**SCCA APPENDIX Z EXCERPT**

**ROLL BARS**

THESE SPECIFICATIONS ARE FOR INSPECTING CARS REGISTERED PRIOR

TO JANUARY 1, 1979 and are mandatory and represent minimum require­ ments. Specific installations are subject to approval by the Technical and Safety Inspector at each event.

1. BASIC DESIGN CONSIDERATIONS
	1. The basic purpose of the roll bar is to protect the driver if the car turns over or is involved in a serious accident. This purpose should not be forgotten.
	2. The top of the roll bar must be a minimum of two inches above the top of the driver's helmet when the driver is sitting in a normal driving position (as near the roof as possible on closed sedans) and shall not be more than six inches behind the driver.
	3. The roll bar must be designed to withstand compression forces result­ ing from the weight of the car coming down on the roll structure, and to take fore and aft loads resulting from the car skidding along the ground on the roll structure.
	4. The two vertical members forming the sides of the hoop shall not be less than 15 inches apart inside dimensions. It is recommended that the roll bar extend the full width of the cockpit to provide maximum bearing area. The roll bar vertical members on Formula Cars must not be less than 15 inches apart, inside dimension, at their attachment points to the uppermost main chassis member.
	5. A system of head restraint to prevent whiplash and to prevent the driver's head from striking the underside of the roll bar must be installed on all vehicles. The head restrained should be capable of withstanding a force of 200 lbs, in an aft direction. It is recommended that a headrest of approximately 36 square inch area with a non -resilient padding two inches thick be used. It is mandatory that any portion of the roll bar or bracing which might be contacted by the driver's helmet shall be covered with Styrofoam or other energy-absorbing material (high densit y) to a minimum thickness of one inch. The energy absorbing material must be covered by duct tape or similar protective wrapping. The padding need not be installed where side or forward vision is restricted.
	6. No portion of the safety roll bar shall have an aerodynamic effect by creating a vertical thrust.
2. MATERIAL
	1. The roll bar hoop and all braces must be seamless, ERW or DOM mild steel tubing or chrome molybdenum alloy steel such as SAE 4125 or SAE 4 130 . It is recommended that mild steel tubing be used as chromium alloys present difficulties in welding and must be normalized to relieve stress. Proof of the use of alloy steel will be the responsibility of the entrant.
	2. For the purpose of determining tubing sizes, the vehicle race weight is without driver. The size of the tubing shall be determined as fol-

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lows:

VEHICLE RACE WEIGHT

Under 1500 lbs

1500 lbs - 2500 lbs

Over 2500 lbs.

MILD STEEL 1.5" X .120"

1.75"x.120"

2.25" X .120"

ROLL BAR

ALLOY STEEL 1.375" X .090"

1.625" X .095"

2.00" X .095"

Note: See alternate tubing sizes and diagrams at the end of Ap­ pendix Z.

An inspection hole of at least 3/16 inch diameter must be drilled in a non-critical area of the roll bar hoop to facilitate verification of wall thickness.

Where bolts and nuts are used, the bolts shall be at least 3/8 inch diameter SAE Grade 5 or equivalent aircraft quality.

1. FABRICATION
	1. One continuous length of tubing must be used for the hoop member with smooth continuous bends and no evidence of crimping or wall failure. It is recommended that the radius of the roll bar hoop be such that the minimum outside width measured at a point four inches below the uppermost point is 12 inches. Whenever possible the roll bar hoop should start from the floor of the car, and in the case of tube frame construction, be attached to the chassis tubes by means of gussets or sheet metal webs in order to distribute the loads.
	2. All welding must be of highest possible quality with full penetration. Arc welding, particularly heliarc, should be used wherever possible. The welds should be inspected by magnaflux or dye penetrant after fabrication. Alloy steel must be normalized after welding.
2. BRACING
	1. ~~Full cockpit width (two seats) roll bar hoops must have two fore/aft braces with tubing of dimensions at least equal to that required for the hoop itself. Diagonal lateral bracing of equal dimension tubing must be installed to prevent lateral distortion of the hoop. (In most cases, a lateral brace from the bottom corner of the hoop on one side to the top corner of the hoop on the other side is sufficient.) The following alternates are permitted: Although installing the di­ agonal lateral brace in the main hoop is the strongest (and hence most preferable) alternative, there may be instances where such an installation is not practical. In such situations, the installation of the diagonal brace as shown in the drawing below will be acceptable.~~
	2. Partial cockpit (single seat) roll bar hoops may have either one fore/ aft brace with a minimum dimension equal to the tubing required for the main hoop or two fore/aft braces with a minimum dimension of

1.0 x .090 inches mild steel or alloy steel.

* 1. The bracing must be attached as near as possible to the top of hoop but not more than six inches below the top of the hoop and at an included angle of at least 30 degree. If a single brace is used, it must be attached at the top of the main hoop.
	2. If the fore/aft bracing must be removable, the connection between

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the roll bar hoop and the brace rod must be of the double - lug type fabricated from material at least 3/16 inch thickness and welded through a doubler or gusset arrangement to avoid distortion or exces­ sive strains caused by welding. (See diagrams). It is recommended that the fore/aft brace be attached to a rear chassis member through a double lug connection. If attached to the engine, it must mount to a major component such as a head stud or combination or head studs.

1. MOUNTING PLATES
	1. . Roll bars and braces must be attached to the frame of the car wher­ ever possible. Mounting plates, regardless of whether welded or bolted to the frame, must be at least 3/16 inch thick.
	2. ~~In the case of cars with unitized or frameless construction, or cars with frames where frame mounting of the roll bar is impractical, mounting plates must be used to secure the roll bar structure to the floor of the car. The important consideration is that the load be distributed over as large an area as possible. Mounting plates bolted to the structures shall not be less than .1875 (3/16) inch thick with a back-up plate of equal size and thickness on the opposite side of the panel with the plates through-bolted together. Mounting plates welded to the structure shall not be less than .080 inch thick. When­ ever possible the mounting plate should extend onto a vertical section of the structure such as a door pillar.~~
2. REMOVABLE ROLL BARS

Removable roll bars and braces must be very carefully designed and constructed to be at least as strong as permanent installation. If one tube fits inside another tube to facilitate removal, the removable portion must fit tightly and must bottom on the permanent mounting, and at least two bolts must be used to secure each such joint. The telescope section must be at least eight inches in length.

1. ~~INSTALLATION ON CARS OF SPACE FRAME AND FRAMELESS DESIGN~~
	1. ~~. It is important that roll bar structures be attached to cars in such a way as to spread the loads over a wide area. It is not sufficient to simply attach the roll bar to a single tube or junction of tubes. The roll bar must be designed in such a way as to be an extension of the frame itself, not simply an attachment to the frame. Considerable care must be used to add as necessary to the frame structure itself in such a way as to properly distribute the loads. It is not true that a roll bar can only be as strong as any single tube in the frame.~~
	2. ~~On cars of frameless construction, consideration should be given to using a vertical roll bar hoop of 360 degrees completely around the inside of the car, and attached with suitable mounting plates. This type of roll bar then becomes a substitute for the frame.~~
2. OTHER ROLL BAR DESIGNS (Acceptable for cars built prior to 1 /1/79) Roll bars of alternate material or design may be accepted by the Technical and Safety Inspector upon presentation of data verifying the installation is able to withstand three simultaneously applied loads:

1.5 G Lateral

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5.5 G Fore-and-Aft

7.5 G Vertical

The induced loads being carried over into the primary structure. Royal Automobile Club (RAC) certification of alternate designs is acceptable for automobiles built prior to 1/1 /79.

I. ALTERNATE TUBING SIZES

Roll bar tubing of an alternate diameter and wall thickness equal to or exceeding the bending strength of those specified in Table B.2 may be used:

|  |  |  |
| --- | --- | --- |
| Under 1 500 lbs | Under 2500 lbs. | Over 2500 lbs. |
|  | Fig. 2 (2 each) |  |
| 1.375 " X .187" | 1.50" X .120" | 2.00" X . 180 " |
| 1.625" X .120" | 1.50" X .250" | 2 .125 " X .162" |
| Fig. 1(2 each) 1.00 " x .0 62"With (2) 1 ¼" x .062" strips | 1.625" x .160"1.875" x .088" | 2.50" X .085" |