

## **2.8.7 CONVERTIBLES and Cars with Removable Roof Sections**

Convertibles are defined as cars with retractable tops, whether soft-top or folding hard-top. Removable roof sections include targa tops and T-tops. These are characterized by part of a fixed body structure above the passenger compartment.

**2.8.7.1 Convertibles** are not allowed to participate in sessions driven at speed unless the car is equipped with the following minimum requirements:

- A roll bar or roll cage meeting the requirements of Appendix B
- 5- or 6-point harnesses for both driver and instructor

**2.8.7.2** At the discretion of the Chapter, cars with factory-installed fixed rollover protection or removable roof sections may be allowed, but only if this protection meets the helmet reference plane described in Appendix B for both the driver and passenger

**2.8.7.3** Cars equipped only with factory pop-up posts or similarly activated rollover protection are not allowed.

**2.8.7.4** Chapters may elect to exclude convertibles or cars with removable roof sections entirely from sessions driven at speed regardless of roll bar or fixed rollover protection or any provision of this section 2.8.7.

About the National standards:

Vehicle safety standards are laid out in NHTSA (National Highway Transportation Safety Administration, a unit of the Department of Transport) regulations, collectively known as the FMVSS (Federal Motor Vehicle Safety Standards). Roof crush resistance standards are found in FMVSS §571.216. As of the most recent version (10/1/2008), a force of 1.5 times the car's weight (but not to exceed 5000 lb) is applied in a specified location and manner to the car's roof, which must deflect no more than 5 inches. Convertibles are specifically exempted from the roof crush standard per FMVSS §571.216.S3(c). However a manufacturer may at its option decide to comply with the normal standard instead of following the alternate standard for convertibles (see below). NHTSA's definition of a convertible in FMVSS §571.201.S3 is this: "Convertible means a vehicle whose A-pillars are not joined with the B-pillars (or rearmost pillars) by a fixed, rigid structural member." Convertibles that do not follow the roof crush standard must instead comply with the occupant protection standard of FMVSS §571.208.S5.3 which specifies a 30 mph lateral rollover with top up and windows closed. The pass criterion per FMVSS §571.208.S6.1 is that a test dummy be contained "within the outer surfaces of the vehicle passenger compartment." Conclusions The DEC is consistent with NHTSA in considering vehicles with folding hard-tops to be convertibles. Fixed-roof are required to meet roof crush standards but convertibles are not. It's possible that some convertibles may meet the fixed-roof standards if their manufacturers have opted to do so. It's not clear whether there is any way to know which, if any, convertibles fall into that category. Recommendations That we define convertibles in the same language as, and with reference to, the FMVSS regulations. This would provide a clear rationale for our position based on objective criteria. That we maintain the current regulations to the effect that convertibles are allowed in high speed events only if they have safety equipment consisting of a full cage or a compliant roll bar (per Appendix B) plus 5/6-point harnesses. Factory hoops or pop-ups don't comply. Chapters may at their option decide to exclude convertibles altogether. Internally we might wish recognize the future possibility that some hard-top convertibles may have passed the same roof crush test as fixed roof vehicles, and that if that could be established then they should be considered for participation high speed events

## APPENDIX B. ROLL BARS FOR CONVERTIBLES

**B.1.1** The basic purpose of the roll bar is to assist in the protection of the driver (and passenger) if the car turns over or is involved in a collision. This purpose should not be forgotten

**B.1.2** The top of the roll bar shall be a minimum of two (2) inches above the top of the driver's (and passenger's) helmet with the driver (and passenger) seated normally and restrained by seat belt/shoulder harness. A plane (Helmet Reference Plane) drawn from the top (not including padding) of the roll bar to structural parts of the chassis in front of the base of the windshield (e.g., top of front suspension strut towers) shall pass over the driver's (and passenger's) helmet. (See Figure 1.)

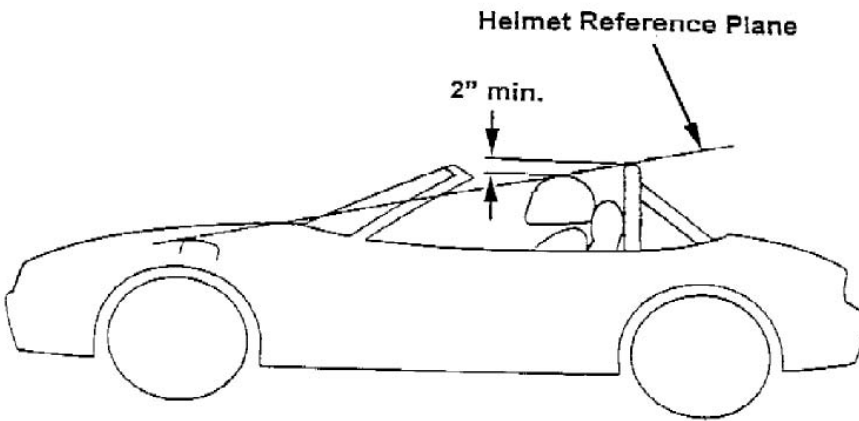


Figure 1

**B.1.3** The roll bar shall be designed to withstand compression forces resulting from the weight of the car coming down on the roll bar, and to take fore, aft, and lateral loads resulting from the car skidding along the ground on the roll bar.

**B.1.4** The roll bar shall extend the full width of the cockpit.

**B.1.5** Any portion of the roll bar or bracing which might be contacted by the driver's (and passenger's) helmet shall be covered with non-resilient material such as Ethafoam or Ensolite or other similar material with a minimum thickness of one-half (1/2) inch. The energy absorbing material shall be firmly attached.

## B.2 MATERIAL

**B.2.1** B.2.1 The roll bar hoop and all braces shall be seamless, ERW (Electric Resistance Welded), or DOM (Drawn Over Mandrel) mild steel tubing (SAE 1010, 1020, 1025, or equivalent), or chrome molybdenum alloy steel tubing (SAE 4125, 4130, or equivalent). 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 shall be the responsibility of the participant.

**B.2.2** The size of the tubing shall be determined based on the vehicle curb weight as follows:

Vehicle Roll Bar Curb Weight Mild Steel Under 2000 lbs 1.50 x 0.120 (Outside Diameter 2001-

3500 lbs 1.75 x 0.120 x Wall Thickness Over 3500 lbs 2.00 x 0.120 in inches) The minus tolerance for tubing diameter and wall thickness shall not be less than

0.010 inch below the nominal value. An inspection hole of at least 3/16-inch diameter shall be drilled in a non-critical area of the roll bar hoop to facilitate verification of tubing wall thickness. Where bolts and nuts are used, the bolts shall be at least 3/8-inch diameter SAE Grade 5 or equivalent

### B.3 WELDING

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B.3.1.1. The weld shall have no cracks.

B.3.1.2. Thorough fusion shall exist between weld metal and base metal.

**B.3.1.3** All craters shall be filled to the cross-section of the weld.

**B.3.1.4** Undercut shall be no more than 0.01 inch deep.

### B.4 ROLL BAR HOOP

One (1) continuous length of tubing shall be used for the roll bar hoop with smooth, continuous bends and no evidence of crimping or wall failure. The radius of the bends in the roll bar hoop (measured at centerline of tubing) shall not be less than three (3) times the diameter of the tubing. The roll bar hoop shall have a maximum of four (4) bends totaling 180 degrees +/- 10 degrees. Whenever possible, the roll bar hoop should start from the floor of the car.

### B.5 BRACING

**B.5.1** Roll bar hoops shall have two (2) fore/aft braces with tubing diameter and wall thickness as listed in B.2.2. The fore/aft braces shall be attached as close as possible to the top of but not more than six (6) inches below the top of the roll bar hoop. The included angle between the fore/aft brace and the vertical part of the roll bar hoop shall be no less than 30 degrees. The fore/aft braces shall have no bends. (See Figure 2.)

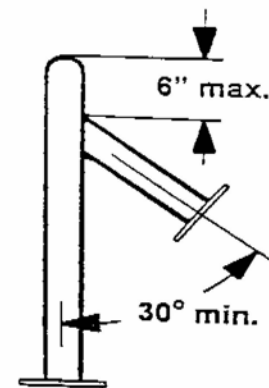


Figure 2

**B.5.2** Roll bar hoops shall have a diagonal brace with tubing diameter and wall thickness as listed in B.2.2 to prevent lateral distortion of the hoop. The diagonal brace shall be attached at the bottom corner of the roll bar hoop on one side and the top corner of the roll bar hoop on the other side. The diagonal brace shall have no bends.

## **B.6 MOUNTING PLATES**

**B.6.1** Roll bar hoops and fore/aft braces shall be attached to the chassis of the car with mounting plates that are at least 3/16 inches thick.

**B.6.2** Carpet/padding/insulation shall be removed under the mounting plates.

**B.6.3** Mounting plates shall be either welded or bolted to the chassis.

**B.6.4** Mounting plates bolted to the chassis shall have a back-up plate of equal size and thickness on the opposite side of the chassis with the plates through-bolted together. Whenever possible, the mounting plate should extend onto a vertical section of the chassis panel.

**B.6.5** There shall be a minimum of three bolts per mounting plate, if bolted.

**B.6.6** The through holes for the bolts shall be a minimum of 3/8 inches from the edge of the mounting plate.

**B.6.7** Each mounting plate shall be no more than 100 square inches in area and shall be no greater than 12 inches nor less than 2.5 inches on a side.

**B.6.8** The mounting plate may be multi-angled but shall not exceed the dimensions in B.6.7 in a flat plane.

## **B.7 OTHER ROLL BAR DESIGNS**

Any roll bar design that does not comply with the specifications in B.2-B.6 shall be accompanied by engineering specifications signed by a registered Professional Engineer (PE) that attest that the installation is able to withstand the following stress loading applied simultaneously to the top of the bar:

- 1.5 X laterally
- 5.5 X longitudinally (for/aft) in either direction
- 7.5 X vertically

Where X = curb weight of car

with no permanent deformation to any part of the roll bar or the chassis and with no greater than 0.5-inch deflection of any part of the roll bar or the chassis as referenced to the unstressed condition. The induced loads must be carried over into the primary structure of the chassis. Other Roll Bar Designs shall comply with the specifications in