

# CCDA ROLL CAGE

## 5.1 APPLICATION

Rollover protection is required as specified in the CCDA Class Specifications and Event Supplementary Rules

## 5.2 DEFINITIONS

- a) **Safety Cage** – A structural framework designed to prevent serious body shell deformation in the event of a collision or the vehicle turning over.
- b) **Roll bar** – Structural frame or hoop and mounting points
- c) **Roll cage** – Structural framework made up of a main roll bar and a front roll bar, their connecting members, one diagonal member, backstays and mounting points.
- d) **Main roll bar** – Structure consisting of a near vertical frames or hoop located across the vehicle just behind the front seats.
- e) **Front roll bar** – Similar to the main roll bar but its shape follows the windscreen pillars and top screen edge.
- f) **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 behind the 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 the driver and co-driver.
- g) **Longitudinal member** – Longitudinal tube which is not part of the main, front or lateral roll bar and linking them, together with the backstays.
- h) **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 or backstay.
- i) **Framework reinforcement** – Reinforcing member fixed to the roll cage to improve its structural efficiency.
- j) **Reinforcement plate** – Metal plate fixed to the bodyshell or chassis structure under a roll bar mounting foot to spread load into the structure.
- k) **Mounting foot** – Plate welded to a roll bar tube to provide for bolting or welding to the bodyshell or chassis structure, usually onto a reinforcement plate.
- l) **Removable members** – Structural members of a safety cage which shall be able to be removed.

## **5.3 SPECIFICATIONS**

### **5.3.1 GENERAL COMMENTS**

Safety cages shall be designed and made so that, when correctly installed, they substantially

reduce body shell 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 fixings and a close fit to the body shell. Tubes shall not carry fluids or compressed air

or be used as a pressure vessel. The safety cage shall not unduly impede the entry or exit of

The driver or 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 or removed.

### **5.3.2 TECHNICAL SPECIFICATIONS**

Main, front and lateral roll bars shall be made in one piece without joints with smooth and even

Construction without ripples or cracks. The vertical part of the main roll bar shall be parallel to

the interior contour or the body shell.

The front leg of a front roll bar or of a lateral roll bar shall be straight, or shall follow the windscreen pillars and have only one bend with its lower vertical part.

Where a main roll bar forms the rear leg as of a lateral roll bar, the connection to the lateral roll

bar shall be at roof level.

To achieve an efficient fixing to the body shell, the original interior trim may be modified around

the safety cages and their fixings by cutting it away or by removing it.

No part of the interior trim/ roof lining etc. should compromise the positioning of the ROP.

Modern contoured roof linings can reduce the height of internal bars by as much as 50mm.

Allowance should also be made for relocation of fuse boxes, heater fans etc.

In open cars the roll bar shall be a minimum of 50 mm above any occupant's head. In conjunction with the vehicle's structure the roll cage should not leave unprotected any part of

an occupant's shoulders when viewed from front or rear.

The main roll bar shall not overhang but shall be within 150mm of any occupant's head.

An occupant's helmet shall be 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. No holes may be drilled in the main bar.

### **5.3.3 FIXING OF ROLL CAGES TO THE BODYSHELL**

Roll cages shall be fixed to the vehicle by one of the following three options:

#### **Option 1**

As a minimum, fixings shall comprise:

- One for each leg of the main or lateral roll bar;
- One for each of the front roll bar;
- One for each backstay.

Fixing may be by bolting or welding to the bodyshell.

Each fixing plate of the front, main and lateral roll bars shall include a reinforcement plate 3mm

thick, or the gauge of the tube onto which it is welded, whichever is the greatest.

If bolted to the bodyshell each fixing plate shall be attached by a minimum of three bolts on a steel

reinforcement plate at least 3mm thick and of at least 15,000mm<sup>2</sup> area which is welded to the

bodyshell. This area can be made up of a single plate or by adding a third dimension (i.e. angle) to

its profile. Minimum Base Plate to be at least 10,000mm<sup>2</sup> with a 100mm single dimension.

Bolts shall be either M8 size to ISO standard 8.8, hexagon head high tensile fasteners to AS2465

or capscrews to AS14201 with nuts to AS1112 or better. Pins for removable connections shall be

the same strength specifications as the bolts.

Fasteners shall be self-locking or fitted with lock washers. Additional fasteners may be used

however all fasteners shall meet these requirements.

If welded to the bodyshell roll bar legs shall be welded to reinforcement plates. Roll bar feet shall

not be welded directly to the bodyshell without a reinforcement plate.

#### **Option 2**

Alternatively all the attachment points of the roll cage may be fitted with a base plate and lower

plate complying with the table below. The base plate, complying with the area requirements

shown in the table below, may be welded to the bodyshell, in which case the use of bolts and the

lower plate is not required.

<b>Application</b>	<b>Minimum Area</b>	<b>Minimum single dimension</b>
<b>Upper (base) plate</b> Over 1151kg	15,000mm <sup>2</sup> Min Baseplate of 10,000mm <sup>2</sup>	100mm
<b>Lower plate</b> <b>Option 3</b>	4,500mm <sup>2</sup>	Proportional to upper plate

Where Event Group regulations permit, the roll bar protection may be an integral part of a space

frame tubular chassis. The rollcage shall comply with these regulations from a point above where

the predominately vertical portion of the roll cage meets a predominately horizontal portion of the

chassis. Parts of the roll cage may extend below this horizontal plane and become integral with

the chassis. Vertical components shall be braced from the chassis.

#### **5.3.4 BACKSTAYS**

Backstays shall be attached near the roofline and near the top outer bends of the main roll bar on

both sides of the vehicle. They shall be at angle of at least 30 degrees with the vertical, shall run

rearwards and be straight and as close as possible to the interior side panels of the bodyshell.

Their materials specification, diameter and thickness shall be as defined in Rule 5.4.

Their fixings shall 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 roll bar leg mounting,

and with identical reinforcement plates of at least 6,000mm<sup>2</sup> area.

A single bolt in double shear is permitted, provided it is of adequate section and strength and

provided that a bush is welded into the backstay.

It may be more appropriate for the longitudinal braces to be forward of the main roll bar than

rearward. Such configurations may be considered by the CCDA Technical Committee.

#### **5.3.5 DIAGONAL MEMBERS**

At least two diagonal members shall be fitted and shall be straight. The attachment points of

diagonal members shall be located so that they cannot cause injury. They may be removable but

shall be in place when competing in events. The lower end of the diagonal shall join the main roll

bar or the backstay not further than 100mm from the fixing 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.

#### **5.3.6 OPTIONAL REINFORCEMENT OF THE ROLL CAGE**

The diameter, thickness and material of reinforcements shall be as defined in Rule 5.4..

They shall

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

### **5.3.7 ROOF REINFORCEMENT**

There shall be at least one straight longitudinal member between the main roll bar and the front roll bar.

### **5.3.8 REINFORCEMENT OF BENDS AND JUNCTIONS**

The junction of the main roll bar or the front roll bar, the top rear bends of the lateral roll bars and

the junction between the main roll bar and the backstays may be reinforced with longitudinal struts.

The ends of these reinforcing struts shall not be more than half way down or along the members to

which they are attached, except for those at the junction of the front roll bar, which may join the

junction of the door strut/front roll bar.

A reinforcement may be added on each side of the front roll bar between the upper corner of the

windscreen and the base of the door pillar roll bar.

### **5.3.9 PROTECTIVE PADDING**

All sections of the roll cage that could come into contact with occupant's bodies or helmets shall

be provide with non-flammable padding for protection.

### **5.3.10 REMOVABLE MEMBERS**

Should removable members be used in the construction of a roll cage, the demountable joints shall

be of a type as specified in the CCDA Demountable Joint Schedule. The bolts must be of at least

ISO Standard 8.8.

Demountable joints shall not be used as part of the main, front or lateral roll bar.

### **5.3.11 GUIDANCE ON WELDING**

All welding shall be of the highest possible quality with full penetration and preferably using a gas

shielded arc, and shall demonstrate good workmanship.

When using heat-treated steel the special instructions of the manufacturers shall be followed

(special electrodes, gas protected welding).

## **5.4 MATERIAL SPECIFICATIONS**

All tubing used in roll bar protection structures shall be circular section cold drawn steel tube (CDS,

CDW or CEW) with properties as shown in the following tables.

### **Composition**

Property	Specification
Carbon Content	0.3% max.
Magnese content	1.0% max.
Other alloy content	0.5% max.

Tensile strength 350 Mpa min.

### **Minimum dimensions**

Component.	Outside Diameter	Wall Thickness
Main Hoop	44.45mm	2.5mm
	50.00mm	2.0mm

All other Components	38mm	2.5mm
	40mm	2.0mm

These figures represent the minimum permitted specification. In selecting the steel, attention shall

be paid to obtaining good elongation properties and adequate weldability.

The CCDA may other consider steel composition and dimensions on application.

The tubing shall be bent by a cold working process and the centreline bend radius shall be at least

three times the tube diameter. Where the tubing is distorted during bending, the ratio of major to

minor diameter shall be 0.9 or greater.

### **5.5 FLEXIBLE JOINTS**

The use of flexible Lug Mounts on the rear brace shall be permitted on the rear brace of the roll bar

provided the following minimum specifications are met:

#### **A. Outer sleeve**

The material shall be that used for the rear brace or of a higher specification and shall be welded

to end of rear brace.

The wall thickness shall be 2.5mm minimum

The minimum outside diameter shall be that used for the rear brace and the maximum outside

diameter shall be 25% larger than that used for the rear brace.

The minimum length shall be equal to the outside diameter of the rear brace.

#### **B. Bushing Material**

Bushings may be rubber, urethane, nylon or similar flexible material

Bushing outside diameter shall be no greater than three and a half times the outside diameter of

the inner sleeve.

The minimum length of bushings shall be equal to the length of the outer sleeve.

#### **C. Inner sleeve/Spacer tube**

Inner sleeves shall be steel of minimum thickness of 1.0mm.

The inside diameter of inner sleeves shall equal the outside diameter of the cross bolt.

Inner sleeve length shall be no greater than the length of the bushing material, and at least 200mm

longer than outer sleeve.

#### **D. Cross Bolt**

Cross bolts shall be 11mm or 7/16 inch, minimum diameter and at least 8.0 Grade steel.

#### **E. Fixing Lugs**

Fixing lugs shall be steel with a minimum thickness of 5mm and a minimum length no less than the

outside diameter of the bushing material.

### **5.6 RECOMMENDED DESIGNS**

#### **5.6.1 CAB CHASSIS VEHICLES**

Due to space considerations in the cabin of cab chassis vehicles either a flexible joint shall be

Used through rear of cab bulkhead or two separate roll cages shall be constructed.

The main rollbar in the cabin shall be within 150mm of the occupants' heads but shall not

Overhang the occupants. If there is insufficient room within the cabin the two diagonal cross braces

may be within the main roll bar to the rear of the cab.

### **5.6.2 ALL VEHICLES**

Ccda will be the main basis of the cage requirements, this can be used as a building platform, and ccda will be the minimum requirement.

Material type and thickness should be adhered to.

Additional options...

The main hoop may attach to the rock sliders provided they are of equivalent or larger material then the main hoop and firmly attached to the chassis to equal ccda specs for mounting main hoop to floor or chassis.

Back stays must attach to the main hoop and not the diagonal braces.

Diagonal braces should have no bends.

Exo cages will be accepted provided the vehicle is dual cab or smaller and the cage is similar to that of ccda spec 6 point internal. If the vehicle is a single cab then a 4 point design cage will also be accepted.

Any wagons will require 4point internal cage as a minimum.6 point is the preferred. NO exo alone will be accepted on any wagons or full bodied rigs....

Any tube style buggies require a 6 point design cage, this can be incorporated into its main frame structure and must be manufactured from material equivalent to or larger then ccda spec...

These are guide lines only and all competitors are responsible for their own cages, its up to each competitor to ensure their cage is satisfactory to meet the required specs.

Remember motor sports are dangerous and cages are for your own protection, we strongly advise you adhere to the required specs of ccda cages.....