



FIA SPECIFICATIONS FOR NON-METALLIC COMPOSITE CHASSIS

(CSR, DSR, S2000, FA, FS)

The Club Racing Competition Board has established that all new formula car and sports racer chassis of non-metallic composite construction shall be proven to meet the FIA specifications for non-metallic composite chassis. The required specifications for all formula cars and sports racers, except ASR, are found in Appendix J of the FIA Technical Regulations-Article 275 (Formula 3 Technical Regulations)-Article 13 (Cockpit) & Article 15 (Safety Structures). A copy of the relevant section is attached at the bottom. You may also find the specs at www.fia.com.

In addition to proving that a non-metallic composite chassis meets the specifications of FIA Appendix J, Article 275.13 & 15, all vehicles with a non-metallic composite chassis must weigh less than, or equal to, 1300 lbs. (589.6 kg) without driver. All vehicles shall have rollover protection structures that meet current SCCA specifications, or are homologated by SCCA as alternate structures. Alternate rollover protection structures shall, as a minimum, contain a main roll hoop measuring at least 1.375" x 0.080" (35.0mm x 2.0mm).

FIA Appendix J, Article 275.15.

ARTICLE 15: SAFETY STRUCTURES

15.1 Materials used for car construction:

- 15.1.1 The use of magnesium sheet less than 3mm thick is forbidden.
- 15.1.2 The use of titanium is forbidden.
- 15.1.3 Within composite structures, the strain-to-failure of any fibrous reinforcing material must not be less than 1.5%.
- 15.1.4 ~~The use of carbon or aramid fibre reinforcing materials in composite structures is forbidden except in the survival cell, frontal impact absorbing structure, roll over structures, non structural components on the engine, bodywork ahead of the front edge of the complete front wheels and bodywork more than 200mm behind the rear wheel centre line.~~

For the purposes of this Article, any parts which are used for the installation of the engine to the gearbox, the engine to the survival cell or which are used for load transfer from the rear suspension to the survival cell cannot be considered non-structural.

- 15.1.5 ~~The surface formed by all the parts lying on the reference plane referred to in Article 3.13 must be made of wood.~~
- 15.1.6 Any repairs to the survival cell or nosebox must be carried out in accordance with the manufacturer's

specifications, in a repair facility approved by the manufacturer.

15.1.7 ~~The car may not be used in another event until the technical passport has been completed satisfactorily.~~

15.2 Roll structures:

15.2.1 The basic purpose of safety structures is to protect the driver. This purpose is the primary design consideration.

15.2.2 All cars must have two roll structures.

The principal structure must be positioned behind the driver. 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 50mm below a line drawn between their highest points at all times.

15.2.3 The principal structure must pass a static load test details of which may be found in Article 15.2.4.

The second structure must be capable of withstanding three loads applied simultaneously to the top of the structure which are 12kN laterally, 45kN longitudinally, and 60kN vertically.

15.2.4 The principal roll structure shall be subjected to a static load test. A load equivalent to 12kN laterally, 45kN longitudinally in a rearward direction, and 60kN 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, but not in a way as to increase the resistance of the structure being tested.

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

This test must be carried out in the presence of an FIA technical delegate and using measuring equipment verified by the FIA.

Furthermore, each car manufacturer must supply detailed calculations which clearly show that the structure is capable of withstanding the same load when the longitudinal component is applied in a forward direction. Alternatively, and only following a request from the car manufacturer, the principal roll structure may be subjected to a further static load test using the same procedure as above but carried out in a forward direction.

15.2.5 The design concept of the roll structures required by Article 15.2.2 shall be free. However, the principal roll structure must have a minimum structural cross section, in vertical projection, of 10000mm², across a horizontal plane passing 50mm lower than its highest point.

15.3 Survival cell and frontal protection:

15.3.1 The survival cell must extend from behind the fuel tank in a forward direction to a point at least 150mm in front of the driver's feet, with his feet resting on the pedals and the pedals in the inoperative position.

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 minimum size to allow access to mechanical components.

The safety structures described in Article 15.2 must be a part of the survival cell or solidly attached to it.

Article 13.1 COCKPIT:

13.1 Cockpit opening:

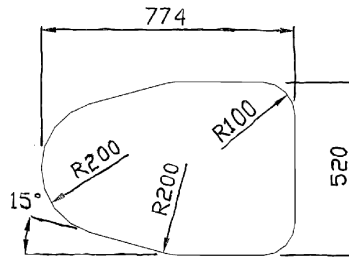
The opening giving access to the cockpit must allow the horizontal template, shown in Drawing 1, to be inserted vertically, from above the car into the survival cell and bodywork, with the steering wheel, steering column, seat and all padding removed.

The front tip of the template must be no less than 625mm from the front wheel centre line and it must be possible to lower the template 25mm below the lowest point of the cockpit opening.

Furthermore, 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.

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 or cockpit padding. Sitting at his steering wheel, the driver must be facing forward.

The cockpit must be so conceived that the maximum time necessary for the driver to get out from his normal driving position does not exceed 5 seconds with all driving equipment being worn and starting with the safety belts fastened.



Drawing 1

- 15.3.2** When he is seated normally, the soles of the driver's feet, resting on the pedals in the inoperative position, shall not be situated to the fore of the vertical plane passing through the centre line of the front wheels.

Should the car not be fitted with pedals, the driver's feet at their maximum forward extension shall not be situated to the fore of the above mentioned vertical plane.

- 15.3.3** In front of the survival cell, an impact absorbing structure must be fitted. This structure need not to be an integral part of the survival cell but must be solidly attached to it.

- 15.3.4** The minimum external width of the survival cell is 340mm. This width must be maintained for a minimum height of 250mm along the whole length of the survival cell. The minimum height of the survival cell between the two rollover structures is 550mm.

The minimum height of the survival cell behind the driver is 750mm.

Furthermore, the parts of the survival cell which are situated each side of the driver's helmet must be no more than 550mm apart and at least as high as a line parallel to and 220mm below the line between the tops of the two roll structures.

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 top of the sides of the survival cell.

- 15.3.5** Furthermore, at least that part of the survival cell forward of a transversal section 200mm to the rear of the front wheel axis, shall be subjected to an impact test against a solid vertical barrier placed at right angles to the centre line of the car.

If such a part is tested separately from the rest of the survival cell it must be attached to the trolley in such a way that it does not increase the impact resistance of the structure being tested.

For the purposes of this test, the total weight of the trolley and test structure shall be 560kg and the velocity of impact 10 metres/sec.

The resistance of the test structure must be such that during the impact the average deceleration of the trolley does not exceed 25g.

Furthermore, all structural damage must be contained in the zone ahead of the front wheel axis.

This test must be carried out in the presence of an FIA technical delegate in an approved testing centre.

- 15.3.6** In addition, the survival cell must be subjected to three separate static lateral load tests:

1) In the cockpit area on a vertical plane passing through the centre of the seat belt lap strap fixing.

2) In the fuel tank area on a vertical plane passing through the centre of area of the fuel tank in side elevation.

3) On a vertical plane passing halfway between the front wheel axis and the top of the first rollover structure.

For the tests described above, a pad 100mm long and 300mm high, with a maximum radius on all edges of 3mm and conforming to the shape of the survival cell, shall 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. Rubber 3mm thick may be used between the pads and the survival cell.

A constant transverse horizontal load of 20kN shall be applied, in less than 3 minutes, to the pads at their centre of area through a ball jointed junction, and maintained for a minimum of 30 seconds.

Under these load conditions, there shall be no structural failure of the inner or outer surfaces of the survival cell and permanent deformation must be less than 1mm after the load has been released for 1 minute. The deformation will be measured at the top of the pads across the inner surfaces. In test 1, deflection across the inner surfaces of the survival cell must not exceed 20mm.

15.3.7 To test the attachments of the frontal impact absorbing structure to the survival cell, a static side load test shall be performed on a vertical plane passing 400mm in front of the front wheel axis.

A constant transversal horizontal load of 30kN must be applied to one side of the impact absorbing structure using a pad identical to the one used in the lateral tests in Article 15.3.6. 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 that 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.

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.

15.3.8 A further static load test must be carried out on the survival cell from beneath the fuel tank. A pad of 200mm diameter must be placed in the centre of area of the fuel tank and a vertical upwards load of 10kN applied in less than 3 minutes through a ball jointed junction. The load must be maintained for a minimum of 30 seconds.

Under these loads conditions, there must be no structural failure of the inner or outer surfaces of the survival cell and permanent deformation must be less than 0.5mm after the load has been released for 1 minute the measurement being taken at the centre of area of the pad.

15.3.9 Two further static load tests must be carried out on the survival cell on each side of the cockpit opening. A pad of 100mm diameter must be placed with its upper edge at the same height as the top of the cockpit side with its centre at a point 200mm forward of the rear edge of the cockpit opening template longitudinally. A constant transverse horizontal load of 10kN will then be applied at 90° to the car centre line, in less than 3 minutes, through a ball jointed junction. The load must be maintained for a minimum of 30 seconds.

Under these load conditions, there must be no structural failure of the inner or outer surfaces of the survival cell, there must be no more than 10mm total deformation and permanent deformation must be less than 1.0mm after the load has been released for 1 minute, the measurements being taken at the centre of area of the pad.

15.3.10 The static load tests in Article 15.2.4, 15.3.6, 15.3.7, 15.3.8 and 15.3.9 must be carried out in the presence of an FIA technical delegate and using measuring equipment verified by the FIA.

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

15.3.11 In order to ensure all survival cells are manufactured in the same way, each constructor must submit the weight of every survival cell produced. These weights will be compared with that of the survival cell which was subjected to the tests in 15.3.6, 15.3.7, 15.3.8 and 15.3.9. If any survival cell weighs less than 95% of the one previously tested, it will then have to be subjected to the tests above.

The FIA reserves the right to carry out the static load tests in Article 15.2.4, 15.3.6, 15.3.7, 15.3.8 and 15.3.9 at random on any other chassis produced by the manufacturer.

These tests will be carried out with 80% of the load referred to in these Articles and during; these tests the deflection of the reference chassis may not be exceeded by more than 20%.

15.4 Lateral protection:

In order to give additional protection to the driver in the event of a side impact, the outer skin laminates of the survival cell, over the areas described below, must be at least 3.5mm thick and must incorporate panels as specified in a) -e) below.

The outer skin laminates must:

- be at least 250mm high at the front wheel centre line;
- taper at a linear rate to at least 350mm high at the front of the cockpit opening and remain at this height to the rear of the survival cell ;
- be no less than 100mm above the reference plane between the front of the cockpit opening and the rear of the survival cell.

Any openings or cut outs in the laminates must be of the minimum size to allow access to mechanical components.

Each panel within the outer skin laminates must be at least 2mm thick and be constructed (and have features) as follows:

- a) each ply must consist of continuous aramid fibres reinforcing an epoxy matrix with a resin density between 1.20 -1.40 g/m³ and resin content between 47% -53%;
- b) the basic fibre properties must meet or exceed the following:
 - axial tensile strength 2.6 GPa
 - axial tensile modulus 114 GPa
 - axial tensile strain-to-failure 2.3%
- c) each ply of material must feature the aramid fibres specified above woven in the following style:
 - DuPont style 285 (160-180 g/m² 4-harness satin) giving a panel nominal thickness of 0.25mm
- d) the laminate must consist of at least 8 consecutive plies of the aramid/epoxy material specified above;
- e) the laminate must have its plies oriented to give quasi-isotropic in-plane properties, at least four being arranged at 0°/90° and at least four at 45°/45°.

Note: The sections that are stricken thru do not apply to SCCA Club Racing formula cars or sports racers.