

Formula SAE Workshop

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MAJOR RULES CHANGES

for 2009

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2009 FSAE Rules - Changes

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Rules Changes for 2009

For the benefit of the teams, below is a summary of the major rules changes for the 2009 Formula SAE competitions. It is not a complete list. If there are any differences between this summary and the official Rules, the Rules will prevail. Therefore, it is the responsibility of the competitors to read the Rules thoroughly.

<u>Rule Number</u>	<u>System</u>	<u>Change</u>
A.1.2.1	Vehicle Design Objectives	Clarified as to the intent of the design
B.4.1	Cockpit Opening	Template requirement added
B.4.2	Cockpit Internal Cross Section	Template requirement added
B,2,5	Visible Access	Without using instruments
B.3.4.2	Alternative Tubing	No Ti tubes with welding in the Primary Structure
B.3.8.1	SEF's	All teams must submit an SEF
B.3.8.5	SEF's	Points deducted for late SEF's
B.3.9.3	Helmet Line	Line to the back of the helmet clarified
B.3.9.4	Percy's Position	Location of Percy's "hips" clarified

Rules Changes for 2009 (cont'd)

<u>Rule Number</u>	<u>System</u>	<u>Change</u>
B.3.9.5	Percy	Penalty for not meeting "Percy" rule clarified
B.3.12.7	Main Hoop Bracing	Clarification on how bracing loads must be transmitted back to the Main Hoop
B.20.4	Impact Attenuator	Size of Anti-intrusion Plate specified
B.3.21	IA Data Report	Test data required. Points off for late submission.
B.4.8	Driver Egress	Driver egress to be done by ALL drivers
B.5.4.5	Shoulder Harness Bar	Gussets or braces for any cantilevered bar
B.5.5.2	Head Restraint	Significant changes on requirements
B.5.6	Roll Bar Padding	Must meet SFI or FIA specifications
B.6.5.7	Steering Wheel	Shape clarified
B.6.6.2	Jacking Point	Changes to aid visibility for workers

Rules Changes for 2009 (cont'd)

<u>Rule</u>		
<u>Number</u>	<u>System</u>	<u>Change</u>
B.7.1.7	Brake System	No brake m/cyl. etc. below frame
B.9.4	Fuel Tanks	Prohibition of fuel tanks carrying a structural load
B.9.5.2	Fuel Tanks	Rear impact protection clarified
B.10.2.3	Exhaust Noise Test	Restrictions on systems with movable tuning devices
B.13.1.d	Gas Cylinders	Not allowed in cockpit
B.17.1.g	Head Covering	Balaclava etc. required for all drivers
B.17.1.h	Foot Covering	No bare skin, no nylon or polyester socks
B.18	Possible 2010 Changes	
C.3	Cost Event	Major changes
D.8.22	Fuel Economy Scoring	100 points max. and 4 minute penalty dropped

A.1.2 Vehicle Design Objectives

- 1.2. For the purposes of the Formula SAE competition, teams are to assume that they work for a design firm that is designing, fabricating testing and demonstrating a prototype vehicle for the nonprofessional weekend autocross racer.
- 1.2.1 The vehicle should have very high performance in terms of acceleration, braking and handling and be sufficiently durable to successfully complete all the events described in the Formula SAE Rules and held at the Formula SAE competitions.
- 1.2.2 It must accommodate drivers whose stature varies from a 5th percentile female to a 95th percentile male.



2.2.5 Photo Requirements (2008 Rule number)

Requirement cancelled !!!

B.4.1 Cockpit Opening

4.1 Cockpit Opening

- 4.1.1 In order to ensure that the opening giving access to the cockpit is of adequate size, a template shown in Figure 8 will be inserted into the cockpit opening. It will be held horizontally and inserted vertically until it has passed below the top bar of the Side Impact Structure (or until it is 350 mm above the ground for monocoque cars).
- 4.1.2 During this test, the steering wheel, steering column, seat and all padding may be removed.

B.4.1 Cockpit Opening - cont'd

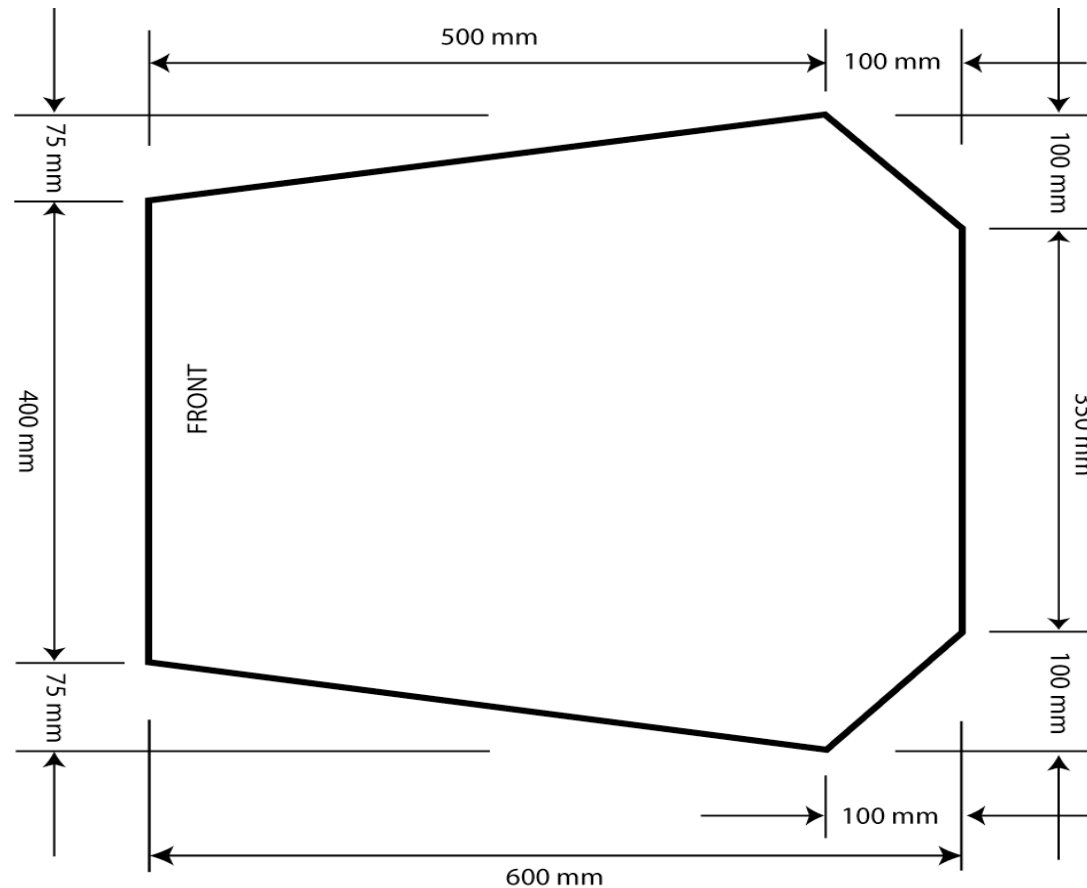


FIGURE 8

B.4.2 Cockpit Internal Cross Section

4.2 Cockpit Internal Cross Section:

- 4.2.1 A free vertical cross section, which allows the template shown in Figure 9 to be passed horizontally through the cockpit to a point 100 mm (4 inches) rearwards of the face of the rearmost pedal when in the inoperative position, must be maintained over its entire length.
- 4.2.2 The only things that may encroach on this area are the steering wheel, steering column and any padding that is required by Rule 5.7 Driver's Leg Protection.
- 4.2.3 For 2009, teams whose cars do not comply with 4.1 or 4.2 will have 35 points deducted from their Design Event score.

B.4.2 Cockpit Internal Cross Section - cont'd

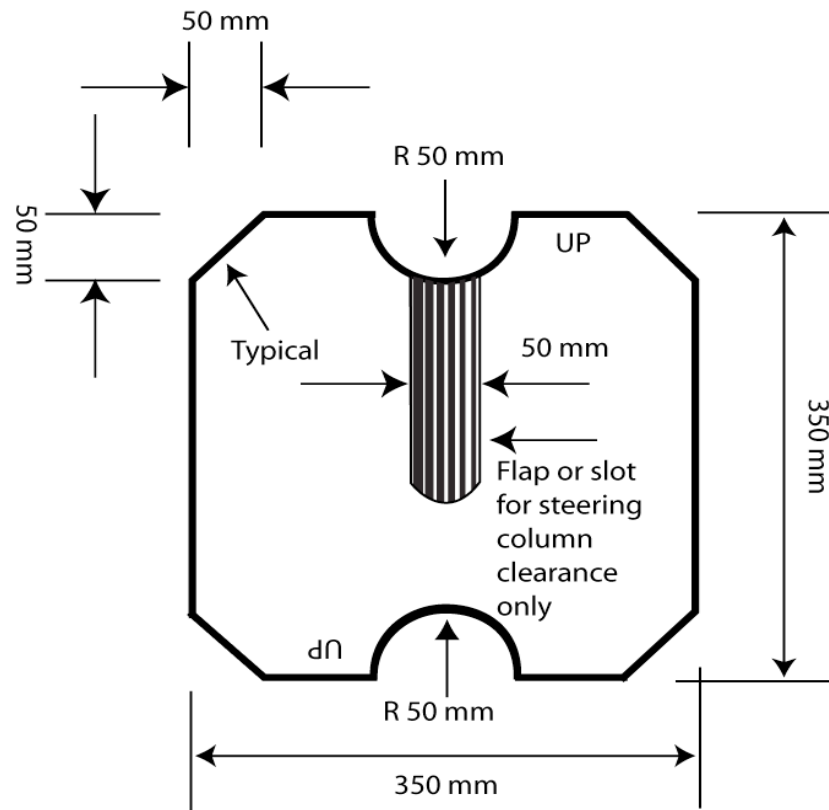


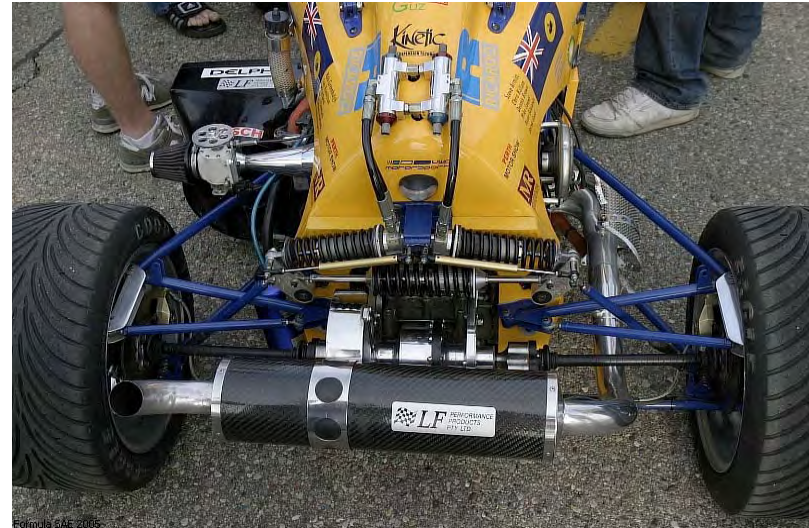
FIGURE 9

B.2.5 & C.2.2.1 Visible Access

B.2.5 Visible Access

All items on the Inspection Form must be clearly visible to the technical inspectors **without using instruments such as endoscopes or mirrors**. Visible access can be provided by removing body panels or by providing removable access panels.

Note: This same wording is repeated in C.2.2.1 Technical Inspection





B.3.4.2 Alternative “Frame” Materials

- 3.4.2 Titanium tubing **on which welding has been utilized** cannot be used for any tubing in the Primary Structure. This includes the attachment of brackets to the tubing or the attachment of the tubing to other components.

B.3.8 Structural Equivalency

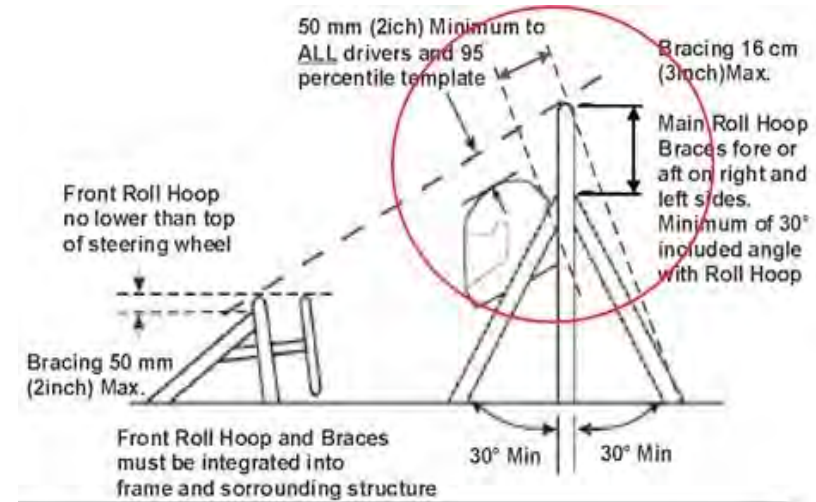
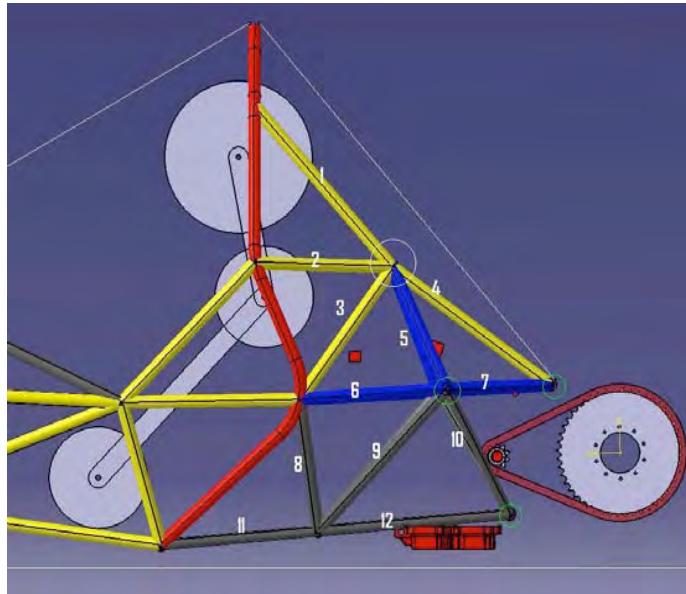
3.8 Structural Equivalency and Structural Equivalency Form (SEF)

3.8.1 ALL TEAMS MUST SUBMIT A STRUCTURAL EQUIVALENCY FORM (SEF), even if they are NOT planning to use alternative materials or tubing sizes to those specified in 3.3.1 Baseline Steel Materials.

3.8.5 Structural Equivalency Form – Submission

- a. Address – SEF's must be submitted to the officials at the competition you are entering at the address shown in the Appendix or indicated at the competition website.
- b. Due Date – SEF's must be submitted no later than the date given in the Action Deadlines indicated on the competition website. Teams that submit their Structural Equivalency Form after the due date for the competition will be penalized 10 points per day up to a maximum of 50 points, which will be taken off the team's Total Score.
- c. Acknowledgement – North America competitions – SEF's submitted for vehicles entered into competitions held in North America will be acknowledged upon receipt.

3.3.4.1 Helmet Clearance - Rearwards - 2008



Clarification of December 3rd 2007

“When seated normally and restrained by the Driver’s Restraint System, a straight line drawn from the top of the Main Hoop to the base of the Main Hoop Bracing or other approved structure, must clear by 50.8 mm (2 inches) the helmet of all the team’s drivers.”

B.3.9.3 Main & Front Hoops - General Requirements - 2009

Helmet Line

- 3.9.3 When seated normally and restrained by the Driver's Restraint System, the helmet of a 95th percentile male (anthropometrical data) and all of the team's drivers must:
- a. Be a minimum of 50.8 mm (2 inches) from the straight line drawn from the top of the main hoop to the top of the front hoop. (Figure 1a)
 - b. Be a minimum of 50.8 mm (2 inches) from the straight line drawn from the top of the main hoop to the lower end of the main hoop bracing if the bracing extends rearwards. (Figure 1b)
 - c. Be no further rearwards than the rear surface of the main hoop if the main hoop bracing extends forwards. (Figure 1c)

B.3.9.3 Main & Front Hoops - General Requirements

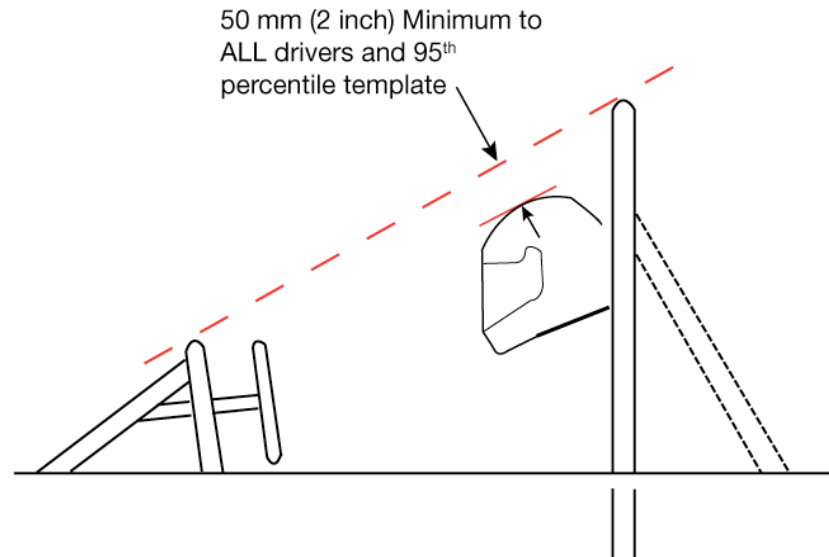


FIGURE 1a

Helmet Line

3.9.3 When seated normally and restrained by the Driver's Restraint System, the helmet of a 95th percentile male (anthropometrical data) and all of the team's drivers must:

- Be a minimum of 50.8 mm (2 inches) from the straight line drawn from the top of the main hoop to the top of the front hoop. (Figure 1a)

B.3.9.3 Main & Front Hoops - General Requirements

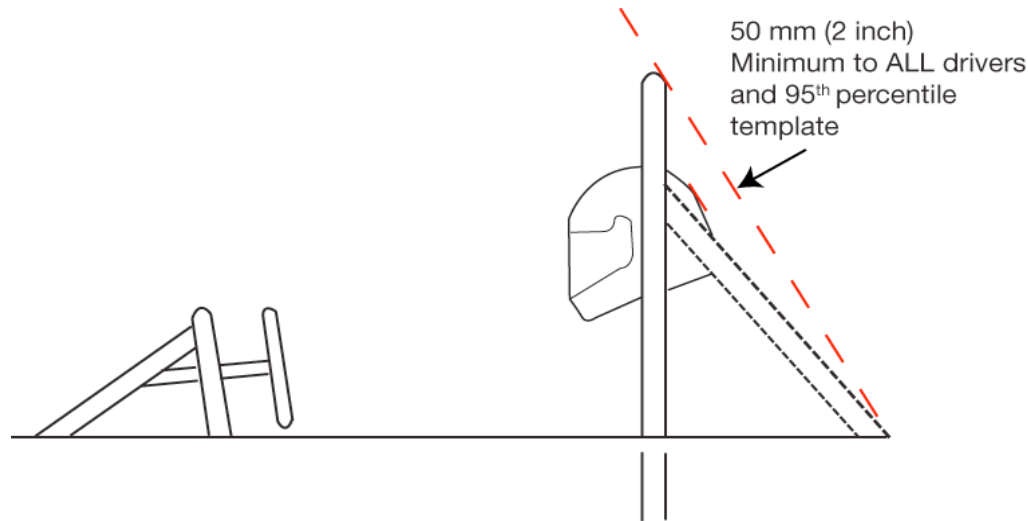


FIGURE 1b

Helmet Line

3.9.3 When seated normally and restrained by the Driver's Restraint System, the helmet of a 95th percentile male (anthropometrical data) and all of the team's drivers must:

b. Be a minimum of 50.8 mm (2 inches) from the straight line drawn from the top of the main hoop to the lower end of the main hoop bracing if the bracing extends rearwards. (Figure 1b)

B.3.9.3 Main & Front Hoops - General Requirements

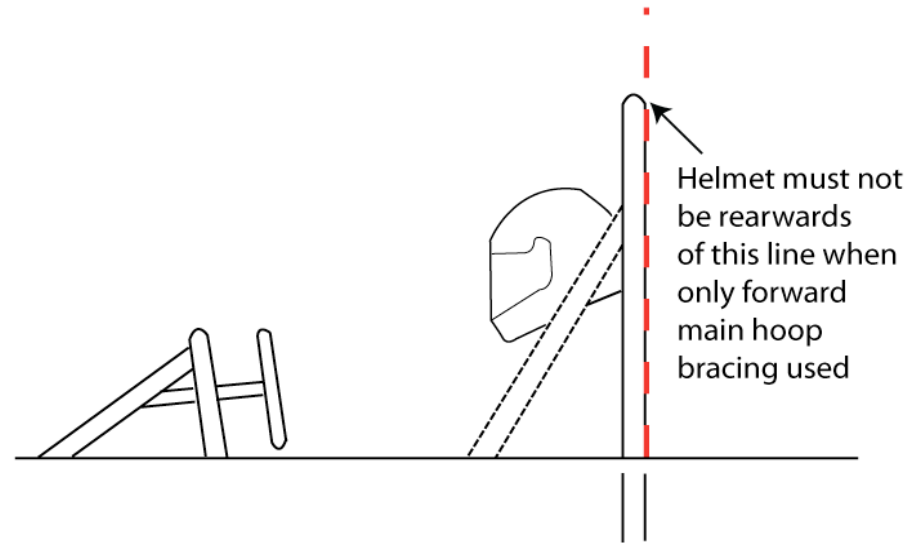


FIGURE 1c

Helmet Line

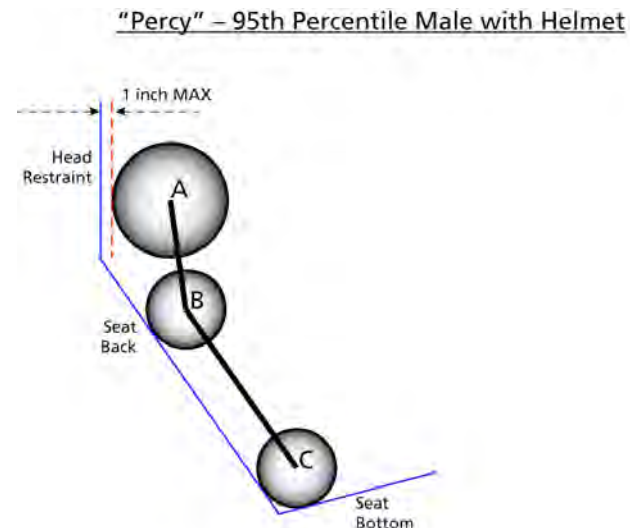
3.9.3 When seated normally and restrained by the Driver's Restraint System, the helmet of a 95th percentile male (anthropometrical data) and all of the team's drivers must:

c. Be no further rearwards than the rear surface of the main hoop if the main hoop bracing extends forwards. (Figure 1c)

B.3.9.4 Main & Front Hoods-General Requirements - Percy

3.9.4 The 95th percentile male template will be positioned as follows: (See Figure 2.)

- The seat will be adjusted to the rearmost position,
- The bottom 200 mm circle will be placed **at the junction of the seat back and the seat bottom, tangential to both.**
- The middle 200 mm circle, representing the shoulders, will be positioned on the seat back.
- The upper 300 mm circle will be positioned no more than 25.4 mm (1 inch) away from the head restraint (i.e. where the driver's helmet would normally be located while driving).



Circle A = Head with helmet – 300 mm diameter
Circle B = Shoulders – 200 mm diameter
Circle C = Hips and buttocks – 200 mm diameter

Line A-B = 280 mm from centerpoint to centerpoint
Line B-C = 490 mm from centerpoint to centerpoint

FIGURE 2



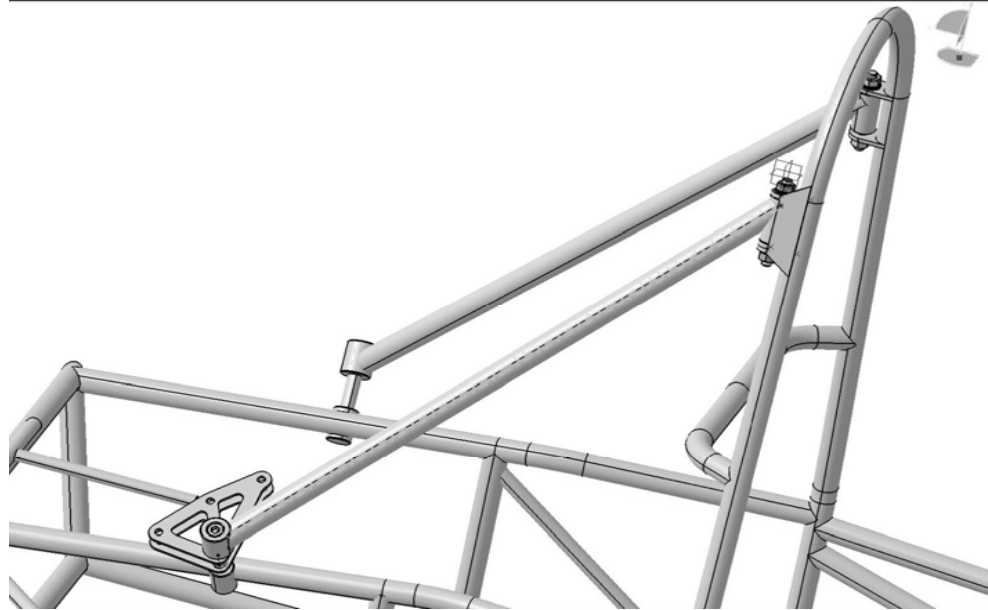
B.3.9.5 Main & Front Hoop - General Requirements - Percy - cont'd

- 3.9.5 If the requirements of 3.9.3 are not met with the 95th percentile male template, the car will be allowed to compete. However, 35 points will be deducted from the team's Design Event score.
- 3.9.6 Drivers who do not meet the helmet clearance requirements of 3.9.3 will not be allowed to drive in the competition.

B.3.12.7 Main Hoop Bracing

- 3.12.7 The attachment of the Main Hoop braces must not compromise the function of the bracing i.e. the attachment method and supporting structure must be capable of transmitting all loads from the Main Hoop into the Major Structure of the Frame without failing. **The braces must transmit this load directly through a properly triangulated structure back to the bottom of the Main Hoop.** Bracing loads must not be fed solely into the engine, transmission or differential, i.e. the bracing must terminate at a node where there is a load path back to the Main Hoop.

B.3.12.7 Main Hoop Bracing - cont'd



Not OK - Goes through Suspension Components

The attachment of the Main Hoop braces must not compromise the function of the bracing i.e. the attachment method and supporting structure must be capable of transmitting all loads from the Main Hoop into the Major Structure of the Frame without failing. **The braces must transmit this load directly through a properly triangulated structure back to the bottom of the Main Hoop.** Bracing loads must not be fed solely into the engine, transmission or differential, i.e. the bracing must terminate at a node where there is a load path back to the Main Hoop.

3.3.5.1 Main Hoop Bracing - Cont'd



Not OK



OK If Tubes Sizes are OK

The attachment of the Main Hoop braces must not compromise the function of the bracing i.e. the attachment method and supporting structure must be capable of transmitting all loads from the Main Hoop into the Major Structure of the Frame without failing. **The braces must transmit this load directly through a properly triangulated structure back to the bottom of the Main Hoop. Bracing loads must not be fed solely into the engine, transmission or differential, i.e. the bracing must terminate at a node where there is a load path back to the Main Hoop.**



B.3.20.4 Impact Attenuator Plate

- 3.20.4 If the Impact Attenuator is foam filled or honeycomb, a 1.5 mm (0.060 in) solid steel or 4.0 mm (0.157 in) solid aluminum anti-intrusion plate must be integrated into the Impact Attenuator. The metal plate must be the same size as **the outside dimensions of** the Front Bulkhead and be bolted or welded to the Front Bulkhead.
- 3.20.5 If the anti-intrusion is not integral with the frame, i.e. welded, a minimum of four (4) 8 mm Grade 8.8 (5/16 inch Grade 5) bolts must attach the Impact Attenuator to the Front Bulkhead.
- 3.20.6 Alternative designs **of the anti-intrusion plate** required by 3.20.4 that do not comply with the minimum specifications given above require an approved Structural Equivalency Form per Section 3.8.

B.3.21 IA Data Report

3.21 Impact Attenuator Data Requirement

- 3.21.1 The team must submit **test data** to show that their Impact Attenuator, when mounted on the front of a vehicle with a total mass of 300 kgs (661 lbs) and run into a solid, non-yielding impact barrier with a velocity of impact of 7.0 metres/second (23.0 ft/sec), would give an average deceleration of the vehicle not to exceed 20 g's, **with a peak deceleration less than or equal to 40 g's.**
- 3.21.2 When using acceleration data, the average deceleration must be calculated based on the raw data. The peak deceleration can be assessed based on the raw data, and if peaks above the 40g limit are apparent in the data, it can then be filtered with a Channel Filter Class (CFC) 60 (100 Hz) filter per SAE Recommended Practice J211 Instrumentation for Impact Test, or a 100 Hz, 3rd order, lowpass Butterworth (-3dB at 100 Hz) filter.
- 3.21.3 A schematic of the test method must be supplied along with photos of the attenuator before and after testing.
- 3.21.4 **The test piece must be presented at technical inspection for comparison to the photographs and the attenuator fitted to the vehicle.**

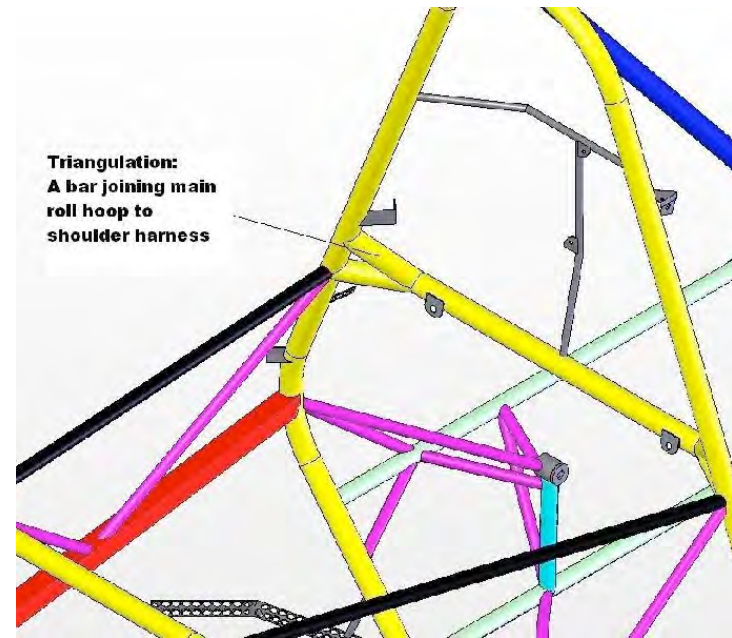
B.3.21 IA Data Report - Cont'd

- 3.21.5 The test data and calculations must be submitted electronically in Adobe Acrobat format (*.pdf file) to the address and by the date provided in the Action Deadlines provided on the relevant competition website. This material must be a single file (text, drawings, data or whatever you are including).
- 3.21.6 The Impact Attenuator Data must be named as follows:
carnumber_schoolname_competition code_IAD.pdf using the assigned car number, the complete school name and competition code
[Example: 087_University of SAE_FSAEV_IAD.pdf]
Competition Codes are listed in Rule A – 2.6
- 3.21.7 Teams that submit their Impact Attenuator Data Report after the due date will be penalized 10 points per day up to a maximum of 50 points, which will be taken off the team's Total Score
- 3.21.8 Impact Attenuator Reports will be graded by the organizers and the grades will be passed to the Captain of the Design Event for consideration in that event.

B.5.4.5 Shoulder Harness Bar



Potential Not OK



OK

If the harness is mounted to a tube that is not straight, the joints between this tube and the structure to which it is mounted **must be reinforced in side view by gussets or triangulation tubes** to prevent torsional rotation of the harness mounting tube.

2008 - 3.4.4 Head Restraint

Not OK - Helmet too far from Headrest

The restraint must have a minimum area of 232 sq. cm (36 sq. inches), be padded, with an energy absorbing material such as Ethafoam® or Ensolite® with a **minimum thickness of 38 mm (1.5 inches)**, and be located **no more than 25 mm (1 inch) away from the helmet** in the uncompressed state. The head restraint must meet the above requirements for all drivers. The restraint, its attachment and mounting must be strong enough to withstand a force of 890 Newtons (200 lbs. force) applied in a rearward direction.



B.5.5.2 Head Restraint

5.5 Head Restraint

- 5.5.1 A head restraint must be provided on the car to limit the rearward motion of the driver's head.
- 5.5.2 The restraint must:
- Have a minimum area of 232 sq. cm (36 sq. inches),
 - **Be vertical or near vertical in side view.**
 - Be padded with an energy absorbing material such as Ethafoam or Ensolite with a minimum thickness of 38 mm (1.5 inches).
 - Be located so that:
 - It is no more than 25 mm (1 inch) away from the back of the driver's helmet in the uncompressed state.
 - The contact point of the back of the driver's helmet on the head restraint is no less than 50 mm (2 inch) from any edge of the head restraint.
- 5.5.3 The restraint, its attachment and mounting must be strong enough to withstand a force of 890 Newtons (200 lbs. force) applied in a rearward direction.

**Notes: (1) The head restraint must meet the above requirements for all drivers.
(2) Head restraints may be changed to accommodate different drivers
(see B.1.2.2.d)**



B.5.6 Roll Bar Padding

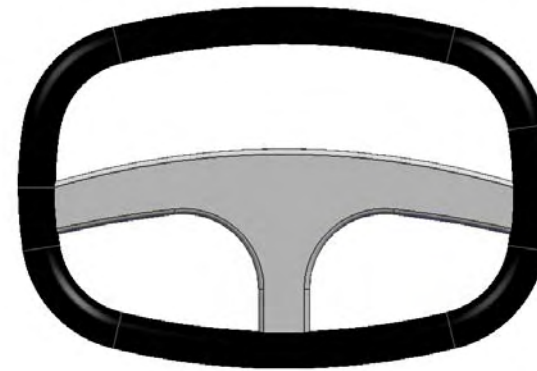
5.6 Roll Bar Padding

Any portion of the roll bar, roll bar bracing or frame which might be contacted by the driver's helmet must be covered with a minimum thickness of 12 mm (0.5 inch) of padding which meets **SFI spec 45.1 or FIA 8857-2001**.

B.6.5.7 Steering Wheel



OK



OK

B.6.5.7 The steering wheel must have a continuous perimeter that is near circular or near oval, **i.e. the outer perimeter profile can have some straight sections, but no concave sections.** Figure 8, or cutout wheels are not allowed.

B.6.5.7 Steering Wheel - cont'd



Not OK



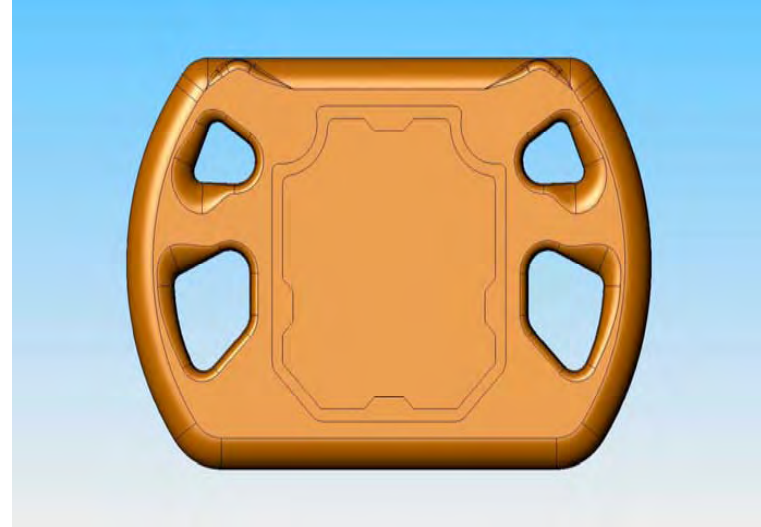
Not OK

B.6.5.7 The steering wheel must have a continuous perimeter that is near circular or near oval, i.e. the outer perimeter profile can have some straight sections, but no concave sections. Figure 8, or cutout wheels are not allowed.

B.6.5.7 Steering Wheel - cont'd



Not OK



OK

B.6.5.7 The steering wheel must have a continuous perimeter that is near circular or near oval, i.e. the outer perimeter profile can have some straight sections, but no concave sections. Figure 8, or cutout wheels are not allowed.

B.6.6.2 Jacking Point

6.6 Jacking Point

6.6.1 A jacking point, which is capable of supporting the car's weight and of engaging the organizers' Quick jacks, must be provided at the very rear of the car.

6.6.2 The jacking point is required to be:

- Visible to a person standing 1 metre (3 feet) behind the car.
- Painted orange.
- Oriented horizontally and perpendicular to the centerline of the car
- Made from round, 25 – 29 mm (1 – 1 1/8 inch) O.D. aluminum or steel tube
- A minimum of 300 mm (12 inches) long
- Exposed around the lower 180 degrees of its circumference over a minimum length of 280 mm (11 in)

The height of the tube is required to be such that:

- There is a minimum of 75 mm (3 in) clearance from the bottom of the tube to the ground measured at tech inspection.
- With the bottom of the tube 200 mm (7.9 in) above ground, the wheels do not touch the ground when they are in full rebound.



B.7.1.7 Brakes

7.1.7 In side view no portion of the brake system that is mounted on the sprung part of the car can project below the lower surface of the frame or the monocoque, whichever is applicable.

B.9.4 Fuel Tanks

9.4 Fuel Tanks

- 9.4.1 The fuel tank is defined as that part of the fuel containment device that is in contact with the fuel. It may be made of a rigid material or a flexible material.
- 9.4.2 Fuel tanks made of a rigid material cannot be used to carry structural loads, e.g. from roll hoops, suspension, engine or gearbox mounts, and must be securely attached to the vehicle structure with mountings that allow some flexibility such that chassis flex cannot unintentionally load the fuel tank.
- 9.4.3 Any fuel tank that is made from a flexible material, for example a bladder fuel cell or a bag tank, must be enclosed within a rigid fuel tank container which is securely attached to the vehicle structure. Fuel tank containers (containing a bladder fuel cell or bag tank) may be load carrying.
- 9.4.4 Any size fuel tank may be used.
- 9.4.5 The fuel system must have a provision for emptying the fuel tank if required.

B.9.5.2 Fuel Tank Location

9.5 Fuel System Location Requirements

- 9.5.1 All parts of the fuel storage and supply system must lie within the surface defined by the top of the roll bar and the outside edge of the four tires. (See Figure 13).
- 9.5.2 All fuel tanks must be shielded from side **or rear impact** collisions. Any fuel tank which is located outside the Side Impact Structure required by 3.24, 3.25, or 3.26 must be shielded by structure built to 3.24, 3.26, or 3.26.
- 9.5.3 A firewall must be incorporated to separate the fuel tank from the driver, per Rule 4.5.

B.13.1.d Gas Cylinders

13.1 Compressed Gas Cylinders and Lines

Any system on the vehicle that uses a compressed gas as an actuating medium must comply with the following requirements:

- a. Working Gas-The working gas must be nonflammable, e.g. air, nitrogen, carbon dioxide.
- b. Cylinder Certification- The gas cylinder/tank must be of proprietary manufacture, designed and built for the pressure being used, certified by an accredited testing laboratory in the country of its origin, and labeled or stamped appropriately.
- c. Pressure Regulation-The pressure regulator must be mounted directly onto the gas cylinder/tank.
- d. Cylinder Location- The gas cylinder/tank and the pressure regulator must be located within the structural portion of the Frame, but not in **the cockpit or** in a non-structural side pod.
- e. Cylinder Mounting- The gas cylinder/tank must be securely mounted to the Frame, engine or transmission.
- f. Cylinder Axis- The axis of the gas cylinder/tank must not point at the driver.
- g. Insulation- The gas cylinder/tank must be insulated from any heat sources, e.g. the exhaust system.
- h. Lines and Fittings- The gas lines and fittings must be appropriate for the maximum possible operating pressure of the system.
- i. Protection- The gas cylinder/tank and lines must be protected from damage resulting from the failure of rotating equipment.



B.10.2.3 Exhaust Noise Test

- 10.2.3 If the exhaust has any form of **movable tuning or throttling device or system**, it must be compliant with the device or system in all positions. The position of the device must be visible to the officials for the noise test and must be manually operable by the officials during the noise test.

B.17. Driver's Gear

17.1 Driver's Equipment

The following equipment must be worn by the driver anytime he or she is in the cockpit with the engine running:

- g. Hair Covering - A head, hair and neck covering (balaclava) of accepted fire resistant material, e.g. a Nomex balaclava, or a full helmet skirt of accepted fire resistant material.

Note: This applies to ALL drivers.

- h. Socks – Socks made from **an accepted fire resistant material**, e.g. Nomex that **cover the bare skin between the driver's suit and the boots or shoes**. Socks made from wool or cotton is acceptable. Socks of nylon or polyester are not acceptable.