

Safety Cage Regulations

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SECTION 1 General Provisions

SECTION 2 shall apply to a Safety Cage structure fitted by an aftermarket supplier to a series production, passenger automobile utilising a steel monocoque construction.

SECTION 3 shall apply to a Safety Cage structure fitted by an aftermarket supplier to a series production, goods carrying automobile utilising a steel monocoque passenger cell, possibly with a separate chassis.

SECTION 4 shall apply to a Safety Cage of free design fitted by an aftermarket supplier to a series production automobile utilising a steel monocoque passenger cell; or to an automobile of alternative construction techniques and materials.

SECTION 5 shall apply to a Safety Cage fitted by the automobile manufacturer or their authorised agents to series production automobiles.

SECTION 6 shall apply to a Safety Cage that has been previously authorised or recognised by sanctioning bodies other than AASA.

SECTION 7 shall apply to repairs to Safety Cage structures

SECTION 1

1. General Provisions

1.1 Scope

The present regulations provide the framework for the design, construction and recognition of automobile rollover protection and Safety Cage structures ("Safety Cages") for the sport of automobilism undertaken under the sanction of the Australian Auto Sport Alliance Pty. Ltd ("AASA"). These activities may be either competitive motor sporting activities or non-competitive automobile recreational activities. The National Competition Rules ("NCR") of the AASA, the applicable Standing Regulations and Event Supplementary Regulations will determine the applicability of the present regulations to each automobile and each event.

1.2 Purpose and limitations

A Safety Cage is a structure added to a series production automobile after the date of manufacture with the intent of generally lessening the risk of injury to the automobile's occupants when certain, foreseeable incidents occur. It comprises a mechanical structure of circular section tubing, mountings and joints designed to reduce the deformation of the production bodyshell¹ in the event of an incident. It may also include the provision of attachment points for safety harnesses, seats and other required safety equipment.

The term Safety Cage shall also include Roll Over Protection Structures ("ROPS")

Each competitor and automobile owner shall note these explicit limitations:

There are foreseeable incidents and circumstances that can and do occur for which a Safety Cage compliant with the present regulations cannot protect the occupants from injury or death.

There are foreseeable incidents and circumstances that can and do occur for which a Safety Cage compliant with the present regulations may increase the risk of injury or death to the occupants.

¹ The bodyshell is the primary structural element of the monocoque automobile. It does not include hanging, swinging or demountable panels nor any subframes nor crossmembers.

The fitment of a Safety Cage compliant with the present regulations shall not be sufficient to demonstrate compliance with specific Event and Standing regulations.

The fitment of a Safety Cage compliant with the present regulations shall not imply compliance with the requirements both specific and general of sanctioning bodies other than AASA.

Specific Group² Regulations may impose limitations on the mounting and design of a Safety Cage. By competing in such a Group, each competitor acknowledges their acceptance of these limitations.

The present regulations impose certain restrictions on the location of various Safety Cage components that are affected by the occupant's location within the cockpit. Each party shall ensure that the automobile can accommodate each occupant in such a way as to enable compliance with all requirements.

A Safety Cage will add weight and structural rigidity to a competition automobile. Safety Cage design however must not compromise protection to minimise weight or maximise structural rigidity.

1.3 Authority

The present regulations were approved and authorized for publication by the Board of AASA on (12/04/2017)

1.4 Registration

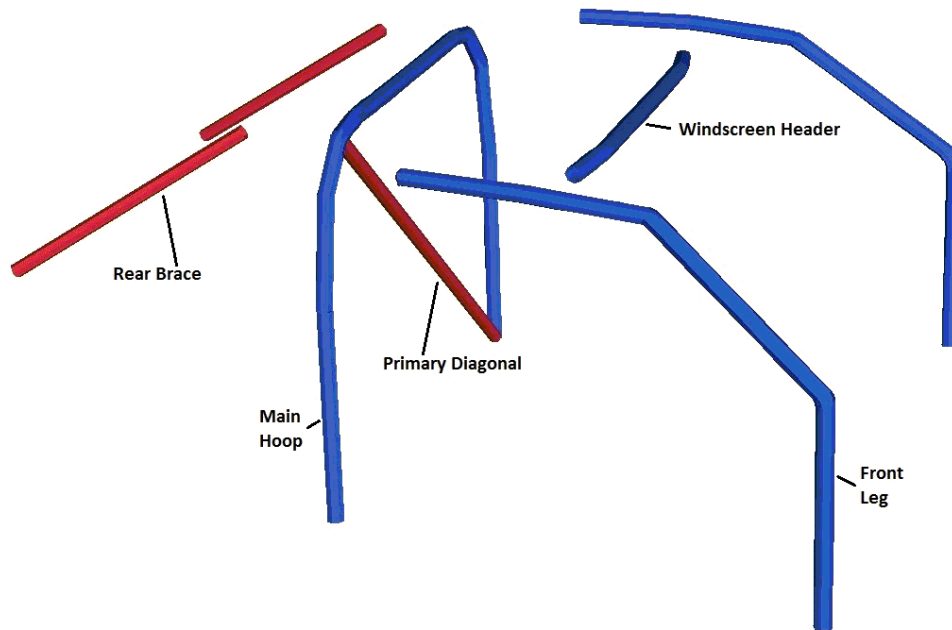
From 1 March 2017, the AASA requires that details of the Safety Cage, including a cage installation certificate, be submitted as part of the application for the issue of an AASA Vehicle Passport. Where the production of an AASA Vehicle Passport is not required, or the AASA Vehicle Passport was issued prior to 1 March 2017 no Safety Cage registration is required, save where specifically required for a particular automobile by AASA.

1.5 Definitions

1.5.1 Main Hoop

The main hoop is a vertical or near vertical member formed from a single tube perpendicular to the automobile centreline extending across the width of the automobile immediately behind the front seat occupants. It will generally extend vertically from the floor of the automobile to a level above the top of the occupants heads. (Drawing SC-1)

² A Group is a collection of automobiles in compliance with a single set of technical regulations. Examples of a Group would be Super TT, or Future Racers



Drawing SC-1

1.5.2 Front Legs

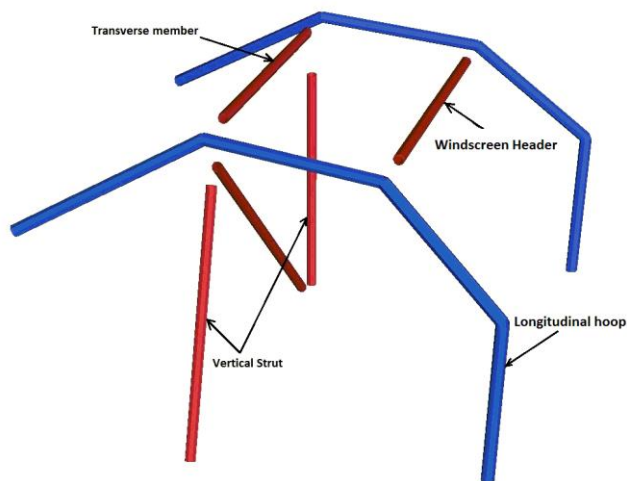
Each front leg is a member formed from a single tube that generally extends from the main hoop at roof height forward above the front door area, follows the A-pillar to the base of the windscreen then vertically to the floor. (Drawing SC-1)

1.5.3 Rear Braces

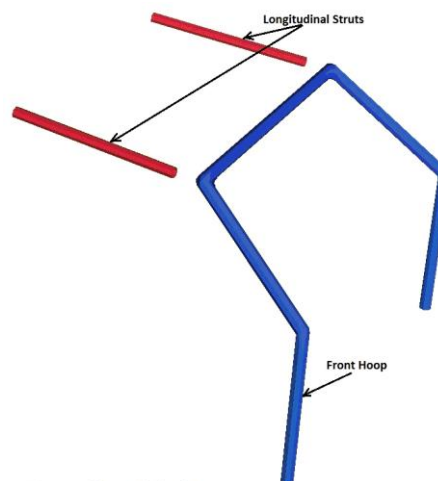
Each rear brace is a member formed from a straight single tube that generally extends from the main hoop at roof height, close to each side, to a substantial part of the automobile at the rear. (Drawing SC-1)

1.5.4 Longitudinal Hoops

Each longitudinal hoop is a member formed from a single tube that generally extends along each side of the automobile. From a substantial part of the automobile at the rear, it rises to the height of the roof next to the occupants, follows the A-pillar to the base of the windscreen, then vertically to the floor. A transverse member in the roof area shall join the longitudinal hoops whilst a vertical strut coplanar with the transverse member supports the hoop immediately behind the occupants. This type of construction is authorised as an alternative to a main hoop, rear braces and front legs for Class 2 and Class 3 cages. (Drawing SC-2).



Drawing SC-2



Drawing SC-3

1.5.5 Front Hoop

The front hoop is a member formed from a single tube, perpendicular to the automobile centreline and extending across the width of the automobile immediately ahead of the front seat occupants. It will generally extend vertically from the floor of the automobile, then follow the A pillars and across the windscreen header. This type of construction is authorised as an alternative to front legs and windscreen header for Class 2 and 3 cages. (Drawing SC-3)

1.5.6 Primary Diagonal

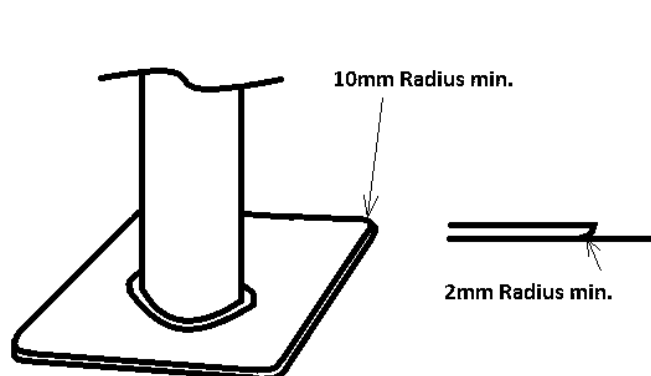
The primary diagonal is a member formed from a straight one-piece tube to provide lateral triangulation of the main hoop. (Drawing SC-1)

1.5.7 Mounting Foot

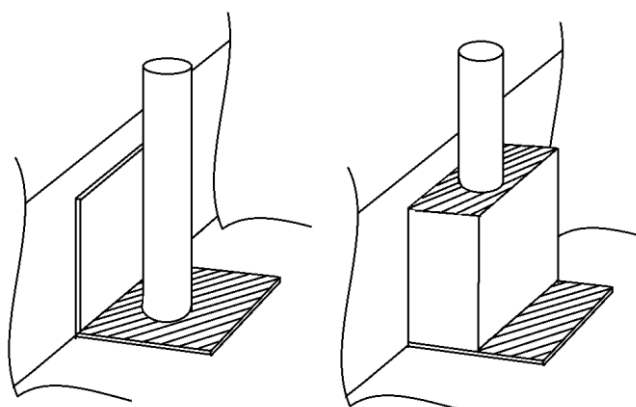
A mounting foot is a plate of metal for distributing load that is welded to each Safety Cage member that attaches to the automobile shell. In vertical projection, it must have all corners rounded to a radius of 10mm min. (Drawing SC-4). A mounting foot is not required when the tube is welded directly to the shell reinforcement.

1.5.8 Shell reinforcement

A shell reinforcement is a plate of metal being at least 3mm in thickness, or a box section of 3mm plate, attached to the body shell by welding for distributing load. (Drawing SC-5).



Drawing SC-4



Drawing SC-5

1.5.9 Reinforcement tube

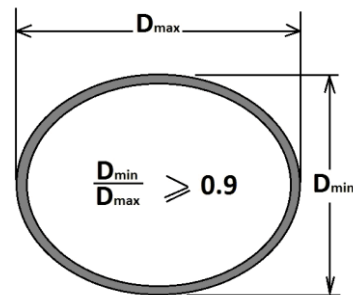
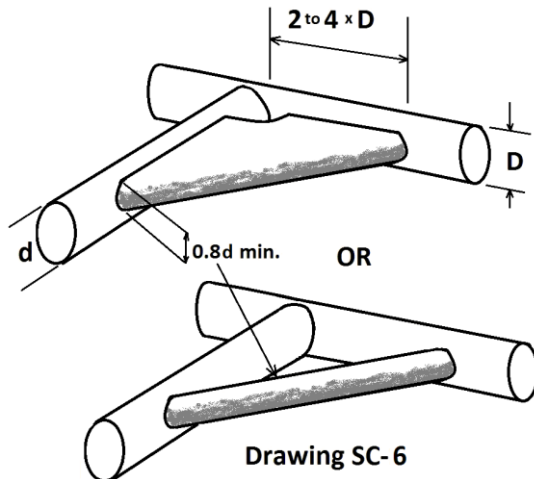
A reinforcement tube is a member added to the Safety Cage to reinforce the structure.

1.5.10 Windscreen header

The windscreen header is a member formed from a single tube that generally extends across the automobile between each front leg of the Safety Cage at the top of the A-pillars. (Drawing SC-1)

1.5.11 Gusset

A gusset is a piece of metal, at least 1.0mm in thickness, formed into a “U” section and welded to the structure to reinforce a junction between two Safety Cage members. The gusset shall extend along each tube a distance of between two and four times the diameter of the larger tube. The thickness of the gusset shall be at least 0.8 times the diameter of the smaller tube. A section of tube, to the same material dimensions is an acceptable alternative to a sheet metal gusset (Drawing SC-6).



1.6 Guidance on Construction

The essence of a good Safety Cage is to have a close fitting³ structure designed specifically for the automobile concerned, using high quality materials, construction techniques and mountings. The cage should not impede access or egress by the occupants beyond that unavoidable within the design requirements. Unless specifically restricted by Group regulations the cage may penetrate front and/or rear firewalls. Interior trim, not including occupied seats, may be cut or locally distorted to enable fitment. Electrical wiring, fuse boxes and electronic control modules may be re-located to facilitate fitment of compulsory Safety Cage members.

1.6.1 Joint preparation

Tubing must be accurately “notched” to minimise any gap between the tubes to be joined prior to welding. Smaller diameter tubing should be centralised when attached to larger diameter tubing.

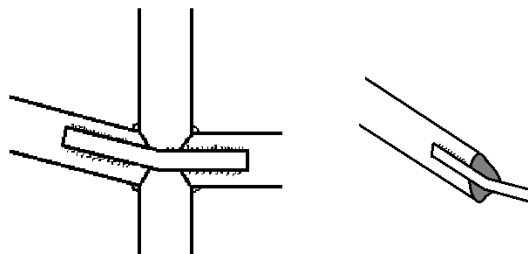
1.6.2 Bending

Tubing must be cold worked into shape. Good practice requires that tubing be bent by rolling around a mandrel rather than pressing. In each case, the ratio of minimum to maximum diameter in each ovalised cross section must not be less than 0.9. (Drawing SC-7)

1.6.3 Welding

Welding must be high quality with full penetration, preferably using a gas-shielded arc (MIG/TIG). Welding must continue around the complete circumference of each joint involving compulsory members of the Safety Cage. It is recognised that this may not be possible for some joints for optional members in the kick panel region: in such places, a reinforcement plate should be used. (Drawing SC-8).

³ Where the automobile retains a curtain SRS airbag, the main hoop of a Class 1 or Class 1a cage may be installed with up to 40mm of clearance from the side reinforcement rails of the roof to permit deployment.



Drawing SC-8

Welding must be conducted by a person:

- holding a recognised welding qualification for the type of welding employed, or;
- engaged by an appropriate business being the subject of an ABN.

1.7 Additional Functions

A Safety Cage member must not carry or hold any fluid save for air. They must not carry ballast. It is acceptable for ferrules to be incorporated in Safety Cage members for the attachment of safety harnesses (Drawing SC-15). Brackets may be incorporated in Safety Cage members for the mounting of compulsory window nets. The mounting of brackets by removable clamps for optional equipment (e.g. video cameras) is authorised.

SECTION 2

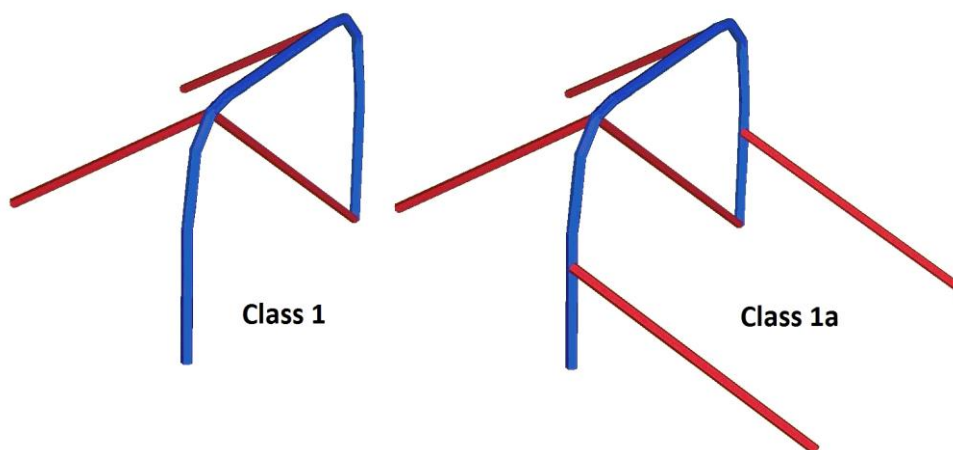
2 This section applies to a Safety Cage fitted by an aftermarket supplier to a closed series production automobile utilising a steel monocoque passenger cell.

2.1 General

The AASA defines three classes of Safety Cage structure for a closed automobile. These definitions will provide automobile owners and event organisers with design requirements to suit a variety of activities with differing risk profiles.

2.1.1 **Class 1** A Class 1 structure consists of a main hoop fitted behind the front seat occupants, to which are attached rear braces and a compulsory diagonal, the upper end of which is behind the driver's head. (Drawing SC-9). This structure may be appropriate for events with a primary risk profile of roll over incidents. Class 1 structures may permit the automobile to retain civil registration.

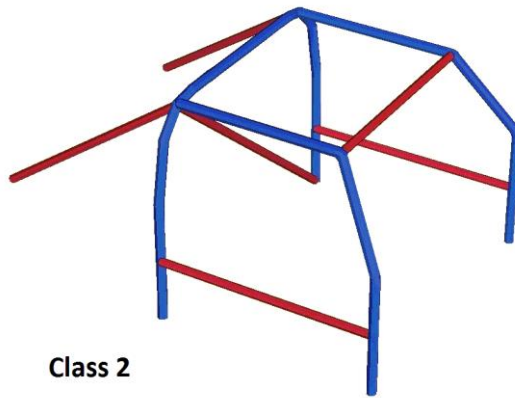
A **Class 1a** cage consists of a Class 1 structure to which side impact protection is added to the standard rollover structure. This may be of benefit where side impact is of concern, such as drift battles or restricted Tarmac Rally events.



Drawing SC-9

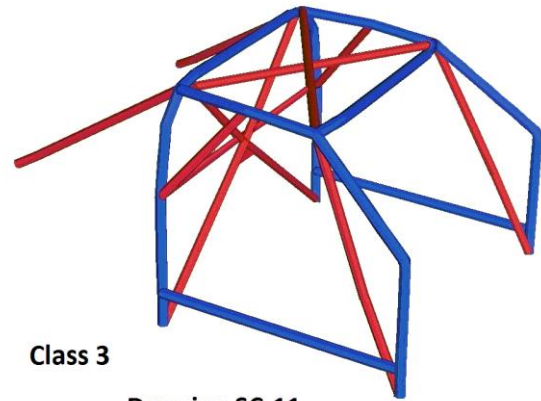
2.1.2 **Class 2** A Class 2 structure consists of a Class 1 structure to which is added front legs and a windscreen header as well as side protection in the door openings (Drawing SC-10). This

structure provides greater protection for events with a risk profile including a higher probability of frontal collisions and lateral impacts.



Class 2

Drawing SC-10



Class 3

Drawing SC-11

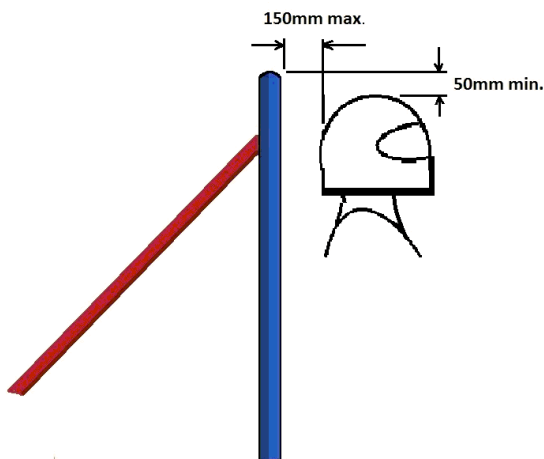
- 2.1.3 **Class 3** A Class 3 structure consists of a Class 2 structure to which further reinforcement has been added (Drawing SC-11). A Class 3 structure will be the most comprehensive structure that provides a higher level of protection for events with a risk profile including impacts with narrow objects such as trees and poles.

2.2 Limitations of extent

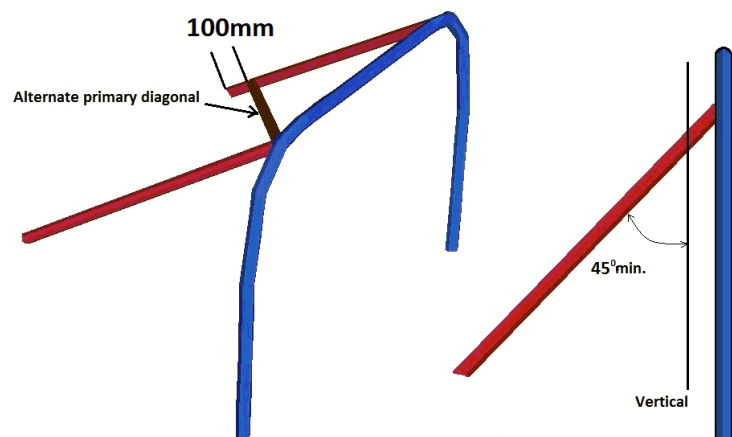
- 2.2.1 The complete Safety Cage, including optional reinforcement members, must be contained longitudinally between a vertical plane through the foremost and a vertical plane through the rearmost suspension mounting points that impose a significant vertical force on the body shell.
- 2.2.2 No part of the Safety Cage may extend below the floor.⁴

2.3 Main Hoop (Compulsory for all cage classes)

- 2.3.1 The main hoop shall be formed from a single piece tube to the specifications shown in Section 1.19, Table ST-1. It shall closely follow the interior of the cockpit with smooth bends and free of joints. Other members may be attached to the main hoop by welding or by clamps of approved design. The hoop shall have no more than five bends in total.
- 2.3.2 The main hoop shall be vertical when viewed from the side, with a 5-degree tolerance. It shall not overhang but must be within 150mm of the occupants' helmets. (Drawing SC-12)



Drawing SC-12



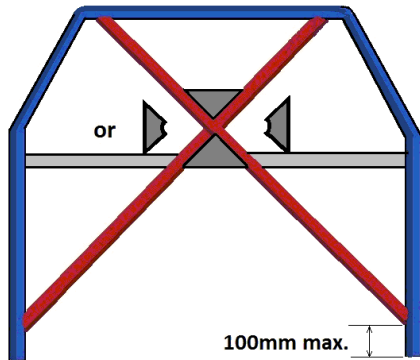
Drawing SC-13

- 2.3.3 The main hoop shall be either mounted to the bodyshell at floor level using a bolted mounting foot, or welded to a shell reinforcement (See article 1.16 for details).

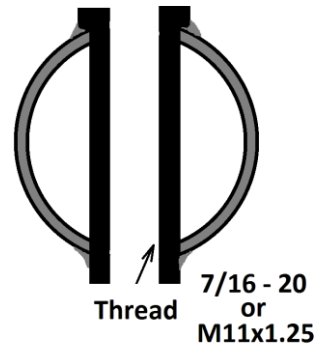
⁴ This requirement shall not in itself preclude the fitting of chassis braces/tubes below the floorpan where Group regulations permit. However, each brace/tube that extends below the floor shall not be regarded, in its entirety, as part of the Safety Cage even if it is welded to a Safety Cage member or cage mounting point.

2.4 Primary Diagonal (Compulsory for classes 1 and 2)

- 2.4.1 The primary diagonal shall be a member composed of a single tube that extends from the lower passenger side to the top of the structure behind the driver's head. It may be either in the plane of the main hoop, or under certain circumstances in the plane of the rear braces.
- 2.4.2 Where the primary diagonal is in the plane of the main hoop, its upper attachment must be within 100mm of the point at which the driver's side rear brace is attached to the main hoop. The lower attachment must be on the main hoop on the passenger's side within 100mm of the mounting point on the bodyshell (Drawing SC-14).
- 2.4.3 Where the rear braces are less than 45 degrees from the vertical when viewed from the side the primary diagonal may be attached in the plane of the rear braces. The upper attachment to the driver's side rear brace must be within 100mm of the point at which that rear brace is attached to the main hoop. The lower attachment must be on the passenger's side rear brace within 100mm of its mounting point on the bodyshell. (Drawing SC-13)



Drawing SC-14



Drawing SC-15

2.5 Rear Braces (Compulsory for all classes)

- 2.5.1 Not fewer than two rear braces must attach to the main hoop at or near roof level, as close as possible to the outer bends of the main hoop. Each must be straight and make an angle of at least 30 degrees to the vertical, when viewed from the side.
- 2.5.2 Each Rear brace must be mounted to a substantial part of the rear structure of the automobile as close to the outside of the automobile as possible. This may include the floorpan, a rear wheel arch or rear suspension tower. Mounting to an unreinforced rear parcel shelf is not acceptable. Reinforcement of the rear parcel shelf is not permitted unless authorised in Group regulations.

2.6 Safety Harness bar (Compulsory for class 3)

- 2.6.1 A safety harness bar, where fitted, must extend the full width of the main hoop.
- 2.6.2 Where the harness bar is intersected by a diagonal member in the plane of the main hoop, each section of the harness bar shall be co-linear.
- 2.6.3 A gusset at the junction of a main hoop cross (see article 1-13) and intersecting the line of the safety harness bar will be deemed to constitute a continuation for the purpose of 1.6.1 (Drawing SC-14)
- 2.6.4 Threaded ferrules (7/16"-20 or M11 x 1.25) may be added to the harness bar. Where fitted these shall extend through the tube and be fully welded (Drawing SC-15).
- 2.6.5 Guides may be added to the harness bar to limit lateral movement of the harness where the harness is attached by wrapping.
- 2.6.6 Where foreseen by the seat manufacturer, the seat backrest may be attached to the harness bar.

2.7 Front Leg (Compulsory for classes 2 and 3)

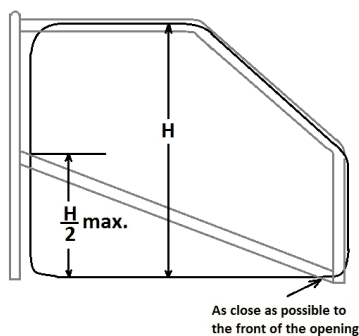
- 2.7.1 Each Front leg must be a single tube, and follow the interior of the cockpit closely. It must be attached to the main hoop as close as possible to the roof, preferably near the junction of the rear braces. Each front leg must have the minimum number of bends required to follow the A-pillars, and only one bend below a horizontal plane through the midpoint of the windscreen. It is recommended that each front leg be tagged to the A-Pillar.
- 2.7.2 Each front leg must be either mounted to the bodyshell at floor level using a bolted mounting foot, or welded to a shell reinforcement (See article 1.16 for details). The mounting point shall not be to the rear of any part of the front leg/lateral hoop.

2.8 Windscreen header (Compulsory for classes 2 and 3)

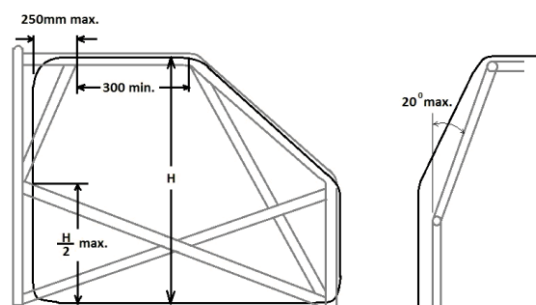
The windscreen header must be attached to the front legs as far forward as possible, whilst remaining in close proximity to the leading edge of the roof reinforcement. It must be a single piece tube with a maximum of three bends along its length.

2.9 Anti-intrusion bar (Compulsory for classes 1a, 2 and 3)

- 2.9.1 At least one anti-intrusion bar must be fitted on the driver's side and, if carrying a passenger/co-driver, on both sides of the automobile.
- 2.9.2 Each anti-intrusion bar shall extend from the main hoop to the front leg (Classes 2 and 3) and be made of a single tube. If practical, it should be bent out towards the exterior of the vehicle, but otherwise straight. In the case of a Class 1a structure, the forward end of the door bar shall be mounted to a point on the sill as close as possible to the front of the door opening (Drawing SC-16).
- 2.9.3 Each anti-intrusion bar must be as high as possible, but not above a point half way up the door opening at either end (Drawing SC-16).



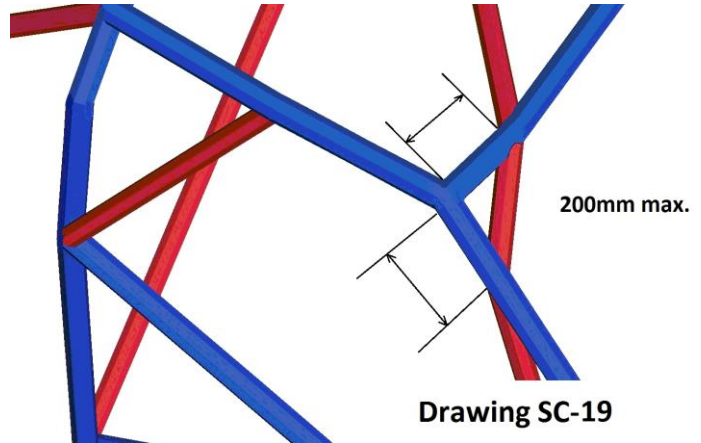
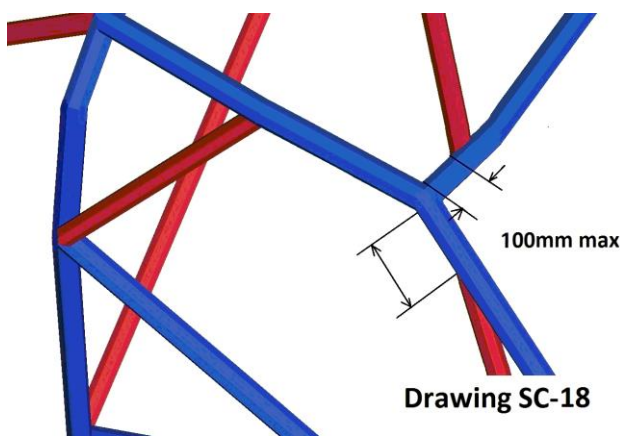
Drawing SC-16



Drawing SC-17

2.10 A-pillar reinforcement (Compulsory for class 3)

The purpose of the A-Pillar reinforcement is to triangulate the forward edge of the cage. At its lower end, it must be mounted to either the same mounting foot or reinforcement plate as the front leg, or to a separate mounting foot or chassis reinforcement to the same specification. At the upper end it must be attached to the front leg either within 100mm of the junction of the header bar (Drawing SC-18), or within 200mm if a reinforcement is fitted (Drawing SC-19)

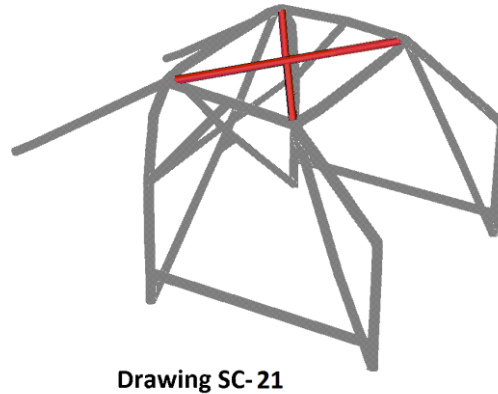
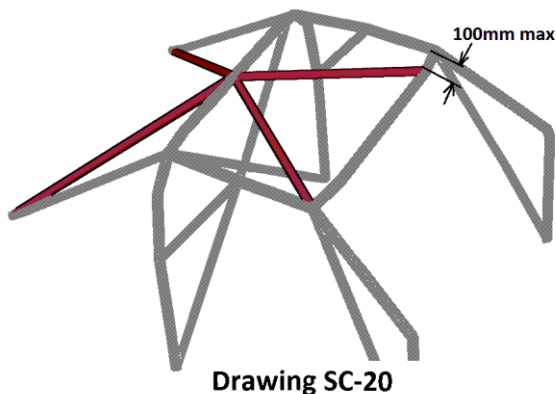


2.11 B-pillar reinforcement (Compulsory for class 3)

The purpose of this member is to support the front leg above the door opening. Its upper junction with the front leg should be approximately beside the driver's helmet, but no more than 250mm ahead of the rearmost part of the door opening and at least 300mm to the rear of the A-pillar reinforcement. (See Drawing SC-17). This bar may have a single bend of up to 20 degrees, as viewed from the front, to provide additional clearance for the occupants.

2.12 Roof reinforcement (Compulsory for Class 3)

The Safety Cage must contain a reinforcement to brace the roof area above the occupants. This may take the form of a "V" or "cross" (Drawings SC-20, SC-21).



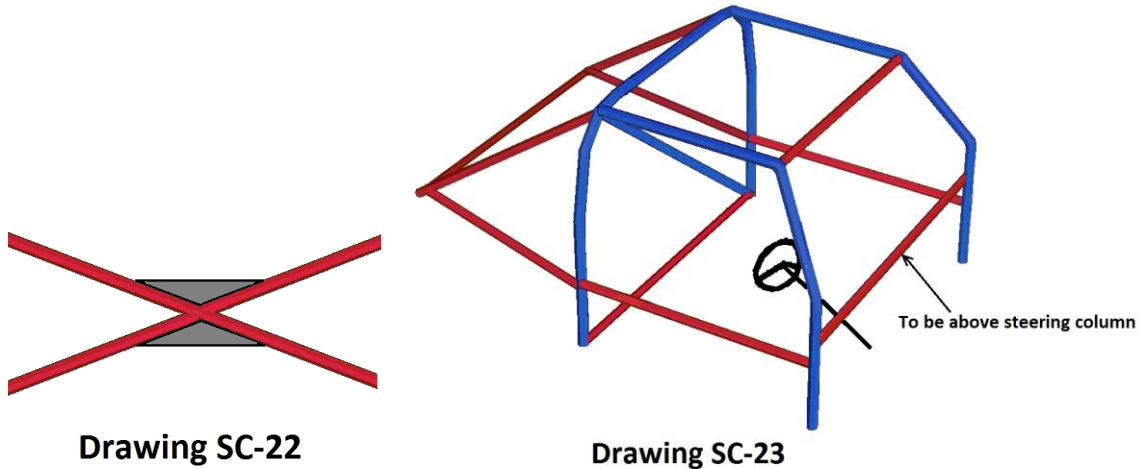
At the forward end, each roof reinforcement member must be attached to the header bar either within 100mm of the junction of the front leg (Drawing SC-18), or within 200mm if a reinforcement is fitted (Drawing SC-19).

2.13 Main hoop cross (Compulsory for class 3)

The main hoop shall be reinforced by at least two diagonal members forming a cross. The junction between the two members shall be reinforced by a pair of opposed gussets. The diagonal braces must terminate within 100mm of the mountings of the main hoop at the bottom and the junction of the rear braces at the top. (Drawing SC-14).

2.14 Double anti-intrusion (door) bar (Compulsory for class 3)

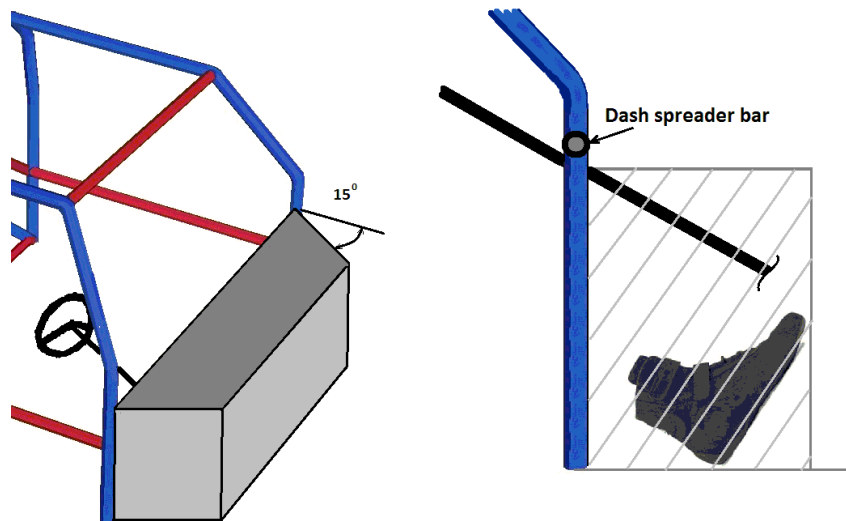
The fitting of a second anti-intrusion door bar is required for class 3 cages. It is preferred that each such bar be one contiguous tube. In cases where the two bars intersect, resulting in a total vertical cross section less than that of the two separate bars, the junction must be reinforced by a pair of opposed gussets fitted to the top and bottom (Drawing SC-22).



2.15 Optional reinforcements

2.15.1 Additional, non-compulsory Safety Cage reinforcements, respecting the provisions of Article 1.2, are permitted in the volume behind the plane of the main hoop. A dash spreader bar may be added between the front legs of the Safety Cage, but it must pass above the steering column (Drawing SC-23).

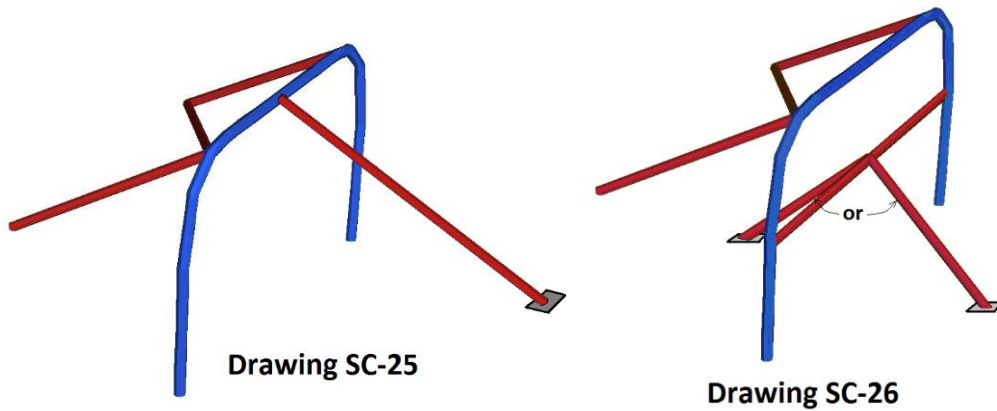
2.15.2 Non-compulsory reinforcements may be added ahead of the front legs, other than within the foot space volume as shown in Drawing SC-24. This volume is bounded at the front by a vertical plane through the soles of the driver's boots, and at the top by the height of a permitted dash spreader bar. At the sides, it is bounded by vertical planes through the front leg tubes that are inclined 15 degrees toward the centre of the automobile.



Drawing SC-24

2.15.3 For Class 1 and Class 1a structures, a forward brace as shown in Drawing SC-25 may be added. The mounting of this brace shall be in the front passenger foot-well.

2.15.4 Where a safety harness bar is added, a forward or rear facing brace may be added as shown in Drawing SC-26, mounted to the transmission tunnel area.



2.16 Mountings (All classes)

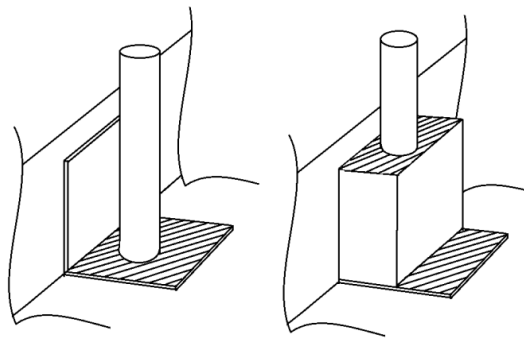
2.16.1 Each Safety Cage shall, as a minimum, be mounted at the following locations:

- 2.16.1.1 At the base of each side of the main hoop tube (Classes 1, 2 and 3);
- 2.16.1.2 At the base of each rear brace tube (Classes 1, 2 and 3); and
- 2.16.1.3 At the base of each front leg tube, or each side of the front hoop (Classes 2 and 3)

2.16.2 At each of the above locations the tube shall be either:

- 2.16.2.1 Welded directly to a shell reinforcement, or;
- 2.16.2.2 welded to a mounting foot which is bolted to a shell reinforcement; or
- 2.16.2.3 welded to a mounting foot which is then bolted directly to the body shell (see 1.16.6.3).

2.16.3 A shell reinforcement must take the form of a steel plate, or combination of steel plates, that closely follows the contour of the shell over the required area. It shall at least 3mm in thickness and shall be in close proximity to the body shell over a total projected area of 12000mm² for each mounting point of the main hoop and front leg/front hoop, and 6000mm² for each rear brace and other mandatory members. (Drawing SC-5)



Drawing SC-5

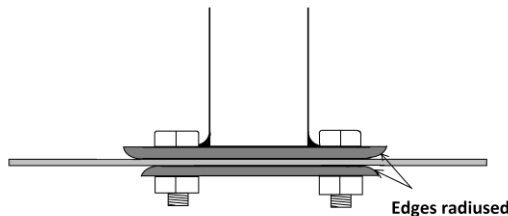
2.16.4 Each shell reinforcement must be welded to the body shell. Safety Cage installers should consult the automobile manufacturer for guidance on the most appropriate welding techniques and materials. Each such recommendation made by the automobile manufacturer shall be binding and shall take priority over any contradictory requirements in the present rules. Care must be taken to ensure a close fit to the shell prior to welding, and to the removal of paint/coatings from the areas to be welded. Stitch welding of at least 20mm in length may be used along the perimeter of the reinforcement. Spot welding may be used provided the spots are along the complete perimeter of the reinforcement and spaced not more than 15mm apart. It is strongly recommended that the shell reinforcement be welded to the shell in at least two planes (e.g. floor and inner sill). (Drawing SC-5)

2.16.5 A mounting box may be used to support the Safety Cage. It shall be made of steel at least 3mm in thickness and must be fully welded along all seams. It is recommended that the box

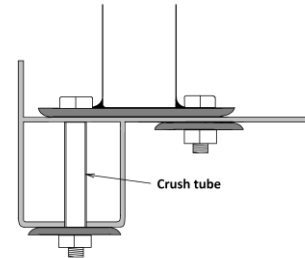
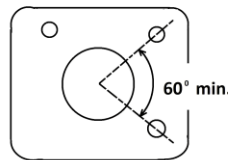
be internally gusseted/reinforced. The shell reinforcement may make up two or more sides of the box but must remain clearly visible. The height of the mounting box shall not exceed 200mm.

2.16.6 Bolted mountings

- 2.16.6.1 At least three bolts shall be used at each mounting foot of the main hoop, front legs or front hoop, and at least two bolts at each other mounting point.



Drawing SC-27

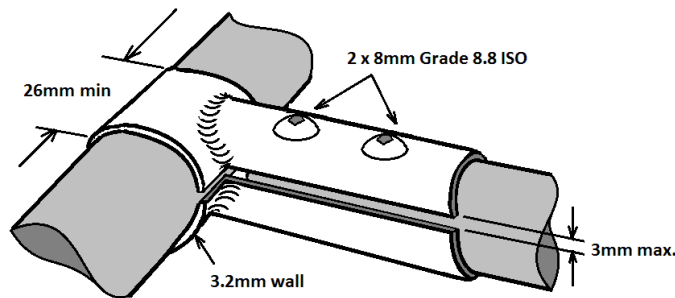


Drawing SC-28

- 2.16.6.2 Each bolt and nut must be of 8mm minimum diameter and grade 8.8 (ISO) minimum strength. When viewed along the axis of the member, each bolt shall be separated radially from all other bolts by an angle of at least 60° subtended from the tube centreline. (Drawing SC-27). Each nut must be locked to the bolt, either mechanically or chemically. Where a bolt passes through a box section a crush tube must be used to allow the bolts to be torqued to at least 40Nm. (Drawing SC-28)
- 2.16.6.3 Optionally for Class 1 or Class 2 Safety Cages, each Safety Cage mounting foot may be bolted to the body shell without a shell reinforcement. The mounting foot at each point shall comply with the dimensional requirements as shown in Table ST-1. Additionally, each foot shall have rounded corners of min 10mm radius in projection along the tube centreline, and each edge rounded off at the bottom (Drawings SC-4 and SC-28). A lower plate must be used under the floor. It shall be at least $\frac{2}{3}$ of the area of the mounting foot and be proportionate in size.
- 2.16.6.4 Where necessary the lower mounting plate may split into two sections provide the required overall projected area is maintained. (Drawing SC-28).

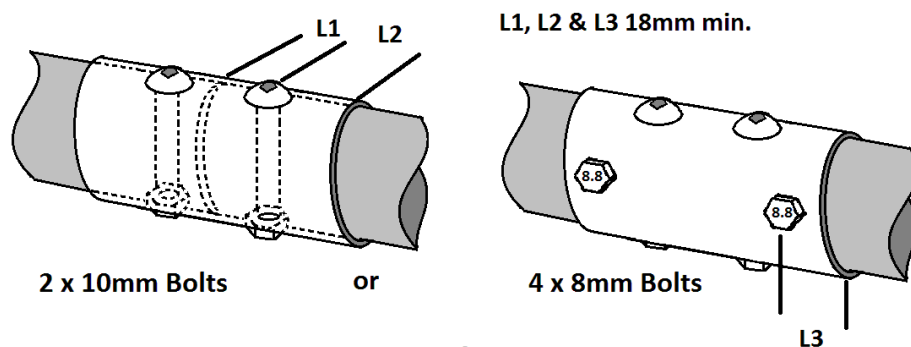
2.17 Demountable Joints

- 2.17.1 Demountable joints shall be no less strong in tension than the tubes that they join, and shall have no less than two 8mm or one 10mm Grade 8.8 ISO bolts in shear. Wherever the bolts may be exposed to the occupants, button head capscrews must be used.
- 2.17.2 No joints which hinges in a vertical plane shall not be used to attach front legs to the main hoop.
- 2.17.3 Tee Clamp joints (Drawing SC-29) may be used to attach front legs and rear braces to the main hoop in Class 1 and 2 cages.



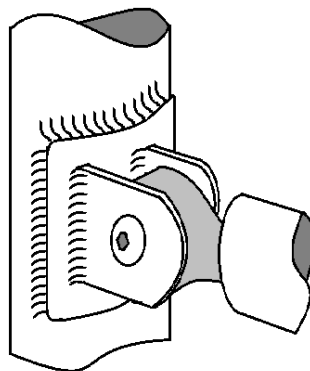
Drawing SC-29

- 2.17.4 A sleeve joints (Drawing SC-30) may be used to join tubes in all structures. Each sleeve shall be of the same or greater wall thickness as the tubes joined, and there must be no more than 0.5mm clearance between the sleeve and tube. The length of each sleeve shall not be less than twice the diameter of the tubes joined. No crush tube is required within the joined tubes. The centreline of each bolt shall be at least 18mm from the end of each tube or sleeve



Drawing SC-30

- 2.17.5 Where a lug for a demountable connection is welded to a safety cage member, the tube must be reinforced to a distance of not less than 10mm from the lug (Drawing SC-31)



Drawing SC-31

2.18 Padding

- 2.18.1 Safety padding must be fitted to each region of any member of a safety cage structure with which an occupant's helmet may make contact. This region is deemed to include any point within 200mm of an occupant's helmet when the occupant is seated normally with safety harness tightened.

- 2.18.2 Safety padding shall comply with the SFI 45.1 standard, or similar internationally recognised standard.
- 2.18.3 Comfort padding of an alternative material may be attached to the Safety Cage wherever compulsory padding as per 1.18.1 is not required.

2.19

Material Specifications

The material requirements are specified in Table ST-2, ST-3 and ST-4. Care should be taken in the selection of Safety Cage materials. The suitability of the steel for welding and cold forming as well as elongation must be taken into account when selecting materials. The use of AS/NZS1163 pipe (CHS) is authorised only for Class 1, Class 1a and Class 2 Safety Cages. In general, the use of cold drawn low carbon mild steel tubing CDS/CEW (FOM) is preferred to the use of black water pipe to AS/NZS1163 (C350L0), particularly if the automobile is to compete in higher-level events or events under other sanctioning bodies. The use of so-called “down grade” or “seconds” pipe is prohibited. The use of alternative mid to high carbon, alloyed high tensile steels may be permitted under the provisions of SECTION 3.

| Table ST-1 Mounting feet for bolted structures | | | |
|---|-------------------------|---------------------------|--------------------------|
| Mounting Location | Projected area of mount | | Minimum single dimension |
| Main hoop tubes Front legs/rollbar | 6500mm ² | Under 700kg [#] | 55mm |
| | 7500mm ² | 701kg-1150kg [#] | 65mm |
| | 10000mm ² | Above 1150kg [#] | 75mm |
| Rear braces | 6000mm ² | | 50mm |

Where specified, weight refers to the “start line” weight of the automobile.

| Table ST-2 Material properties for tubing | |
|--|---------------|
| Carbon Content | Maximum 0.33% |
| Carbon Equivalent Value* | Maximum 0.80% |
| Elongation | 20% |
| Ultimate Tensile Strength | 450MPa Min |
| Yield Strength | 350MPa Min |

*CEV - As per International Institute of Welding (IIW) guidelines

| Table ST-3 Minimum Tubing Dimensions (mm) CDS/CDW FOM tubing | | | | |
|---|--------------|------|------------------|------------|
| | Up to 1150kg | | 1150kg and over | |
| Tube | Diameter | Wall | Diameter | Wall |
| Main Hoop (per SC-1) | 38.1mm | 2.4 | 44.5mm | 2.5 |
| Vertical struts and transverse member (per SC-2) | 38.1mm | 2.4 | 44.5mm | 2.5 |
| All other compulsory members | 38.1mm | 1.6 | 38.1mm 40.0mm | 2.5 2.0 |
| Non-compulsory braces | 38.1mm | 1.6 | 38.1mm | 1.6 |

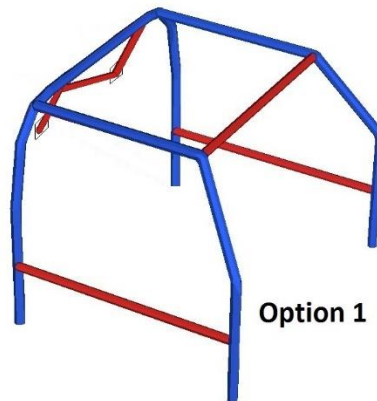
| Table ST-4 Tubing Dimensions (mm) AS1163 black/painted pipe | | |
|--|------------------------|------|
| All weights [#] | Minimum permitted size | |
| Tube | Diameter | Wall |
| Main Hoop (per SC-1) | 48.3mm | 2.3 |
| Vertical struts and transverse member (per SC-2) | 48.3mm | 2.3 |
| All other compulsory members | 42.4 | 2.3 |
| Non-compulsory braces | 42.4 | 2.0 |

SECTION 3

- 3 This section shall apply to a Safety Cage fitted by an aftermarket supplier to a series production, goods carrying automobile utilising a steel monocoque passenger cell, possibly with a separate chassis.

3.1 Option 1

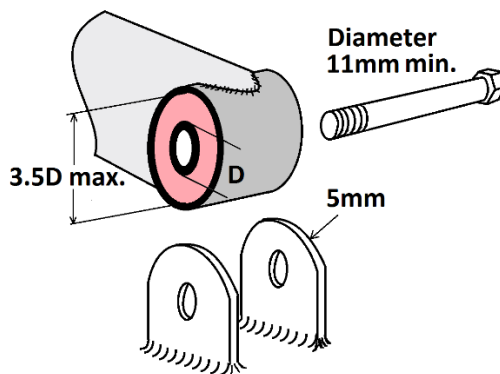
- 3.1.1 For an automobile with sufficient space behind the occupants (Extra Cab or Crew cab), a Safety Cage in compliance with SECTION 1 may be used, noting that the provisions of Article 1.5.1 must be respected.
- 3.1.2 The rear braces may terminate at a location immediately below the rear window as per Drawing SC-33.



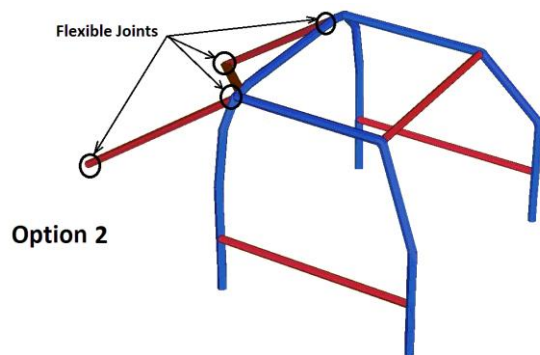
Drawing SC-33

3.2 Option 2

- 3.2.1 For an automobile with insufficient space behind the occupants, the safety cage may be extended through the rear of the cockpit and terminate on the rear chassis.
- 3.2.2 The provisions of Article 1.2 must be respected.
- 3.2.3 Each rear brace and the diagonal member may pass through the rear window aperture. In such cases, a rear window made from glass may be replaced by another of polycarbonate material.
- 3.2.4 Where the automobile utilises a separate chassis and a rigid connection is impractical, the joints of the rear brace and diagonal at the chassis and main hoop may contain a flexible bushing. See Drawing SC-34 and SC-35



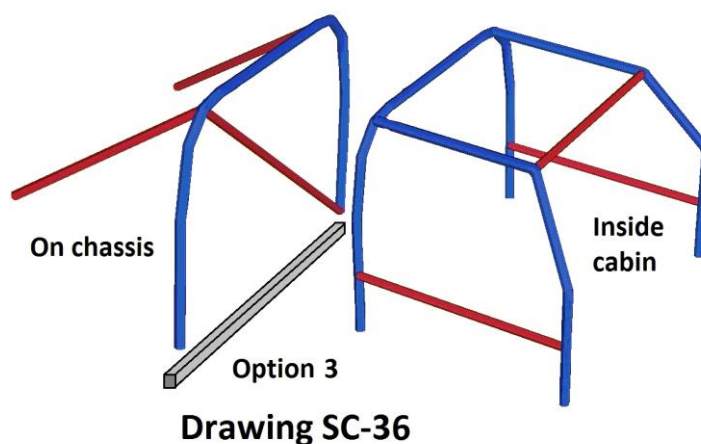
Drawing SC-34



Drawing SC-35

3.3 Option 3

- 3.3.1 The automobile may be equipped with a Safety Cage within the cockpit and a separate Roll Over Protection Structure (ROPS) in the load area.
- 3.3.2 The ROPS shall extend in height at least to the highest point of the roof.
- 3.3.3 The ROPS may be mounted onto a commercially available tray designed for the automobile concerned. In such case each ROPS mounting shall be as per the requirements of SECTION 1.
- 3.3.4 Where no load tray is utilised, the ROPS may be mounted at the front onto an RHS steel tube mounted to the chassis rails. The tube shall be 100mm square, with a wall thickness of 3mm. If the automobile has a mass over 1.8T the tube shall be 100mm square, 4mm wall thickness.
- 3.3.5 The ROPS shall be of sufficient width to enclose each occupant when viewed from the rear.
- 3.3.6 Under Option 3, the Safety Cage need not be equipped with rear braces or a diagonal. See Drawing SC-36



SECTION 4

4 Application

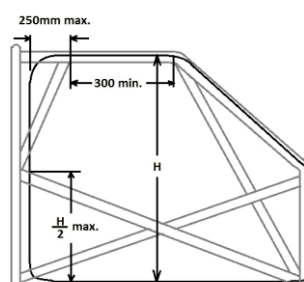
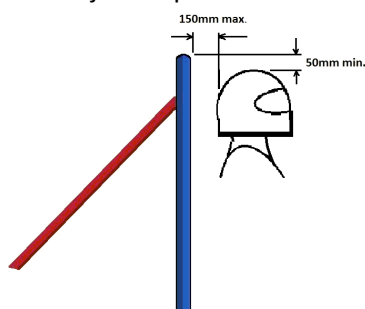
This section shall apply to each Safety Cage of free design fitted by an aftermarket supplier to a series production automobile that utilises a steel monocoque passenger cell; or to an automobile of alternative construction techniques and materials.

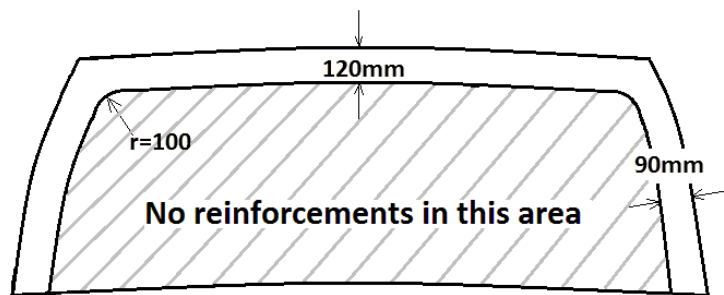
4.1 Approval

A Safety Cage manufacturer/installer may seek approval from the AASA to install a Safety Cage structure of free design. The freedom of design shall extend to the materials used in the construction of the cage, the design of the structure, and its mountings.

4.2 Restrictions

- 4.2.1 The restrictions shown in the following drawings SC-12 and SC-32 shall apply to each Safety Cage which is subject to present section:





Drawing SC-37

- 4.2.2 Where a transparent windscreen is fitted, no Safety Cage reinforcement may be present in the windscreen area more than 90mm from the side of the windscreen nor 120mm from the top of the windscreen. See Drawing SC-37
- 4.2.3 Where no transparent windscreen is fitted, a maximum of three Safety Cage reinforcement members may be added into the windscreen area. These braces must not form a “cross” at any point within the within the windscreen aperture.
- 4.3 Submission of Design**
The manufacturer or installer of the Safety Cage must consult the AASA Technical Department prior to the commencement of construction. Failure to do so may result in the rejection of the structure.
- 4.4 Strength Requirements.**
- 4.5 The manufacturer or installer of the Safety Cage shall demonstrate, by physical testing or FEA analysis by a recognised company or expert person, that the structure complies with such strength requirements in the US Federal Motor Vehicle Safety Standard number 216 (FMVSS216) as are specified by the AASA. These requirements will be provided by the AASA upon request. These test requirements shall apply to the standalone Safety Cage, not in conjunction with the automobile structure. For the purpose of such testing, the weight of the automobile shall be taken as the predicted weight of the car as it would be as it starts the event, including occupants and fluids. Should the measured weight of the automobile after completion exceed the estimate by more than 5%, re-testing of the structure will be required.
- 4.6 Bonding of mounting reinforcement plates**
Where welding to the chassis is not permitted by the automobile manufacturer, or is otherwise impractical, the reinforcement plates may be chemically bonded to the shell. The Safety Cage installer must provide details of the bonding agent used along with the estimated loadings used to determine the design of the mountings.
- 4.7** Once complete, the Safety Cage installer must complete and submit a Free Design Safety Cage form to the AASA. This form is available on request from tech@aasa.com.au
- 4.8** Once approved, an AASA Certification Number and Certificate will be provided. The number must be attached to the Safety Cage structure and a copy of the Certificate provided to the owner of the automobile.

SECTION 5

- 5 A Safety Cage installed by the manufacturer of a series production automobile, or by their authorised agents, will be accepted by the AASA, provided that:
- Manufacturer's documentation is presented to prove its authenticity
 - It is intended as a functional, rather than cosmetic, item.
 - It meets the configuration requirements (Class of Cage) for the event

Where a manufacturer's Safety Cage is installed in the automobile, its acceptance and applicable Class will be recorded in the AASA Passport.

SECTION 6

- 6 A Safety Cage fitted to an automobile that has previously been used to compete in events under recognised sanctioning bodies other than the AASA will be accepted by the AASA provided that:
- The safety cage was fitted to the particular automobile at the time of such previous competition event, and remains unmodified
 - Documentation is presented to establish such previous history
 - It meets the configuration requirements (Class of Cage) for the event

Sanctioning bodies recognised by the AASA are:

- CAMS - Confederation of Australian Motor Sport
- MSNZ – Motor Sport New Zealand
- MSA(UK) – Motor Sport Association of the United Kingdom
- DMSB – Deutsche Motor Sport Bund
- ACCUS – Automobile Competition Council of the United States, and its delegated Clubs/Associations
- JAF – Japan Automobile Federation.

Another sanctioning body may be recognised by the AASA. Contact the AASA Technical Department.

The acceptance and relevant Class of a Safety Cage installed in the automobile previously used in events under another authorised sanctioning body will be recorded in the AASA Passport.

SECTION 7

7 **Damage**

Damage to the Safety Cage fitted to an automobile indicates a significant impact to the automobile's structure has occurred. It is frequently the case that the repair of a Safety Cage will not be economically or practically viable. If this subsequently involves the replacement of the bodyshell, the original Passport will be cancelled and new Passport must be obtained

7.1 **Suspension of Passport**

Where it is determined that damage has occurred, whether by bending or crushing, to the main hoop, primary diagonal, a rear brace, front leg or windscreen header, the Chief Scrutineer will be required to suspend the automobile's Passport. The Chief Scrutineer is authorised to suspend the Passport where it is deemed that other safety cage damage is significant or will be difficult to repair. The Passport shall be notated accordingly and returned to the AASA by the Event Organiser.

7.2 Repairs

- 7.2.1 Repairs to the Safety Cage should preferably be performed by the original safety cage manufacturer or installer. If this is not possible, or practical, repairs must be carried out by, an installer registered with the AASA.
- 7.2.2 Each repair must be carried out in compliance with the requirements for a new structure. Each tube may be returned to its original shape by cold working only. A crushed or kinked tube must be replaced in its entirety. Sleeved or sectioned repairs are specifically prohibited.
- 7.2.3 Where the automobile Passport has been suspended, a repair diary must be kept. This must include photographic evidence that clearly identifies the automobile, and demonstrates the method and extent of the repair. When the repair is completed, the diary, and a AASA Repair Certificate, must be sent to the AASA. The AASA will issue a Temporary Passport and the automobile must be completed by a AASA licensed scrutineer prior to the next use of the automobile in competition. If all is satisfactory, the Passport will be re-issued.