Welded Rollcage Specification v4.0

Contents

1.0 About This Specification.

All changes to requirements of the ANDRA Welded Rollcage Specification v3.2 are highlighted by green text in this new ANDRA Welded Rollcage Specification v4.0.

This document pertains to a welded rollcage only, if you wish to install a removable rollcage, you are encouraged to contact ANDRA Technical at technical@andra.com.au

Prior to fabricating a rollcage, you are encouraged to contact ANDRA Technical at technical@andra.com.au with any questions you may have regarding the specifications.

Published by the Australian National Drag Racing Association Limited, 11 McInnes Street, Ridleyton SA 5008. Requirements published in this specification are effective from 1st October 2020.

All ANDRA specification welded rollcages that begin fabrication after 1st October 2020 should comply with the applicable requirements in this document.

This document is the official Welded Rollcage Specification of the Australian National Drag Racing Association Ltd (ANDRA), recognised by Motorsport Australia and the Federation Internationale de l'Automobile (FIA). The validity of this specification as an official ANDRA publication will be noted by ANDRA Stewards Hearings, Tribunals and the Australian Motor Sports Appeal Court (AMSAC).

The requirements published in this specification remain in effect until suspended or revised by the ANDRA Board. Announcement of such changes will be notified in writing to all ANDRA Divisional Councils and posted on the ANDRA website giving at least 28 days' notice on implementation of a change, or immediately in the case of urgent safety amendments.

This design specification is intended for a full-bodied car with a stock or modified/ OEM floor-pan with a firewall and with an OEM frame or Uni-Body construction, used in ANDRA drag racing competition. There is no competition ET limitation on a welded rollcage, except for those specifically listed under Single Rollover Hoop and Four Point Rollcage. Please note that in some classes there are mandatory minimum requirements where the rollcage structure must meet SFI requirements, refer to the ANDRA Rulebook for specifications. Vehicles with a performance of 8.00 seconds or quicker (1/4 mile or equivalent) are recommended to be built to the applicable SFI chassis specification. Vehicles built to SFI chassis specifications are not required to adhere to the ANDRA Rollcage Specifications.

A representation of compliance with this specification is not an indication, nor an assurance that the rollcage will provide adequate driver protection in all situations of a vehicle crash. However, it is suggested that rollcages which do not comply with the design information given, may not perform their intended function nor might they provide adequate protection to a driver in a crash situation.

This specification is advisory only. There is no agreement between ANDRA, or any other party to be guided by it and its use by any association, organisation, manufacturer, or individual is entirely voluntary. ANDRA will not accept any responsibility for consequences resulting from its application.

This specification is in addition to the ANDRA Rulebook. All applicable requirements and specifications in the ANDRA Rulebook must also be followed.

ANDRA understand that there is a vast array of vehicles competing under its sanctioning and that due to this a rollcage design may require tailoring to a certain vehicle. If there is a requirement to diverge from these specifications, please contact ANDRA Technical prior to the construction/ fabrication stage of the build. Any divergence from these specifications requires written permission from ANDRA Technical prior to removable rollcage fabrication. No retrospective permission will be granted to non-compliant rollcage components without the prior written permission which is granted by ANDRA Technical. This is the case even if a vehicle and/or rollcage has passed an ANDRA Technical Inspection.

2.0 Welded Rollcage Definition

A rollcage with no removable sections or components. All points of attachment are welded to the vehicle.

3.0 Rollcage Declaration and Registration

Currently ANDRA does not require a welded rollcage to be registered. Note that welded rollcage registration for welded rollcages may be a requirement in future.

4.0 Materials

A welded rollcage may be fabricated from either 350 MPa minimum yield stress Mild Steel or 4130N Chromoly to 4130N-MIL-T-6736B specification.

Table 1

Minimum Specification of Materials used in ANDRA Welded Rollcages		
Rollcage Component	**Mild Steel**	**Chromoly**
Main Hoop	1 5/8" x 0.120" or 1 3/4" x 0.102"	1 5/8" x 0.083"
Main Hoop Diagonal Brace	1 1/4" x 0.102"	1 5/8" x 0.083"
Rear Stay without X Supports	1 5/8" x 0.120"	1 5/8" x 0.083"
Rear Stay with X Supports	1 1/2" x 0.102"	1 5/8" x 0.083"
Rear Stay Stiffening Tube	As per Rear Stay material	1 5/8" x 0.083"
Taxi Bar	1 1/2" x 0.102"	1 5/8" x 0.083"
Back-set Taxi Bar Supports	1 1/2" x 0.102"	1 5/8" x 0.083"
Side Intrusion Bar	1 1/2" x 0.102"	1 5/8" x 0.083"
Forward Support	1 5/8" x 0.120" or 1 3/4" x 0.102"	1 5/8" x 0.083"
Windscreen Brace	1 5/8" x 0.120" or 1 3/4" x 0.102"	1 5/8" x 0.083"
Mounting Plate	3mm thickness 350N/mm² minimum tensile strength Mild Steel plate or 3mm thickness 4130N Chromoly.	

5.0 Design and Fabrication of an ANDRA Specification Welded Rollcage

5.1 Rollcages must be designed and fabricated so that, when correctly installed, they substantially reduce body shell deformation and so reduce the risk of injury to occupants, in the event of a crash.

5.2 The fabricator should label each rollcage with the manufacturer's name and serial number, as well as the date of manufacture. If applied the identification tag must be clearly legible at all times and not covered by any component that may inhibit the visual inspection of the identification information.

5.3 Longitudinally, the rollcage should be entirely contained between the dimensions of the wheelbase, however, it can extend beyond the rear axle into the boot floor and the Rear Stay mounts should be mounted/ welded to a substantial chassis component, or by any of the methods described in section 17.0 of this specification.

5.4 No rollcage tube may carry fluid.

5.5 No section of a rollcage may be electroplated.

5.6 All rollcage tube components must be fabricated from one single piece of tube.

5.7 No rollcage tube may unduly impede the egress of the occupant(s) from the vehicle or the use of any controls including foot pedals.

5.8 It is recommended that all tubing should be bent by a cold working process.

5.9 The bend radius centreline must be at least three times the outside diameter (OD) of the tube being bent.

e.g. If 1 5/8” (41.3mm) OD tube is being bent the minimum bend centreline radius is 124mm.

5.10 If tubing is ovalised during bending, the ratio of thinnest OD to original OD must be 0.9 or greater.

e.g. if using 1 5/8” (41.3mm) tube the minimum tube diameter within the bend, must be no less than 37.1mm.

5.11 The surface of the tube must be smooth and even, without ripples or cracks.

5.12 When measuring from the end of a bend on a rollcage tube, the end of the bend is defined as where the tube becomes straight again.

5.13 It is recommended that the minimum distance between the end of one bend and the start of another bend in the same plane is two times the tube OD.

5.14 It is recommended that the minimum distance between the end of one bend and the start of another bend in differing planes is three times the tube OD.

5.15 It is recommended that the minimum distance to the start of a bend from the end of a tube is two times tube OD.

5.16 All welds on 4130N Chromoly material must be by the Gas Tungsten Arc (TIG) welding process. MIG welding may be used on Mild Steel material.

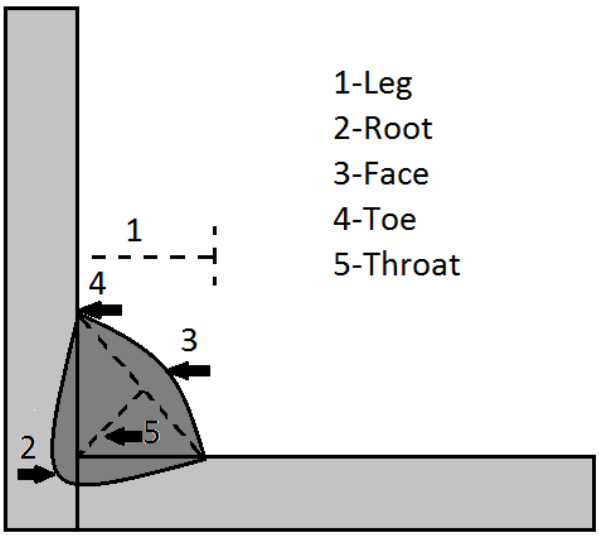
5.17 Compatible filler rods should be used in the welding of 4130N Chromoly. Examples of compatible filler metal that could be used, dependent upon desired strength and ductility, are ER80SD-2, ER70S-2 & ER70SD-6.

5.18 To prevent embrittlement, 4130N Chromoly must not be allowed to cool quickly. If welding of 4130N Chromoly is undertaken in an ambient temperature of 15°C or below, it is recommended that the weld is cooled in a controlled manner.

5.19 If welding of 4130N Chromoly is undertaken in an ambient temperature of 15°C or below it is recommended to preheat the area to be welded.

5.20 It is recommended that pre-weld heating and post-weld stress relief be undertaken on 4130N Chromoly which has a thickness of greater than 3mm (1/8”).

5.21 Fillet size must be a minimum of the sum of the gauges of the two components being welded. e.g. 2.1mm gauge tube to 3.0mm pad, weld fillet (face) must be a minimum of 5.1mm.



5.22 All welds must be continuous (not stitched) around the whole perimeter of a tube.

5.23 Where the welding of a joint will produce a fully sealed tube section, a pressure relief hole should be drilled. The hole should be as small as possible. If welding tube to plate, the hole should be in the plate. If fittings are welded into a tube at both ends the fitting should have a through hole.

5.24 Grinding of welds is not permitted.

6.0 Rollcage Classification - Single Roll Over Hoop

6.1 A Single Roll Over Hoop (Figure 1) is the minimum rollcage specification that is required in the following vehicles.

a) Cars with unmodified construction and a fixed steel roof, slower than 10.00 seconds 1/4 mile (or equivalent) but faster than 10.99 seconds 1/4 mile (or equivalent).
Excluding Modern Street Cars slower than 10.00 seconds 1/4 mile (or equivalent).
b) Cars with modified structural construction, slower than 11.00 seconds 1/4 mile (or equivalent) but faster than 11.99 seconds 1/4 mile (or equivalent).
c) Street registered Open Cars, slower than 11.00 seconds 1/4 mile (or equivalent) but faster than 12.99 seconds 1/4 mile (or equivalent).

Modified: A Unibody Car with modifications to the rear floor, rear wheelwells* or boot floor.
*Modified Rear Wheelwells: Where material has been added to the wheelwells and has changed the profile of the wheelwell, (e.g. mini-tubbing or tubbing to accommodate larger rear tyres). Any changes to the chassis or floor at the wheelwell location is recognised as a modification and is therefore classed as "modified wheelwells".
The reshaping of existing OEM wheelwell material is not considered as a "modified wheelwell".

6.2 A Single Rollover Hoop must have the following components, in the positions illustrated in Figure 1, as a minimum.

A. One Main Hoop
B. Two Rear Stays
C. One Taxi Bar
D. One Intrusion Bar

Note: Additional Diagonal Support within the Main Hoop is also recommended, see Figure 7, component B.

6.3 A single Side Intrusion Bar (D) on the driver's side is the minimum acceptable only if no passenger is present. If a passenger is present, then a Side Intrusion Bar is also required on the passenger's side of the vehicle.

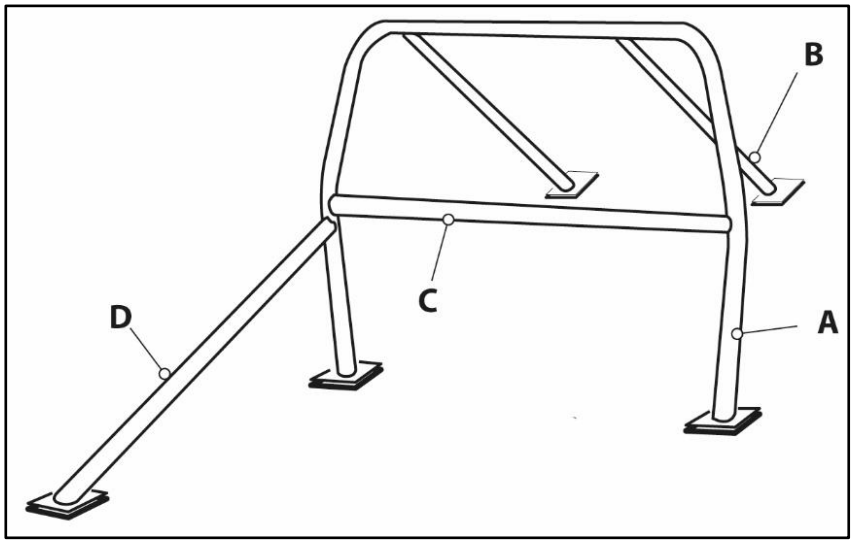


Figure 1: Single Roll Over Hoop.

7.0 Rollcage Classification – Four Point Rollcage

7.1 A Four Point Rollcage (Figure 2) is the minimum rollcage specification that is required in the following vehicles.

a) A utility vehicle (pick-up), slower than 8.00 seconds 1/4 mile (or equivalent) but faster than 10.99 seconds 1/4 mile (or equivalent).
b) 1930s style "Chop-Top" Coupes, Hot Rods and/or "T-Bucket" style vehicles where the fitment of Rear Stays is restrictive, slower than 8.00 seconds 1/4 mile (or equivalent) but faster than 10.99 seconds 1/4 mile (or equivalent).

7.2 A Four Point Rollcage must have the following components, in the positions illustrated in Figure 2, as a minimum.

A. One Main Hoop
B. One Diagonal Brace (in one or two sections)
C. One Taxi Bar (in one or two sections)
D. Two Side Intrusion Bars
E. Two Forward Supports
F. One Front Roof Support

7.3 A back-set Taxi Bar may be fitted to a Four Point Rollcage, as per Figure 8, component C.

A back-set Taxi Bar must be fitted with Taxi Bar Upper Supports (Figure 8, components H2). It is recommended to also fit Taxi Bar Lower Supports (Figure 8, components H1) to a back-set Taxi Bar.

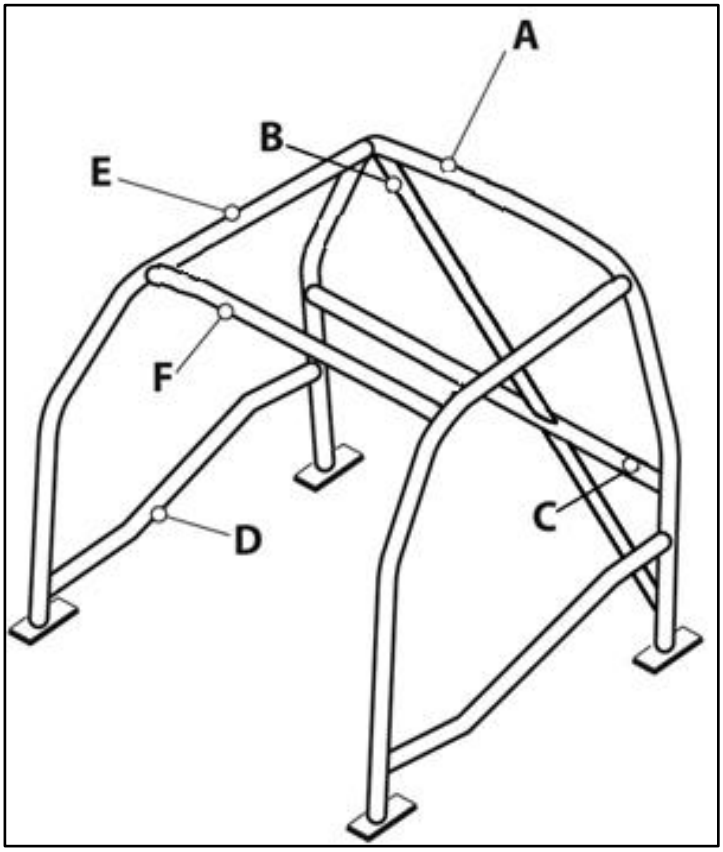


Figure 2: Four Point Rollcage.

8.0 Rollcage Classification – Six Point Rollcage

8.1 A Six Point Rollcage (Figure 3) is the minimum rollcage specification that is required in the following vehicles.

a) All vehicles not previously listed under Four Point Rollcage or Single Roll Over Hoop, 11.00 seconds or quicker 1/4 mile (or equivalent) and/or 10.00 seconds or quicker 1/4 mile (or equivalent) for Modern Street Cars.

Modern Street Cars: Street registered, sedan-based vehicle (and derivatives such as Coupes, Utilities and Station Wagons etc) built after 01JAN2008 and with a compliance identification plate dated 01JAN2008 or later.

8.2 A Six Point Rollcage must have the following components, in the positions illustrated in Figure 3, as a minimum.

A. One Main Hoop
B. Two Rear Stays
C. One Taxi Bar
D. Two Side Intrusion Bars
E. Two Forward Supports
F. One Front Roof Support

Note: Additional Diagonal Support within the Main Hoop is also recommended, see Figure 7, component B.

8.3 A back-set Taxi Bar may be fitted to a Six Point Rollcage, as per Figure 8, component C.

A back-set Taxi Bar must be fitted with Taxi Bar Upper Supports (Figure 8, components H2). It is recommended to also fit Taxi Bar Lower Supports (Figure 8, components H1) to a back-set Taxi Bar.

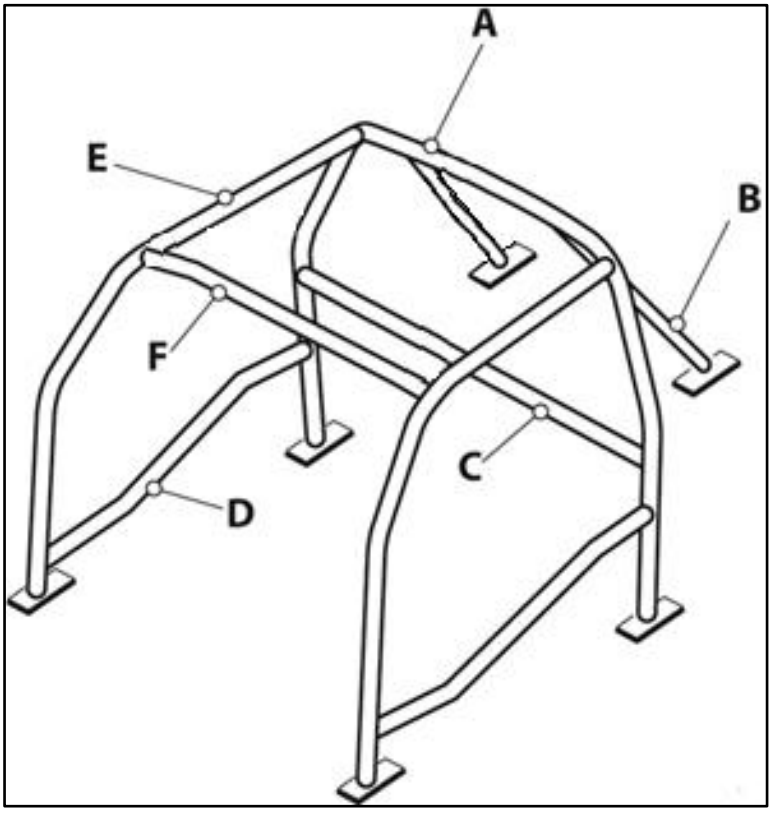


Figure 3: Six Point Rollcage.

9.0 No Rollcage Required

9.1 The following vehicles do not require a rollcage.

a) Street registered Open Cars 12.99 seconds or slower 1/4mile (or equivalent).
b) Open Competition Cars, certified by and complying with relevant Motorsport Australia (CAMS) regulations, 11.00 seconds or slower 1/4 mile (or equivalent).
c) Unmodified Cars, with a fixed steel roof, 11.00 seconds or slower 1/4 mile (or equivalent).
d) Modern Street Cars, 10.00 seconds or slower 1/4 mile (or equivalent).

Modified: A Unibody Car with modifications to the rear floor, rear wheelwells* or boot floor.

*Modified Rear Wheelwells: Where material has been added to the wheelwells and has changed the profile of the wheelwell, (e.g. mini-tubbing or tubbing to accommodate larger rear tyres). Any changes to the chassis or floor at the wheelwell location is recognised as a modification and is therefore classed as "modified wheelwells".
The reshaping of existing OEM wheelwell material is not considered as a "modified wheelwell".

Modern Street Cars: Street registered, sedan-based vehicle (and derivatives such as Coupes, Utilities and Station Wagons etc) built after 01JAN2008 and with a compliance identification plate dated 01JAN2008 or later.

10.0 Rollcage Components – Main Hoop

10.1 In no case must the driver's helmet centreline be behind the centreline of the Main Hoop.

10.2 The Main Hoop must be placed rearwards of any occupant's head, when their seat is in the rearmost position, to a maximum horizontal distance of 150mm (6") between the rear of the helmet and the front of the Main Hoop tube.

10.3 The Main Hoop should be near vertical and may have a maximum angle of +/-10 degrees to the vertical.

10.4 In closed vehicles, the Main Hoop must follow, as close as is practical, the profile of the vehicle's interior

10.5 In closed vehicles the Main Hoop tube should be within 25mm (1") of the roof/ headliner in the area above the driver's helmet.

10.6 In open vehicles there must be a minimum of 75mm (3") clearance between the top of the driver's helmet and the bottom of the Main Hoop.

11.0 Rollcage Components – Rear Stays

11.1 Single Rollover Hoop and Six Point Rollcages require a minimum of two Rear Stays.

11.2 In all rollcages, where possible, Rear Stays should be straight.

11.3 If Rear Stays are bent, a Stiffening Tube (Figure 8 component K) must be fitted in between the Rear Stays within 100mm (4") of the bend in the Rear Stay.

11.4 If the Rear Stay Stiffening Tube is not positioned within 100mm (4") of the top of the rear window then an additional Rear Roof Support Tube must also be fitted in between the Rear Stays within 100mm of the top of the rear window.

11.5 The Rear Stay Stiffening Tube must have a maximum of two bends and be straight in side view.

11.6 No bend in the Rear Stay Stiffening Tube may exceed 20 degrees.

11.7 The Rear Roof Support Tube must have a maximum of two bends and be straight in side view.

11.8 No bend in the Rear Roof Support Tube may exceed 20 degrees.

11.9 A Rear Stay should be mounted onto the vehicle structure at its rear termination by an approved Mounting Pad and/or Mounting Plate.

Rear Stay tubing may be welded directly onto an OEM chassis rail, or onto a non-OEM chassis rail, or via Mounting Plate onto a reinforced floor area providing all have been fabricated/ reconstructed with 3mm thickness 4130N Chromoly, or 3mm thickness 350N/mm² minimum tensile strength Mild Steel plate, at a minimum.

11.10 A Rear Stay must make an angle of between 30-60 degrees from horizontal at its rear termination/ attachment point (e.g. the Mounting Pad).

11.11 A Rear Stay must be connected to the top section of the Main Hoop, within 100mm (4") of the centreline of the upper bend.

Bent Rear Stays with an X Support

11.12 If Rear Stays are bent, they require a Stiffening Tube as per 11.3 – 11.6, or an "X" Support may also be used. See Figure 4.

11.13 If an X Support is fitted, it must be fixed between the two Rear Stays where they are sub-horizontal.

11.14 The X Support upper connection with the Rear Stays must be within 100mm of the upper bend in the Rear Stay.

11.15 The X Support lower connection with the Rear Stays must be within 100mm of the Rear stay to chassis mounting point

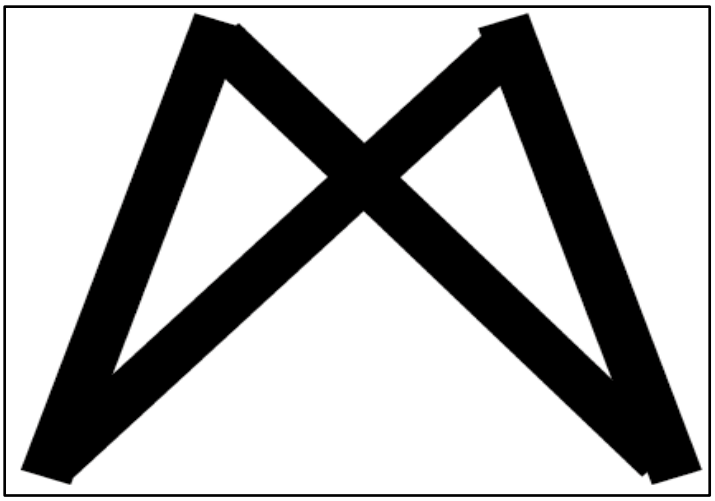


Figure 4: Rear Stay X Support viewed from rear of vehicle.

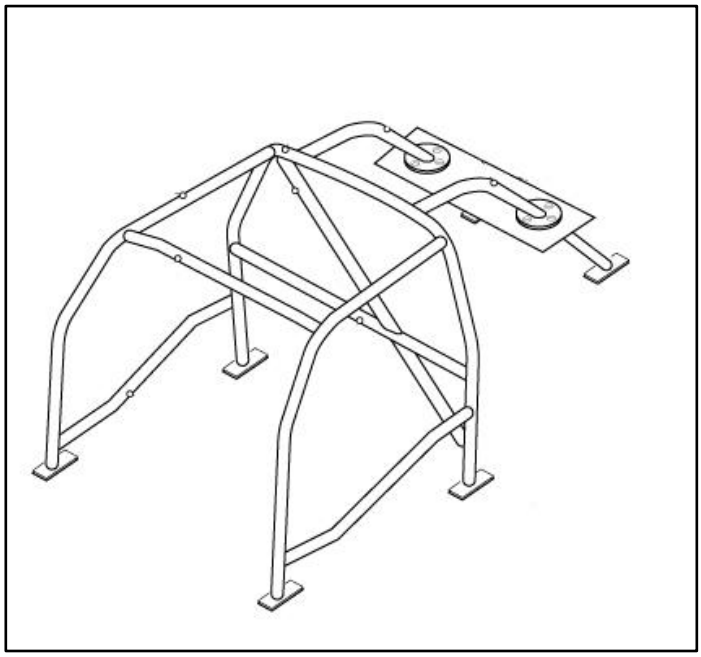
Alternative Rear Stay Mounting Design

11.16 Rear Stays should be mounted/ welded to a substantial chassis component, or by any of the methods described in section 17.0 of this specification. To do this, Rear Stays can be split in design, as per Figure 5. (Rear Stay Stiffing Tube/ X Support not shown for clarity).

Note: requirement 11.10 does not need to be met with a split Rear Stay design.

11.17 Split Rear Stay fabrication involves the fitting of Mounting Plates on the rear parcel shelf, with a supporting structure under the parcel shelf, which is mounted to a substantial chassis component.

11.18 The supporting structure under the parcel shelf may be designed and fabricated with;



a) Two straight support tubes each connected to the underside of the parcel shelf and a substantial chassis component.

b) Two straight support tubes, with cross bracing, each connected to the underside of the parcel shelf and a substantial chassis component. The cross bracing must be welded to the supports no further than 100mm (4") from the ends of the support tubes.

Figure 5: Stiffening Tube/ X Support not shown for clarity.

12.0 Rollcage Components – Taxi Bar

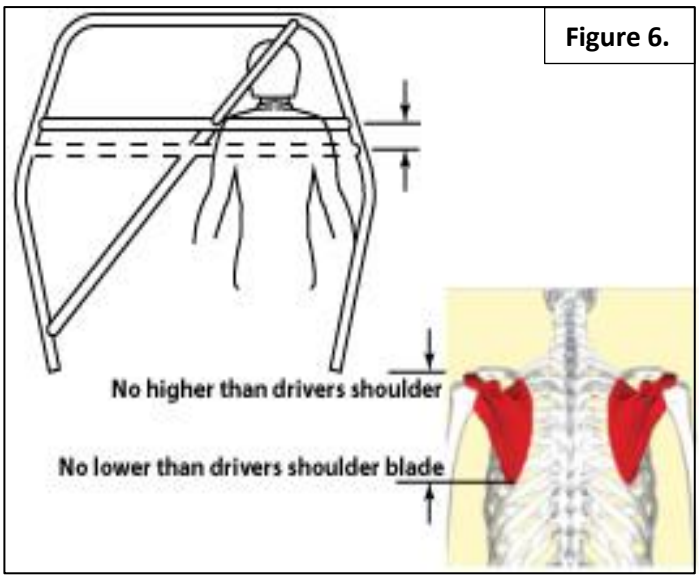


Figure 6.

12.1 A Taxi Bar must be fitted between the uprights of the Main Hoop spanning the full width of the vehicle.

12.2 The Taxi Bar must be positioned horizontally such that it passes behind the driver between their shoulder height and the lowest point of their shoulder blades.

Taxi-Bar Bracing

12.3 In a Four Point Rollcage, a straight Taxi Bar must be reinforced with a Diagonal Brace as per Figure 7, component B. This is optional but recommended for a Six Point Rollcage and a Single Rollover Hoop.

12.4 The Diagonal Brace must be fitted between the Main Hoop horizontal tube behind the driver and the opposite Main Hoop vertical tube, via the Taxi-Bar.

12.5 The upper connection of the Diagonal Brace to the Main Hoop must be no further than 100mm (4") from the centreline of the Main Hoop upper bend on the driver's side of the vehicle.

12.6 The lower connection of the Diagonal Brace to the Main Hoop upright must be no further than 100mm (4") from the Main Hoop Mounting Pad on the opposite side of the vehicle.

12.7 Passengers are not allowed in the vehicle unless two Diagonal Braces are present in a cross formation to the dimension specifications above.

12.8 In a Six Point Rollcage, an alternative to a Diagonal Brace is the fitting of a Diagonal Member between the two Rear Stays. The Diagonal Member must be straight.

12.9 The Diagonal Member must be joined to the driver's side Rear Stay no further than 100mm (4") from the Rear Stay to Main Hoop joint.

12.10 The Diagonal Member must be joined to the Rear Stay on the opposite side no further than 100mm (4") from the Rear Stay mounting point.

12.11 Passengers are not allowed in a vehicle with a Diagonal Member fitted between the two Rear Stays unless two Diagonal Members are fitted in a cross formation to the dimensions specified.

12.12 Figures 7 and 8 show the rear half of Six Point Rollcages. The front half is not shown for clarity.

12.13 If the Taxi Bar is back-set (Figure 8, component C) two Taxi Bar Upper Supports fixed to the horizontal section of the Main Hoop and the Taxi Bar are required (Figure 8, components H2).

12.14 It is also recommended to use Taxi Bar Lower Supports that are fixed to the Taxi Bar and the floorplan or transmission tunnel (Figure 8, components H1).

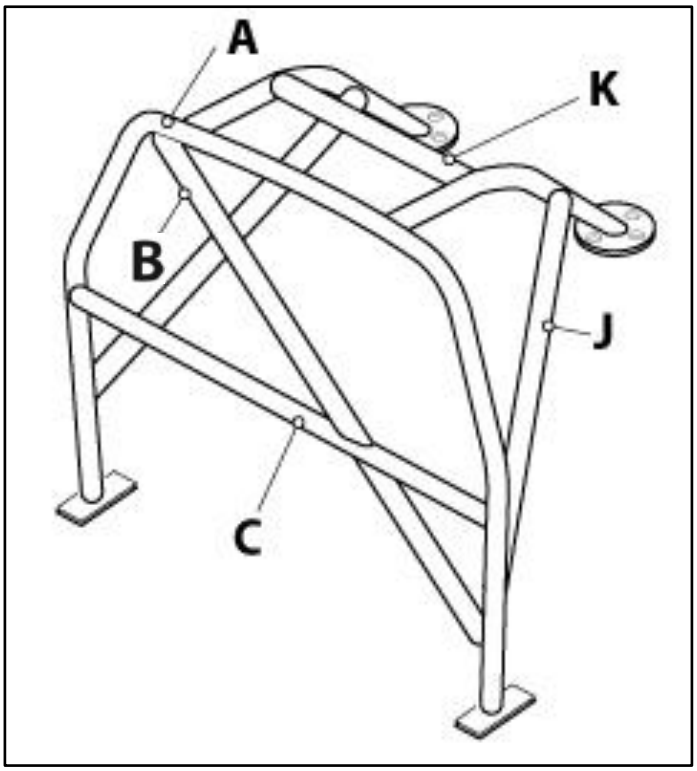


Figure 7 (above): Component K is required if Rear Stays are bent.
Component B is required in a 4-point Rollcage but optional in a 6-point Rollcage.
Component J is additional and optional.

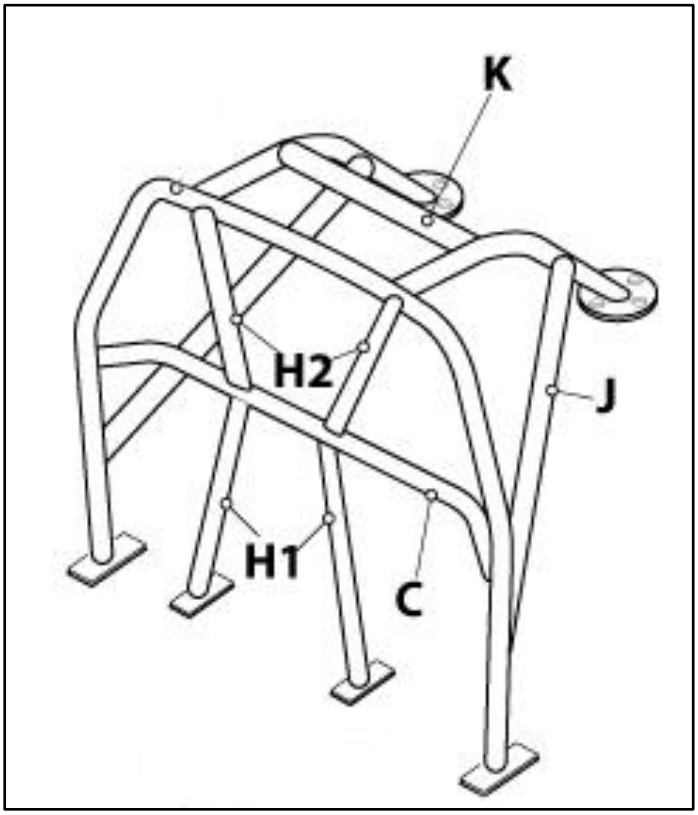


Figure 8 (above): Component K is required if Rear Stays are bent.
Components H2 are required if the Taxi Bar (C) is back-set.
Components H1 are recommended but optional.
Components J is additional and optional.

13.0 Rollcage Components – Side Intrusion Bar

13.1 A Side Intrusion Bar must be designed and fabricated to ensure that it does not unduly impede egress from the vehicle when it is in place.

13.2 A Side Intrusion Bar must be as straight as is practical, both laterally and vertically, but may be curved/bent to avoid internal door fittings (e.g. arm rests and window winders).

13.3 A Side Intrusion Bar must pass the driver's/ passenger's body midway between their shoulder and elbow when seated in racing position and must connect to the Main Hoop upright at a similar height.

13.4 In a Four Point and Six Point Rollcage a Side Intrusion Bar must have its forward connection to a Forward Support tube no higher than half the height of the door opening.

13.5 In a Single Rollover Hoop Rollcage a Side Intrusion Bar must extend forward as far as possible and should be mounted/ welded to a substantial chassis component, or by any of the methods described above 17.0 of this specification.

13.6 In a Single Rollover Hoop Rollcage a Side Intrusion Bar mount must meet the size requirements detailed in 17.12.

14.0 Rollcage Components – Forward Supports

14.1 A Forward Support must be connected to the Main Hoop upright no further than 100mm (4") from the upper Main Hoop bend on both sides of the vehicle.

14.2 A Forward Support must follow the vehicle's body line across the top of the front window and the A-Pillar as close as is practical.

14.3 There must only be one bend in the vertical section of a Forward Support.

14.4 Forward Support tubing may be welded directly onto an OEM chassis rail, or onto a non-OEM chassis rail, or via Mounting Plate onto a reinforced floor area providing all have been fabricated/ reconstructed with 3mm thickness 4130N Chromoly, or 3mm thickness 350N/mm² minimum tensile strength Mild Steel plate, at a minimum.

Forward Stays should be mounted/ welded to a substantial chassis component, or by any of the methods described above 17.0 of this specification.

14.5 Four Point and Six Point Rollcages require a minimum of two Forward Supports.

14.6 Forward Support reinforcements may be fabricated as per the ANDRA Removable Rollcage Specification, however as these are optional, are not a minimum requirement.

15.0 Rollcage Components – Roof Support and Roof Braces (Diagonals)

15.1 A Front Roof Support Tube must be fitted to a Four Point and a Six Point Rollcage.

15.2 A Front Roof Support Tube must be connected to a Forward Support no further than 100mm (4") from the upper bend in the Forward Support Tube.

15.3 The Front Roof Support Tube must have a maximum of two bends and be straight in side view.

15.4 No bend in the Front Roof Support Tube may exceed 20 degrees.

15.6 Roof Braces may be fitted in either a forward or reverse "V" configuration between the Front Roof Support and the top of the Main Hoop.

15.7 If fitted, the angle between the "V" of the Roof Braces must be as great as is practical.

16.0 Rollcage Components – Additional Tubing

16.1 The addition of tubing or gussets that reinforce a rollcage is encouraged.

16.2 Additional tubing is such as Figure 8, component J.

16.3 Any rollcage tubing which is added beyond the minimum requirements (and is therefore considered as "additional tubing") need not meet the minimum material specifications as detailed in Table 1 of this specification.

17.0 Rollcage to Chassis Mounting

17.1 Mounting Plate: A metal plate welded to the vehicle. Mounting Pad: A metal plate welded to the rollcage tube.

17.2 Mountings for the Main Hoop, Rear Stays and Forward Supports may comprise of a Mounting Pad and/or a Mounting Plate.

Main Hoop, Rear Stay and Forward Support tubing may be welded directly onto an OEM chassis rail, or onto a non-OEM chassis rail, or via Mounting Plate onto a reinforced floor area providing all have been fabricated/ reconstructed with 3mm thickness 4130N Chromoly, or 3mm thickness 350N/mm² minimum tensile strength Mild Steel plate, at a minimum.

17.3 All Mounting Plates must be of at least 120cm^2 (19 in^2 (square inches)) in surface area, may be of any shape, provided the minimum width and area dimensions are maintained or exceeded.

17.4 If the mounting type requires two plates, one beneath the floor and one on top, the lower plate must be larger or smaller than the upper plate by at least 20mm all around the upper plates' perimeter. The minimum surface area specification must be maintained or exceeded by both plates.

17.5 It is preferential to have the thickness of the pad/ plate material as close as possible to that of the material to which it is welded to whilst staying within the minimum material specifications.

17.6 Mounting Plates must be designed and fabricated such that they can withstand minor deformation during a roll over, the Mounting Plates must not be designed and fabricated so that they shear through the supporting chassis/body material during a roll over.

17.7 Mounting Plates must be fabricated to reinforce the material which they are welded to.

17.8 A Mounting Plate must be attached to the body (including transmission tunnel) of a vehicle as close as possible to the chassis beams or a substantial chassis component.

17.9 Mounting Plates should be stitch welded to the vehicle around their whole perimeter. Acceptable stitch sizes are 25mm (1") weld with a 25mm (1") gap.

17.10 Tube to Mounting Pad welding must be continuous (not stitched) around the whole perimeter of the tube.

17.11 All corners of Mounting Pads and Plates should be radiused to a minimum of 25mm (1") radius.

17.12 Mounting Pads must meet the sizing dimensions as per Table 2 below.

Table 2

Mounting Pad Location	Minimum Surface Area	Minimum Single Dimension
Forward Support	100cm² / 15.5 in^2	7.5cm / 3"
Main Hoop	100cm² / 15.5 in^2	7.5cm / 3"
Rear Stays	60cm² / 9.3 in^2	7.5cm / 3"
Additional Supports*	100cm² / 15.5 in^2	7.5cm / 3"
Side Intrusion Bar**	100cm² / 15.5 in^2	7.5cm / 3"

* e.g. Taxi Bar Lower Supports "H2" ** Single Roll Over Hoop only.