

ROLLCAGES: JANUARY 1, 2000 TO DECEMBER 31, 2008  
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## FOR REFERENCE ONLY NOT APPLICABLE FOR NEW VEHICLES

### 29. ROLLCAGES: JANUARY 1, 2000 TO DECEMBER 31, 2008

The following rollcage specifications are for reference purposes only for cars with log books issued between January 1, 2000 and December 31st, 2008.

Please see regulation NRR 12.3.2 for new rollcage requirements.

#### 29.1 Roll Over Protection.

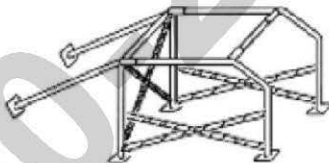
29.1.1 Rollcages are mandatory for all vehicles.

29.1.2 Specific roll over protection is subject to the approval of the scrutineer at each event.

29.1.3 Basic design considerations.

The basic purpose of the roll over protection is to prevent serious bodyshell deformation, and so reduce the risk of injury to occupants, in the case of a collision or of a car turning over. The essential features of safety cages are sound construction designed to suit the particular vehicle, adequate mountings and a close fit to the bodyshell. The safety cage must not unduly impede the entry or exit of the driver and co-driver.

29.1.4 The rollcage is a structural framework made up of a main rollbar and a front rollbar (or a main rollbar and two lateral rollbars), their connecting members, two diagonal members, backstays and mounting points. (For example, see diagram below.) Longitudinally, the safety cage must be entirely contained between the top mounting points of the front suspension and the top mounting points of the rear suspension.



29.1.5 Definitions:

(a) Main rollbar:

Structure consisting of a near-vertical frame or hoop located across the vehicle just behind the front seats. (see drawing 253-39)

(b) Front rollbar:

Similar to main rollbar but its shape follows the windscreen pillars and top screen edge.

(c) Lateral rollbar:

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 rollbar must be just behind the front seats.

The front leg must be against the windscreen pillar and the door pillar such that it does not unduly impede the entry or exit of driver and co-driver. (see drawing 253-40)

A lateral half-rollbar is a lateral rollbar connected to a main rollbar which constitutes its rear leg. (see drawing 253-4).

(d) Longitudinal member:

Longitudinal tube which is not a part of the main, front or lateral rollbar but which links them.

(e) Diagonal member:

Transverse tube between a top corner of the main rollbar or upper end of a backstay and a lower mounting point on the other side of the rollbar or backstay.

(f) Framework reinforcement:

Reinforcing member fixed to the rollcage to improve its structural efficiency.

(g) Reinforcement plate:

Metal plate fixed to the bodyshell or chassis structure under a rollbar mounting foot to spread load into the structure.

(h) Mounting foot:

Plate welded to a rollbar tube to permit its bolting or welding to the bodyshell or chassis structure, usually onto a reinforcement plate.

(i) Removable members:

Structural members of a safety cage which are able to be removed.

(j) Back Stay:

A bracing member which connects the top of the main hoop to the body of the car behind the main hoop.

29.1.6 Basic safety cage:

Only rollcages must be used.

29.1.6.1 Compulsory diagonal members:

Different ways of fitting the compulsory diagonal members: see drawings 253-3 to 253-5. The combination of several members is permitted.

29.1.6.2 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.

Longitudinal rollcage extensions are allowed up to the level of the original suspension mounting points on the shell. There must not be direct connection between the top extension and the bottom extension.

29.1.7 Main, front and lateral rollbars:

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 rollbar must be as straight as possible and as close as possible to the interior contour of the bodyshell.

The front leg of a front rollbar or of a lateral rollbar 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 rollbar forms the rear legs of a lateral rollbar (drawing 253-4), the connection to the lateral rollbar must be at roof level.

One continuous length of tubing must be used for each of the hoops with smooth continuous bends and no evidence of crimping or wall failure.

The tubing must be bent by a cold working process and the centreline bend radius must be at least 3 times the tube diameter. If the tubing is ovalised during bending, the ratio of minor to major diameter must be 0.9 or greater.

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 unless permitted elsewhere in these regulations.

29.1.8 Protective Padding:

Where the occupants' bodies could come into contact with the safety cage, flame retardant padding must be provided for protection.

Where the occupants' crash helmets could come into contact with the safety cage, the padding must comply with FIA standard 8857-2001, type A (see technical list n°23 "Roll Cage Padding Homologated by the FIA").

## 29.1.9 Doorbars (for side protection):

One or more longitudinal members must be fitted at each side of the vehicle (see drawings 253-7, 253-8, 253-12, 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 onto the longitudinal member and that at least one part of the "X" be a single-piece bar.

## 29.1.10 Backstays:

These are compulsory and must be attached near the roof line and near the top outer bends of the main rollbar 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 29.1.13

Their mountings must be reinforced by plates. Each backstay should be secured by bolts having a cumulative section area at least two thirds of that recommended for each rollbar leg mounting in 29.1.14, and with identical reinforcement plates of at least 60 cm<sup>2</sup> 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 sleeve is welded into the backstay.

## 29.1.11 Diagonal members:

At least one diagonal member must be fitted. The fitting of two diagonal members is recommended for all cars, and mandatory for all cars with a log book issued after January 1, 2002. The diagonals may be in the main hoop or in the backstays. For vehicles with log books issued after January 1, 2007, the diagonals must be in the main hoop. The connection between the two members must be reinforced by a gusset.

Drawings 253-3 to 253-5 are examples of diagonal members and they must be straight, not curved.

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 rollbar or backstay not further than 100 mm from the mounting foot. The upper end must join the main rollbar not further than 100 mm from the junction of the backstay joint, or the backstay not more than 100 mm from its junction with the main rollbar.

They must comply with the minimum specification set out in 29.1.13. Diagonal members fixed to the bodyshell must have reinforcement plates as defined in 29.1.14.

## 29.1.12 Roof bars:

Effective Jan 1 2007, all vehicles must have at least one roof reinforcement bar, as shown in drawings 253-9A to 9E. Vehicles with log books issued after January 1, 2007 must have two roof reinforcement bars, as shown in drawings 253-9A to 9C.

## 29.1.13 Material:

- 29.1.13.1 Highly recommended for all events and vehicle classes, but required for all FIA sanctioned championship events: cold drawn seamless or DCM tubing. Material must be unalloyed carbon steel containing a maximum of 0.3% of carbon and having a minimum tensile strength of 350N/mm<sup>2</sup>. The maximum content of additives is 1% for manganese and 0.5% for other elements.

The size of tubing to be used shall be as follows:

Dimensions (mm)	Dimensions (in)	Use
45 x 2.5 or 50 x 2.0	1.75" x 0.095" or 1.98" x 0.08"	Main rollbar (drawing 253-39) or lateral rollbars, and their connections (drawing 253-40), according to construction.
38 x 2.5 or 40 x 2.0	1.5" x 0.095" or 1.58" x 0.08"	Lateral half-rollbars and other parts of the safety cage.

- 29.1.13.2 For all other CARS vehicle classes and all other events, safety cages may use Seamless or DOM mild steel tubing.

The size of tubing to be used shall be as follows:

Dimensions (mm)	Use
44 x 3 (1.75"x0.12")	All parts of the safety cage.

- 29.1.13.3 Note that these figures represent the minima allowed. In selecting the steel, attention must be paid to obtaining good elongation properties and adequate weld ability.

An inspection hole of at least 4.5 mm diameter must be drilled in a non-critical area of the main hoop to facilitate verification of wall thickness.

- 29.1.13.4 Where nuts and bolts are used, they must be of at least M8 size of ISO standard 8.8 or better.

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

- 29.1.14 Mounting of rollcages to the bodyshell:

Minimum mountings are:

- 1 for each leg of the main or lateral rollbar ;
- 1 for each of the front rollbar ;
- 1 for each backstay.

Each mounting foot of the front, main and lateral rollbars must include a reinforcement plate, of a thickness of at least 3 mm 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 3 mm thick and of at least 120 cm<sup>2</sup> area which is welded to the bodyshell. Examples are shown in drawings 253-18 to 253-24. This does not necessarily apply to backstays (see 29.1.10).

These are minimum requirements. In addition to these requirements, more fasteners may be used, the rollbar legs may be welded to reinforcement plates, the rollcage may be welded to the bodyshell. Rollbar mounting feet must not be welded directly to the bodyshell without a reinforcement plate. If the mounting foot reinforcement plate is welded to the bodyshell, then bolts are not required.

- 29.1.15 Required Reinforcement

- 29.1.15.1 Bends and joints:

Gussets or corner braces joining the front continuous tubing, whether front rollbar or lateral rollbar, and the brace tubing are required. The gusset or brace shall span the weld that joins the two tubes and may be positioned either in the roof quadrangle or in the windshield area.

If gussets are used they must be of a thickness equal to the wall thickness of the roll cage tubing and must be a minimum of 5 cm long where they contact the roll cage tubing. They must be welded along this entire length and relieved in the corners so as to not interfere with existing welds.

If reinforcing tubes are used they must span at least 13 cm across the corner at its longest point but 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 rollbar, which may join the junction of the door strut/front rollbar.

- 29.1.16 Optional Reinforcement

The diameter, thickness and material of reinforcements shall be as defined in 29.1.13.

They shall be either welded in position or installed by means of demountable joints.

- 29.1.16.1 Rollcage reinforcement:

It is permitted to reinforce the junction of the main rollbar or the front rollbar with the longitudinal struts (drawings 253-10 and 253-16), as well as the top rear bends of the lateral rollbars and the junction between the main rollbar and the backstays.

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

- 29.1.16.2 Roof reinforcement:

Reinforcing the upper part of the rollcage by adding members as shown in drawings 253-9 and 253-9A is permitted.

## 29.1.16.3 Transverse reinforcing members:

The fitting of two transverse members as shown in drawing 253-7 is permitted. The transverse member fixed to the front rollbar 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.

## 29.1.17 Minimum Door Aperture

For all vehicles with a log book issued after January 1, 2002, the presence of the rollcage in the door aperture must comply with the following criteria (see drawing 253-17D):

- dimension A must be a minimum of 300 mm
- dimension B must be a maximum of 250 mm
- dimension C must be a maximum of 300 mm
- dimension D (measured from the upper corner of the windscreen, without the seal) must be a maximum of 100 mm
- dimension E must not be more than the half height of the door aperture.

## 29.1.18 Minimum Windscreen Aperture

For all vehicles with a log book issued after January 1, 2003, in frontal projection, reinforcements of bends and junctions of the upper corners of the front roll-cage must be only visible through the area of the windscreen described by drawing 253-17E.

## 29.1.19 Removable members:

Should removable members be used in the construction of a rollcage, the demountable joints used must comply with a type approved by the FIA (see drawings 253-27 to 253-36). They must not be welded.

Where nuts and bolts are used, they must be of at least M8 size of ISO standard 8.8 or better.

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

It should be noted that demountable joints must not be used as part of a main, front or lateral rollbar because they act as hinges in the principal structure and allow deformation. Their use is solely for attaching members to the rollbars and for attaching a lateral rollbar to a main rollbar (drawing 253-4). In this last case, hinged joints such as illustrated in drawings 253-30, 253-33 and 253-36 must not be used.

## 29.1.20 Guidance on welding:

All welding must be of the highest possible quality with full penetration and preferably using a gas shielded arc. They must be carried out along the whole perimeter 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.

## 29.1.21 Other roll over protection designs.

29.1.21.1 Roll over protection of alternate material or design may be accepted by the scrutineer provided the entrant can produce a certificate specifying the following: the quality of steel used, the dimensions of the tubes, the optional reinforcing members and the mounting to the vehicle, and that the construction is certified to withstand the stress minima given hereafter in any combination on top of the safety cage:

- 1.5 W\* lateral;
- 5.5 W fore and aft;
- 7.5 W vertical.

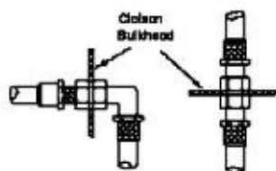
(\*W = weight of the car + 150 kg).

The certificate, approved by CARS and signed by qualified technicians, must be presented to the event's scrutineers. It must contain drawings or photos of the safety cage in question including its fixation and particularities, and must declare that the rollcage can resist the forces specified above.

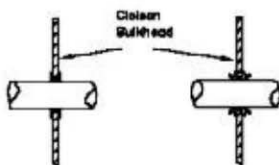


- 29.1.21.2 For vehicles having a log book issued prior to January 1, 2000 and not meeting current regulations may have their roll over protection accepted by the scrutineer provided the safety cage meets the requirements described in appendix 1.
- 29.1.22 FIA homologated rollcages are acceptable provided they are equipped with door bars. It is the entrant's responsibility to present the cage's homologation papers at scrutineering. (Note that the homologation is only valid if the cage is installed exactly according to the manufacturer's instructions, without modification.)

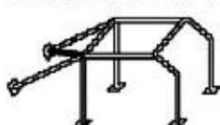
2000-2008



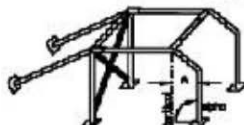
Dessin / Drawing N° 253-1



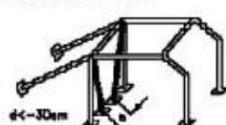
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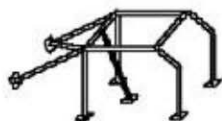
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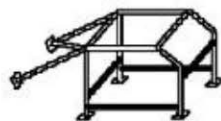
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Dessin / Drawing N° 253-5



Dessin / Drawing N° 253-6



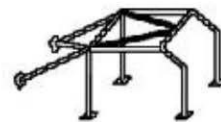
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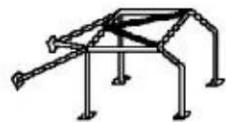
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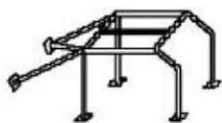
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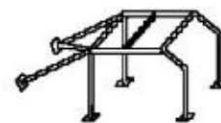
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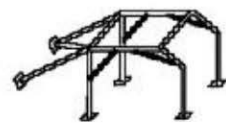
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Dessin / Drawing N° 253-9D



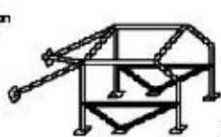
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Dessin / Drawing N° 253-10



Dessin / Drawing N° 253-11



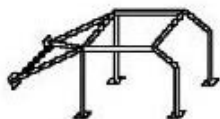
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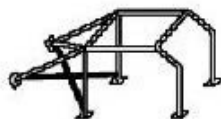
Cette connexion peut être située au niveau de l'entretoise de portillon  
This connection may be situated at the level of the doorbar

Dessin / Drawing N° 253-13

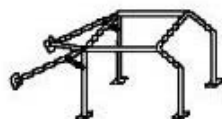




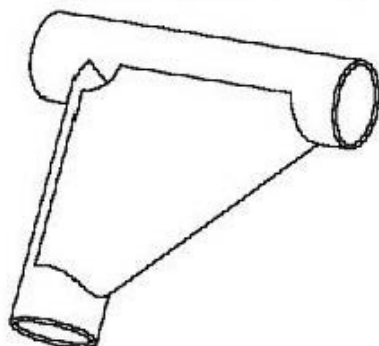
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Dessin / Drawing N°253-15



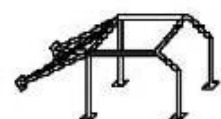
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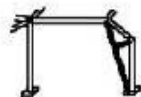
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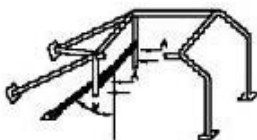
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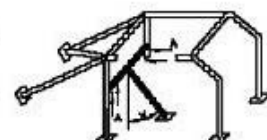
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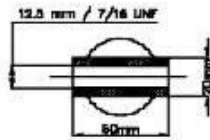
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⊗ Traces de montage pour harnais  
Mounting holes for harnesses

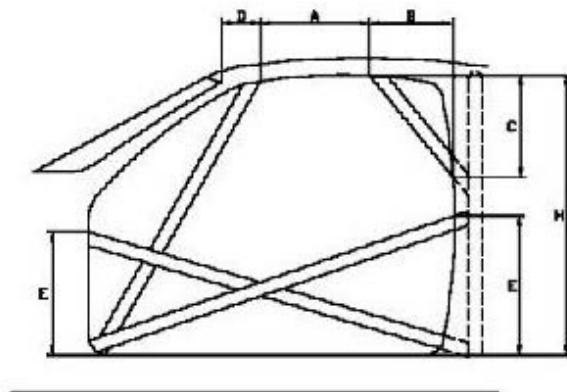


⊗ Angle minimum 30°  
Minimum angle 30°

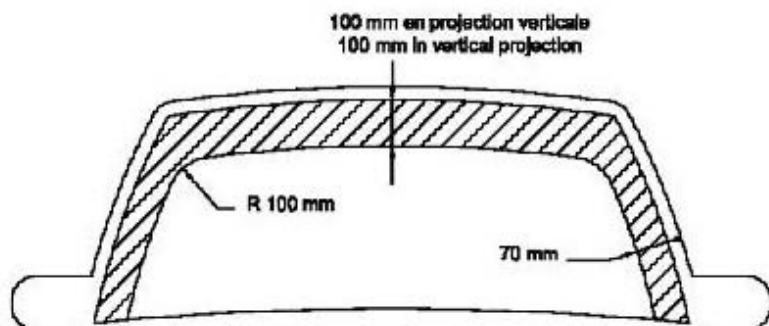


Agrandissement de A  
Magnification of A

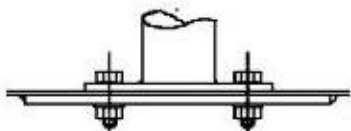
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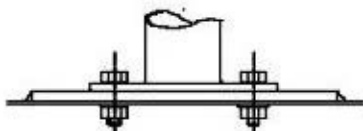
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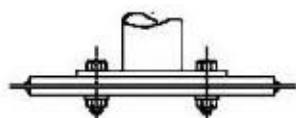
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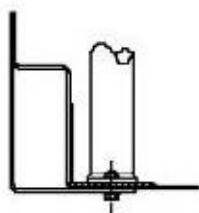
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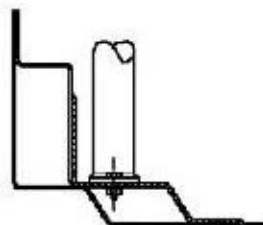
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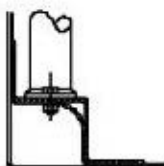
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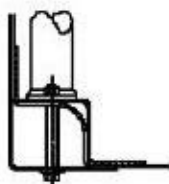
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Dessin/Drawing N°253-22



Dessin/Drawing N°253-23



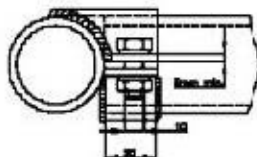
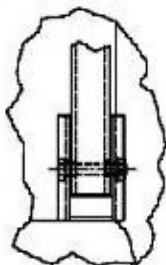
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Dessin/Drawing N°253-25



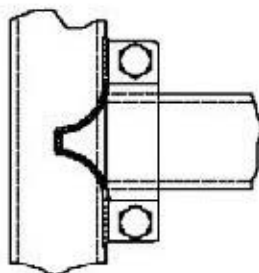
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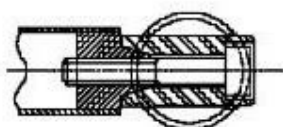


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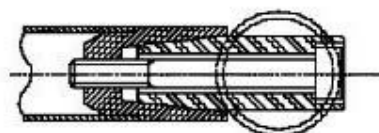


Direction d'application de la charge  
Direction of applied load

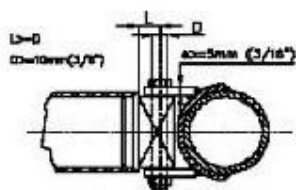




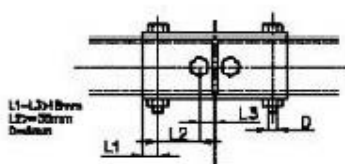
Dessin / Drawing N°253-28



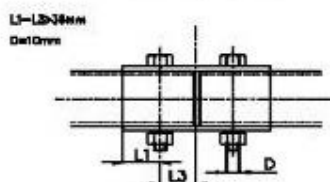
Dessin / Drawing N°253-29



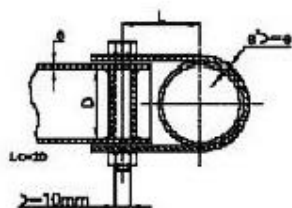
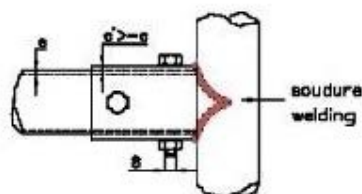
Dessin / Drawing N°253-30



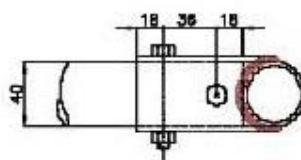
Dessin / Drawing N°253-31



Dessin / Drawing N°253-32



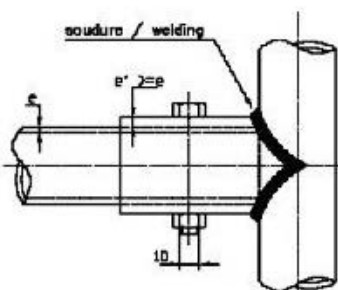
Dessin / Drawing N°253-33



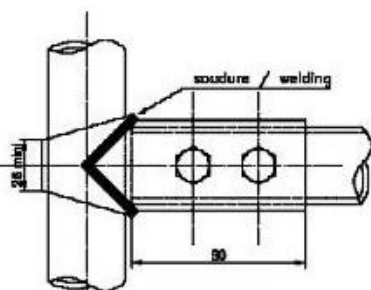
Dessin / Drawing N°253-34  
(Dimensions en/in mm)

L doit être minimum  
Le largeur de la tête doit  
être d'au moins 25mm

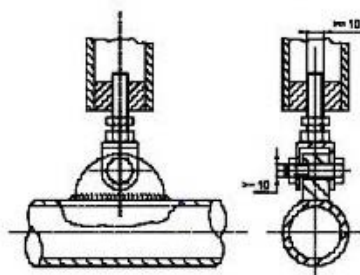
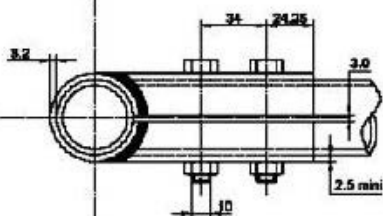
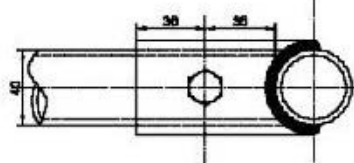
L must be minimum  
The sleep width must  
be at least 25mm



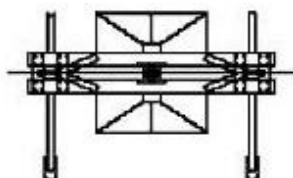
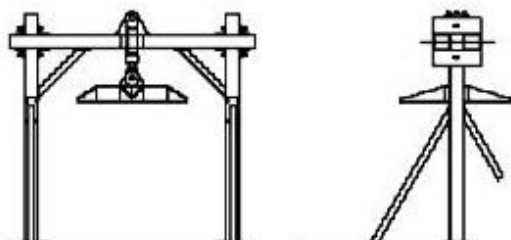
Dessin / Drawing N° 253-35



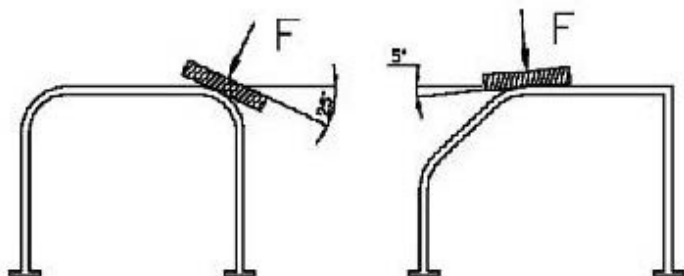
Dessin / Drawing N° 253-36



Dessin / Drawing N° 253-37



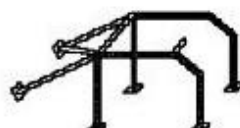
Dessin / Drawing N° 253-38



Dessin / Drawing N° 253-38B

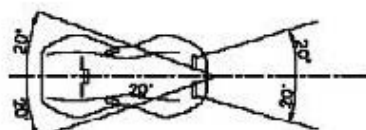
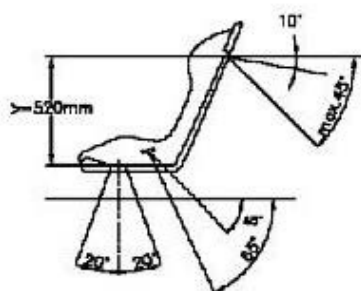


Dessin / Drawing N° 253-39

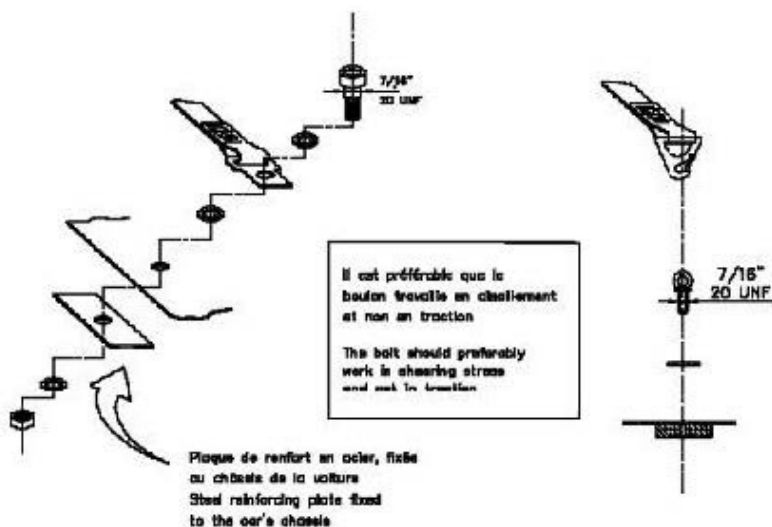


Dessin / Drawing N° 253-40





Dessin / Drawing N° 253-42



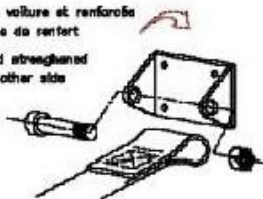
Il est préférable que le  
boulon travaille en cisaillement  
et non en traction

The bolt should preferably  
work in shearing stress  
and not in traction

Plaque de renfort en acier, fixée  
au châssis de la voiture  
Steel reinforcing plate fixed  
to the car's chassis

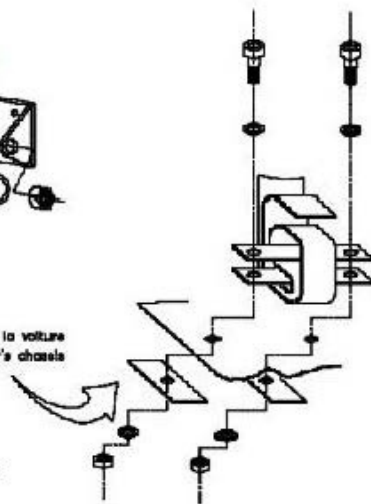
Dessin / Drawing N° 253-43

plaque fixée au châssis de la voiture et renforcée de l'autre côté par une plaque de renfort  
 plate fixed to the chassis and strengthened by a reinforced plate on the other side

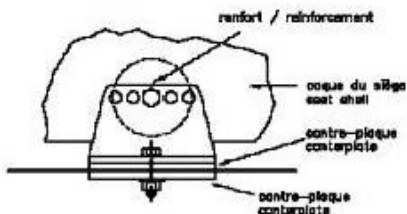


Dessin / Drawing N°253-44

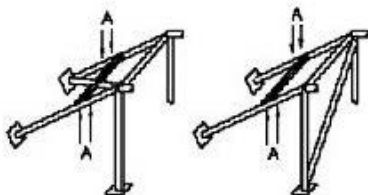
plaque de renfort fixée au châssis de la voiture  
 reinforcing plate fixed to the car's chassis



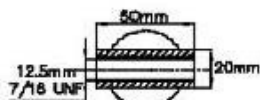
Dessin / Drawing N°253-45



Dessin / Drawing N°253-52



④ trousse de montage pour harnais  
 mounting brace for harness



Agrandissement de A  
 Magnification of A

Dessin / Drawing N°253-53