APPENDIX B. ROLL BARS FOR CONVERTIBLES

These specifications are for inspecting convertible roll bars and represent minimum requirements. The words "shall" and "shall not" indicate that the specification is mandatory. Convertible roll bars shall be inspected by and are subject to approval by the Chief Technical Inspector at each event.

B.1 BASIC DESIGN CONSIDERATIONS

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.)

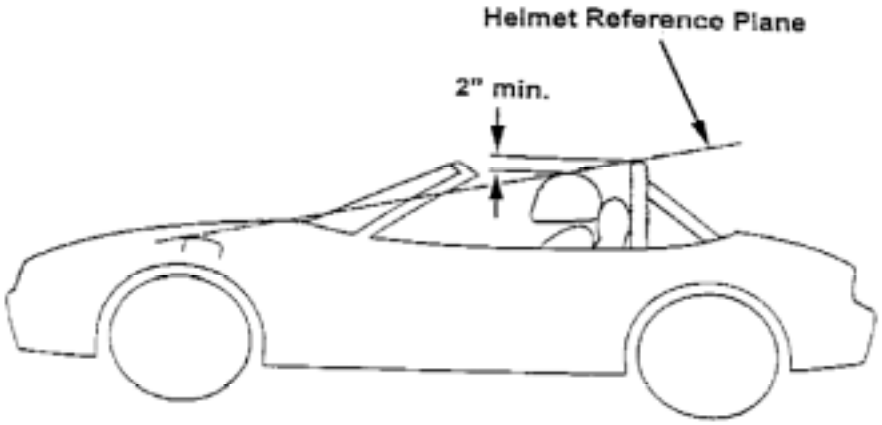

Figure 1

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 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 Curb Weight	Roll Bar Mild Steel	Alloy Steel	
Under 1500 lbs	1.5 x 0.120	1.375 x 0.090	(Outside Diameter
1501-2500 lbs	1.75 x 0.120	1.625 x 0.095	x Wall Thickness
Over 2500 lbs	2.25 x 0.120	2.00 x 0.095	in inches)
	2.00 x 0.180		

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

B.3.1 Welding shall conform to American Welding Society D1.1, Structural Welding Code, Chapter 10, Tubular Structures. Welds shall be visually inspected and shall be acceptable if the following conditions are satisfied:

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

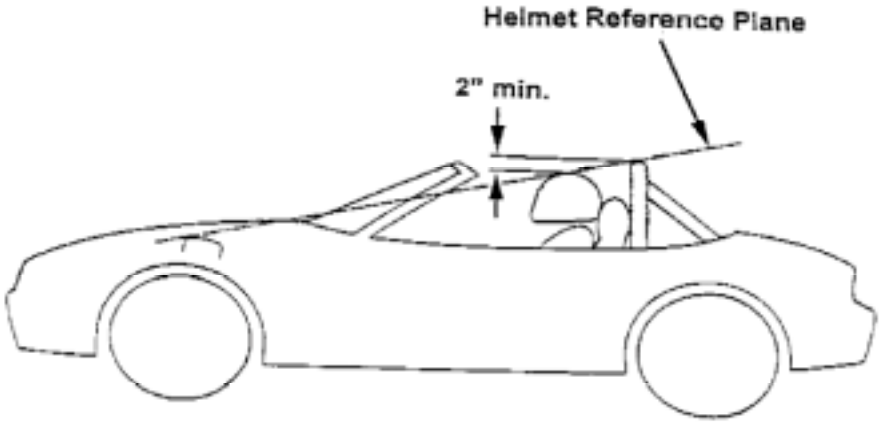

Figure 1

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.)

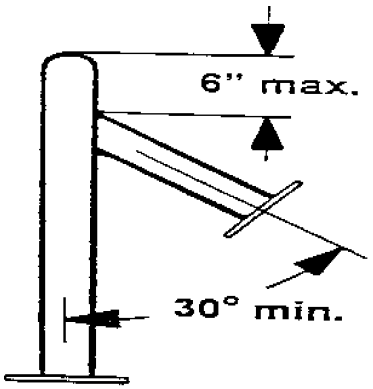

Figure 2

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 (fore/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 B.1.

CONVERTIBLE ROLLBAR CERTIFICATION
ACKNOWLEDGMENT AND RELEASE

In addition to all other pre-event preparation and inspection, I/we hereby certify that the roll bar installed in my/our convertible has been installed and checked by a qualified individual. I/We further understand that the choice of roll bar and any and all other rollover protection equipment or devices added to, or used in connection with this vehicle are entirely my choice and responsibility, that the _____ Chapter of the BMW CCA, Inc., BMW CCA, Inc. and/or its members cannot be held liable or responsible for any vehicle or its equipment, and that problems, malfunctions or damage, including the possibility of bodily injury, may occur in connection with the operation of this vehicle, prior, during or subsequent to the driving school.

I/We specifically acknowledge that the trackside vehicle spot-check which may have been performed on this vehicle cannot verify that the roll bar and any other rollover protection equipment or devices do I in fact provide adequate protection or have in fact been properly installed or used, for this high speed driving event**. No representations or warranties are implied or expressed** as to the quality or adequacy of any roll bar, or rollover protection equipment or device, its manufacture or installation by any spot check of the vehicle or by permission to enter and drive this vehicle in this High Performance Driving School. I/We do not rely on _____ Chapter of the BMW CCA, Inc., BMW CCA, Inc. and/or its members in any way in my/our decision to so equip my/our vehicle or drive the vehicle in this High Performance Driving School.

I/We acknowledge that the inspection of my/our convertible and roll bar, as equipped, by members of the _____ Chapter of the BMW Car Club of America, Inc., is for the purpose of determining whether my roll bar appears from a visual inspection to be attached and intact. **I/We acknowledge that there is being made no guarantee of fitness for use or particular purpose, and that I am relying solely on my own judgment and decision in using my convertible, as equipped, in a Club event and in choosing such equipment for use in a Club event**. I release, acquit and forever discharge the BMW Car Club of America, Inc., its Chapters, officers, members, employees, lessors, associates, successors, or assigns from any and all liability, claims, demands or causes which may arise from any injury sustained by me, whether or not due to their negligence, including bodily injury.

I represent that I am the age of 18 years (or if between 16 and 18, both I and my parent have signed a Minor Release waiver), that I understand that I am participating in a dangerous event, and that my roll bar or other Rollover equipment or device may, in fact, not fully protect me under the circumstances of my participation in this event. **I further represent that I have read the foregoing in its entirety, and I fully understand its contents.**

Date: _____ Signed by:

_____

Signed by: _____

The parent of any participating minor must read and sign this certification, acknowledgment, and release prior to said minor's participation in the event.