GENERAL REQUIREMENTS FOR CARS AND DRIVERS

Schedule J - Safety Cage Structures

I. APPLICATION

A safety cage is required as follows.

1.1 Races all cars except:

(i) Unrestricted Road Registered, Closed Cars in Club or Multi-Club Level races (refer to "Race" in the CAMS Manual of Motor Sport); and

(ii) those in competition exclusively for the 5th Category unless otherwise specified in the relevant Historic Technical Regulations.

(iii) Notwithstanding Article 8 of these present regulations, a safety cage to at least Type 3 Full Cage specification is required to be fitted to all closed vehicles in all National, and State-level races, save for the exemption in (ii) above.

1.2 Truck Races: as specified in Appendix A to the Truck Formula (refer to "Race" in the CAMS Manual of Motor Sport).

1.3 State Level and above Speed Events: all cars except cars of the 5th Category (unless otherwise specified in the relevant Historic Technical Regulations), and cars which are road registered.

1.4 Off Road Events: Each Extreme 2WD, Performance 2WD, Production 4WD and Extreme 4WD automobile.
Note: Pro, Prolite, Super 1650, Sportsman and Clubman classes must comply with the prescriptions of GR9, including the diagram "Regulated Tubes for all Buggies" (refer to "Off Road Vehicles - General Requirements, in the "Off Road" section of the CAMS Manual of Motor Sport).

~~**1.5 Rallies:** all cars in timed rallies/trials, other than Introductory events. Notwithstanding article 8 of these present regulations, a safety cage to at least Type 3 Full Cage specification is required to be fitted to all closed~~

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~~vehicles in all National level rallies and all tarmac rallies.~~

~~An exemption to these requirements is provided for vehicles subject of a CAMS 5th Category (Historic) documentation (eg, CoD/Temporary Permit to Compete), other than those issued with log books for Group C, Group N Historic Touring Cars and Group 5. However, Historic vehicles must be fitted with a safety cage in rallies if such would be required for the particular vehicle should it be entered in Historic-only circuit races, and the safety cage shall be to at least the same specification as required in such a race.~~

1.5 Rallies: required in all timed rallies/trials other than as specified in Article 1.5.3.

Specific requirements:

1.5.1 Closed Cars

In a National level Rally and/or a Tarmac Rally, each closed car shall be fitted a safety cage to at least Type 3 Full Cage specification, notwithstanding Article 8 of these present regulations.

1.5.2 Open Cars

In a timed rally/trial, each open car shall be fitted with a Type 3 Full Cage with roof reinforcement members complying with drawing 253-9A, 253-9B, 253-9C or 253-9D.

1.5.3 Exceptions

A safety cage is not mandatory in the following event types:

(i) Introductory Rallies

(ii) Club Level Rallysprints

(iii) Some Touring Road Events (refer Touring Road Event Regulations)

(iv) Touring Assemblies

(v) CAMS 5th Category Historic Cars competing in rallies shall be fitted with a safety cage if a safety cage is required for the particular vehicle when entered in Historic-only circuit races. In such cases, the safety cage shall be to at least the same specification as required in a race.

Where an Historic car is subject of a CAMS 5th Category Certificate of Description, the car remains in conformance with that Certificate, and where it is permitted to compete in historic circuit races without a safety cage, it may also be used in rally competition for which it is eligible without a safety cage.

This exception does not apply to Historic Touring Cars or Historic Production Sports Cars.

1.6 **Other events:** as specified in the event Supplementary Regulations.

1.7 **Motorkhana:** As specified in Group 4H (refer to the "Auto Test" section of the CAMS Manual of Motor Sport).

1.8 ~~Entrants~~ Competitors in events listed on the FIA International calendar should make themselves familiar with any additional requirements for safety cages over and above the following that may be required for such competitions.

1.9 **Drifting:** Safety cages are mandatory for open cars and strongly recommended for closed cars.

2. DEFINITIONS

2.1 ~~Safety cage: A structural framework designed to prevent serious bodyshell deformation in the case of a collision or of a car turning over~~

Safety cage: A multi-tubular structure installed in the cockpit and fitted close to the bodyshell, the function of which is to reduce the deformation of the bodyshell (chassis) in case of an impact. A safety cage must be made up of a main roll bar and a front roll bar (or of two lateral roll bars), their connecting members, one diagonal member, backstays and mounting points, (for example, see drawings 253-3, 253-4 and 259-1).

2.2 **Roll bar:** Structural frame or hoop and mounting points.

~~2.3 Safety cage: Structural framework made up of a main roll bar and a front roll bar (or of two lateral roll bars), their connecting members, one diagonal member, backstays and mounting points. (For example, see drawings 253-3, 253-4 and 259-1.)~~

2.3 **Main roll bar:** Structure consisting of a near-vertical frame or hoop located across the vehicle just behind the front seats.

2.4 **Front roll bar:** Similar to main roll bar but its shape follows the windscreen pillars and top screen edge.

2.5 **Lateral roll bar:** Structure consisting of a near-vertical frame or hoop located along the right or left side of the vehicle. The rear legs of a lateral roll bar must be just behind the front seats. The front leg must be against the screen pillar and the door pillar such that it does not unduly impede the entry or exit of driver and co-driver.

2.6 **Longitudinal member:** Longitudinal tube which is not a part of the main, front or lateral roll bar and linking them, together with the backstays.

2.7 **Diagonal member:** Transverse tube between a top corner of the main roll bar or upper end of a backstay and a lower mounting point on the other side of the roll bar of backstay.

2.8 **Framework reinforcement:** Reinforcing member fixed to the safety cage to improve its structural efficiency.

2.9 **Reinforcement plate:** Metal plate fixed to the bodyshell or chassis structure under a roll bar mounting foot to spread load into the structure.

2.10 **Mounting foot:** Plate welded to a roll bar tube to permit its bolting or welding to the bodyshell or chassis structure, usually onto a reinforcement plate.

2.11 **Removable members:** Structural members of a safety cage which must be able to be removed.

3. SPECIFICATIONS

3.1 **General comments**

3.1.1 Safety cages must be designed and made so that, when correctly installed, they substantially reduce

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bodyshell deformation and so reduce the risk of injury to occupants.

The essential features of safety cages are sound construction, designed to suit the particular vehicle, adequate mountings and a close fit to the bodyshell.

Tubes must not carry fluids. The safety cage must not unduly impede the entry or exit of the driver and co-driver.

Members may intrude into the occupant's space in passing through the dashboard and front side-trim, as well as through the rear side-trim and rear seats. The rear seat may be folded down.

Longitudinally, the safety cage must be entirely contained between the top mounting points of the front and rear suspension that carry a vertical load (springs and suspension dampers).

3.1.2 Basic safety cage: Only safety cages must be used.

3.1.3 Compulsory diagonal member: Different ways of fitting the compulsory diagonal member: see drawings 253-3 to 253-5.

The combination of several members is permitted.

3.1.4 Optional reinforcing members: Each type of reinforcement (drawings 253-6 to 253-17, 253-17A and 253-17C) may be used separately or combined with others. A forward brace as per drawing 6-5 may be used in open cars where there is only one occupant.

Note: This means that safety cages may only be constructed in accordance with the drawings shown in this schedule. The use of reinforcements other than those shown will require the specific approval of CAMS through the CAMS Safety Cage Certification process.

3.2 Technical specifications

3.2.1 Main, front and lateral roll bars: These frames or hoops must be made in one piece without joints. Their construction must be smooth and even, without ripples or cracks. The vertical part of the main roll bar must be as straight as possible and as close as possible to the interior contour of the bodyshell.

The front leg of a front roll bar or of a lateral roll bar must be straight, or if it is not possible, must follow the windscreen pillars and have only one bend with its lower vertical part. Where a main roll bar forms the rear legs of a lateral roll bar (drawing 253-4), the connection to the lateral roll bar must be at roof level.

To achieve an efficient mounting to the bodyshell, the original interior trim may be modified around the safety cages and their mountings by cutting it away or by distorting it.

However, this modification does not permit the removal of complete parts of upholstery or trim.

Where necessary, the fuse box and ECU may be moved to enable a safety cage to be fitted.

In open cars the roll bar must be a minimum of 50mm above the top of the driver's helmet.

In conjunction with the vehicles structure the safety cage should not leave unprotected any part of the driver's shoulders when viewed from front or rear.

The main roll bar must not overhang but must be within 150mm of the driver's head.

In 1st Category be constructed so that the driver helmet is prevented from passing between the bars to the extent that the helmet is visible at the rear of the hoop when viewed from the side.

Holes drilled in the main roll bar and braces shall be fitted with a bush, the wall thickness of which is the same as the drilled tube.

3.2.2 Mounting of safety cages to the bodyshell:

Option 1

Minimum mountings are:

- 1 for each leg of the main or lateral roll bar;
- 1 for each of the front roll bar;
- 1 for each backstay (see 3.2.3).

Each mounting foot of the front, main and lateral roll bars must include a reinforcement plate, of a thickness of at least 3mm which must not be less than that of the tube onto which it is welded.

Each mounting foot must be attached by at least three bolts on a steel reinforcement plate at least 3mm thick and of at least 12,000mm^2 area which is welded to the bodyshell. Examples are shown in drawings 253-18 to 253-24. (For drawings 253-18 and 253-20, the reinforcement plate does not necessarily have to be welded to the bodyshell.) This does not necessarily apply to backstays (see below).

Bolts must be either M8 size to ISO standard 8.8, hexagon head high tensile fasteners to AS2465 or cap screws to AS1420 with nuts to AS1112 or better. Pins for removable connections (see drawing 253-30) shall the same strength specification as the bolts.

Fasteners must be self-locking or fitted with lock washers.

These are minimum requirements. In addition to these requirements, more fasteners may be used, the roll bar legs may be welded to reinforcement plates, the safety cage may be welded to the bodyshell. Roll bar mounting feet must not be welded directly to the bodyshell without a reinforcement plate.

Option 2

Non-international use only: As an alternative to welding reinforcement plates to the chassis of the vehicle, ~~all the~~ **each** attachment point~~s~~ of the safety cage may be fitted with a base foot and lower plate complying with the table below. The base foot, complying with the area requirements shown below may be welded to the bodyshell, in which case the use of bolts and the lower plate is not required (see drawing 6-4).

Option 3

Where group regulations permit, the roll over protection may be an integral part of a space frame tubular

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chassis. The safety cage shall comply with these regulation from a point above where the predominantly vertical portion of the safety cage meets a predominantly horizontal portion of the chassis. Parts of the safety cage may extend below this horizontal plane and become integral with the chassis.

Application		Minimum Area	Minimum single dimension
~~Upper plate~~ Base foot	Cars under 700kg	6,500mm²	55mm
	701kg to 1150kg	7,500mm²	65mm
	Over 1151kg	10,000mm²	75mm
Lower plate		4,500mm²	Proportional to upper plate

3.2.3 Backstays: These are compulsory and must be attached near the roof line and near the top outer bends of the main roll bar on both sides of the car. They must make an angle of at least 30° with the vertical, must run rearwards and be straight and as close as possible to the interior side panels of the bodyshell.

Their materials specification, diameter and thickness must be as defined in Article 4.

Their mountings must be reinforced by plates. Each backstay ~~should~~ **must** be secured by bolts having a cumulative section area at least two thirds of that recommended for each roll bar leg mounting in 3.2.2 above, and with identical reinforcement plates of at least 6000mm² area (see drawing 253-25).

A single bolt in double shear is permitted, provided it is of adequate section and strength (see drawing 253-26) and provided that a bush is welded into the backstay.

For 1st Category cars and Sports cars it may be more appropriate for the longitudinal braces to be forward of the main roll bar rather than rearward. Such configurations may be considered by CAMS upon the application for a specific Safety Cage Certificate.

3.2.4 Diagonal members: ~~At least one~~ **Each** diagonal member must be fitted. Its location must be in accordance with drawings 253-3 to 253-5 and it must be straight.

The attachment points of the diagonal members must be so located that they cannot cause injuries. They may be made removable but must be in place during events. The lower end of the diagonal must join the main roll bar of backstay not further than 100mm from the mounting foot. The upper end must join the main roll bar not further than 100mm from the junction of the backstay joint, or the backstay not more than 100mm from its junction with the main roll bar.

They must comply with the minimum specification set out in Article 4. Diagonal members fixed to the bodyshell must have reinforcement plates as defined in 3.2.3 above.

For FIA International events for Group N and A vehicles, any vehicle of a type homologated after 1 January 2002 the fitting of a second diagonal in the main hoop as per drawing 253-4 is mandatory. The junction of these two members must be reinforced by a pair of opposing gussets. Details are available from CAMS, or the FIA web site, *www.fia.com*.

3.2.5 Optional reinforcement of the safety cage: The diameter, thickness and material of reinforcements must be as defined in Article 4. They shall be either welded in position or installed by means of demountable joints.

3.2.5.1 Transverse reinforcing members: The fitting of two transverse members as shown in drawing 253-7 is permitted. The transverse member fixed to the front roll bar must not encroach upon the space reserved for the occupants. It must be placed as high as possible but its lower edge must not be higher than the top of the dashboard**, and it** must be above the steering column.

3.2.5.2 Doorbars (for side protection): One or more longitudinal members may be fitted at each side of the vehicle (see drawings 253-7, 253-8, 253-12, and 253-17). They may be removable. The side protection must be as high as possible, but its upper attachment points must not be higher than half the total height of the door measured from its base. If these upper attachment points are located in front of or behind the door opening, this height limitation is also valid for the corresponding intersection of the strut and the door opening. In the case of doorbars in the form of an "X" (cross-struts), it is recommended that the lower attachment points of the cross-struts be fixed directly on to the longitudinal member.

3.2.5.3 Roof reinforcement: Reinforcing the upper part of the safety cage by adding members as shown in drawings 253-9A to 253-9D is permitted.

3.2.5.4 Reinforcement of bends and junctions: It is permitted to reinforce the junction of the main roll bar or the front roll bar with the longitudinal struts (drawings 253-10 and 253-16), as well as the top rear bends of the lateral roll bars and the junction between the main roll bar and the backstays.

The ends of these reinforcing tubes must not be more than half way down or along the members to which they are attached, except for those of the junction of the front roll bar, which may join the junction of the door strut/front roll bar.

A reinforcement as in drawing 253-17B may be added on each side of the front roll bar between the upper corner of the windscreen and the base of this roll bar.

For all vehicles first issued with a log book after 1 January 2002, safety cage members for both Certified and Basic cages shall comply with the following:

- In the front door aperture (drawing 253-17D)
- Dimension A must be a minimum of 300mm
- Dimension B must be a maximum of 250mm
- Dimension C must be a maximum of 300mm.
- In front projection, reinforcements of bends and junctions of the upper corners of the front safety cage

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must only be visible through the area of the windscreen described in drawing 253-17E.

3.2.6 Protective padding: Where the occupants' bodies or their helmets could come into contact with the safety cage, non-flammable padding must be provided for protection.

For all Group N and A cars competing in FIA International events, the following applies.

Where the occupants' helmets could come into contact with the safety cage, the padding must comply with FIA standard 8857-2001, type A (strongly recommended), or with FIA standard 8857-2001 type B (see technical list no. 23 'Roll Cage Padding Homologated by the FIA') or SFI specification 45.1.

3.2.7 Removable members: Should removable members be used in the construction of a safety cage, the demountable joints used must comply with a type approved by the FIA/CAMS (see drawings 253-27 to 253-37). They must not be welded.

The screws and bolts must be of at least ISO standard 8.8.

It should be noted that demountable joints must not be used as part of a main, front or lateral roll bar because they act as hinges in the principal structure and allow deformation. Their use is solely for attaching members to the roll bars and for attaching a lateral roll bar to a main roll bar (drawing 253-4). In this last case, hinged joints illustrated in drawings 253-30, 253-33 and 253-37 must not be used.

3.2.8 Guidance on welding: All welding must be of the highest possible quality with full penetration and preferably using a gas shielded arc. Welds must be along the whole circumference of the tube.

Although good external appearance of a weld does not necessarily guarantee its quality, poor looking welds are never a sign of good workmanship.

When using heat-treated steel the special instructions of the manufacturers must be followed (special electrodes, gas protected welding).

It must be emphasised that the use of heat-treated or high carbon steels may cause problems and that bad fabrication may result in a decrease in strength (caused by brittle heat-affected zones) or inadequate ductility.

4. MATERIAL SPECIFICATIONS

Specifications of the tubes used: All tubing used in roll over protection structures shall be circular section cold drawn steel tube (CDS, CDW or CEW) with properties as shown in the following table.

Note: The use of drawn welded tubing (CDW or CEW) is authorised for international events provided the safety cage is homologated by CAMS.

Property	Specification
Carbon content	0.3% max.
Manganese content	1.5% max.
Other alloy content	0.5% for any element max.
Tensile strength	350 MPa min.

Component	Outside Diameter	Wall Thickness
Main hoop	44.45 mm	2.5 mm
or	50 mm	2.0 mm
All other components	38 mm	2.5 mm
or	40 mm	2.0 mm
Roll bar and braces for 1st Category vehicles under 700kg	38 mm	2.5 mm
	40 mm	2.0 mm

CAMS may consider other steels and sizes not in compliance with the above through the process of roll over protection certification.

Note that these figures represent the minimum strengths and dimensions permitted. In selecting the steel, attention must be paid to obtaining good elongation properties and adequate weld ability.

The tubing must be bent by a cold working process and the centreline bend radius must be at least three times the tube diameter. Where the tubing is distorted during bending, the ratio of minor to major diameter must be 0.9 or greater.

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5. CERTIFICATION BY CAMS

The FIA permits safety cage manufacturers to submit a safety cage of their own design to CAMS for approval as regards the quality of steel used, the dimensions of the tubes, the optional reinforcing members and the mounting to the vehicle.

The regulations for the certification of safety cages are available to safety cage manufacturers from the CAMS Technical Department upon request.

6. FIA HOMOLOGATION

FIA suggests that each car manufacturer should recommend a type of safety cage complying with FIA standards, as defined in Article 5 above. This safety cage must be described on a homologation extension form presented to FIA for approval and the safety cage must not be modified (see 3.1.1) in any way.

7. FORMS OF ACCEPTABLE SAFETY CAGES

Type	Description	Vehicle application	Remarks
1	Solo Roll Bar	1st Category Race Cars	Vehicles up to 700 kg
		Open Sports Cars	For Speed Events, no passengers permitted
2	Half Cage	Open Sports Cars	Minimum acceptable in Races~~, Special Stage and International rallies and Off Road~~
		Closed Cars	Minimum acceptable in Speed Events
3	Full Cage (see Diagrams 253-3 to 253-17)	Open Sports Cars	Minimum acceptable in timed Rallies/Trials (refer to 1.5). Note: Roof reinforcement members complying with drawing 253-9A, 253-9B, 253-9C or 253-9D required.
		Closed Cars	Minimum acceptable in Races~~, Special Stage and International~~ timed Rallies/Trials and Off Road

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8. IMPLEMENTATION

~~Where safety cages have been fitted to cars and where such cars have been issued with a CAMS log book, or where safety cages have been certified, such cages may continue to be used in competition provided they remain in~~ **Where a safety cage has been fitted to a vehicle and where that vehicle is issued with a CAMS log book , or where the safety cage has been certified by CAMS, such safety cage may continue to be used in competition provide it remains in** conformity with the regulations that were in force at the date of issue of either initial log book for the car, or the certification document.

Competitors are advised that Supplementary Regulations may require more stringent requirements than those identified in articles 1 and 8 of this Schedule. Such requirements shall take precedence over articles 1 and 8 herein.

9. NON-COMPLYING SAFETY CAGES

In cases where the type and/or status of the event does not require an automobile to be fitted with any form of safety cage, the use of structures which do not comply with these regulations is permitted unless the ~~scrutineers believe~~ **Chief Scrutineer believes** the structure to be of unsafe construction.

10. REGISTRATION

~~All~~ **Any** safety cage structure fitted to **an** automobile for which a CAMS log book is issued after 1 January, 2001 must be either registered with CAMS and carry a valid safety cage registration label, or be the subject of a CAMS safety cage certificate. This requirement shall not apply when the type and/or status of an event ~~do~~ **does** not require the use of a safety cage.

11. REPAIRS

All repairs to safety cages/roll bars must be done in such a manner to ensure the structure conforms with the requirements for new structures as were in place at the time of original manufacture.

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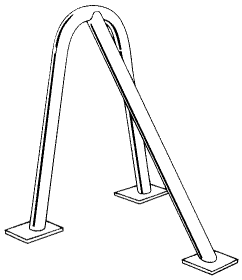
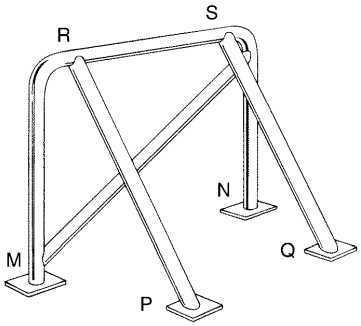
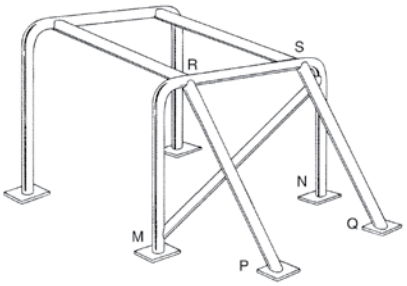
Safety Cages
Drawings



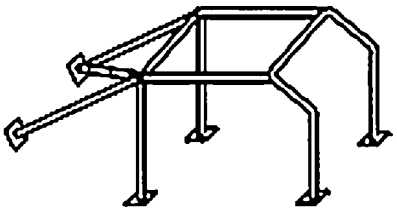
Type 1: Solo Roll Bar



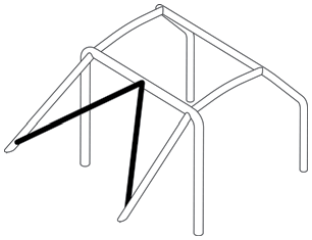
Type 2: Half Cage



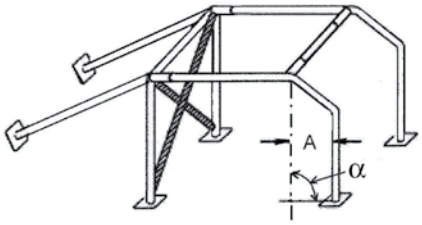
Type 3: Full Cage



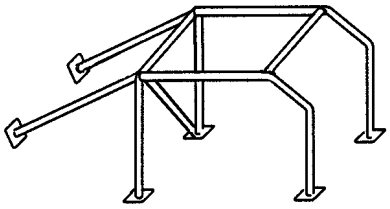
Drawing 253-3



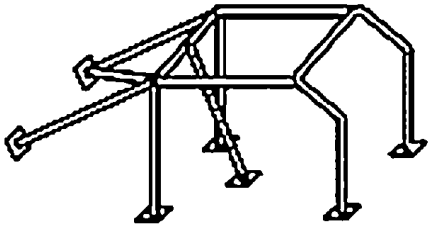
Drawing 253-3A



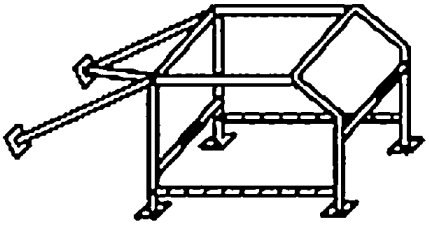
Drawing 253-4



Drawing 253-5



Drawing 253-6



Drawing 253-7

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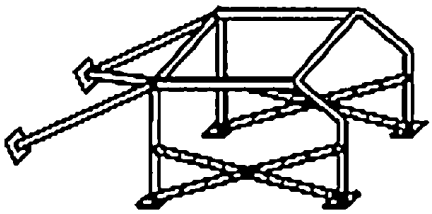
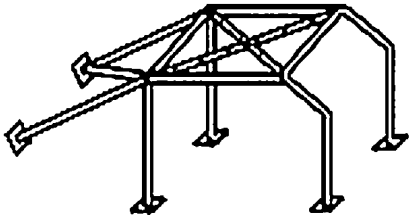
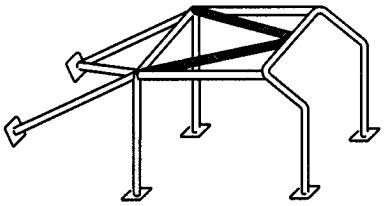
Safety Cages
Drawings (continued)



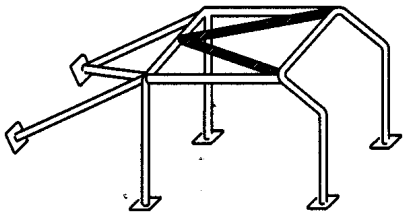
Drawing 253-8



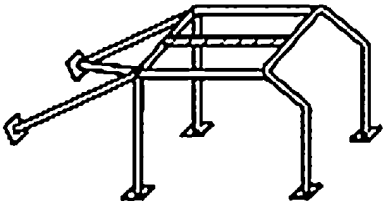
Drawing 253-9A



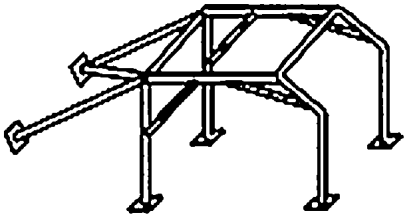
Drawing 253-9B



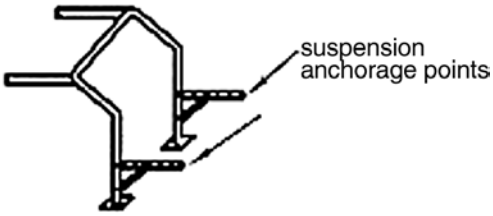
Drawing 253-9C



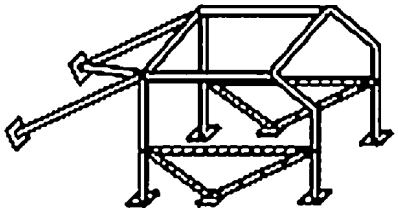
Drawing 253-9D



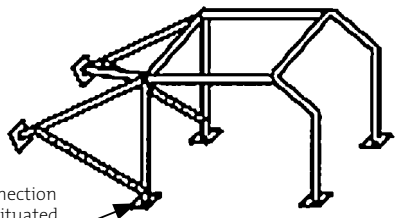
Drawing 253-10



Drawing 253-11

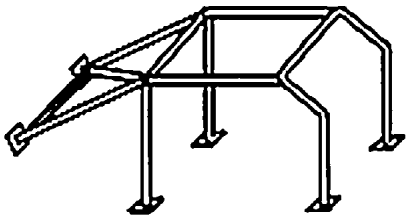


Drawing 253-12



This connection may be situated at the level of the doorbar

Drawing 253-13



Drawing 253-14

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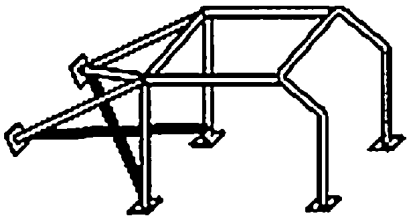
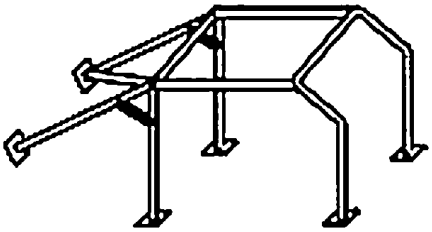
Safety Cages

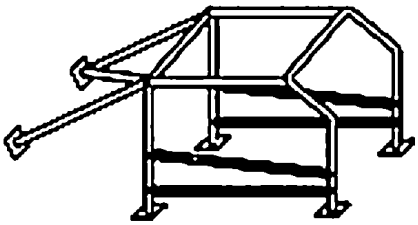
Drawings (continued)



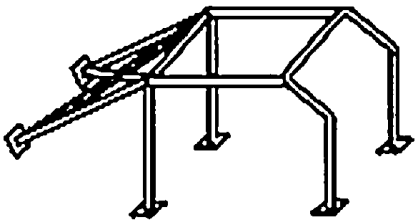
Drawing 253-15



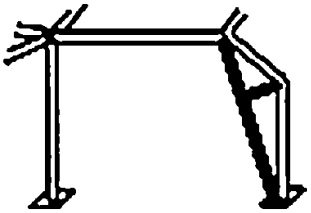
Drawing 253-16



Drawing 253-17

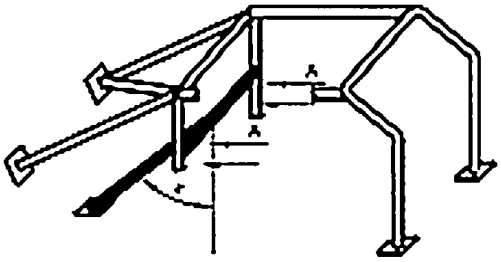


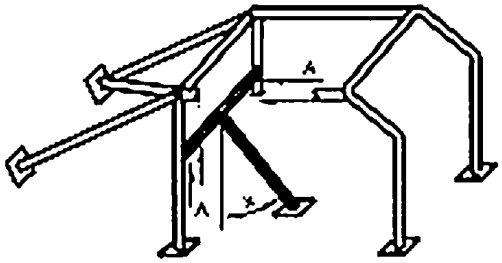
Drawing 253-17A



Drawing 253-17B

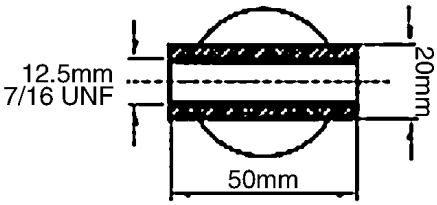
Drawing 253-17C





Ⓐ mounting hole for harnesses

ⓧ minimum angles 30˚



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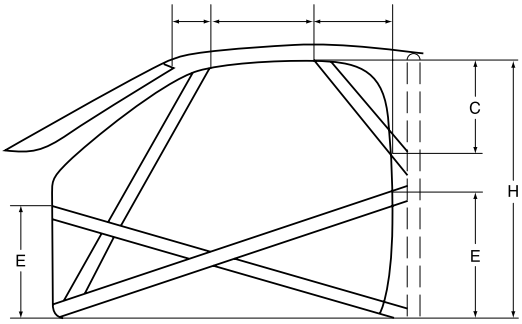
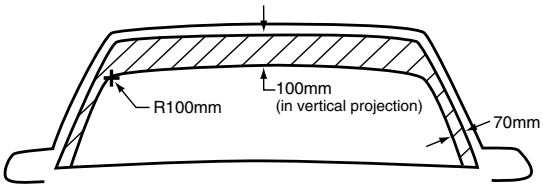
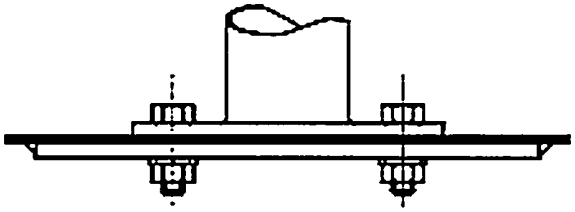
Safety Cages
Drawings (continued)



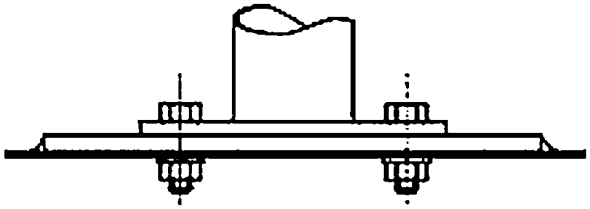
Drawing 253-17D



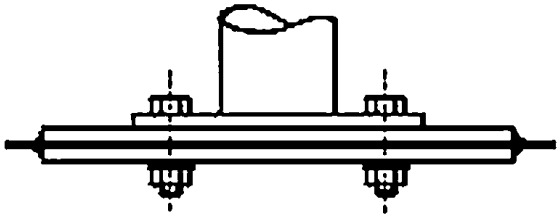
Drawing 253-17E



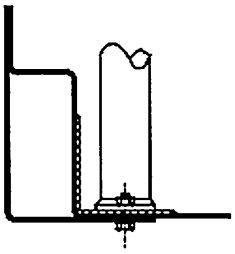
Drawing 253-18



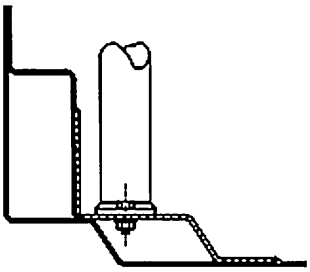
Drawing 253-19



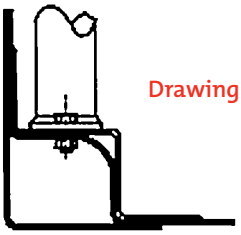
Drawing 253-20



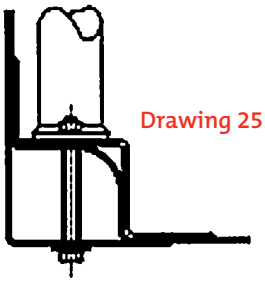
Drawing 253-21



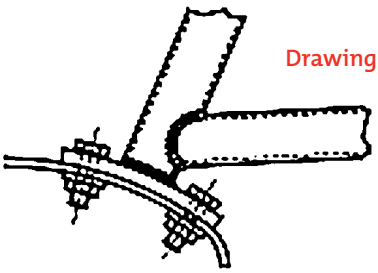
Drawing 253-22



Drawing 253-23



Drawing 253-24



Drawing 253-25

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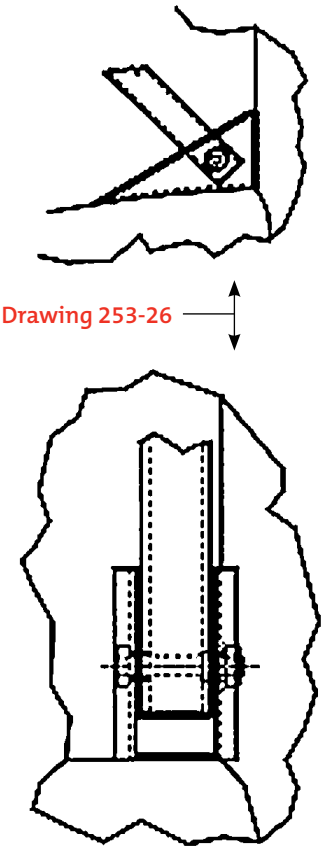
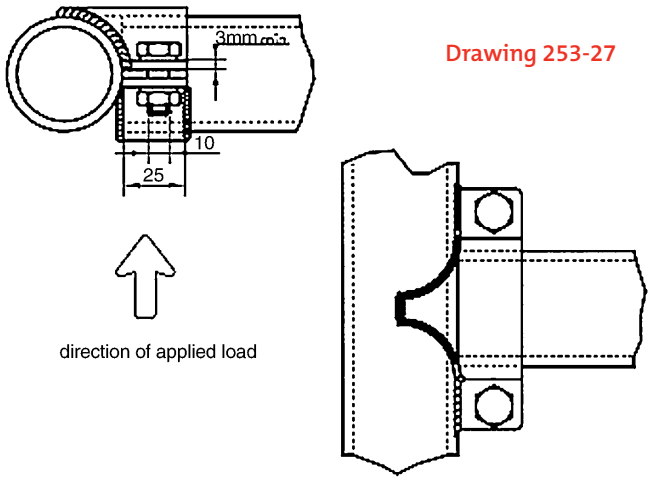
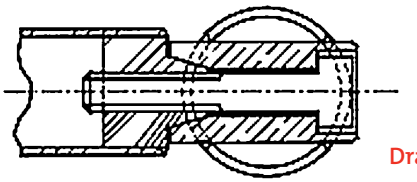
Safety Cages
Drawings (continued)



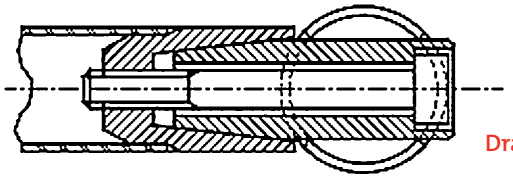
Drawing 253-26



Drawing 253-27

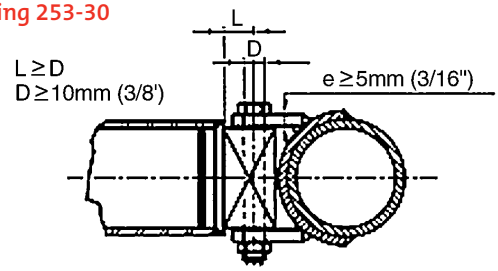


Drawing 253-28

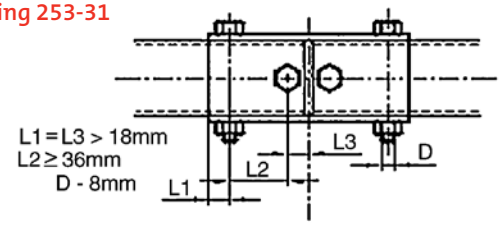


Drawing 253-29

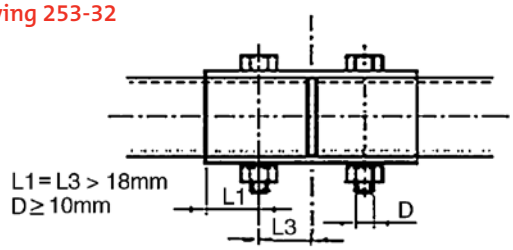
Drawing 253-30



Drawing 253-31



Drawing 253-32



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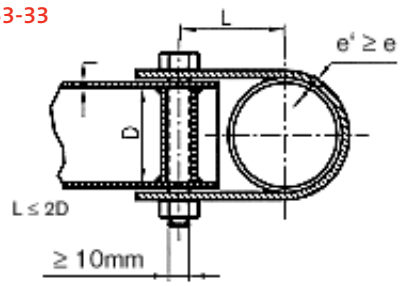
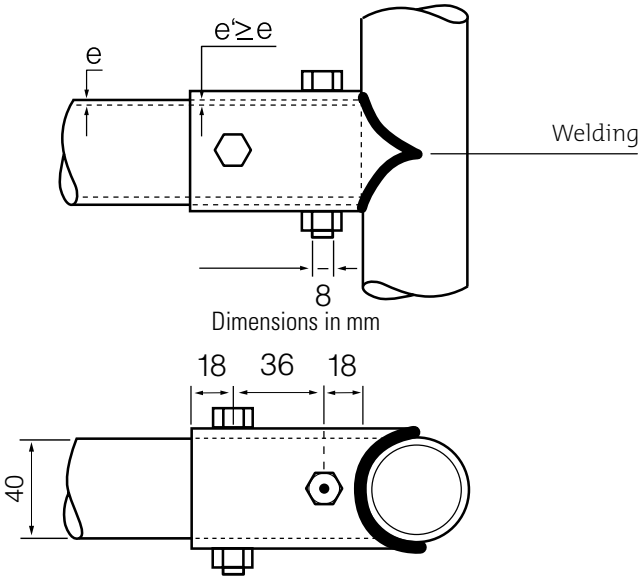
Safety Cages
Drawings (continued)

Drawing 253-33

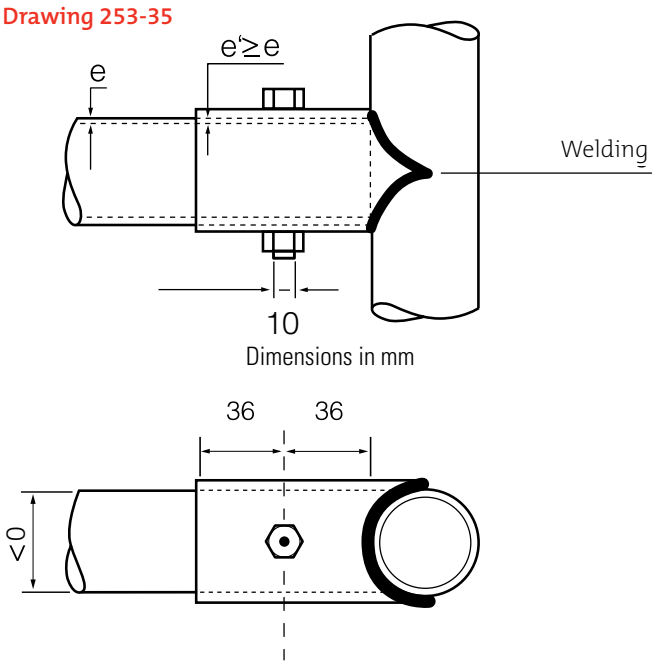


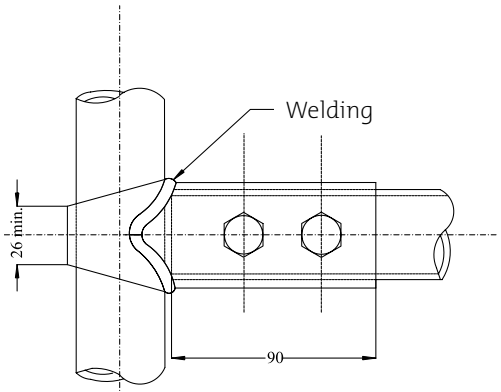
L must be minimum
The clamp width must be at least 25mm

Drawing 253-34

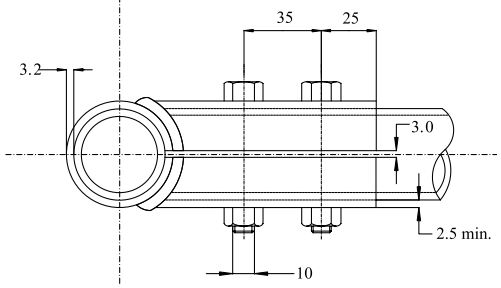


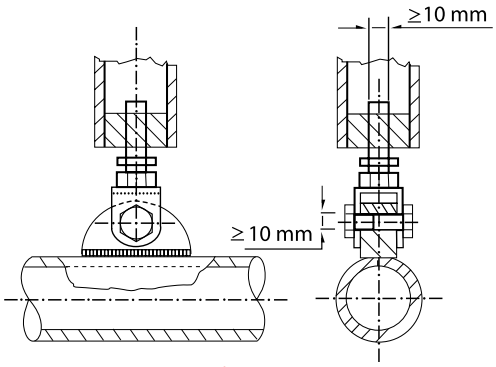
Drawing 253-35



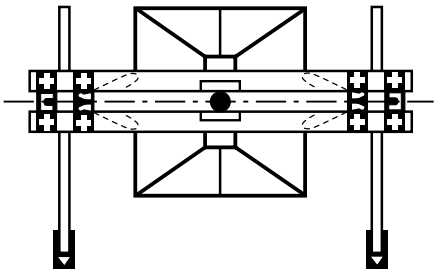


Drawing 253-36





Drawing 253-37



Drawing 253-38

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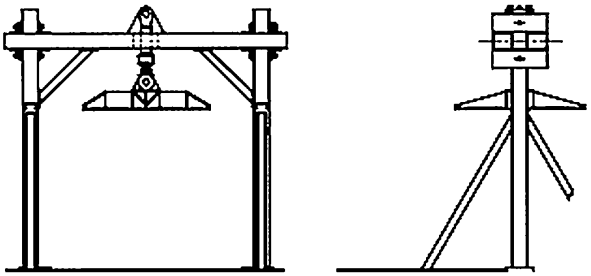
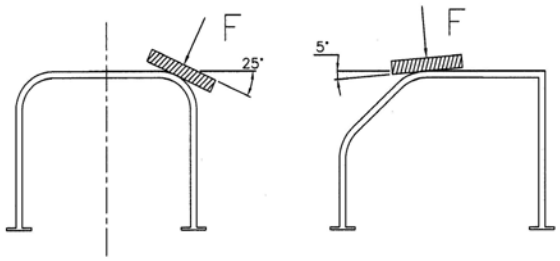
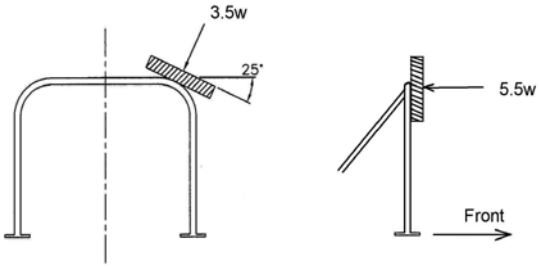
Safety Cages
Drawings (continued)



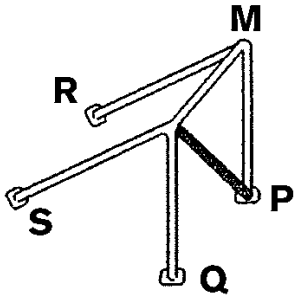
Drawing 253-38A



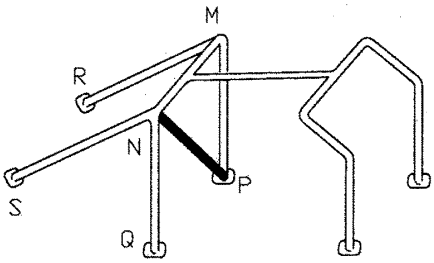
Drawing 253-38B



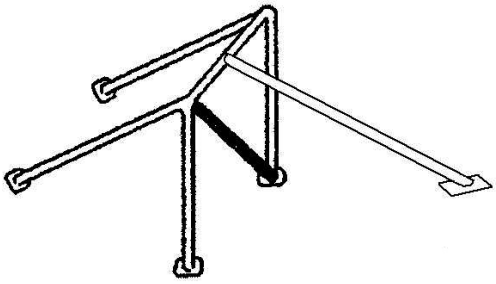
Drawing 253-38C



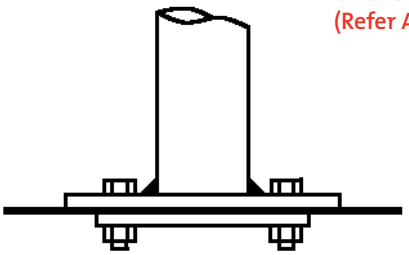
Drawing 259-1



Drawing 259-3



Drawing 6-4
(Refer Article 3.2.2)



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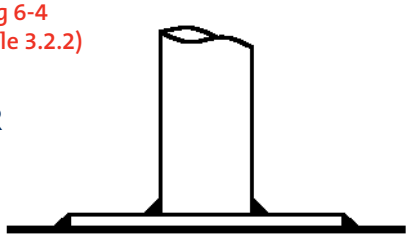

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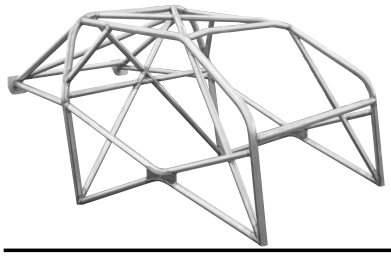

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