsm fabric with a cured resin content of 50% (+/-5%) by weight ;
- are positioned so as to be the first point of contact for the driver's helmet in the event of an impact projecting his head towards them during an accident.

14.6.2 The first area of padding for the driver's head must be positioned behind him and be between 75mm and 90mm thick over an area of at least 40000mm².

14.6.3 The two further areas of padding for the driver's head must be positioned directly alongside each side of his helmet. The upper surfaces of these areas of padding must be at least as high as the survival cell over their entire length.
Each area of padding must be between 75mm and 90mm thick over an area of at least 25000mm² and may have a radius of 10mm along it's upper inboard edge. When calculating their area, any part which is greater than 75mm thick and which lies between the front face of the rear area of padding and the forward most part of the driver's helmet whilst he is seated normally, will be taken into account (area 'B' in Drawing 4). The thickness will be measured perpendicular to the car centre line.

14.6.4 Forward of the side areas of padding further cockpit padding must be provided on each side of the cockpit rim. The purpose of the additional padding is to afford protection to the driver's head in the event of an oblique frontal impact and must therefore be made from the same material as the other three areas of padding.

These extensions must :
- be symmetrically positioned about the car centre line and a continuation of the side areas of padding ;
- be positioned with their upper surfaces at least as high as the survival cell over their entire length;
- have a radius on their upper inboard edge no greater than 10mm ;
- be positioned in order that the distance between the two is no less than 360mm ;
- be as high as practicable within the constraints of driver comfort.

14.6.5 All of the padding described above must be so installed that if movement of the driver's head, in any expected trajectory during an accident, were to compress the foam fully at any point, his helmet would not make contact with any structural part of the car.
Furthermore, for the benefit of rescue crews all of the padding described above must be installed using the system described in the Appendix to these regulations. The method of removal must also be clearly indicated.

14.6.6 No part of the padding described above may obscure sight of any part of the driver's helmet when he is seated normally and viewed from directly above the car.

14.6.7 In order to minimise the risk of leg injury during an accident, additional areas of padding must be fitted each side of, and above, the driver's legs.

These areas of padding must :
- be made from a material described in the Appendix to these regulations ;
- be no less than 25mm thick over their entire area ;
- cover the area situated between points lying 50mm behind the centre of the point at which the second roll structure test is carried out and100mm behind the face of the rearmost pedal when in the inoperative position, as shown in Drawing 4 ;
- cover the area above the line A-A shown in Drawing 3.

14.7 Wheel retention :
All cars, whilst under their own power, must be fitted with devices which will retain any wheel in the event of it coming loose.
After the wheel nut is fastened, these devices must be manually fitted in a separate action to that of securing the wheel nut.

14.8 Seat fixing and removal :

14.8.1 In order that an injured driver may be removed from the car in his seat following an accident, all cars must be fitted with a seat which, if it is secured, must be done so with no more than two bolts. If bolts are used they must :
- be clearly indicated and easily accessible to rescue crews ;
- be fitted vertically ;
- be removable with the same tool for all Teams and which is issued to all rescue crews.

14.8.2 The seat must be equipped with receptacles which permit the fitting of belts to secure the driver and one which will permit the fitting of a neck support.

14.8.3 The seat must be removable without the need to cut or remove any of the seat belts.

14.8.4 Details of the tool referred to above, the belt receptacles and the neck support may be found in the Appendix to these regulations.

14.9 Head and neck supports :
No head and neck support worn by the driver may be less 25mm from any structural part of the car when he is seated in his normal driving position.

ARTICLE 15 : CAR CONSTRUCTION

15.1 Materials :

15.1.1 The use of magnesium sheet less than 3mm thick is forbidden.

15.1.2 No parts of the car may be made from metallic materials which have a specific modulus of elasticity greater than 40 GPa / (g/cm^3). Tests to establish conformity will be carried out in accordance with FIA Test Procedure 03/02, a copy of which may be found in the Appendix to these regulations.

15.2 Roll structures :

15.2.1 All cars must have two roll structures which are designed to help prevent injury to the driver in the event of the car becoming inverted.
The principal structure must be at least 940mm above the reference plane at a point 30mm behind the cockpit entry template. The second structure must be in front of the steering wheel but no more than 250mm forward of the top of the steering wheel rim in any position.
The two roll structures must be of sufficient height to ensure the driver's helmet and his steering wheel are at least 70mm and 50mm respectively below a line drawn between their highest points at all times.

15.2.2 The principal structure must pass a static load test details of which may be found in Article 17.2. Furthermore, each Team must supply detailed calculations which clearly show that it is capable of withstanding the same load when the longitudinal component is applied in a forward direction.

15.2.3 The second structure must pass a static load test details of which may be found in Article 17.3.

15.2.4 Both roll structures must have minimum structural cross sections of 10000mm², in vertical projection, across a horizontal plane 50mm below the their highest points.

15.3 Structure behind the driver :

The parts of the survival cell immediately behind the driver which separate the cockpit from the car's fuel tank, and which lie less than 150mm from the centre line of the car, may be situated no further forward than the line a-b-c-d-e shown in Drawing 2.

15.4 Survival cell specifications :

15.4.1 Every survival cell must incorporate three FIA supplied transponders for identification purposes. These transponders must be a permanent part of the survival cell, be positioned in accordance with Drawing 6 and must be accessible for verification at any time.

15.4.2 The survival cell must have an opening for the driver, the minimum dimensions of which are given in Article 13.1. Any other openings in the survival cell must be of the minimum size to allow access to mechanical components.

15.4.3 An impact absorbing structure must be fitted in front of the survival cell. This structure need not be an integral part of the survival cell but must be solidly attached to it.
Furthermore, it must have a minimum external cross section, in horizontal projection, of 9000mm² at a point 50mm behind its forward-most point.

15.4.4 Referring to Drawing 5 :
The external width of the survival cell between the lines B-B and C-C must be no less than 450mm and must be at least 60mm per side wider than the cockpit opening when measured normal to the inside of the cockpit aperture. These minimum dimensions must be maintained over a height of at least 350mm.
The width of the survival cell may taper forward of the line B-B but, if this is the case, it must do so at a linear rate to a minimum of 300mm at the line A-A.
Between the lines A-A and B-B the width of the survival cell must be greater than the width defined by the two lines a-b. This minimum width must be arranged symmetrically about the car centre line, must be maintained over a height of at least 400mm at the line B-B and may taper at a linear rate to 275mm at the line A-A. When assessing the minimum external cross-sections of the survival cell, radii of 50mm at the line B-B, and reducing at a linear rate to 25mm at the line A-A, will be permitted.
The minimum height of the survival cell between the lines A-A and B-B need not be arranged symmetrically about the horizontal centre line of the relevant section but must be maintained over its entire width.
The minimum height of the survival cell between the lines B-B and C-C is 550mm.

15.4.5 When the test referred to in Article 13.1.1 is carried out and the template is in position with its lower edge 525mm above the reference plane, the shape of the survival cell must be such that no part of it is visible when viewed from either side of the car.
The parts of the survival cell which are situated each side of the driver's helmet must be no more than 550mm apart and, in order to maintain good lateral visibility the driver, when seated normally with his seat belts fastened and looking straight ahead, must have his eyes above the sides of the survival cell.

15.4.6 In order to give additional protection to the driver in the event of a side impact a flat test panel of uniform construction, which is designed and constructed in order to represent a section of the survival cell sides, must pass a strength test. Details of the test procedure may be found in Article 18.6.
Referring to Drawing 5, with the exception of local re-enforcement and/or inserts, all parts of the survival cell which are as wide or wider than the minimum widths stipulated in Article 15.4.4, including any radii applied, must be manufactured to the same specification as a single panel which satisfies the requirements of Article 18.6. Furthermore, parts to this tested specification must cover an area which:

- begins at least 250mm high at line A-A ;
- tapers at a linear rate to at least 400mm high at line B-B and which remains at this height to the rear of the survival cell ;
- is no less than 100mm above the reference plane between the line B-B and the rear of the survival cell.

15.5 Survival cell safety requirements :

15.5.1 The survival cell and frontal absorbing structure must pass an impact test against a solid vertical barrier placed at right angles to the centre line of the car, details of the test procedure may be found in Article 16.2.

15.5.2 Between the front and rear roll structures, on each side of the survival cell, impact absorbing structures must be fitted and must be solidly attached to it. The purpose of these structures is to protect the driver in the event of a lateral impact and, in order to ensure this is the case, a lateral strength test in the vicinity of the driver's seating position must be carried out successfully. Details of the test procedure may be found in Article 18.2.2.
The survival cell and one of these impact absorbing structures must pass an impact test, details of the test procedure may be found in Article 16.3. If these structures are not designed and fitted symmetrically about the car centre line a successful impact test must be carried out on them both.

15.5.3 An impact absorbing structure must be fitted behind the gearbox symmetrically about the car centre line with its rearmost point no less than 480mm behind the rear wheel centre line. It must also have a minimum external cross section, in horizontal projection, of 9000mm² at a point 50mm forward of its rearmost point. When calculating this area only those parts situated less than 100mm from the car centre line may be considered and the cross section may not diminish forward of this point.
This structure must pass an impact test and must be constructed from materials which will not be substantially affected by the temperatures it is likely to be subjected to during use. Details of the test procedure may be found in Article 16.4.

15.5.4 The survival cell must also be subjected to five separate static load tests :

1) on a vertical plane passing through the centre of the fuel tank ;
2) on a vertical plane passing through the rearmost point at which the outer end of the forward-most front wheel tether would make contact with the survival cell when swung about the inner attachment;
3) on a vertical plane 375mm forward of the rear edge of the cockpit entry template ;
4) from beneath the fuel tank ;
5) on each side of the cockpit opening.

Details of the test procedures may be found in Article 18.2.

15.5.5 To test the attachments of the frontal and rear impact absorbing structures static side load tests must be carried out on the same structures which will subsequently undergo the impact tests described in Articles 16.2 and 16.4. Details of these test procedures may be found in Articles 18.5 and 18.7.

ARTICLE 16 : IMPACT TESTING

16.1 Conditions applicable to all impact tests :

16.1.1 All tests must be carried out in accordance with FIA Test Procedure 01/00, in the presence of an FIA technical delegate and by using measuring equipment which has been calibrated to the satisfaction of the FIA technical delegate. A copy of the test procedure may be found in the Appendix to these regulations.

16.1.2 Any significant modification introduced into any of the structures tested shall require that part to pass a further test.

16.1.3 The reference survival cell must have passed every static load test described in Articles 15.2, 15.5.4 and 15.5.5 before being subjected to any impact test.

16.2 Frontal test :
All parts which could materially affect the outcome of the test must be fitted to the test structure which must be solidly fixed to the trolley through its engine mounting points but not in such a way as to increase its impact resistance.
The fuel tank must be fitted and must be full of water.
A dummy weighing at least 75kg must be fitted with safety belts described in Article 14.4 fastened. However, with the safety belts unfastened, the dummy must be able to move forwards freely in the cockpit.
The extinguishers, as described in Article 14.1 must also be fitted.
For the purposes of this test, the total weight of the trolley and test structure shall be 780kg and the velocity of impact 14.0 metres/sec.

The resistance of the test structure must be such that during the impact :

- the average deceleration over the first 150mm of deformation does not exceed 5g ;
- the average deceleration of the trolley does not exceed 40g ;
- the peak deceleration in the chest of the dummy does not exceed 60g for more than a cumulative 3ms, this being the resultant of data from three axes.

Furthermore, there must be no damage to the survival cell or to the mountings of the safety belts or fire extinguishers.

This test must be carried out on the survival cell subjected to the higher loads in the tests described in Articles 18.2-4, and on the frontal impact absorbing structure identical to the one which was subjected to the test described in Article 18.5.

16.3 Side test :
All parts which could materially affect the outcome of the test must be fitted to the test structure which must be solidly fixed to the ground and a solid object, having a mass of 780kg and travelling at a velocity of 10m/s, will be projected into it.
The object used for this test must :

- incorporate an impactor assembly, the specification of which may be found in the Appendix to these regulations ;
- be positioned in order that its centre of area strikes the structure 300mm (+/-25mm) above the reference plane and at a point 500mm forward of the rear edge of the cockpit opening template.

During the test the striking object may not pivot in any axis and the survival cell may be supported in any way provided this does not increase the impact resistance of the parts being tested. The impact axis must be perpendicular to the car centre line and parallel to the ground.
The resistance of the test structure must be such that during the impact :

- the average deceleration of the object, measured in the direction of impact, does not exceed 20g ;
- the force applied to any one of the four impactor segments does not exceed 80kN for more than a cumulative 3ms ;
- the energy absorbed by each of the four impactor segments must be between 15% and 35% of the total energy absorption.

Furthermore, all structural damage must be contained within the impact absorbing structure.
This test must be carried out on the survival cell subjected to the higher loads in the tests described in Articles 18.2-4.

16.4 Rear test :
All parts which will be fitted behind the rear face of the engine and which could materially affect the outcome of the test must be fitted to the test structure. If suspension members are to be mounted on the structure they must be fitted for the test. The structure and the gearbox must be solidly fixed to the ground and a solid object, having a mass of 780kg and travelling at a velocity of 12m/s, will be projected into it.
The object used for this test must be flat, measure 450mm wide by 550mm high and may have a 10mm radius on all edges. Its lower edge must be at the same level as the car reference plane and must be so arranged to strike the structure vertically and at 90° to the car centre line.
During the test, the striking object may not pivot in any axis and the crash structure may be supported in any way provided this does not increase the impact resistance of the parts being tested.
The resistance of the test structure must be such that during the impact :

- the average deceleration of the object does not exceed 35g ;
- the maximum deceleration does not exceed 60g for more than a cumulative 3ms, this being measured only in the direction of impact

Furthermore, all structural damage must be contained within the area behind the rear wheel centre line.

This test must be carried out on the rear impact absorbing structure which was subjected to the test described in Article 18.7.

16.5 Steering column test :
The parts referred to in Article 10.4.4 must be fitted to a representative test structure, any other parts which could materially affect the outcome of the test must also be fitted. The test structure must be solidly fixed to the ground and a solid object, having a mass of 8kg and travelling at a velocity of 7m/s, will be projected into it.
The object used for this test must be hemispherical with a diameter of 165mm.
For the test, the centre of the hemisphere must strike the structure at the centre of the steering wheel along the same axis as the main part of the steering column.
During the test the striking object may not pivot in any axis and the test structure may be supported in any way provided this does not increase the impact resistance of the parts being tested.
The resistance of the test structure must be such that during the impact the peak deceleration of the object does not exceed 80g for more than a cumulative 3ms, this being measured only in the direction of impact.
After the test, all substantial deformation must be within the steering column and the steering wheel quick release mechanism must still function normally.

ARTICLE 17 : ROLL STRUCTURE TESTING

17.1 Conditions applicable to both roll structure tests :
17.1.1 Rubber 3mm thick may be used between the load pads and the roll structure.

17.1.2 Under the load, deformation must be less than 50mm, measured along the loading axis and any structural failure limited to 100mm below the top of the rollover structure when measured vertically.

17.1.3 Any significant modification introduced into any of the structures tested shall require that part to pass a further test.

17.2 Principal roll structure :
A load equivalent to 50kN laterally, 60kN longitudinally in a rearward direction and 90kN vertically, must be applied to the top of the structure through a rigid flat pad which is 200mm in diameter and perpendicular to the loading axis.
During the test, the roll structure must be attached to the survival cell which is supported on its underside on a flat plate, fixed to it through its engine mounting points and wedged laterally by any of the static load test pads described in Article 18.2.

17.3 Second roll structure :
A vertical load of 75kN must be applied to the top of the structure through a rigid flat pad which is 100mm in diameter and perpendicular to the loading axis.
During the test, the rollover structure must be attached to the survival cell which is fixed to a flat horizontal plate.

ARTICLE 18 : STATIC LOAD TESTING

18.1 Conditions applicable to the tests in 18.2-18.5 :

18.1.1 The tests described in Articles 18.2, 18.3, 18.4 and 18.5 must be carried out on the survival cell which will be subjected to the impact tests described in Article 16.

18.1.2 Every subsequent survival cell produced must also be subjected to the tests described in Articles 18.2, 18.3 and 18.4.
However, the tests described in Articles 18.2.1, 18.3 and 18.4 may be carried out on subsequent survival cells with peak loads reduced by 20%. During these subsequent tests (on deflections greater than 3.0mm),
the deflection across the inner surfaces must not exceed 120% of the deflection obtained at 80% of the peak load during the first test.

18.1.3 Deflections and deformations will be measured at the centre of area of circular load pads and at the top of rectangular pads.

18.1.4 All peak loads must be applied in less than three minutes, through a ball jointed junction at the centre of area of the pad, and maintained for 30 seconds.

18.1.5 Following the tests described in 18.2, 18.3 and 18.4, permanent deformation must be less than 1.0mm (0.5mm in 18.3) after the load has been released for 1 minute.

18.1.6 All tests must be carried out by using measuring equipment which has been calibrated to the satisfaction of the FIA technical delegate.

18.1.7 A radius of 3mm is permissible on the edges of all load pads and rubber 3mm thick may be placed between them and the test structure.

18.1.8 For the tests described in 18.2, 18.3 and 18.4, the survival cells must always be produced in an identical condition in order that their weights may be compared. If the weight differs by more than 5% from the one subjected to the impact tests described in Articles 16.2 and 16.3 further frontal and side impact tests and roll structure tests must be carried out.

18.1.9 Any significant modification introduced into any of the structures tested shall require that part to pass a further test.

18.2 Survival cell side tests :

18.2.1 For test 1, referred to in Article 15.5.4, pads 100mm long and 300mm high, which conform to the shape of the survival cell, must be placed against the outermost sides of the survival cell with the lower edge of the pad at the lowest part of the survival cell at that section.
A constant transverse horizontal load of 25.0kN will be applied and, under the load, there must be no structural failure of the inner or outer surfaces of the survival.

18.2.2 For test 2), referred to in Article 15.5.4, pads 200mm in diameter which conform to the shape of the survival cell, must be placed against the outermost sides of the survival cell.
The centre of the pads must pass through the plane mentioned above and the mid point of the height of the structure at that section.
A constant transverse horizontal load of 30.0kN will be applied to the pads and, under the load, there must be no structural failure of the inner or outer surfaces of the survival cell and the total deflection must not exceed 15mm.

18.2.3 For test 3), referred to in Article 15.5.4, pads 200mm in diameter which conform to the shape of the survival cell, must be placed against the outermost sides of the survival cell.
The centre of the pads must be located 350mm above the reference plane and on the vertical plane mentioned in Article 15.5.4.
A constant transverse horizontal load of 30.0kN will be applied to the pads and, under the load, there must be no structural failure of the inner or outer surfaces of the survival cell and the total deflection must not exceed 15mm.

18.3 Fuel tank floor test :
A pad of 200mm diameter must be placed in the centre of area of the fuel tank floor and a vertical upwards load of 12.5kN applied.
Under the load, there must be no structural failure of the inner or outer surfaces of the survival cell.

18.4 Cockpit rim test :
Two pads, each of which is 100mm in diameter, must be placed on both sides of the cockpit rim with their upper edges at the same height as the top of the cockpit side with their centres at a point 200mm forward of the rear edge of the cockpit opening template longitudinally.
A constant transverse horizontal load of 10.0kN will then be applied at 90° to the car centre line and, under the load, there must be no structural failure of the inner or outer surfaces of the survival cell and the total deflection must not exceed 20mm.

18.5 Nose push off test :
During the test the survival cell must be resting on a flat plate and secured to it solidly but not in a way that could increase the strength of the attachments being tested.
A constant transversal horizontal load of 40.0kN must then be applied to one side of the impact absorbing structure, using a pad identical to the ones used in the lateral tests in Article 18.2.1, at a point 550mm from the front wheel axis.
The centre of area of the pad must pass through the plane mentioned above and the mid point of the height of the structure at the relevant section. After 30 seconds of application, there must be no failure of the structure or of any attachment between the structure and the survival cell.

18.6 Side intrusion test

18.6.1 The test must be carried out in accordance with FIA Test Procedure 02/00, in the presence of an FIA technical delegate and by using measuring equipment which has been calibrated to the satisfaction of the FIA technical delegate. A copy of the test procedure may be found in the Appendix to these regulations.

18.6.2 The test panel must be 500mm x 500mm and will be tested by forcing a rigid truncated cone through the centre of the panel at a rate of 2mm (+/-1mm) per second until the displacement exceeds 150mm.
During the first 100mm of displacement the load must exceed 150kN and the energy absorption must exceed 6000J. There must be no damage to the fixture or border before these requirements have been met.

18.7 Rear impact structure push off test :
During the test the gearbox and the structure must be solidly fixed to the ground but not in a way that could increase the strength of the attachments being tested.
A constant transversal horizontal load of 40kN must then be applied to one side of the impact absorbing structure, using a pad identical to the ones used in the lateral tests in Article 18.2.1, at a point 300mm from the rear wheel axis.

The centre of area of the pad must pass through the plane mentioned above and the mid point of the height of the structure at the relevant section. After 30 seconds of application, there must be no failure of the structure or of any attachment between the structure and the gearbox.

ARTICLE 19 : FUEL

19.1 Purpose of Article 19 :

19.1.1 The purpose of this Article is to ensure that the fuel used in Formula One is petrol as this term is generally understood.

19.1.2 The detailed requirements of this Article are intended to ensure the use of fuels which are predominantly composed of compounds normally found in commercial fuels and to prohibit the use of specific power-boosting chemical compounds. Acceptable compounds and compound classes are defined in 19.2 and 19.4.4. In addition, to cover the presence of low level impurities, the sum of components lying outside the 19.2 and 19.4.4 definitions are limited to 1% max m/m of the total fuel.

19.1.3 Any petrol which appears to have been formulated in order to subvert the purpose of this regulation will be deemed to be outside it.

19.2 Definitions :

Paraffins - straight chain and branched alkanes.

Olefins
- straight chain and branched mono-olefins and di-olefins.
- Monocyclic mono-olefins (with five or more carbon atoms in the ring) with or without paraffinic side chains.

Di-olefins - straight chain or branched or monocyclic or bicyclic or tricyclic hydrocarbons (with five or more carbon atoms in any ring) with or without paraffinic side chains, containing two double bonds per molecule.

Naphthenes - monocyclic alkanes (with five or more carbon atoms in the ring) with or without paraffinic side chains.

Aromatics - monocyclic and bicyclic aromatic rings with or without paraffinic or olefinic side chains and/or fused naphthenic rings. Only one double bond may be present outside the aromatic ring. Fused naphthenic rings must meet the naphthene definition above.

Oxygenates - specified organic compounds containing oxygen.

19.3 Properties :

The only fuel permitted is petrol having the following characteristics:

Property	Units	Min	Max	Test Method
RON		95.0	102.0	ASTM D 2699-86
MON		85.0		ASTM D 2700-86
Oxygen	%m/m		2.7	Elemental Analysis
Nitrogen	%m/m		0.2	ASTM D 3228
Benzene	%v/v		1.0	EN 238
RVP	hPa	450	600	ASTM D 323
Lead	g/l		0.005	ASTM D 3237
Density at 15°C	kg/m³	720.0	775.0	ASTM D 4052
Oxidation stability	minutes	360		ASTM D 525
Existent gum	mg/100ml		5.0	EN 26246
Sulphur	mg/kg		10	EN-ISO/DIS 14596
Copper corrosion	rating		C1	ISO 2160
Electrical Conductivity	pS/m	200		ASTM D 2624

Distillation characteristics :

	Units	Min	Max	Test Method
At E70°C	%v/v	20.0	48.0	ISO 3405
At E100°C	%v/v	46.0	71.0	ISO 3405
At E150°C	%v/v	75.0		ISO 3405
Final Boiling Point	°C		210	ISO 3405
Residue	%v/v		2.0	ISO 3405

The fuel will be accepted or rejected according to ASTM D 3244 with a confidence limit of 95%

19.4 Composition of the fuel :

19.4.1 The composition of the petrol must comply with the detailed below:

	Units	Min	Max	Test Method
Aromatics	%v/v	0*	35*	ASTM D 1319
Olefins	%v/v	0	18*	ASTM D 1319
Total di-olefins	%m/m	0	1	GCMS
Total styrene and alkyl derivatives	%m/m		1	GCMS

*Values when corrected for fuel oxygenate content.

In addition, the fuel must contain no substance which is capable of exothermic reaction in the absence of external oxygen.

19.4.2 The total of individual hydrocarbon components present at concentrations of less than 5%m/m must be at least 30% m/m of the fuel.

19.4.3 The total concentration of each hydrocarbon group in the total fuel sample (defined by carbon number and hydrocarbon type), must not exceed the limits given in the table below:

% m/m	C4	C5	C6	C7	C8	C9+	Non PONA*	Unas signed
Paraffins	10	30	25	25	55	20	-	
Naphtenes	-	5	10	10	10	10	-	
Olefins	5	20	20	15	10	10	-	
Aromatics	-	-	1,2	35	35	30	-	
Maximum	15	40	45	50	60	45	1	5

* Non PONA are components not meeting definitions in 19.2 and 19.4.4

For the purposes of this table, a gas chromatographic technique must be employed which can classify hydrocarbons in the total fuel sample such that all those identified are allocated to the appropriate cell of the table. Compounds present at concentrations below 0.1% by mass may be deemed unassigned, except that it is the responsibility of the fuel approval laboratory to ensure that components representing at least 95% by mass of the total fuel are assigned.

The sum of the non PONA and unassigned hydrocarbons must not exceed 5.0% by mass of the total fuel sample.

19.4.4 The only oxygenates permitted are :

Methanol (MeOH)
Ethanol (EtOH)
Iso-propyl alcohol (IPA)
Iso-butyl alcohol (IBA)
Methyl Tertiary Butyl Ether (MTBE)
Ethyl Tertiary Butyl Ether (ETBE)
Tertiary Amyl Methyl Ether (TAME)
Di-Isopropyl Ether (DIPE)
n-Propyl alcohol (NPA)
Tertiary Butyl Alcohol (TBA)
n-Butyl Alcohol (NBA)
Secondary Butyl Alcohol (SBA)

Compounds normally found as impurities in any of the above oxygenates are permitted at concentrations below 0.8% m/m of the total petrol sample.

19.4.5 Manganese based additives are not permitted

19.5 Air :

Only ambient air may be mixed with the fuel as an oxidant.

19.6 Safety :

19.6.1 Manganese based additives are not permitted.

19.6.2 All competitors must be in possession of a Material Safety Data Sheet for each type of petrol used. This sheet must be made out in accordance with EC Directive 93/112/EEC and all information contained therein strictly adhered to.

19.7 Fuel approval :

19.7.1 Before any fuel may be used in an Event, two separate five litre samples, in suitable containers, must be submitted to the FIA for analysis and approval.

19.7.2 No fuel may be used in an Event without prior written approval of the FIA.

19.8 Sampling and testing at an Event:

19.8.1 All samples will be taken in accordance with FIA Formula One fuel sampling procedure, a copy of which may be found in the Appendix to these regulations.

19.8.2 Fuel samples taken during an Event will be checked for conformity by using densitometry and a gas chromatographic technique which will compare the sample taken with an approved fuel. Samples, which differ from the approved fuel in a manner consistent with evaporative loss, will be considered to conform. However, the FIA retains the right to subject the fuel sample to further testing at an FIA approved laboratory.

19.8.3 GC peak areas of the sample will be compared with those obtained from the reference fuel. Increases in any given peak area (relative to its adjacent peak areas) which are greater than 12%, or an absolute amount greater than 0.1% for compounds present at concentrations below 0.8%, will be deemed not to comply.

If a peak is detected in a fuel sample that was absent in the corresponding reference fuel, and its peak area represents more than 0.10% of the summed peak areas of the fuel, the fuel will be deemed not to comply.

19.9 Amendments to Article 19 :

19.9.1 The physical and compositional properties of the fuel described in 19.3 and 19.4 incorporate the currently known limits for 2000, as laid out in European Fuels Directive 98/70/EC (13 October 1998).

19.9.2 When the Final Directive, as defined by the FIA, is adopted for 2005 (or such other date as the Directive may specify), the new values will replace those being used in 19.3 and 19.4 no later than one year after the figures are known.

ARTICLE 20 : TELEVISION CAMERAS

20.1 Presence of cameras and camera housings :

All cars must be fitted with either two cameras, two camera housings or one of each at all times throughout the Event.

20.2 Location of camera housings :

Camera housings, when used, must be fitted in the same location as cameras. Details concerning the size and weight of all camera housings may be found in the Appendix to these regulations.

20.3 Location and fitting of camera equipment :

20.3.1 All cars must be equipped with five positions in which cameras or camera housings can be fitted. Referring to Drawing 6, all cars must carry a camera or camera housing in position 4, the position of the remaining camera or camera housing will be determined by the FIA after consultation with the relevant Competitor.

Once positions are determined in the above manner, any decision as to whether a camera or camera housing is fitted in those positions will rest solely with the relevant Competitor.

20.3.2 Any camera or dummy camera fitted in positions 1, 2 or 3 shown in Drawing 6 must be mounted in order that its major axis does not subtend an angle greater than 5° to the reference plane.

20.4 Transponders :

All cars must be fitted with a timing transponder supplied by the officially appointed timekeepers. This transponder must be fitted in strict accordance with the instructions detailed in the Appendix to these regulations.

ARTICLE 21 : FINAL TEXT

The final text for these regulations shall be the English version should any dispute arise over their interpretation.

ARTICLE 22 : CHANGES FOR 2005

22.1 Amendments to Article 6.2.1 :

6.2.1 All apertures in the fuel tank must be closed by hatches or fittings which are secured to metallic or composite bolt rings bonded to the inside of the bladder. The total area of any such hatches or fittings which are in contact with the fuel may not exceed 30000mm².

Bolt hole edges must be no less than 5mm from the edge of the bolt ring, hatch or fitting.

22.2 Amendments to Article 17.1 :

17.1 Conditions applicable to both roll structure tests :

17.1.1 Rubber 3mm thick may be used between the load pads and the roll structure.

17.1.2 Both peak loads must be applied in less than three minutes and be maintained for 10 seconds.

17.1.3 Under the load, deformation must be less than 50mm, measured along the loading axis and any structural failure limited to 100mm below the top of the rollover structure when measured vertically.

17.1.4 Any significant modification introduced into any of the structures tested shall require that part to pass a further test.

22.3 Amendments to Article 18.6 :

18.6 Side intrusion test

18.6.1 The test must be carried out in accordance with FIA Test Procedure 02/05, in the presence of an FIA technical delegate and by using measuring equipment which has been calibrated to the satisfaction of the FIA technical delegate.

18.6.2 The test panel must be 500mm x 500mm and will be tested by forcing a rigid truncated cone through the centre of the panel at a rate of 2mm (+/-1mm) per second until the displacement exceeds 150mm.
During the first 100mm of displacement the load must exceed 250kN and there must be no damage to the fixture before this requirement has been met.