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TRIANGLE Z CLUB & TARHEEL SPORTS CAR CLUB

Driving School & Time Trial Series

Technical Specifications Guide

TRIANGLE Z CLUB & TARHEEL SPORTS CAR CLUB

Technical Specifications Guide

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Credits

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Introduction

The purpose of Annual Technical Inspection is to ensure each and every vehicle entered in a THSCC/TZC event is thoroughly inspected on a lift, once each season, by someone other than the owner and/or driver. Annual Tech will help insure that the vehicle is track worthy enough to last a typical track event weekend. Breakdowns are both dangerous and disruptive to the event and can be minimized by performing normal preventative maintenance. Critical systems, such as suspension, brakes, steering and cooling, should be well maintained and in serviceable condition when the vehicle is presented for annual tech. Fully serviceable condition is defined as a component that is expected to perform its intended function for the current track season or calendar year. It is recommended the owner/driver have a shop manual on hand to verify service wear limits. The Annual Inspection sticker will only be issued to vehicles inspected by the manner described in this document.

Any non-OEM modifications or components must be secure and not interfere with safe operation of the vehicle. It is the solely the responsibility of the owner and driver to ensure, at all times, the safety and suitability of their vehicle for high-speed track events, in particular the HPDE or Time Trial Series. Persons performing the inspection are not responsible for the condition of the vehicle or the actions of its driver. The Driver must sign the statement at the bottom of the Tech form acknowledging the above statement before the inspector stamps or signs the tech form. This guide and requirements are NOT a guarantee against serious injury or death to those involved in the HPDE or Time Trial Series in any capacity.

Items are listed in the order they appear on the Annual Technical Inspection Form. Where applicable, the SCCA General Competition Rules (GCR), SCCA Time Trial Rule (TTR), or Department of Transportation requirements are referenced. Detailed drawings and safety equipment installation documentation have been included to aid in the proper installation and verification of non-factory supplied equipment.

1.0 Vehicle Interior

1.1 Throttle Pedal

Check for smooth travel and positive return

1.2 Rear View Mirror

Required. Must be securely mounted and consistent with the ability to pass State Inspection. Conditional waivers may be given, pending correction by the owner.

1.3 Windshield Wipers

Required. Check and verify operation consistent to pass State Inspection. Conditional waivers may be given; pending correction by the owner.

1.4 Glass

Pitting, chips, and small cracks are acceptable provided the structural integrity of the windscreen is not compromised.

Verify door windows roll down completely.

Verify DOT Safety Glass, Lexan, or Polycarbonate

1.5 Brake Pedal

Verify firm brake pedal. Soft and/or excessive pedal travel is not permitted or acceptable.

1.6 Steering

Verify smooth operation without excessive free play or leaks. More than two inches of total free play at the outer radius of the steering wheel rim is unacceptable. Verify against factory service manual for actual specifications.

2.0 Underbody/Suspension

2.1 Brake Pads

Verify the pads on the vehicle will be the same as used on track. If the driver plans to change pads upon arrival at the track, they are required to have those pads available for inspection when the vehicle is presented for annual tech. Pads and/or shoes used on track must not be less than the manufacturer's minimum thickness or .250" of friction material.

2.2 Steering linkage/Rack/Tie Rods

Securely mounted, dust boots in place. No excessive play in rack assembly. Tie rod assembly, idler arms and/or steering arm components must be in fully serviceable condition suitable for high speed track use.

2.3 Shock Absorbers/Struts

Oil seepage on struts is acceptable. Verify that mounts and bushings are in good condition. Each corner of the vehicle should settle after one bounce to insure high-speed stability during track use.

2.4 Ball Joints

Wear indicators must not exceed the factory specification and be in fully serviceable condition for high speed track use.

2.5 Tires

It is not required to present track tires at the Annual Tech Inspection.

Tires used on track must meet or exceed the speed rating specified by the vehicle's manufacturer. H speed rating is the required minimum, unless the OEM specifications are greater. Tires must be in good condition. Tires must not show cords at any time during the event. In order to facilitate wet weather use, the minimum tread depth should be 3/32" or .0937". Drivers using slick tires will not be permitted to run during wet conditions. We do not recommend the use of a repaired, plugged, or patched tire for high speed operation. Verify driver/owner is aware of the tire manufacturer's minimum and maximum recommended values of inflation pressure. Drivers are reminded that tires should be constantly monitored during the event for wear and inflation pressures.

2.6 Wheel Rims and fasteners

Inspect carefully for cracks or signs of impact damage. Wheel fasteners should be torqued to manufacturer specification or 90 ft lbs. Drivers are reminded to re-torque wheel fasteners before each track session. Threads of wheel studs must be at a minimum flush with the top surface of the wheel nuts. Threads of wheel bolts must fully engage the hub to original OEM depth.

2.7 Brake calipers

Securely mounted without any signs of fluid leakage.

2.8 Brake lines

Securely mounted, rust free, without any signs of fluid leakage, and consistent to pass State Inspection. Insure sufficient clearance from moving parts or heat sources. Use heat shields where necessary. DOT rated braded steel brake lines are highly recommended.

2.9 Fuel, Fuel lines & Containers

Securely mounted, rust free, without any signs of fluid leakage, lack of fuel odor, and consistent to pass State Inspection. Verify the condition of filter, pumps and/or accumulator where possible for integrity. Insure sufficient clearance from moving parts or heat sources. Use heat shields where necessary. Gasoline or DOT approved Propane or GNG conversions are the only allowed fuel's permitted for the HPDE & Time Trial Series. Fuel can only be carried in the stock factory specification fuel tank/tank's or an SCCA/FIA rated Safety Fuel Cell installed per SCCA GCR Section 19.NOX

equipped vehicles must either remove the NOX bottle or verify 0 pressure in the system.

2.10 Suspension Location Points

Bushings and mounts in fully serviceable condition. Make certain any surface rust has not compromised the structural integrity of the vehicle.

2.11 Wheel Bearings

Tapered bearings should not have any play. Slight endplay in sealed units is acceptable. Endplay should not exceed manufacturer's maximum. Vehicles presented for Annual Tech must not have marginal wheel bearings.

2.12 CV Joints

Boots in good condition and not ripped or torn. CV joints and mounting hardware should be tight with shafts in good condition.

2.13 Motor Mounts

Check for cracks, separation, or other signs of failure where rubber meets metal. This is a common cause of breakdowns during track events.

2.14 Exhaust

Must be secure, leak free, and exit behind the driver. Drivers are reminded the venues we attend enforce a 93dB sound limit. Sound measurements are taken by track management to ensure compliance. Annual tech inspection can not check for sound limits. The driver should be aware that an excessively loud car may be excluded from the event by the venue. For the purpose of Annual Tech, rotary engines require a muffler to meet the 93dB limit.

3.0 Vehicle Exterior

3.1 Brake Lights

Two functional brake lights are required. A conditional waiver may be given pending driver/owner correction.

3.2 Fluid Leaks

Slight oil seepage is common and acceptable. If the vehicle drips oil to the extent that it puddles on the floor, leakage is unacceptable. Any evidence of cooling system leaking is not acceptable. Pressure checking the cooling system is highly recommended. This is a common cause of breakdowns, is disruptive to the event, and poses safety issues.

3.3 Exterior Mirror

Left side mirror is required. It must be secure and functional.

3.4 Panels & Trim

Doors must latch and secure properly. Hood and deck lids must latch properly or be secured with retention devices such as hood pins. Bumper covers and spoilers must be secure.

3.5 Gas caps are required.

4.0 Engine Bay & Trunk

4.1 Battery

It must be firmly secured by OEM or a metal clamp and/or strap to a metal base. There should be no visible leaks or acid corrosion. Cables must be secured and in good condition

4.2 Relays & Electrical Harnesses

Secured, taped, and/or tie wrapped to protect from moving parts and protect from damage where passing through bulkheads. Conditional waivers may be issued pending correction by owner/driver.

4.3 Throttle Linkage

Where applicable, manually operate by hand and ensure smooth operation and cables free from fouling.

4.4 Fuel lines

Secure with no evidence of leakage and protected from heat sources.

4.5 Fan Belts & Hoses

Fan belts and hoses must not show evidence of dry rot, swelling, softness, cracks or abrasion. Failure of these components is a common cause of on-track breakdowns and is disruptive to the event. Pressure checking the cooling system is highly recommended.

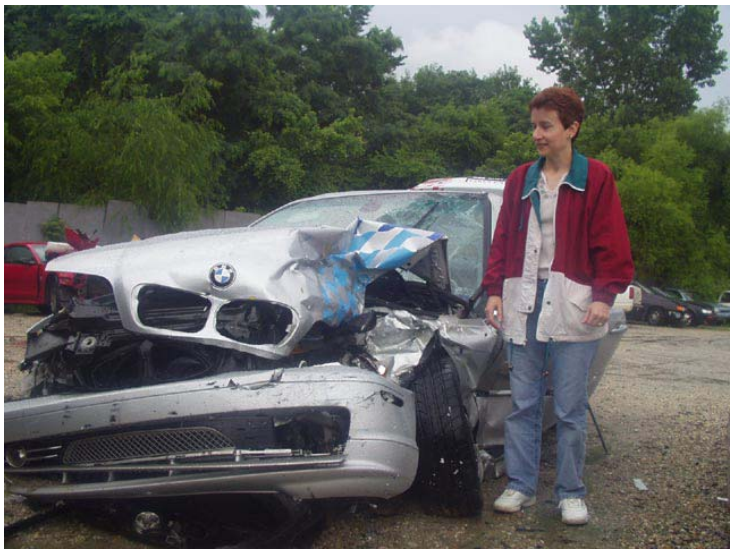
4.6 Brake Fluid

Cars must have clear fresh fluid when presented at annual tech and must be flushed within 3 months of an event. DOT 3 or DOT 4 high temperature rated fluid is recommended. However, the "freshness" of the fluid is more important then it's temp rating when new. This is of critical importance.

4.7 Exhaust Headers

Inspect and listen for leaks. This is a safety issue if exhaust fumes accumulate in the cockpit.

5.0 Personal Safety (Driving School)



THSCC member Penny Vitacco inspecting the remains of her once new 330ci the morning after taking a near head on hit on the driver's side on her way home from work.

Modern passenger cars are capable of providing a high level of protection. It is strongly recommended that vehicles used for both daily transportation and track use not compromise existing safety equipment. Vehicles used for the HPDE must, at minimum, meet State Inspection Standards.

No additional safety equipment is required to participate in the HPDE other than the use of a SNELL SA2005 or SFI 31.1 rated (minimum) helmet.

Many drivers attempt to install competition harnesses in passenger cars to cope with the higher g-forces encountered during track driving. For the vast majority of vehicles, it is not possible to safely mount competition harnesses because there is no proper place to mount and position the shoulder harness as well as making sure that the anti-sub strap passes through the center of the seat bottom cushion. In many cases, "harness bars" that are used for shoulder harness mounting are too small, untested, and of unknown strength.

Harness bars should only be used to guide or position a harness. They must never be used for the anchorage of shoulder harnesses. Harnesses must be

anchored to a structural member or bulkhead with proper reinforcement. Keep in mind that "peak loads of any lap or shoulder mounting point in a 35mph impact to a solid barrier is approximately 3,000 lbs for 60 to 70ms for a person of 175 lbs."

Shoulder straps should never run downwards from the backrest (or backrest slots) more than 0 to 10 degrees from a horizontal plane without a harness guide bar that can take the load applied during a crash. The backrest of any seat, including race seats, are not designed to take this load and will collapse.

The recommended solution for dual-purpose vehicles are:

1) 3 point OEM seat belt system or,

2) Schroth street legal ASM 4 pt harnesses systems that meet German TÜV, ECE-R 16.04, and US-DOT FMVSS 209. As these systems have been crashed tested and certified for use on public roads, they are acceptable for the HPDE as an alternative to stock 3 point belts or competition harnesses. However, the stock system must be retained for use at the discretion of the instructor. Note, the ASM system is not compatible with a HANS device.

If a driver so chooses, competition harnesses can be used for the HPDE but they must without exception, be installed in compliance to the current SCCA GCR (Section 9.3.19). Competition harnesses that fall under the SCCA GCR are covered in this document in Section 6.

The appendix lists detailed drawings and descriptions to guide harness installation to ensure compliance. OEM replacement harnesses having the DOT label will have been tested to FMVSS209 Federal Certification. They will be specific to a make and model or be included on the list of make, models, and possibly seat type for which they are certified. It is mandatory for the driver/owner to produce this documentation to allow inspection of the vehicle. These documents can be obtained from the manufacturer and should be included with the harnesses. If this documentation is not present, it must be assumed the harnesses do not meet FMVSS 209 and will not be acceptable.

Examples of DOT spec harnesses are given in the Appendix of this document.

5.1 Driver & Passenger Restraints

5.1.1 Must be one of the following:

- Factory Stock 3 point system DOT (FMVSS209)
- Schroth Profi II ASM, Quick Fit Pro (limited BMW Mini, VW/Audi, and Subaru applications only), AutoControl II, Auto Control III, tested and certified to FMVSS209.
- SFI 16.1,116.5 or FIA 8853/89, 8854/98 certified 5 or 6 point Harness installed per SCCA GCR Section 9.3.19. The SFI or FIA certification label will indicate the date harnesses expire. The club policy is belts must not be older than 5 years.

See Appendix Figures 1, 2 and/or 3 for some examples of installation and threading but always use what the manufacture specifies.

5.1.2 All harnesses, hardware, retractors, and mounts must be in good condition, free of cuts, tears, excessive chafing, or signs of excessive UV damage that can reduce effectiveness regardless of age and type.

5.1.3 Stretch indicators must not be visible.

5.1.4 THSCC/TZC enforces an "Equal Protection Policy". This requires both driver and passenger have available the same level of protection. This applies to Seats, Harnesses, Padding and all installed safety equipment.

5.1.5 Harnesses must be inspected with the driver of the car seated in their normal driving position.

5.1.6 The driver's (and passenger's) head with helmet must fit inside the vehicle when seated in the normal driving position. The top of the helmet must not exceed beyond the height of the roof or T-Top along a plane starting from the top of the windscreen frame to the top of the rear C pillar (or Roll Bar, if equipped). There are no exceptions to this minimum requirement. 2" clearance is highly recommended.

5.2 Helmets

Helmets used for the HPDE must be SNELL Foundation rated SA 2005, SFI 31.1a, 31.2a or higher. Such helmets will have a SNELL or SFI sticker designation either under the padding or embossed on the outer rear of the shell.

- SNELL designates the SNELL Memorial Foundation.
- SA designates Special Applications for Motorsports.
- SHA designates helmets with tether mounts factory installed.
- M (Motorcycle) rated helmets are no longer acceptable.
- SNELL SA2005 or SA2010/SAH2010 rated helmets are required.
- The number designates the year the helmet was rated. Designations older than 10 years are not acceptable.
- Example: SA 2000 will expire Dec 31, 2010.
- SFI designates the SEMA Foundation Inc. safety rating.

5.3 Convertibles

Convertibles must have a roll bar to participate in the HPDE. This is a requirement of all venues where we currently hold events. Hard top vehicles do not require roll bars to participate in the HPDE.

5.3.1 Targa or T-Top models are not classified as convertibles and thus do not require a roll bar.

5.3.2 Convertibles with removable roofs installed are still convertibles and require a roll bar.

5.3.3 Roll Bars must meet either SCCA Time Trial Rules spec as defined in the current SCCA TTR. Level 3 or THSCC-TZC Time Trial Spec. See details in Section 6 of this guide.

5.3.4 Factory installed "head rest braces", "roll hoops", or aftermarket "style bars" do not meet this requirement.

5.3.5 Roll bars must be installed per the requirements in the SCCA TTR (Time Trial Rules) for Level 3. See details in Section 6.

5.3.6 The roll bar must be padded with SFI 45.1 rated high density padding in areas where a helmet may contact. Assume 6 inches minimum for seat and/or harness displacement.

5.3.7 Both the driver and passenger must use arm restraints.

5.4 Driver Clothing

Drivers and passengers, when on track, must wear long sleeve shirts and long pants of natural fibers with closed toe leather top shoes. Driving suits are recommended but not required.

6.0 Personal Safety (Time Trial Series)

An example of forces involved in a roll over exiting a low speed corner.

The requirements in this section only apply to vehicles entered in the Time Trial Series, and do not apply to HPDE participants/vehicles.

One aspect that separates the THSCC/TZC Time Trial Series from other organizations that hold Time Trials is closer alignment with SCCA Time Rules in regard to safety requirements and class rules.

Vehicles that have a Log Book issued from a nationally recognized sanctioning body for Club or Pro Racing, which exceeds these requirements, are not required to perform Annual Tech providing the Log Book is current and presented at event registration.

6.1 Driver Restraint System

6.1.1 Only Five (5) or Six (6) Point Harnesses systems (GCR Section 9.3.19) with either SFI 16.1, SFI 16.5, FIA #8853/98, #88854/98, certification labels are acceptable. HANS devices with compatable harnesses are encouraged.

6.1.2 Belts must not be older than 5 years. Replacement on expiration date stated on the certification label is recommended. Note: only one belt in a set may contain the label.

6.1.3 Harnesses must be installed per GCR Section 9.3.19 and/or in compliance with the manufactures installation guides. See Appendix Figure 1, 2 and/or 3 for detailed drawings and description of proper installation and threading.

6.1.4 Harnesses must be anchored to the frame, structural member of the car, or reinforced bulkhead. Each belt in the harness must have an individual mounting point. For example, there must be 2 mounts for the shoulder harness, 2 mounts for the lap belts and 1 mount for each anti-submarine strap.

6.1.5 Y-design and 4 point harnesses are not permitted for Time Trials.

6.1.6 5-point systems are recommended for vehicles where the driver is seated in an upright position. 6-point systems are recommended for reclined seating positions or when the Anti-sub strap cannot pass through the bottom of the seat.

6.1.7 If the driver is using a HANS's device the harness must be HANS compatible.

6.1.8 Belt material must be Nylon or Dacron polyester. Hardware must be metal with a metal-to-metal single quick release system.

6.1.9 All harnesses, hardware, retractors, and mounts must be in good condition, free of cuts, tears, excessive chafing, or signs of excessive UV damage that can reduce effectiveness.

6.1.10 Shoulder straps should be anchored to the roll bar and never exceeds 30 degrees upwards or 0 to 10 degrees downwards from the backrest (or backrest slots) from a horizontal plane without a guide bar or roll bar that can take the load applied during a crash. The backrest of any seat (including many race seats) is not designed to take this load, can collapse, and is not acceptable.

6.1.11 The anti-sub strap should be mounted just behind the plane of the driver's chest to where the plane of the spine would intercept the floor board and pass up directly between the legs through the bottom of the seat. When a 6 point competition harness is used, it is permissible for the leg straps to be secured at a point common to the lap belt, pass under the back rest, under the driver and up between his or her legs.

6.1.12 Effective Jan 2011 all classes will require the use of an Head & Neck restraint system. Foam collars do not constitute a Head & Neck restraint system. SFI rated Head & Neck restraint systems are recommended but not mandatory. The driver may choose the best H&N restraint system solution for their use which may include "self-contained" systems designed to work independent of the 5 or 6 point harness system. Recommended systems may include, but are not limited to: HANS, Safety Solutions (Hybrid-Pro & Rage), LFT R3, Hutchens, Isaac, G-Force (SRS-1). The H&N restraint system must be designed and tested for motorsports applications. Follow the manufactures specification for shoulder strap width as required.

6.2 Four (4) point Roll Bar

All Time Trial Series vehicles must have a minimum four (4) point Roll Bar mounted to the floor or chassis of the vehicle meeting the requirements of SCCA TTR (Time Trial Rules Sec.11.3) for Level 3 or published at:

http://cms.scca.com/documents/Club Forms/2009 TTR Book.pdf

6.2.1 The roll bar must have at least one diagonal bar, per Figures 7, 8, or 9, be mounted to the floor or chassis, and incorporate two support legs. The Roll Bar may have two diagonal brace bars as illustrated in Figure 9. In some applications, a rear chassis cross member or substantial bulk head may be incorporated as part of the upright support legs.

6.2.2 The diagonal on plane with the main hoop should incorporate a harness attachment crossbar together with the diagonal, Figure 7. This diagonal and harness attachment crossbars may be removable. Acceptable removable bar joint design is illustrated in Figure 11 and in the GCR section 18.2.

6.2.3 The design and installation of the Roll Bar must comply with the current SCCA TTR, LEVEL 3 or 4. Roll bars may either be welded or bolted to the structure of the car. "Bolt-in" bars must use SAE Grade 5 hardware with three locking or double nut fasteners and backing plates to "sandwich" the structure of the car at each mount.

6.2.4 The driver's head, with helmet, must fit under the roll bar along a horizontal plane starting at the top of the windscreen frame extending to the top of the Roll Bar. This may require competition seats to lower the driver. This requirement may not capable with OEM seats. 2" minimum clearance is preferred.

6.2.5 Roll Cages can be used as long as they meet the requirement of a nationally recognized sanctioning body such as: SCCA, NASA, BMWCCA Club Racing, PCA, etc. If the driver/owner cannot provide current cage specifications, the current year SCCA GCR will be used.

6.2.6 Roll Bars must be made of the following Materials:

Vehicle Weight	Minimum Size	Material
Under 1000 lbs	1.000 x .060	DOM Seamless Steel
1001 to 1500 lbs	1.250 x .090	DOM Seamless Steel
Over 1501 lbs	1.500 x .120	DOM Seamless Steel
	1.750 x .095	DOM Seamless Steel

6.2.7 High-density padding must be used where it is possible for the helmet to contact. Assume a 6-inch deflection for the seat back and/or harness stretch upon an impact. SFI 45.1 rated padding is required.

6.3 Helmets (GCR 9.3.20.C.2)

Helmets used for the Time Trial Series must be rated by one of the following: Snell Foundation SA2005, SFI 31.1a, 31.2a, FIA 8860-2004, BS6658-85 or higher. Current examples are SA2005 and SA2010. SNELL rating of M is not acceptable. Helmets older than 10 years are not acceptable. It is acceptable to use either SA or SAH rated helmets with H&N restraint systems.

6.4 Drivers Clothing

Fire-resistant driving suits are not required but highly recommended. Drivers must wear long sleeve and long pants of natural fibers with closed toe leather top shoes.

6. 5 Fire Extinguisher:

Minimum of one hand held fire extinguisher is required: (GCR 9.3.23B)

6.5.1 Two (2) pound minimum capacity. Halon or Dry Chemical with ABC rating.

6.4.2 Must be mounted within the drivers reach using a metal quick release bracket mounted to a metal mounting point with metal fasteners.

6.6 Requirements for Convertibles

Arm restraint systems are required on open top cars for both the driver and passenger during the event. Passengers are not permitted during the time trial

6.7 Class and Number Designations

These are required on both sides of the car. They must be a minimum of 8 inches tall and 1 ¼ stroke (thick) and of contrasting color to the vehicle. Only one set of numbers and class designations may be displayed while vehicle is on track. (National Solo Rules 3.7)

6.8 Transponders

From Jan 1 2006, the Time Trial Series will be run via AMB Timing & Scoring. All Time Trial entries requires use of an AMB TransX 260 transponder. Multiple drivers cannot share the same transponder.

The Transponder must be securely fastened to the vehicle to space with an un-obstructed view of the ground between 5 and 24 inches (2ft) height.

Transponders can be secured with rivets, machine screws, bolts or tie wraps. The supplied "T" decal should be displayed on the vehicle near the vicinity the transponder is located.

7.0 Documentation

7.1 Annual Tech Sticker

Place at the lower left corner of the windscreen

Punch out the year

Puch out either HPDE or Time Trial.

7.1.2 Approved Annual Tech facilities.

All vehicles participating in the HPDE and Time trial must have an annual tech performed. Track Inspections can be performed at any shop of the participant's choice. Inspections performed at recommended shops will qualify to receive an annual tech sticker. Alternatively, the club may reserve the right to issue a weekend tech sticker tech sticker. The club may perform a safety audit to any vehicle, at any time, during the event. Substandard vehicles may be rejected by club officials any time prior or during an event. It is the owner/drivers responsibility to ensure their vehicle is track ready before arrival at the event.

Please see the current list of recommended shops to have an annual tech performed, as well as any scheduled annual tech days, and the tech form to use on our web site.

www.timetrials.net

7.2 Helmet Sticker

Place at lower left side of helmet.

Yellow sticker designates SA rated helmets valid until 12/31/10

7.3 Annual Tech Form

Must be signed and dated by the driver/owner.

Must be signed or stamped by the person or shop that performed the inspection.

One copy should remain with the car. The signed original should be turned in at your first event registration for the season and kept on file by the HPDE and Time Trial Series Tech Director.

The Annual Tech Form is located at:

http://www.thscc.com/timetrial/

7.4 DOT Aftermarket Restraints

Must have a DOT Label and documentation, by the Manufacturer, of FMVSS209 certification and intended make and model of application.

Must have installation sheet provided by Manufacturer to verify the restraint system was installed in the same configuration it was certified.

4 Point Harnesses are not allowed.

Appendix I

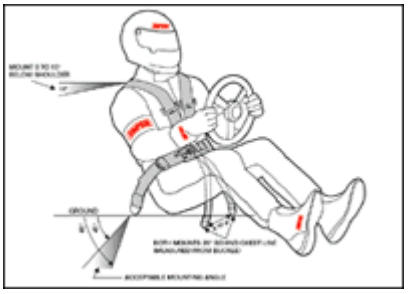
Figure 1 Simpson Race Products 5 and 6 point Harness Product Guide
Figure 2 Simpson Race Products Harness Mounting Product Guide
Figure 3 Simpson Race Products Harness Webbing Product Guide
Figure 4 GFORCE Harness Installation Guide
Figure 5 SFI Article on SFI rated competition seat belt systems

Figure 2 Typical SCCA TTR Spec Roll bar by Autopower
Figure 3 SCCA TTR Spec Roll Bar "Hard Dog" Miata Single Diagonal
Figure 4 Alternative TTR Spec "Hard Dog" Miata Double Diagonal
Figure 5 SCCA TTR Spec Roll Bar "Hard Dog" BMW Z3
Figure 11 Bray-Krause Roll bar extension for the Boxter

Figure 12 SCCA TTR Spec Roll Bar Honda Sports 2000 "Hard Dog"
Figure 13 SCCA TTR Spec Roll Bar Toyota MR2 Bethania Garage
Figure 14 Approved Roll Bar for Viper #220-601 and seat lowering kit
Figure 15 SCCA Spec Drawing for Slip Joint for Removable Diagonal
Figure 16 FMVSS 209 Rated OEM replacement Harness acceptable for HPDE only.

Figure 17 Example of acceptable Harness Bar.

UPRIGHT SEATING POSITIONS

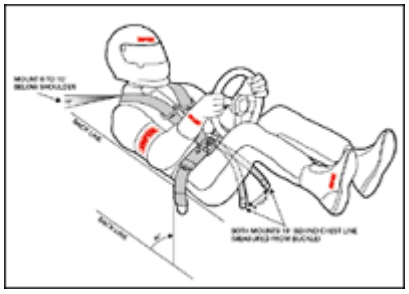


Lap Belt must be anchored to the frame rail or roll cage as close to the hip as possible at an angle of 45 degrees, but no greater than 60 degrees to the ground.

5-Point Anti-Submarine Belt should be anchored on or slightly behind the Chest Line1.

6-Point Anti-Submarine Belt should be anchored at an angle of 20 degrees behind the Chest Line as measured from the intersection of the Chest Line and the lap belt buckle. Mounts should be approximately 8 to 12 inches apart (approximately located under each hip and as close to the body as possible). Two routing holes in the seat or a special seat mount may be required. Using the 5-Point hole detracts from the effectiveness of this system.

RECLINED SEATING POSITIONS



Center Shoulder to Center Hip angles between 30 to 50 degrees to the ground.

Lap Belt anchors must be positioned at an angle of 60 degrees in relation to the Back Line2 and mounted to the frame rail or roll cage as close to the hip as possible.

5-Point Anti-Submarine Belt should be anchored approximately 10 degrees behind the Chest Line as measured from the intersection of the Chest Line and the lap belt buckle.

6-Point Anti-Submarine Belt should be anchored at an angle of 10 degrees behind the Chest Line |as measured from the intersection of the Chest Line and the lap belt buckle. Mounts should be approximately 8 to 12 inches apart (approximately located under each leg, even with the pelvis).

ALL SEATING POSITIONS

Anchor shoulder straps at point zero to 10 degrees below the top of the shoulder. Note: Preferred mount is as close to shoulder as possible.

Shoulder Harness Adjusters should be located in line with the bottom of the sternum (lower chest area).

During adjustment of the belts, make sure that webbing enters and exits straight and in-line with all adjusters and mounting hardware.

Figure 6 Simpson Race Products 5 and 6 point Harness Product Guide

MOUNTING BRACKETS

Mounting brackets should be installed at an angle that is compatible with the direction of pull on the webbing under full load. Preferred mount is in a double shear with allowance for the bolt-in bracket to pivot and align toward the direction of the load as shown in Figure 1.

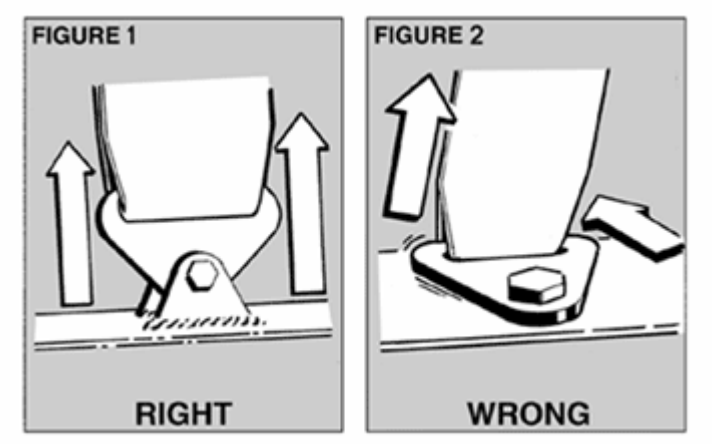


Figure 1 and Figure 2
All mounting brackets should be attached directly to the frame or chassis of the car and installed to limit the driver's body travel both upward and forward. Do not weld around or near belts or belt hardware.

Minimum specification for bolts and washers to attach the seat belts, harnesses and anti-submarine belt hardware are Grade 8.

Wrap Around style mounts should have a provision to prevent lateral or side-to-side movement.

DO NOT MOUNT TO THE SHEET METAL FLOORBOARD. ALL MOUNTS SHOULD HOLD A MINIMUM OF 3,000 LBS.FORCE.

Figure 2 Simpson Race Products Harness Mounting Product Guide

WEB INSTALLATION

Belt webbing must have an unobstructed travel path. Allow a minimum 1-inch space around the belts in the seat opening for anticipated travel. Your belts will move in the direction of the impact. Make sure this area is clear of obstruction.All edges including any seat holes must have an edge guard to protect the webbing against abrasion and cuts.

Keep belts away or protected from sources of heat (i.e., exhaust headers and welding).

UNDER NO CIRCUMSTANCES ARE BOLTS INSERTED THROUGH BELT WEBBING ACCEPTABLE FOR MOUNTING.

"LOCKING" the 3-Bar Slide Adjuster shown in Steps 1 through 4 is VERY IMPORTANT. The 3-Bar Slide Adjuster must be located as close as possible to the Bolt-in bracket or Roll Bar (in Wrap Around design).

Figure 3 Simpson Race Products Harness Webbing Product Guide

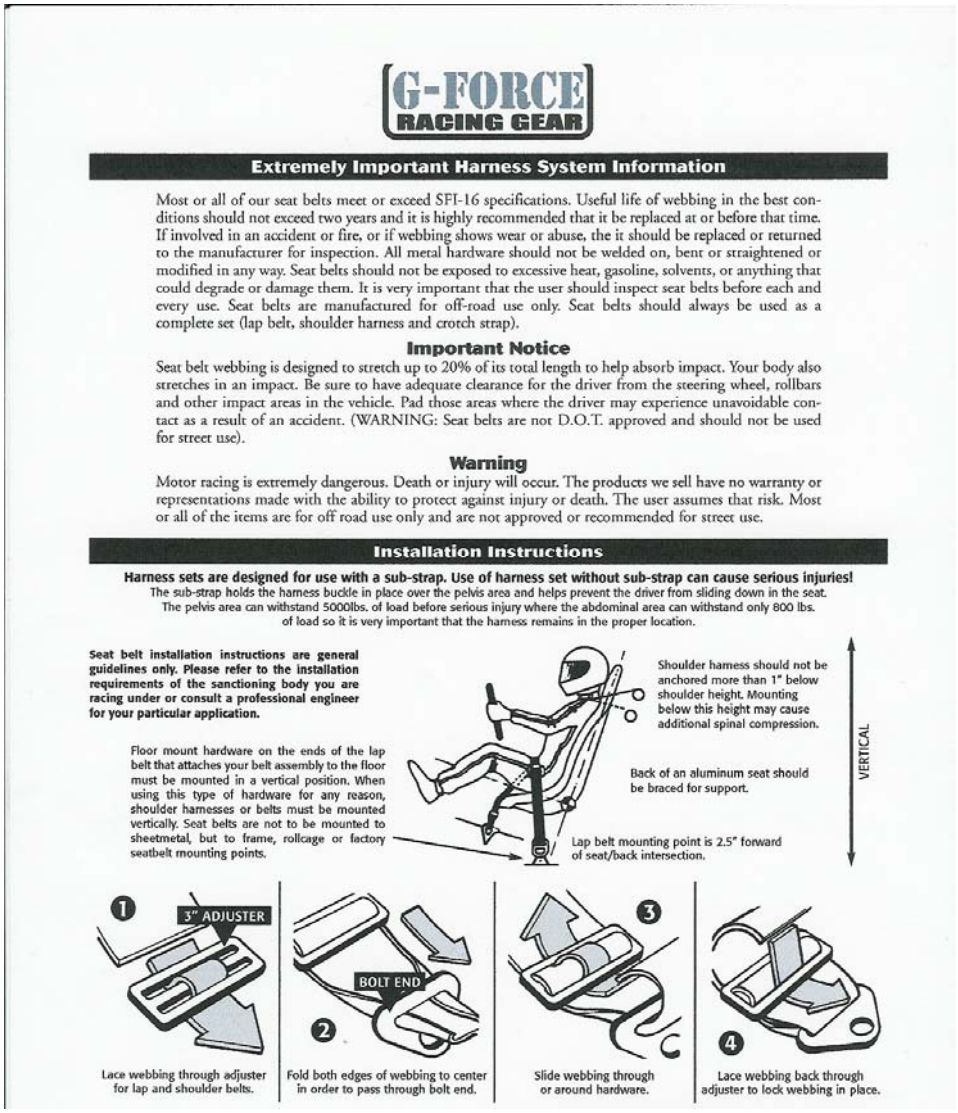


Figure 4 GFORCE Harness Installation Guide

Figure 5 SFI Article on SFI rated competition seat belt systems (three pages)

SEAT BELTS
Essential to Driver Safety

by Jennifer M. Bowden

The primary goal of any race car driver is to be the best and cross the finish line first. This is achieved by putting long hours of hard work into the engine and tweaking the chassis just right. A lot of thought goes into shaving every fraction of a second off lap time in order to gain even the slightest advantage over competitors.

Hopefully just as much thought goes into driver safety equipment as into the engine. Using quality safety equipment can help a driver get to the finish line in one piece as well as first.

An integral part of safety equipment is the driver restraint assembly, or seat belts, to keep the driver inside the roll cage where the least amount of injury will occur in a crash.

The Anatomy of a Seat Belt

A restraint assembly consists of several components, each with a specific function. The shoulder harness is a belt assembly, one strap for each shoulder, intended to restrain movement of the upper torso and shoulder regions. An optional cross strap across the chest can be used to hold the shoulder harness together. The lap belt restrains movement of the pelvis and the anti-submarine strap prevents the pelvis from slipping forward from under the lap belt in the event of an accident.

The buckle which attaches the belts together should have a quick and easy release mechanism in the case of an emergency situation. There are three types of buckles to choose from: latch/lever, turn/push, and cam lock. All three can be opened in 1 or 2 motions.

A restraint assembly also utilizes two types of hardware. The adjustment hardware is used to alter the length of the individual straps to fit the driver. Mounting hardware secures each strap to the vehicle.

SFI Helps Maintain Quality Assurance in Seat Belt Performance

The purchase of belts should be based on more important criteria than whether or not the color matches the car. One way to tell if one manufacturer's restraint assembly is more reliable than another's is to look for belts that are certified to meet performance specifications. Manufacturers whose products pass the standard laboratory tests participate in the SFI Foundation, Inc.'s certification program.

What is SFI Foundation, Inc. and what do they do? SFI is a non-profit organization established to issue and administer standards for all kinds of specialty/performance automotive and racing equipment. Manufacturers of equipment are the primary users of SFI standards. Some standards are adopted as part of the rules of race sanctioning bodies. Ultimately, the consumer benefits from the program because it establishes recognized levels of performance or quality for a product such as driver restraint assemblies.

The specifications are created through a committee process. Technical committees are comprised of individuals from all facets of the industry who provide a comprehensive cross-section of knowledge. Such diverse expertise and open participation is the means by which standards are fairly established.

Participation in the program is purely voluntary, so this does not mean that all manufacturers not in the program produce inferior belts. Their restraint assemblies may be just as good as one that is certified, but they merely choose not to participate in the SFI program. However, to ensure quality belts, it would be a good idea to look for the SFI label.

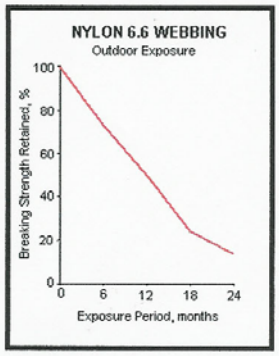
The standard that applies to safety belts is SFI Specification 16.1. The spec defines a driver restraint assembly and outlines basic design dimensions and requirements. It also explains the testing procedures in detail and how to interpret the test results to determine if the product meets the required criteria and thus passes the test.

Once a product is passed, the manufacturer installs SFI certification tags on the belts which display the date of manufacture. The purpose of the dated certification tags is to enable drivers and race officials to easily determine when the belts reach their 2-year life span. One of the most important requirements of the specification states that the useful life of the webbing in the straps of the restraint assembly shall not exceed two years and they must be replaced at or before that time. Only the original manufacturer can reweb an assembly prior to recertifying.

Seat Belts Should be Inspected and Recertified Every Two Years

Restraints must be maintained, inspected, and replaced or rewebbed **every two years** because they degenerate from exposure to the elements and over time. Prolonged exposure of seat belt webbing and thread to sunlight can cause degradation of the fibers and loss of restraint integrity.

The rate at which the breaking strength of the webbing decreases with outdoor exposure is illustrated in the graph below. The webbing used in motorsports restraints is typically made with DuPont Nylon 6-6 or a similar product. According to the data, the webbing loses about half of its strength in one year.



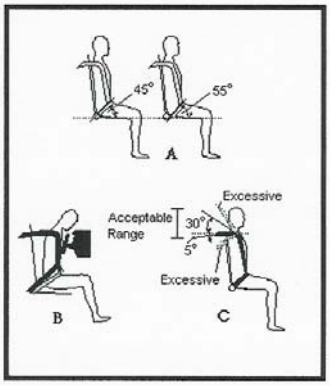
With this kind of rapid deterioration, it is obvious why replacing the webbing every two years is essential to driver safety. Old and weakened belts could easily snap under the loads imposed upon them in an accident situation. Failure to properly restrain the driver in a crash would have devastating consequences.

Proper Installation is Important

The effectiveness of a restraint assembly is also influenced by attachment techniques. The principal precaution for installing the mounting hardware to the vehicle is to minimize bending stress in the fitting. This is achieved by making sure the belts pull from a straight angle against the hardware. The assembly should be installed so that the straps do not rub against any surface that can cause the webbing to fray. The anchoring mechanisms should also periodically be checked so that they don't become loose or weakened.

Proper installation of the restraint assembly also means achieving the correct fit to the driver. Belts should be as short as possible to reduce stretching for better control of occupant movement.

The attachment points must provide the optimum geometry to minimize movement of the belts. Lap belts perform best when they act at an angle between 45° and 55° relative to the longitudinal axis of the vehicle as illustrated in part A of the Figure. This angle permits the lap belt to react to the upward pull of the shoulder harness. A system installed with a shallow belt angle, as shown in part B of the Figure, permits the shoulder harness to pull the lap belt up off the pelvic area and into the abdominal region with the likelihood of injury to internal organs.



The end attachments of the shoulder harness must also be installed at appropriate angles. The ideal position is anywhere between 5° below and 30° above the driver's shoulder, as seen in part C of the Figure.

If the upper attachment point falls significantly below the driver's shoulder, then a spinal compression injury is likely to occur. In an accident situation, the shoulder belts pull down and back on the torso as they resist the forward motion of the driver. The resultant restraint force compresses the spinal column and will add to the stresses in the spine already caused by the force of the crash impact.

On the other hand, if the trailing ends of the harness are too far above the shoulder (greater than 30°), then two problems can occur. First, tension in the shoulder harness is increased and undue stress is

applied to the harness and its structural attachments. Second, excessive angle will cause excessive motion. If the harness belts are too far above the shoulder, they will provide little resistance to forward motion of the driver's upper torso. The result is impact with the steering wheel and the possibility of neck injury. The shoulder straps should also be 3-6" apart behind the driver's neck to prevent slippage off the shoulders.

The reliability of a restraint system is greatly affected by the way it is installed. It is imperative to follow the installation instructions provided by the seat belt manufacturer. Also, the necessity of replacing or rewebbing seat belts every two years cannot be more important.

As cars become more advanced and consequently go faster, everything possible must be done to make the racing experience safe as well as fun. Failure to do so can cause serious injury, or worse. If there is anything that can be learned from the sport of racing, it's that anything is possible, and taking the attitude that "it won't happen to me" is risky, because it does happen.

Photo examples

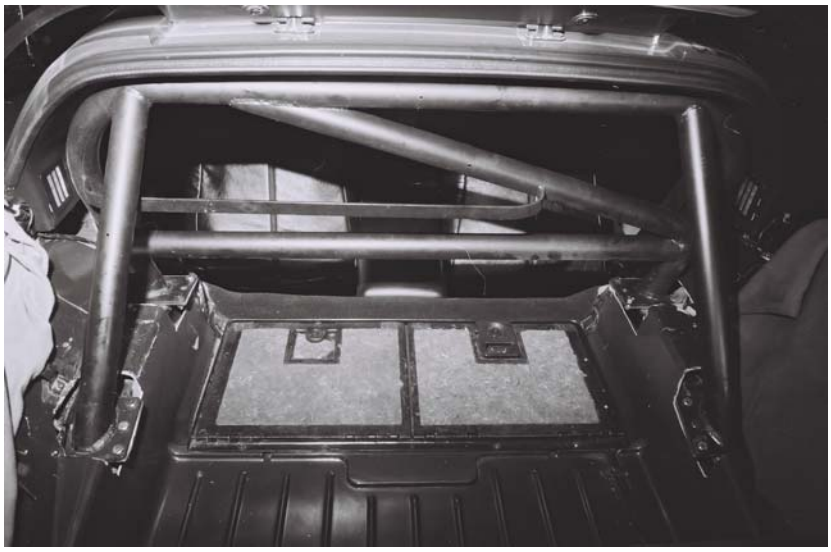


Figure 7 Typical SCCA TT Spec Roll bar by Autopower

Figure 8 SCCA TTR Spec Roll Bar: "Hard Dog" by Bethania Garage Single Diagonal

Figure 9 Alternative TT Spec "Hard Dog" Double Diagonal

Figure 10 SCCA TTR Spec Roll Bar BMW Z3 Bethania Garage

Figure 11 Bray-Krause Roll bar extension for the Boxter

Figure 12 SCCA TTR Spec Roll Bar Honda Sports 2000 Bethania Garage

Figure 13 SCCA-TT Spec Roll Bar Toyota MR2 Bethania Garage

Figure 14 SCCA/NHRA Dodge VIPER Roll Bar #220-601 snakeoylproducts.com
Seat lowering Kit #222-532-100-00 required

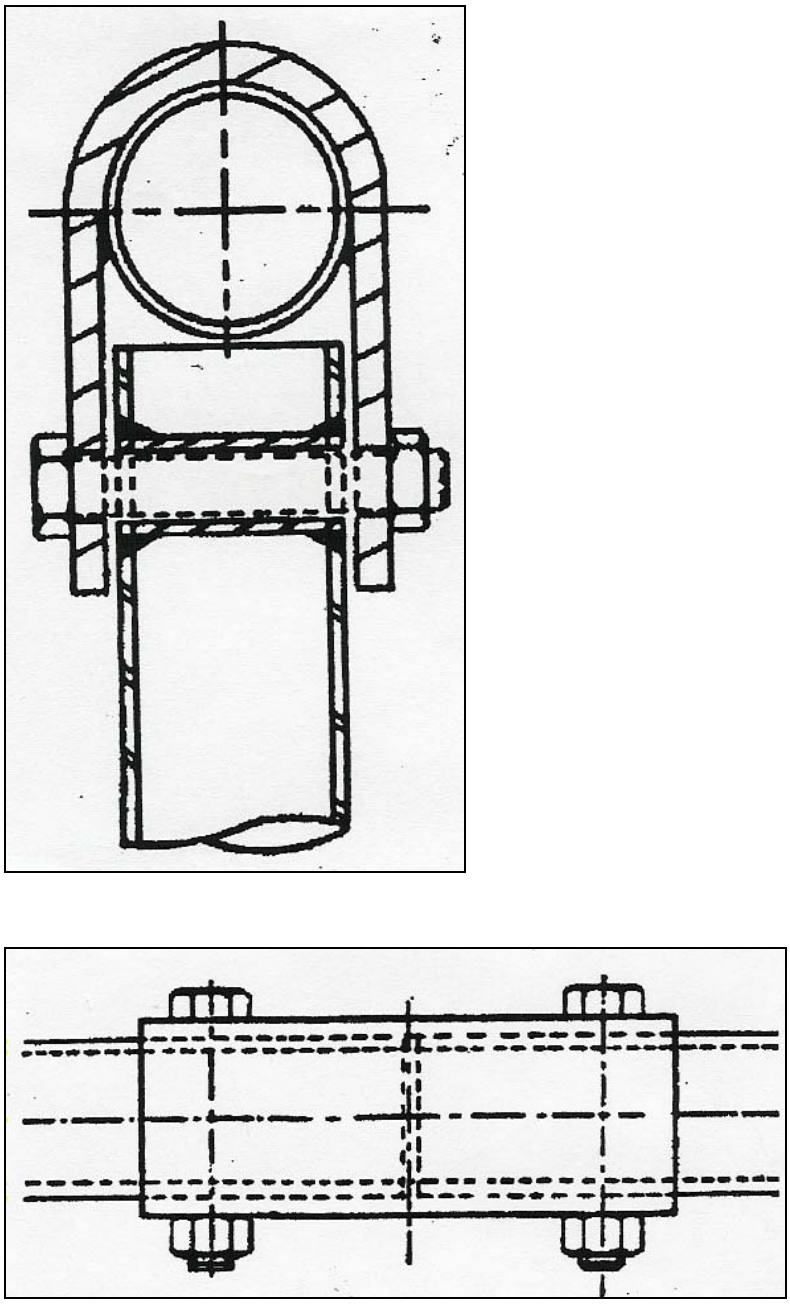


Figure 15 SCCA Spec Drawing for Slip Joint and Removable Diagonal

Refer to Schroth web site for installation information and documentation:
http://www.schrothracing.com/main/Documents

Figure 16 Schroth DOT-FMVSS 209, TUV, and ECE-R 16.04, 3 pt Street Legal Vehicle Specific Harness. Make and model of the applicable car is printed on the tail strap label. ASM Autocontrol II, PROFI II ASM, and Quick Fit PRO

Figure 17 Acceptable Harness Bar and seat back brace mount.

Index

History

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