

2011 Collegiate Design Series Baja SAE® Rules Table of Contents

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**2011 Baja SAE Rules
 Partial List of rule updates/changes**

This introduction list to the 2011 Baja SAE rules is intended to highlight areas of the 2011 Baja SAE Rules that you may find of interest or a change that has been made to a rule.

These are not the complete changes---Caution – Neither this list of updates/changes nor any summary to the rules is a substitute for thoroughly reading and understanding the rules. You are responsible for knowing and following all the Baja SAE rules.

Please be sure to reference the Baja Forum... http://forums.sae.org/access/dispatch.cgi/bajasae_pf for all updates.

B10.3.2 Anti-Submarine Belt / Lap Belt Mounting (revised rule)

B3.1 General Electrical System Overview (revised rule)

B3.5 Brake Light switch (revised rule)

B8.3.2 Roll Hoop Overhead members (revised rule)

B8.7 Front Bracing (revised rule)

B8.8.2 Rear Bracing (revised rule)

B8.6 Under Seat Member (revised rule)

B11 Braking Systems (new rule)

B12.9 Fuel Containers (revised rule)

NOTES PAGE

2011 Baja SAE Rules

PART A: ADMINISTRATIVE REGULATIONS

ARTICLE 1: BAJA SAE OVERVIEW

The Baja SAE[®] competition originated at the University of South Carolina in 1976, under the direction of Dr. John F. Stevens. Since that time, the Baja SAE Series has grown to become a premier engineering design series for university teams.

A1.1 **Baja SAE Program Objective**

Baja SAE is an intercollegiate engineering design competition for undergraduate and graduate engineering students. The object of the competition is to simulate real-world engineering design projects and their related challenges. Each team is competing to have its design accepted for manufacture by a fictitious firm. The students must function as a team to design, build, test, promote and compete with a vehicle within the limits of the rules. They must also generate financial support for their project and manage their educational priorities.

A1.2 **Design Subject (NEW)**

Each team's goal is to design and build a single-seat, all-terrain, sporting vehicle whose structure contains the driver. The vehicle is to be a prototype for a reliable, maintainable, ergonomic, and economic production vehicle which serves a recreational user market, sized at approximately 4000 units per year. The vehicle should aspire to market-leading performance in terms of speed, handling, ride, and ruggedness over rough terrain and off-road. Performance will be measured by success in the dynamic events which are described in the Baja SAE Rules, and are subject to on-event weather and course conditions.

A1.3 **Good Engineering Practices**

Vehicles entered into Baja SAE competitions are expected to be designed and fabricated in accordance with good engineering practices.

ARTICLE 2: BAJA SAE SERIES

A2.1 The Baja SAE Series will consist of six competitions. Three competitions are held in North America under the sponsorship of SAE:

Baja SAE Birmingham – Hosted by the University of Alabama at Birmingham

Baja SAE Kansas – Hosted by Pittsburg State University

Baja SAE Illinois – Hosted by the Central Illinois Section

Baja SAE competitions held in Africa, Asia and South America are associated with SAE, but organized and sponsored by their local hosts:

Baja SAE Brazil – Sponsored and hosted by SAE BRASIL

Baja SAE Korea – Sponsored and hosted by Yeungnam University

Baja SAE South Africa – Sponsored by Sasol and hosted by the University of Pretoria

A2.2 All Baja SAE competitions have open registration policies and accept teams of university students from any country.

A2.2.1 Some sections of rules governing Baja SAE events held outside North America are specific to these competitions. Such variations are published on the individual websites.

A2.2.2. The dynamic events at competitions differ. Teams should check the websites of the specific competitions they are planning to enter and consider any unique requirements that might affect the design and fabrication of their vehicle.

A2.3 Official Announcements and Competition Information

Teams are required to read the articles posted on the Baja SAE homepage

(<http://students.sae.org/competitions/bajasae/>) published by SAE and the other organizing bodies. Teams must also be

familiar with all official announcements concerning the competitions and rule interpretations released by the Baja SAE Rules Committee.

A2.4 Official Languages

The official language of the Baja SAE Series is English. Document submissions, presentations and discussions in English are acceptable at all competitions in the series.

Team members, judges, and officials at non-U.S. competition events may use their respective national languages for document submissions, presentations and discussions if all the parties involved agree to the use of that language.

Baja SAE Birmingham	English
Baja SAE Kansas	English
Baja SAE Illinois	English
Baja SAE Brazil	English and Portuguese
Baja SAE Korea	English and Korean
Baja SAE South Africa	English and Afrikaans

ARTICLE 3: BAJA SAE RULES AND ORGANIZER AUTHORITY

A3.1 Rules Authority

The Baja SAE Rules are the responsibility of the Baja SAE Rules Committee and are issued under the authority of the SAE University Programs Committee. Official announcements from the Baja SAE Rules Committee, SAE or the other Baja SAE Organizers shall be considered part of and have the same validity as these rules.

Ambiguities or questions concerning the meaning or intent of these rules will be resolved by the Baja SAE Rules Committee or SAE Staff.

A3.2 Rules Validity

The Baja SAE Rules posted on the SAE Website and dated for the calendar year of the competition are the rules in effect for the competition. Rule sets dated for other years are invalid.

A3.3 Rules Compliance

By entering a Baja SAE competition, the team members, faculty advisors and other personnel of the entering university agree to comply with, and be bound by, the rules and all rules interpretations or procedures issued or announced by SAE, the Baja SAE Rules Committee and other organizing bodies. All team members, faculty advisors and other university representatives are required to cooperate with, and follow all instructions from competition organizers, officials and judges.

A3.4 Understanding the Rules

Teams are responsible for reading and understanding the rules in effect for the competition in which they are participating. The section and paragraph headings in these rules are provided to facilitate reading; they do not affect the paragraph contents.

A3.4.1 Loopholes

It is virtually impossible for a set of rules to be so comprehensive that it covers all possible questions about the vehicle's design parameters or the conduct of the competition. Please keep in mind that safety remains paramount during Baja SAE, so any perceived loopholes should be resolved in the direction of increased safety/ concept of the competition

A3.5 Participating in the Competition

Teams, team members as individuals, faculty advisors and other representatives of a registered university who are present on-site at a competition are considered to be "participating in the competition" from the time they arrive at the event site until they depart the site at the conclusion of the competition or earlier by withdrawing.

A3.6 Violations of Intent

The violations of the intent of a rule will be considered a violation of the rule itself. Questions about the intent or meaning of a rule may be addressed to the Baja SAE rules committee or SAE staff.

A3.7 Right to Impound

SAE and the other competition organizing bodies reserve the right to impound any on-site registered vehicle at any time during a competition for inspection and examination by the organizers, officials and technical inspectors.

A3.8 General Authority

SAE and the competition organizing bodies reserve the right to revise the schedule of any competition and/or interpret or modify the competition rules at any time and in any manner that is, in their sole judgment, required for the efficient operation of the event or the Baja SAE series as a whole.

A3.9 Penalties

Organizers have the right to modify the penalties listed in the various dynamic event descriptions (part D) to better reflect the design of their event courses, the course lengths or any special conditions unique to the site. The standard dynamic event penalties in these rules are default values that will be applied unless there is a change by the organizer.

A3.10 SAE Technical Standards Access...New Rule on Technical Standards

A cooperative program of SAE's Education Board and Technical Standards Board is making some of SAE's Technical Standards available to teams registered for any North American CDS competition at no cost. The Technical Standards referenced in the Collegiate Design Series rules, along with other standards with reference value, will be accessible online to registered teams, team members and faculty advisors.

To access the standards (1) your team must be registered for a competition in North America and (2) the individual team member or faculty advisor wanting access must be linked to the team in SAE's system.

Access Procedure - Once your team has registered there will be a link to the technical standards titled "Design Standards" on the main registration screen where all the required onsite insurance information is added. On the technical standards webpage you will have the ability to search standards either by J-number assigned or topic of interest such as brake light.

A list of accessible SAE Technical Standards can be found in Appendix S.

ARTICLE 4: INDIVIDUAL PARTICIPATION REQUIREMENTS**A4.1 Eligibility Limits**

Eligibility is limited to undergraduate and graduate students to ensure this is an engineering competition rather than a race. Individual members of teams participating in this competition must satisfy the following requirements:

A4.2 Student Status

Team members must be enrolled as degree seeking undergraduate or graduate student in a college or university. Team members who have graduated during the last seven (7) month period prior to the competition remain eligible to participate.

A4.3 Society Membership

Team members must be members of at least one of the following societies: (1) SAE or an SAE affiliate society, (2) ATA, or (3) IMechE or (4) VDI. Proof of membership, such as a membership card, is required at the event.

Students who are members of one of the societies listed above are not required to join any of the other societies in order to participate in any SAE competition. Those interested may join SAE at: www.sae.org/students

A4.4 Age

Team members must be at least eighteen (18) years of age at the time of the competition.

A4.5 Driver's License

Team members who will drive a competition vehicle at any time during a competition must hold a valid, government issued driver's license.

A4.6 Liability Waiver

All on-site participants and faculty are required to sign a liability waiver upon registering on-site.

A4.7 Insurance

Individual medical and accident insurance coverage is required and is the sole responsibility of the participant.

A4.8 Individual Registration Requirements – ACTION REQUIRED

A4.8.1 All participating team members and faculty advisors must be sure that they are individually linked to their respective school/university on the SAE website.

A4.8.2 If you are not an SAE member, go to www.sae.org and select the “Join SAE/Membership Renewal” link under “Quick links”, and then select the “Join SAE” link in the top right column. Students will need to select the “Student Membership” link and then follow the series of questions that are asked. Faculty members who wish to become SAE members should choose the “Professional Membership” link. Please note all student participants must be SAE members to participate in the events; this is not mandatory for faculty advisors.

A4.8.3 All international student participants, or unaffiliated faculty advisors, who are not SAE members, are required to complete the International Student Registration Form per team found on the Registration page of the specific event. Upon completion, email the form to collegiatecompetitions@sae.org.

A4.8.4 All student participants and faculty advisors must affiliate themselves to the appropriate team(s) online. To do this you will need to go to the Baja SAE homepage and select the Baja SAE Series link to expand the menu. Select the event(s) that you are registered for, and once the menu expands, click on the Registration link. From here you will select the “Register Your Team/Update Team Information” link in which your team link should appear on the next page. Select the team link and scroll to the bottom of the page; the “Add New Member” button will allow individuals to include themselves with the rest of the team.

A4.8.5 Once you have associated yourself to your respective university team(s), all affiliated students and faculty must complete the following information on the SAE website:

1. Medical Insurance (Provider, Policy/ID number, Telephone number)
2. Driver’s License (State/Country, ID number)
3. Emergency contact data (point of contact (guardian/parent or spouse), relationship and phone number)

The “Add New Member” button will allow individuals to access this page and include the necessary credentials. If the individual is already affiliated to the team, simply select the “Edit” button next to the name. Please be sure this is done separately for each of the events your team has entered.

PLEASE BRING YOUR OFFICIAL DRIVER’S LICENSE OR PHOTO ID/PASSPORT FOR NON-DRIVERS AS WELL AS YOUR MEDICAL INSURANCE CARD TO ONSITE REGISTRATION.

All students, both domestic and international, must affiliate themselves online or submit the International Student Registration form by February 25, 2011. For additional assistance, please contact collegiatecompetitions@sae.org.

**Note: When your team is registering for a competition, only the student or faculty advisor completing the registration needs to be linked to the school. All other students and faculty can affiliated themselves after registration has been completed; however this must be done before the deadline of February 25, 2011.

ARTICLE 5: FACULTY ADVISOR**A5.1 Faculty Advisor Status**

Each team is expected to have a Faculty Advisor appointed by the university. The faculty advisor is expected to accompany the team to the competition and will be considered by competition officials to be the official university representative.

A5.2 Responsibilities

Faculty Advisors are expected to advise their teams on general engineering and engineering project management theory.

A5.3 Limitations

Faculty advisors may not design any part of the vehicle nor directly participate in the development of any documentation or presentation.

Faculty Advisors may neither fabricate nor assemble any components nor assist in the preparation, maintenance, testing or operation of the vehicle.

Faculty Advisors are not allowed to participate during technical inspection, cost audit or design presentations. The team captain or other designated members of the team must do all the presenting although Faculty Advisors may silently observe.

In brief – Faculty Advisors may not design, build or repair any part of the vehicle.

ARTICLE 6: ELIGIBILITY – VEHICLES**A6.1 Student Created**

The vehicle and associated documentation must be conceived, designed and fabricated by the team members without direct involvement from the professional engineers, faculty or professionals in the off-road and racing communities.

A6.2 Professional Fabrication Limits

Vehicles which have been professionally fabricated may be disqualified from the competition. If a team does not have access to machine shop facilities, the frame can be professionally fabricated without penalty. Lack of access must be documented (letter from the faculty advisor, copy of policies which prohibit machine shop access, etc).

A6.3 Kit Vehicles – Prohibited

Vehicles fabricated from a kit or published designs are ineligible to compete.

A6.4 Prefabricated Subassemblies

These rules do not exclude the use of prefabricated or modified sub-assemblies.

ARTICLE 7: REGISTRATION**A7.1 Maximum Entries per University**

A maximum of two (2) vehicles per university will be allowed in each competition.

For the first two (2) weeks of online registration, universities will only be able to register one (1) vehicle per university, per competition in the North American Baja SAE competitions. On **Monday, October 18, 2010 at 10:00 AM EDT** (exactly two weeks after registration initially opens), registration will open to those universities with one entry who wish to register a second vehicle in any of the North American competitions, should there be any slots remaining.

A7.2 Registration Deadline

Teams must register for each Baja SAE competition they intend to enter by the specified deadline in the action deadlines.

A7.3 Registration Fee

North American Competitions – The registration fee must be paid online by credit card at the time of registration. Registration fees may not be paid by any other means.

Competitions outside North America – Registration fees and procedures are listed in the action deadlines or will be found on the competition website.

Registration fees are NOT refundable.

A7.4 Registration Limit

Baja SAE Birmingham is limited to 100 vehicles.
Baja SAE Kansas is limited to 100 vehicles.
Baja SAE Illinois limited to 115 vehicles.

A7.5 Withdrawals

A7.5.1 Registered teams that find that they will not be able to attend the competition are requested to officially withdraw by notifying the following no later than one (1) week before the event:

A7.5.2 Baja SAE North American event withdrawals: Sam Barill, barill@sae.org

A7.5.3 For events outside North America, please visit the respective competition website for contact information.

A7.6 International Participation – U.S. Visa Letters

International teams requiring visa letters to enter United States must fill out the online form a minimum of four (4) weeks prior to the competition in which they are competing at: <http://students.sae.org/competitions/bajasaw/> (Visa Invitation)

A7.7 International Participation – Vehicle Shipping/U.S. Customs

SAE and the Baja SAE organizers strongly recommend international teams ship their vehicles early in order to allow enough time to compensate for any delays that may occur in clearing U.S. Customs. Please check with the United States Customs Service concerning the regulations governing the temporary importation of racing vehicles. You may want to consider using the services of freight forwarder who is familiar with the international shipping of racing vehicles.

Vehicle Shipping

Vehicle shipments by commercial carrier must comply with the laws and regulations of nations from which, and to which, the vehicle is being sent. Teams are advised to consult with their shipping company or freight forwarder to be sure their shipment fully complies with all relevant customs, import/export and aviation shipping requirements.

Shipments must be sent with the sending team or university listed as the receiving party. Neither the competition organizers nor the competition sites can be listed as the receiving party.

Vehicle shipping procedures for the North American competitions are published on the Baja SAE website for each competition and are incorporated into these Rules by reference.

Neither SAE staff nor the Baja SAE competition organizers are permitted to provide advice on U.S. Custom matters.

ARTICLE 8: RULES QUESTIONS**A8.1 Questions:**

By submitting a question to Baja SAE you and your team agree that both your question and the Committee's answer can be reproduced and distributed by SAE, in both complete and edited versions, in any medium or format anywhere in the world.

A8.2 Question Types

The Baja SAE Committee will answer questions that are not already answered in the rules or FAQs or that require new or novel rule interpretations. The Committee will not respond to questions that are already answered in the rules. For example, if a rule specifies a minimum dimension for a part the Committee will not answer questions asking if a smaller dimension can be used.

A8.3 Question Submission

An electronic question submission system is being developed for the North American competitions. Until that system is ready for use questions should be submitted following the traditional procedure of emailing Bajarules@sae.org. Questions and answers will be posted on: <http://students.sae.org/competitions/bajasae/rules/tqa.htm>

When the electronic submission system is ready for use an announcement will be made on the Baja SAE news page. Please watch for announcements.

Throughout the 2011 Baja SAE competition season questions can still be submitted by the traditional submission procedure.

A8.3.1 Question Documentation

Teams submitting questions are required to bring copies of the questions and answers with them to technical inspection.

A8.4 Response Time

Please allow a minimum of two (2) weeks for a response. The Rules Committee will respond as quickly as possible, however responses to questions presenting new issues, or of unusual complexity, may take more than two weeks.

NOTE: Please keep in mind that final operating approval of a Baja SAE vehicle can only be given on site at the competition.

A8.5 Event Related Questions

Questions pertaining to the operation and schedules of specific Baja SAE competitions should be emailed to the respective organizers.

ARTICLE 9: PROTESTS

It is recognized that hundreds of hours of work have gone into fielding a vehicle. In the heat of competition, emotions peak and disputes can arise. The organizers and SAE staff will make every effort to fully review all questions and resolve problems quickly and equitably

A9.1 Preliminary Review – Required

If a team has a question about scoring, judging, policies or any official action it must be brought to the organizer's or SAE staff's attention for an informal preliminary review before a protest can be filed.

A9.2 Cause for Protest

A team may protest any rule interpretation, score or official action (unless specifically excluded from protest) which they feel has caused some actual, non-trivial harm to their team, or has had a substantive effect on their score. Teams may not protest rule interpretations or actions that have not caused them any substantive damage.

A9.3 Protest Format and Forfeit

All protest must be filed in writing and presented to the organizer or SAE Staff by the team captain or a designated student team member. In order to have a protest considered, a team must post a twenty-five (25) point protest bond which will be forfeited if the protest is rejected.

A9.4 Protest Period

Protests concerning any aspect of the competition must be filed within one half hour (30 minutes) of the end of the event to which the protest relates.

A9.5 Decision

The decision of the organizer or SAE Staff regarding any protest is final.

PART B: TECHNICAL REQUIREMENTS

ARTICLE 1: GENERAL DESIGN REQUIREMENTS

B1.1 Vehicle Configuration

The vehicle must have four (4) or more wheels not in a straight line.

B1.1.1 The vehicle may only use one Briggs & Stratton engine of a model specified below. The vehicle must be capable of carrying one (1) person 190cm (75 in) tall weighing 113kg (250lbs).

B1.1.2 Maximum Vehicle Dimensions

Width: 162 cm (64 in) at the widest point with the wheels pointing forward at static ride height.

Length: Unrestricted, see note below.

NOTE: Teams should keep in mind that Baja SAE courses are designed for vehicles with the maximum dimensions of 162 cm (64 in) width by 274 cm (108 in) length.

B1.2 All-Terrain Capability

B1.2.1 The vehicle must be capable of safe operation over rough land terrain including obstructions such as rocks, sand jumps, logs, steep inclines, mud and shallow water in any or all combinations and in any type of weather including rain, snow and ice.

B1.2.2 The vehicle must have adequate ground clearance and traction.

B1.2.3 Vehicles competing in the Baja SAE water competition require flotation and water propulsion.

B1.3 Vehicle Ergonomic Capacity

As a prototype of a commercial product, the vehicle should accommodate drivers of all sizes from the 95th percentile male (in the country in which the competition is held) to the 5th percentile female. The larger driver should be able to meet the roll cage minimum clearances, and fit into a comfortable driving position, while wearing the entire required driver's equipment. The smaller driver should be able to comfortably reach all of the vehicle's controls.

ARTICLE 2: REQUIRED ENGINE

B2.1 Briggs & Stratton 10 hp OHV Intek

For over thirty years, the Briggs & Stratton Corporation has generously provided engines to the Baja SAE teams without charge. **Teams pay only \$150.00 for shipping and handling of the required engines.**

B2.2 Engine Eligibility

Teams will be eligible to receive a new Briggs & Stratton engine in every second competition season in which they participate. Engines are allocated on the basis of one engine per vehicle per two season of participation.

Example: Teams that received a new Briggs & Stratton engine for the 2009 competition season and competed in a Baja SAE competition in 2009 and 2010 will be eligible to receive a new engine for the 2011 competition season.

Example: A team that received an engine in 2004, but did not compete in a Baja SAE event until 2005 and does not compete again until 2008, will only become eligible to receive an engine in 2009.

B2.3 Eligible Teams - Receiving New Engines

Teams that are eligible to receive a new engine must order online upon completion of registering the team for a competition. Please contact collegiatecompetitions@sae.org if your team has trouble placing the engine order.

Eligible teams will pay only the cost of shipping if the engine is shipped to a continental United States or Canada address.

B2.3.1 Engine Shipment outside the U.S. & Canada

Teams from countries outside of the continental United States and Canada will need to have their engines shipped:

A. To the organizer of the competition they have registered for and have it held for the team’s arrival.

Or

B. To an address in the United States

B2.3.2 Briggs & Stratton will not ship engines outside of the continental United States or Canada; international orders must follow one of the shipping methods listed above as exporting is not an option. If for any reason the engine fails to arrive, it will not be replaced. Additionally, the team will not be permitted to order an engine next year.

B2.3.3 Neither Briggs & Stratton nor SAE assume any responsibility for the delivery of engines.

NOTE: Teams requesting that engines be shipped to the organizer will be responsible for installing the engine prior to technical inspection and will need to bring the tools necessary to install the engine onsite. Teams should also get permission from the organizer.

B2.4 Purchasing of Additional Briggs & Stratton Engines

Teams may purchase additional Briggs & Stratton engines directly through their local Briggs & Stratton dealer. There is no special discount or purchase price for additional engines.

B2.5 Engine Requirement and Restrictions

To provide a uniform basis for the performance events, all vehicles must use the same engine: a stock four cycle, air cooled, Briggs & Stratton OHV Intek Model.

The following Briggs & Stratton engines are the only acceptable engines for the 2011 Baja SAE competitions:

Model	Type
205432	0536-E9
205332	0536-E9
205332	0536-B1

The required engine must remain completely stock in all ways, with the following qualifications:

NOTE: Blueprinting (reworking an engine to a manufacturer’s exact specifications) is considered to be modification.

B2.5.1 Replacement Parts

Only Original Equipment Briggs & Stratton replacement parts may be used.

B2.5.2 Piston Rings

Only standard size original Briggs & Stratton piston rings may be used.

B2.5.3 Intake Ports

No cleaning or removing of aluminum flashing from intake or exhaust ports may be done

B2.5.4 Valves

A. Valve Clearance

Any valve clearance setting between tappet and valve stem – intake and exhaust may be set.

B. Valve Lapping

Valves may be lapped to ensure proper sealing. Intake angle must remain at 45 degrees; exhaust angle must remain at 45 degrees.

B2.5.5 Shafts and Rods

Camshaft, crankshaft, connecting rod and flywheel must not be altered or modified.

B2.5.6 Spark Plugs

Must use RC12YC Only.

B2.5.7 Armature

Any armature air gap setting is allowed. No slotting or elongating of armature mounting holes to increase or retard ignition timing.

B2.5.8 Flywheel Rotation

No flywheel rotation to advance or retard timing is permissible.

B2.5.9 Carburetor**A. Carburetor Re-jetting – Prohibited**

This is a fixed carburetor, re-jetting of the carburetor is prohibited.

B. Idle Speed

Any idle speed adjustment is allowed, Briggs & Stratton recommends 1750, ± 100 RPM.

C. Carburetor Float

Carburetor float is non-adjustable and may not be re-adjusted.

D. Carburetor Venturi

Modification of carburetor venturi is prohibited.

B2.5.10 Air Cleaner

The air intake may be relocated, but Briggs & Stratton parts must be used to relocate the air filter: 792349 remote kits, 695329 – choke shaft and 699960 bases. The supplied air hose may be shortened to a minimum of 152 mm (6.0 in). No other type of hose will be allowed. A team may also add additional pre-filters to the top of the air intake. These parts must be included on the cost report. Any changes made to the air filter will have to pass Briggs & Stratton inspection.

Note from Briggs & Stratton: Relocation of the air cleaner may decrease engine performance.

B2.5.11 Exhaust System**A. Muffler Relocation**

If the vehicle design requires an exhaust system reconfiguration to keep it from impinging on part of the vehicle, the re-routing must be done using tubing having an ID of 32mm (1.25 in). Any remote mounted exhaust system must use the original muffler and must be securely mounted so that it does not vibrate loose during the competition.

B. Muffler Support

Support of the exhaust pipe and muffler are strongly recommended.

C. Exhaust Pipe

Exhaust pipe may not protrude inside of the exhaust port, so as to alter port configuration.

D. Exhaust Pipe – Length

Any exhaust pipe length is allowed, however pipe length may not be adjustable.

E. Exhaust Pipe – Holes & Tubes

No extra holes or tubes are allowed in the exhaust pipe.

F. Exhaust System – Durability Required

The exhaust pipe and muffler must be completely intact and operational throughout the competition. Any vehicle found to have a loose or leaking exhaust system will be removed from competition until the issue can be corrected.

B2.5.12 Starter

The Recoil starter rope may be extended to accommodate the driver starting the engine while seated

B2.5.13 Alternator

The engine may be fitted with an alternator to generate electrical energy. The only alternators which may be used are those which Briggs & Stratton specifies for the engine model

B2.5.14 Engine Governor

Each engine is equipped with a governor. Each governor will be set at competition to a 3,800 rpm or lower maximum speed. Random inspection of the governor may be conducted at any time. Any attempt to defeat the engine governor so as to increase the engine speed is grounds for immediate disqualification. Random inspection of the governor may be conducted at any time.

GOVERNOR SETTING NOT TO EXCEED 3800 RPM.

The governor operation must remain free of obstructions at all times. Governor area must be shielded from debris. The stock configuration of fuel tank mounted to the engine is acceptable for debris management. However, if the fuel tank is to be remote mounted, a debris shield covering the exposed governor area is required. Briggs & Stratton part number 697326 Control Cover may be used or some other part with equivalent features.

NOTE: The governor spring must be placed in hole #6.

B2.5.15 Hybrid Electric Power Systems

Hybrid electric power systems are specifically prohibited.

B2.5.16 Energy Storage Devices Used for Propulsion

Hydraulic accumulators are the only type of stored energy device that may be incorporated into the vehicle for propulsion purposes. If employed, hydraulic accumulators must be at zero energy at the start of each event. Hydraulic power systems must be properly shielded and documentation of the shielding made available for review.

B2.6 Engine Use Restriction

Briggs & Stratton generously provides engines to the teams for the exclusive purpose of use on their Baja SAE vehicle. If, for any reason, a team receives an engine and at a later date decides not to participate, it must, at its own expense, return the engine to SAE or Briggs & Stratton.

ARTICLE 3: ELECTRICAL SYSTEM**B3.1 General Electrical System Overview**

The electrical system must include at least two kill switches, a brake light, and a battery power source. The kill switches must deactivate the engine ignition. **The kill switches must NOT deactivate the brake light.** The brake light must operate regardless of the kill switch setting. The brake light, and any reverse light and alarm, must be powered whenever the vehicle is in motion.

B3.2 Batteries

B3.2.1 Batteries must be mounted with sound engineering practice and not come loose during a roll over.

B3.2.2 Non-recharging batteries

Batteries which are not recharged by an engine alternator may power only safety items (brake light, reverse light and alarm) and instrumentation (driver display, data acquisition), and may not power any control or actuation function in the drivetrain, steering and suspension systems.

NOTE: all instrumentation must be included in the cost report.

B3.2.2.1 Batteries must be able to provide power to safety items (brake light, reverse light and alarm) for the duration of each event

B3.2.2.2 Vehicles will be black flagged if safety equipment is not functioning.

B3.2.2.3 The batteries must be factory sealed (incapable of being opened or serviced) and not leak in the event of a roll over. A sealed battery is one that is incapable of being opened or serviced.

B3.2.3 Recharging batteries

Only batteries which are recharged by an engine alternator may be used to power control or actuation functions in the drivetrain, steering and suspension systems

B3.3 Kill Switches

Each vehicle must be equipped with two (2) easily accessible kill switches turning off the ignition and the entire electrical system of the vehicle (with the exception of the brake light). The Kill switches do not need to de-energize other systems such as electronic accessories or data acquisition systems.

B3.3.1 Kill Switch – Type

The kill switches must be one of the following:

(A) 01-171 Ski-Doo kill switch available at <http://www.mfgsupply.com/m/c/01-171.html?id=UxSI4Vzn>

(B) After market WPS#27-0152 or 27-0124 <http://www.parkeryamaha.com/index.asp?PageAction=PRODSEARCH&txtSearch=27-0152&Page=1>

(C) A Stock Polaris # 4110106

B3.3.2 Kill Switch – Locations and Orientation

(A) Cockpit Switch – The cockpit switch must be located in the front of the cockpit within easy reach of the driver with the safety harness tight. The switch may not be mounted on a removable steering wheel assembly.

(B) External Switch – The external switch must be mounted on the driver’s right side of the vehicle, on a panel generally perpendicular to the firewall between RRH and Rear Bracing within the red area, (Fig 2) and behind the plane of the RRH. The switch cannot be more than 178 mm (7 in) vertically below point. B_R. The switch must be within easy reach of track workers. The switch must be mounted rigidly, with no sharp edges nearby.

Sample Mountings (Note: The kill switches must be mounted using the outer cases. If they are mounted using adhesive on the back cover the switch will fail.

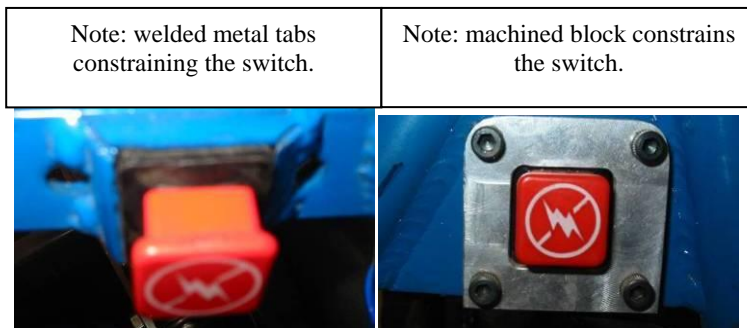


Figure 1

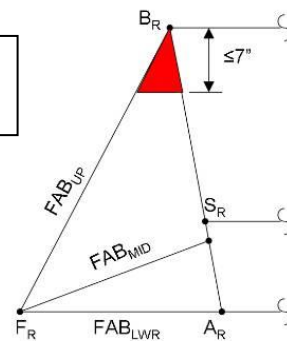


Figure 2

B3.3.3 Wiring

All wiring must be sealed, protected and securely attached.

B3.4 Brake Light

B3.4.1 The vehicle must be equipped with a red brake light that is SAE “S” or “U” rated and must be clearly visible. The brake light must be mounted at a minimum of 1 meter (39.4 in) above the ground... Light must be mounted such that it shines parallel to the ground, not up at an angle.

B3.5 Brake Light Switch

The brake light must be activated by hydraulic pressure switches. Each independent brake hydraulic system must be equipped with a brake light switch, so that no brake, including cutting brakes may be activated without lighting the brake light.

B3.5.1 Push style or momentary switches are not allowed.

B3.6 Reverse Light and Alarm

Vehicles with reverse must be equipped with a back up light marked with an SAE “R” on the lens and be equal to, or exceed the SAE standard J759. The reverse light must be mounted at a minimum of 70 cm (27.6 in) above the ground. Vehicles with reverse must also be equipped with a backup alarm. The alarm must be rated per SAE standard J1741 or J994 and sound whenever the vehicle is in reverse. An example of an acceptable backup alarm is available at www.waytekwire.com, part #48001.

ARTICLE 4: TOWING HITCH POINT

B4.1 Each vehicle must have towing hitch points at the front and rear, along its longitudinal centerline. These hitch points are used both for dynamic events and for vehicle recovery. Hitch points must be structurally attached to the vehicle’s main structure, and must allow for transmission of both longitudinal and lateral towing loads from the vehicle to the hook or clevis of a tow rope without entanglement in vehicle components. The journal of the hitch point (on which a hook or clevis would bear) must not have a diameter greater than 25.4 mm (1 in.). If not circular in cross section, the journal must have a longitudinal dimension no greater than 25.4 mm (1 in.) and a vertical dimension no greater than 9.5 mm (3/8 in.). Bearing space inboard of the hitch point journal must be no less than 25.4 mm (1 in.).

B4.2 Front Hitch Point

The front hitch point must be strong enough to serve as a vertical lift point for the vehicle. The front hitch point, when not attached to a tow rope, may not present a danger of penetration in the event of a frontal collision. For example, if a hitch plate as described in B4.4 is used, then it must be free to pivot down so as to not present a narrow protrusion.

Examples of acceptable Front Hitches:

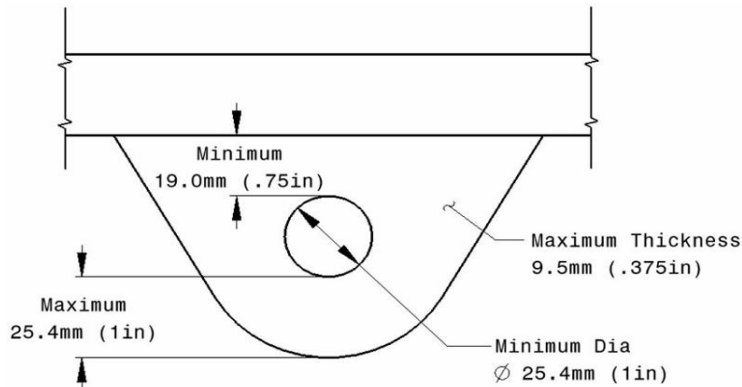


B4.3 Rear Hitch Plate

The rear hitch point must be a plate complying with the requirements of B4.4

B4.4 Hitch Plate Requirements – Maximum and Minimum

- Towing plate **Maximum** thickness – 9.5 mm (.375 in)
- Hole diameter **Minimum** – 25.4 mm (1.0 in)
- Radial clearance **Maximum** from hole – 25.4 mm (1.0 in)
- Hole to tube **Minimum** clearance – 19.0 mm (.75 in)



ARTICLE 5: VEHICLE IDENTIFICATION

B5.1 Number Assignment

U.S and Canadian competitions: Numbers are automatically assigned as part of the online registration. Assigned numbers may be found on the Baja SAE website in the “registered team list” for each competition.

B5.1.1 Other competitions: Vehicle numbers at other competitions will be assigned by the respective organizers.

B5.1.2 It is each team’s responsibility to provide its vehicle number markings. These markings include primary cutout numbers (side) and body numbers (front/rear). The numbers must be clearly visible from all sides, front, and rear of the vehicle. The numbers must remain readable throughout the competition.
Numbers that are not readable might not be scored during the endurance event.

COMMENT: Schools which are entering more than one vehicle should consider painting them in individually distinctive colors to facilitate in lap counting.

B5.2 Vehicle Number – Primary Cutout

B5.2.1 Each vehicle must display its number as either a stamp or a blank (positive or negative cutout), so that the shape may be read when the number is covered with mud. The stamp or blank mounting must allow mud to shed. The number must be a block style numeral that is clear and easy to read. Vehicles with numbers that are hard to read, missing, damaged or obscured may not be scored and may be black flagged.

B5.2.2 Number Location

Primary cutout numbers must be affixed to the upper sides of the frame behind the rear roll hoop. The numbers must be in the elevation plane of the vehicle.

B5.2.3 Number Size

The primary cutout numbers must be at least 203 mm (8 in) high.

COMMENT: Avoid sharp edges or points on the inner and outer edges of the cutout numbers.

B5.3 Vehicle Number – Body

All vehicles must display their assigned number in block numerals on the front and rear of the vehicle. These numbers must be at least 203 mm (8 in.) high, have a minimum line width of 25 mm (1 in.) and must strongly contrast with the numeral background color.

All vehicles must display their school name or initials

B5.4 Sponsor Logos

B5.4.1 Briggs & Stratton

Briggs & Stratton logos must be displayed in a prominent space on the front and each side of the vehicle.

B5.4.2 SAE Logo

Two (2) SAE logos must be displayed on the vehicle in prominent locations. These will be distributed during registration at the competition.

B5.4.3 Sponsor Identification

Teams may display advertising from their vehicle's sponsors, provided it is in good taste and does not conflict with the vehicle's number. Organizers may require all entrants to display advertising from the competition sponsors.

ARTICLE 6: TRANSPONDERS

B6.1 Transponders – US and Canadian Competitions

Transponders will be used as part of the primary timing system for all closed loop dynamic events at competitions in the US and Canada.

B6.1.1 Vehicles must carry a functional, properly mounted and fully charged transponder of the specified type. Vehicles without a specified transponder will NOT be allowed to compete in any event for which a transponder is used for timing.

Use of transponders at competitions outside of the US and Canada is at the option of the organizer.

B6.2 Transponder Requirement

All vehicles must be equipped with at least one AMB MX Rechargeable transponder. (Recently acquired by MyLaps). <http://www.mylaps.com>. All teams are responsible for purchasing their transponder

The timing system is capable of recording two transponder identifications per vehicle; therefore, a second transponder may be mounted as a backup.

B6.3 Transponder Purchase

All teams are responsible for purchasing their transponder directly through AMB (recently acquired by MyLaps). <http://www.mylaps.com>

B6.4 Transponder Mounting

B6.4.1 Each transponder is supplied with a mounting bracket (SEE PHOTO). Teams are advised to weld a small plate to their frame to attach the bracket. The bracket can be attached with rivets, zip ties or bolts. Comments: Attaching the bracket with an M4 pan OR flat head bolts with lock nuts OR wire is strongly suggested.



B6.4.2 Transponder mounting requirements:

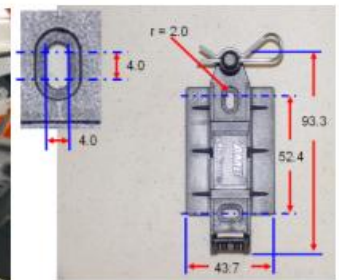
- A. Orientation – The bracket must be mounted vertical to the frame in the orientation shown in the photograph and oriented so the transponder number can read “right-side up”.
- B. Location – The transponder must be mounted on the driver’s right side forward of the seat and preferably within the lower horizontal plane of the front suspension. The transponder must be no more than 61 cm (24 in) above the track.
- C. Unobstructed – There must be an open, unobstructed line between the antenna on the bottom of the transponder and the ground. (Do not mount the transponder inside the vehicle if sight line is obstructed.) Metal and carbon fiber may interrupt the transponder signal. The signal will normally transmit through fiberglass and plastic. If the signal will be obstructed by metal or carbon fiber, a 10.2 cm (4 in) diameter opening can be cut and the transponder mounted flush with the opening.

D. Protection – Mount the transponder where it will be protected.

Suggested Mounting Locations (Right Front of Vehicle)



Bracket Dimensions (mm)



B6.5 Transponder Black Flag

If, for any reason, a vehicle’s transponder is not being received by the timing system, the vehicle could be black flagged for transponder repair, relocation or replacement.

ARTICLE 8: ROLL CAGE

B8.1 Objective

The purpose of the roll cage is to maintain a minimum space surrounding the driver. The cage must be designed and fabricated to prevent any failure of the cage’s integrity.

B8.2 Lateral Space

Minimum space is based on clearances between the driver and the two virtual side surfaces of the cage. Clearances are relative to any driver selected at technical inspection (usually the largest driver; may be several drivers), seated in a normal driving position, and wearing all required equipment

The virtual side surfaces are defined by the Side Impact Member (SIM) the Roll Hoop Overhead Member (RHO) and the locus of any straight line connecting any point on the outside of the SIM to any point on the outside of the RHO, exclusive of any padding or covering on these members.

If there are any triangulating members joining the SIM or the RHO to the vertical members of the Rear Roll Hoop (RRH-B8.3.2), and these triangulating members conform to B8.3.12, then the virtual side surfaces may be extended by an outboard crease over the triangulating members.

The driver’s helmet shall have 152 mm (6 in.) clearance to the side surfaces.

The driver’s shoulders, torso, hips, thighs, knees, arms, elbows, and hands shall have 76 mm (3 in.) clearance to the side surfaces.

B8.2.1 Vertical Space

The driver’s helmet shall have 152 mm (6 in.) clearance to the top of the roll cage, defined by the top surface (not centerline) of: the RHO members (exclusive of any covering or padding); the RRH_{UPPER}, LC; and the LC between points C.

In an elevation (side) view, no part of the driver’s body, shoes, and clothing may extend beyond the envelop of the roll cage.

B8.3 Roll Cage Structure

B8.3.1 Elements of the Roll Cage

The roll cage must be a space frame of tubular steel. The required members of the roll cage are illustrated in Figs.RC2 and RC4. Primary members must conform to B8.3.12. Primary members are:

- Rear Roll Hoop (RRH)
- Roll Hoop Overhead Members (RHO)
- Front Bracing Members (FBM)

Lateral Cross Member (LC)

Secondary members must be steel tubes having a minimum wall thickness of 0.89 mm (.035 in) and a minimum outside diameter of 25.4 mm (1.0 in): Secondary members are:

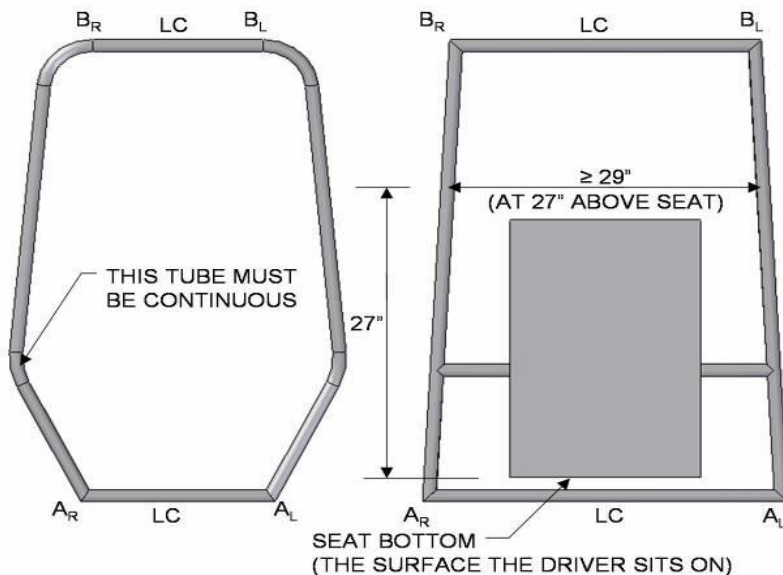
- Lateral Diagonal Bracing (LDB)
- Lower Frame Side (LFS)
- Side Impact Member (SIM)
- Fore/Aft Bracing (FAB)
- Under Seat Member (USM)
- All Other Required Cross Members
- Any tube that is used to mount the safety belts

Roll cage members which are not straight must not extend longer than 711 mm (28 in.) between supports. Small bend radii (<152 mm, 6 in.) at a supported end of a member are excepted, and are not considered to make a member not-straight. The minor angle between the two ends of a not-straight tube must not exceed 30°.

Note: Required dimensions between roll cage members are defined by measurements between member centerlines, except where noted.

B8.3.2 Rear Roll Hoop (RRH)

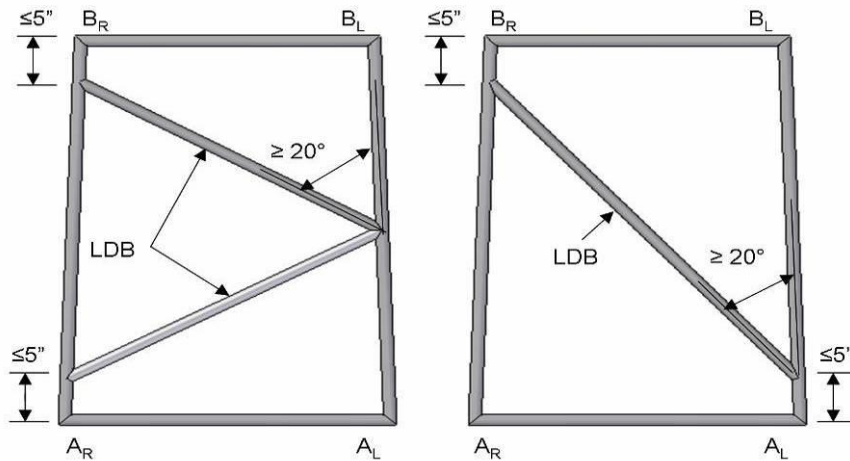
The RRH is a structural panel behind the driver’s back, and defines the back side of the roll cage. The driver and seat must be entirely forward of this panel. The RRH is substantially vertical, but may incline by up to 20° from vertical. The minimum width of the RRH, measured at a point 686 mm (27 in.) above the inside seat bottom, is 736 mm (29 in.). The vertical members of the RRH may be straight or bent, and are defined as beginning and ending where they intersect the top and bottom horizontal planes (points A_R and A_L, and B_R and B_L in Fig.RC1). The vertical members must be continuous tubes (i.e., not multiple segments joined by welding). The vertical members must be joined by LC members at the top and bottom. The LC members must be continuous tubes



RC 1

B8.3.2.1 Rear Roll Hoop Lateral Diagonal Bracing (LDB)

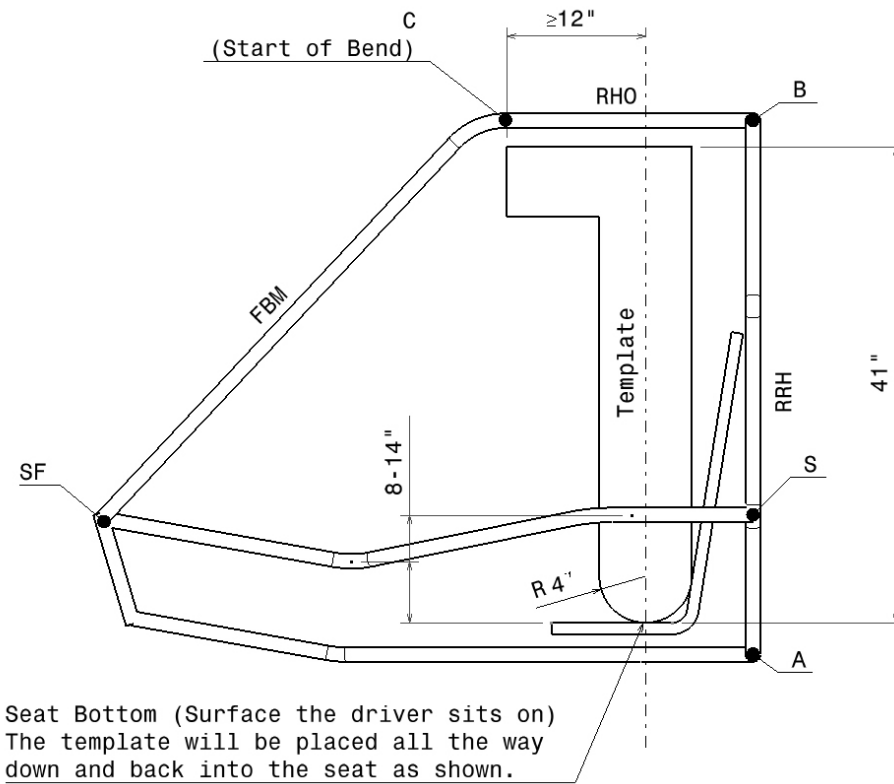
The RRH must be diagonally braced. The diagonal brace(s) must extend from one RRH vertical member to the other. The top and bottom intersections of the LDB members and the RRH vertical members must be no more than 127 mm (5in.) from the RRH top and bottom horizontal planes, respectively. The angle between the LDB members and the RRH vertical members must be greater than or equal to 20°. Lateral bracing may consist of more than one member



RC 2

B8.3.3 Roll Hoop Overhead Members (RHO)

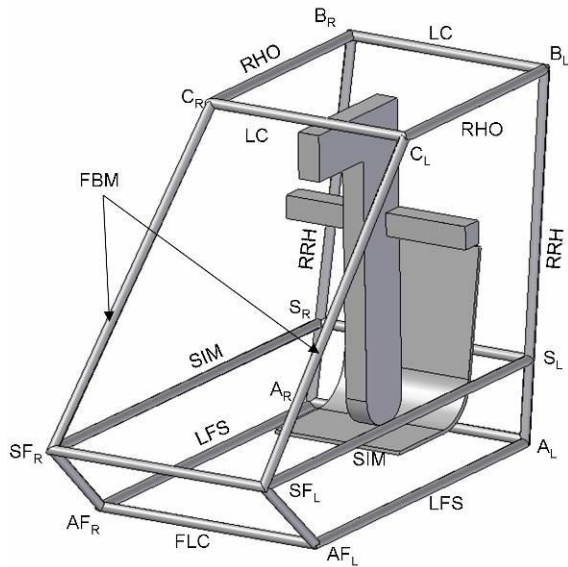
The RHO members define the upper right and left edges of the roll cage. The ends of the two RHO members define four points above the driver's head in a generally horizontal plane. The RHO members extend generally forward from the top of the RRH. The forward ends of the RHO members are joined by a Lateral Cross (LC) member. The RHO members must be continuous tubes. The intersection between the RHO members and the RRH must be no more than 51 mm (2 in.) from points B. The RHO members must be high enough to allow a clearance of 1041 mm (41 in.) between the inside seat bottom and the bottom (not the centerline) of the RHO members (exclusive of RHO member padding or covering). The forward ends of the RHO members (intersection with the LC) define points C_R and C_L (Fig.RC3). Points C_R and C_L must be at least 305 mm (12 in.) forward of a point, in the vehicle's elevation view, defined by the intersection of the RHO members and a vertical line rising from the after end of the seat bottom. This point on the seat is defined by the seat bottom intersection with a 101 mm (4 in.) radius circle which touches the seat bottom and the seat back.



RC 3

B8.3.4 Lower Frame Side Members (LFS)

The two Lower Frame Side members define the lower right and left edges of the roll cage. These members are joined to the bottom of the RRH and extend generally forward, at least as far as a point forward of every driver's heels, when seated in normal driving position. The forward ends of the LFS members are joined by an LC, the Front Lateral Cross (FLC – Fig. RC4). The intersection of the LFS members and the FLC define the points AF_R and AF_L.



RC 4

B8.3.5 Side Impact Members (SIM)

The two Side Impact Members define a horizontal mid-plane within the roll cage. These members are joined to the RRH and extend generally forward, at least as far as a point forward of every driver’s toes, when seated in normal driving position. The forward ends of the SIM members are joined by an LC. The intersection of the SIM members with this LC define the points SF_R and SF_L. The SIM members must be between 203 mm (8 in.) and 356 mm (14 in.) above the inside seat bottom (Fig.RC3).

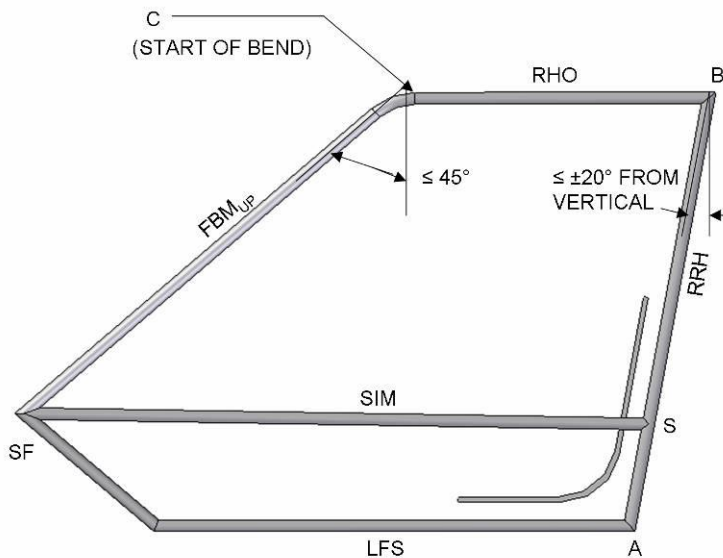
NOTE: Every driver’s feet must be entirely behind the plane defined by points AF_{R,L} and SF_{R,L}. If the LC between SF_{R,L} is below the driver’s toes then an additional LC must run between the FBM members above the driver’s toes.

B8.3.6 Under Seat Member (USM)

The two LFS members must be joined by the Under Seat Members. The USM must and pass directly below the driver where the template in RC3 intersects the seat bottom. The USM must be positioned in such a way to prevent the driver from passing through the plane of the LFS in the event of seat failure.

B8.3.7 Front Bracing Members (FBM)

Front bracing members must join the RHO, the SIM and the LFS (Fig. RC5). The upper Front Bracing Members (FBM_{UP}) must join points C on the RHO to the SIM at or behind points SF. The lower Front Bracing Members (FBM_{LOW}) must join points AF to points SF. The FBM must be continuous tubes. The angle between the FBM_{UP} and the vertical must be less than or equal to 45 degrees.



RC 5--FBM

B8.3.8 Fore/Aft Bracing (FAB)

The RRH must be restrained from rotation and bending in the elevation plane by a system of triangulated bracing. Bracing must either: 1) Rear Bracing - directly restrain both points B from longitudinal displacement in the event of failure of the joints at points C; or 2) Front Bracing - restrain both points C from longitudinal and vertical displacement, thus supporting points B through the RHO members. Better design will result if both front and rear bracing are incorporated.

Members used in the FAB systems must not exceed 1016 mm (40 in.) in unsupported length. Triangulation angles (projected to the elevation view) must not exceed 20°.

B8.3.8.1 Front Bracing

Front systems of FAB must connect the FBM_{UP} members to the SIM members (on the same sides). The intersection with the FBM_{UP} members must be within 127 mm (5 in.) of points C. The intersection with the SIM members must be vertically supported by further members connecting the SIM members to the LFS members.

B8.3.8.2 Rear Bracing

Rear systems of FAB must create a structural triangle, in the elevation view, on each side of the vehicle. Each triangle must be aft of the RRH, include the RRH vertical side as a member, and have one vertex near Point B and one vertex near either Point S or Point A.

The third (after) vertex of each rear bracing triangle must additionally be structurally connected to whichever point, S or A, is not part of the structural triangle. This additional connection is considered part of the FAB system, and is subject to B8.3.1, but may be formed using multiple joined members, and this assembly of tubes, from endpoint to endpoint, may encompass a bend of greater than 30 degrees.

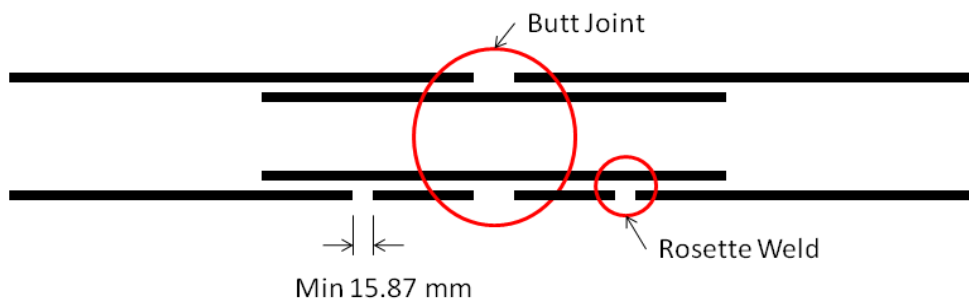
Attachment of rear system FAB must be within 127 mm (5in.) of Point B, and must be within 51 mm (2 in.) of points S and A. In the plan view, the rear bracing structural triangles must not be angled more than 20 degrees from the vehicle centerline. The after vertices (right/left) of the FAB structural triangles must be joined by an LC.

B8.3.9 RHO/FBM Gusseting

If the RHO and FBM on one side of the vehicle are not comprised jointly of one tube, bent near point C, then a gusset is required at point C to support the joint between the RHO and the FBM.

B8.3.10 Tube Joints

- B8.3.10.1** Roll cage element members which are made of multiple tubes, joined by welding, must be reinforced with a welding sleeve. Many roll cage elements are required to be continuous tubes, and may not be made of multiple pieces. Tubes which are joined at an angle need not be sleeved.
- B8.3.10.2** Sleeves must be designed to fit tightly on the inside on the joint being reinforced. External sleeves are not allowed. Sleeves must extend into each side of the sleeved joint, a length of at least two times the diameter of the tubes being reinforced, and be made from steel at least as thick as the tubes being reinforced.
- B8.3.10.3** The general arrangement of an acceptable sleeved joint is shown in Fig.RC9. A butt weld and four rosette welds (two on each tube piece, on holes of a minimum diameter of 16 mm (0.625 in.) are required.
- B8.3.10.4** A minimum of 4 linear inches of weld is required to secure the sleeve inside the joint, including the butt joint and the rosette welds.



RC 9

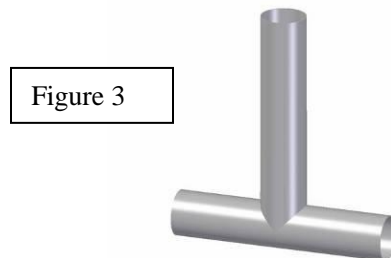
B8.3.11 Welding Process Check

Each person who makes any welded joint on any of the vehicle’s roll cage elements must personally make two welding samples, using the same materials and processes as used in the roll cage element welds. All welding samples must be submitted at Technical Inspection. Vehicles for which complete sets of welding samples are not submitted, or for which any of the welding samples are judged inadequate, will not be allowed to compete in dynamic or endurance events.

Welding samples must be made from the same tube material, diameter, and thickness as the welds made by each person on the roll cage elements.

(A)Sample 1 – Destructive Testing:

A 90 degree joint, the leg length free (Fig 3). This joint must be destructively tested causing the joint to fail in the base material (as opposed to the weld metal). The testing method is free-either tensile or bending failure may be induced.



(B)Sample 2 – Destructive Inspection:

Two tubes joined at a 30 degree angle with a length of at least 150 mm (5.9 in.) from the center of the joint(Fig 4). The sample must be sectioned along the length of tube to reveal adequate and uniform weld penetration (Fig 5).

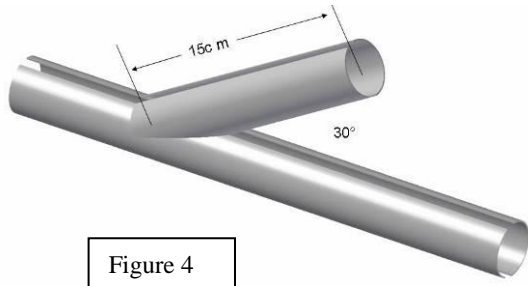


Figure 4

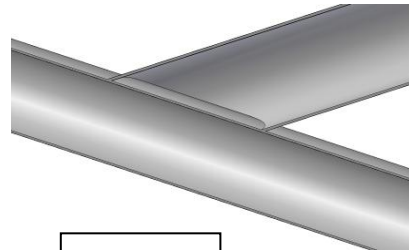


Figure 5

B8.3.12 Roll Cage & Bracing Materials

The material used for the Primary Roll Cage Members must be:

- (A) Circular steel tubing with an outside diameter of 25mm (1 in.) and a wall thickness of 3 mm (0.120 in.) and a carbon content of at least 0.18%.

OR

- (B) A steel shape with bending stiffness and bending strength exceeding that of circular steel tubing with an outside diameter of 25mm (1 in.) and a wall thickness of 3 mm (0.120 in.) and a carbon content of 0.18%. The wall thickness must be at least 1.57 mm (0.062 in.), regardless of material or section size. Calculations must be presented at Technical Inspection which prove sufficient bending stiffness and bending strength. All calculations must be in SI units. Invoices or other evidence of the properties of the roll cage materials must be attached to the calculations. Calculations must be performed using three significant figures to the nominal tube sizes as specified by the invoice.

- (C) The bending stiffness and bending strength must be calculated about a neutral axis that gives the minimum values. Bending stiffness is considered to be proportional to the product EI where:

E Modulus of elasticity (205 GPa for all steels)
 I Second moment of area for the structural cross section

Bending strength is given by:

$$\frac{S_y I}{c}$$

where:

S_y Yield strength (365 MPa for 1018 steel)
 c Distance from neutral axis to extreme fiber

- (D) **Roll Cage Specification Sheet:**

Each vehicle must present a completed Baja SAE Roll Cage Specification Sheet (Appendix) at Technical Inspection. Newly completed copies must be presented for each competition.

B8.3.12 Head Restraint

A head restraint must be provided to limit rearward motion of the driver's head. The head restraint must be mechanically fastened (NO Velcro or adhesive) to the vehicle, preferably the vehicle frame. Head restraints may also be mechanically fastened or integral to the driver's seat

B8.3.13 Roll Cage Specification Sheet

Each vehicle must present a completed Baja SAE Roll Cage Specification Sheet at Technical Inspection. Newly completed copies must be presented for each competition

B8.4 Sharp Edges on Roll Cage

The roll cage must have no exposed sharp edges which might endanger the driver or people working around the vehicle while the vehicle is in any attitude (static, dynamic, inverted, etc.).

B8.5 Bolted Roll Cages

B8.5.1 Bolted Roll cages joints are acceptable only if the following requirements are met (Fig. 6):

- (A) Flanges or tabs must be twice (2X) the thickness of the frame tube, and made of the same material. They must be properly welded to each tubing part to be joined. The face of the flange must be perpendicular to the axis of the frame tube.

- (B) The radius of the flange must be at least 25mm (1 in) larger than the outer radius of the frame tube.
- (C) The gap between faces of the flanges (before being tightened) must be no greater than 0.07 mm (0.003 in).
- (D) The flanges must be attached with at least 3 bolts with a minimum diameter of 8 mm (5/16 in), equally spaced on the flanges. The minimum edge distance between the bolt holes and the edge of the flanges must be twice the bolt diameter.
- (E) Pin Joints and not permitted

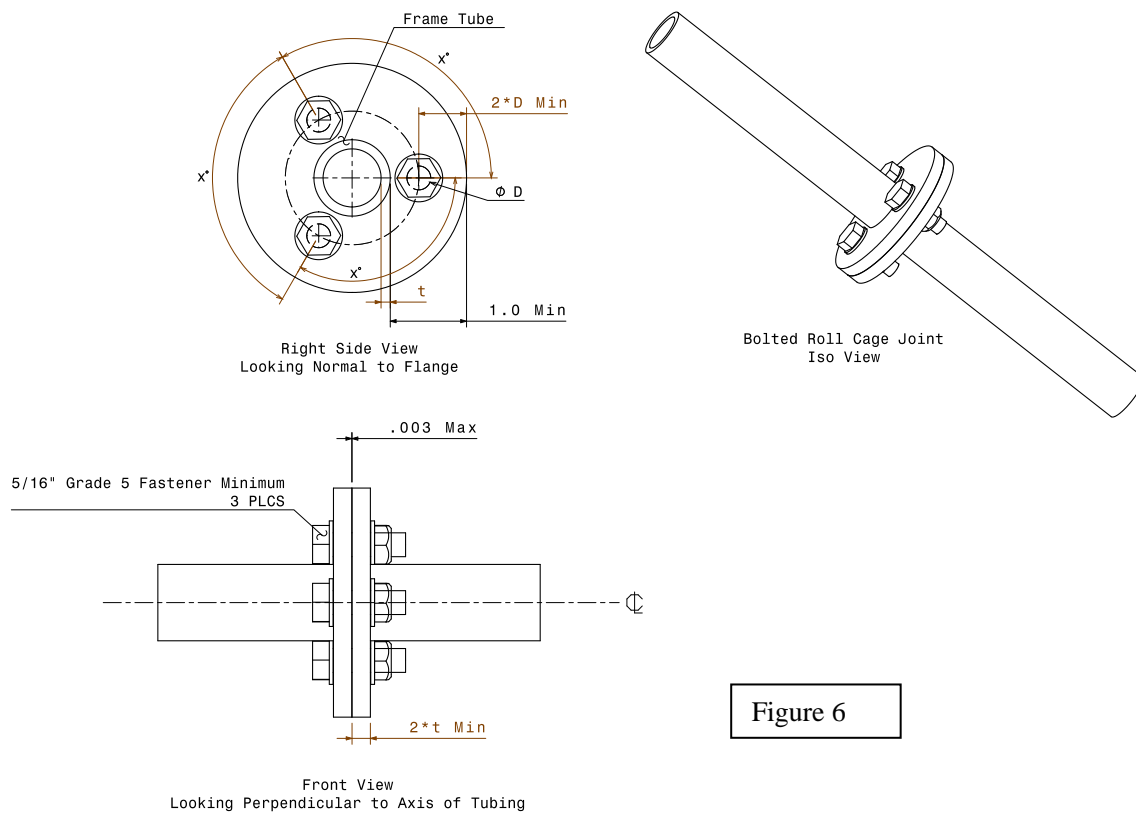


Figure 6

B8.6 Cockpit

B8.6.1 Design Objective

The cockpit must be designed to (1) protect the driver and (2) permit easy driver exit in an emergency.

B8.6.2 Driver Exit Time

All drivers must be able to exit on either side of the vehicle within five (5) seconds. Exit time begins with the driver in the fully seated position, hands in driving position on the connected steering wheel, and wearing the required driver equipment. Exit time will stop when the driver has both feet on the ground. Driver’s exit time must be demonstrated by a team driver, as selected at technical inspection

B8.6.3 Firewall

There must be a firewall between the cockpit and the engine and fuel tank compartment. It must cover the area between the lower and upper lateral cross members on the Rear Roll Hoop.

B8.6.3.1 The firewall must be metal, at least 0.50 mm (0.020 in.) Thick, and must completely separate the engine compartment and fuel tank from the cockpit.

B8.6.3.2 Multiple panels may be used to form the firewall but there must be no gaps between the joints. Cutouts in the firewall are allowed, but they must have grommets or boots that prevent large amounts of fuel from getting into the cockpit.

B8.6.3.3 Front or Mid-engine vehicles

If the engine is not placed in the rear of the vehicle, then a firewall is not required to cover the area between the RRH lateral cross members. Instead, the firewall must meet the following standards:

- (A) Fuel tank must be in a sealed container that prevents fuel from leaking in the event of fuel tank failure.
- (B) Splash shields must prevent fuel from being poured anywhere in the cockpit area during fueling. (See rule B12.6 “Spill Prevention”)
- (C) Engine must be completely enclosed and protect the driver in the event of an engine failure. Shielding must meet guarding requirements. This shielding must be made of metal. (See rule B15.1 “Powertrain Guards”).
- (D) Driver must be able to still egress from either side of the vehicle.
- (E) The exhaust must not exit towards the driver and must be shielded.
- (F) There must be a place to mount the Technical Inspection sticker (30cm x 30cm or 12 in x 12 in) on the RRH. It must be located on the driver’s right side above the shoulders in easy view of track workers.

B8.6.4 Body Panels

The cockpit must be fitted with body panels that cover the area between the lower frame side member and the side impact member. No gaps can exist that are larger than 6.35 mm (0.25 in). These panels must be made of plastic, fiberglass, metal or similar material. They must be designed to prevent debris and foreign object intrusion into the driver compartment. The panels must be mounted securely to the frame using sound engineering practices (zip ties and Velcro are not acceptable).

B8.6.5 Belly Pan

The cockpit must be fitted with a belly pan over the entire length of the cockpit, so that the driver cannot contact the ground and is protected from debris while seated normally. Belly pan material must be metal, fiberglass, plastic, or similar material. They must be designed to prevent debris and foreign object intrusion into the driver compartment. Expanded metal, fabric, or perforated panels are not allowed.

B8.6.6 Leg and Foot Shielding

All steering or suspension links exposed in the cockpit must be shielded with metal. The shielding must prevent the driver’s legs and feet from coming in contact, or becoming entangled during operation or a failure. No gaps can exist that are larger than 6.35 mm (0.25 in) are allowed. The driver’s feet must be completely within the roll cage.

B8.6.7 Fire Extinguisher – Size and Location

Each vehicle must have two identical fire extinguishers with a minimum UL rating of 5 B-C. One must be mounted in the cockpit below the driver’s head, with the top half above the side impact member on the right side of the firewall and be easily accessible by course workers. The manufacturer mounts must be used; they must be metal and have a metal draw latch. This mount must be securely fastened to the vehicle frame (RRH) and it must resist shaking loose over rough terrain, while allowing the course workers to remove it easily if necessary. The second must be brought to technical inspection with mounting accessories; it will be used as a replacement if needed. All fire extinguishers must be equipped with a manufacturer installed dial pressure gauge. The gauge must be readable.

Fire extinguishers must be labeled with school name and vehicle number.

ARTICLE 9: THROTTLE

B9.1 Only foot operated throttle controls are allowed. A wide-open throttle stop must be mounted at the pedal. Mechanical, hydraulic or other throttle controls must be designed to return to idle-stop in the event of a failure. The throttle cable must be covered (sheathed) between its forward mounting point and the firewall. Foot pedals must be positioned so as to avoid foot entrapment in any position.

B9.2 Throttle Extensions

Mechanical extensions such as thick pads or blocks may not be attached to control surfaces or the driver’s feet.

ARTICLE 10: DRIVER RESTRAINT

B10.1 Minimum Five Strap System Required

A safety harness system of at least 5 points must be worn by all drivers. The lap belt and shoulder belts must be approximately 76 mm (3 in.) wide. The fifth (“anti-submarine”) belt must be worn between the legs to prevent the lap belt from riding up along the driver’s torso. The safety harness must be installed using good engineering practice. The safety harness must be worn snugly (one finger width maximum gap).

As an alternative to a five point harness, a six or seven point safety harnesses may be used if properly installed and worn.

NOTE: If the belts do not have enough adjustment capacity, the vehicle may not be operated.

B10.1.1 Release Mechanism

All belts must join with a single metal-to-metal quick release lever type buckle. No camlock systems are allowed.

B10.1.2 Safety Harness Expiration

The material of all straps must be of Nylon or Dacron polyester and in new or perfect condition. All driver restraint systems must meet either SFI Specification 16.5/16.1, or FIA specification 8853/98. The belts must bear the appropriate dated labels, and on Jan 1st of the competition year be no more than three years old.

B10.2 Shoulder Harness

The shoulder harness must be of the over-the-shoulder type. Only separate shoulder straps are permitted (i.e. “Y”-type shoulder straps are not allowed).

B10.2.1 Vertical Location

Shoulder belt mounts must be no higher than vertically level with each driver’s shoulders, and no lower than 102 mm (4 in.) vertically below each driver’s shoulders. Shoulder belt mounts must be entirely on the cockpit side of the firewall, and be protected by the firewall. The shoulder belts must run directly from their mountings to the driver’s shoulders, without redirection by any part of the vehicle or its equipment (Fig.8).

B10.2.2 Lateral Spacing

The shoulder harness mounting points must be between 178 mm (7 in) and 229 mm (9 in) apart (Fig 7).

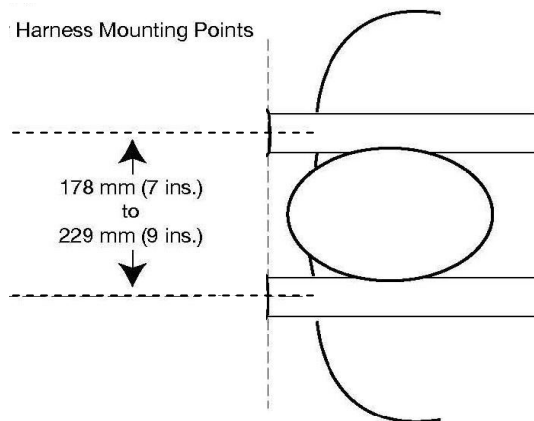


Figure 7

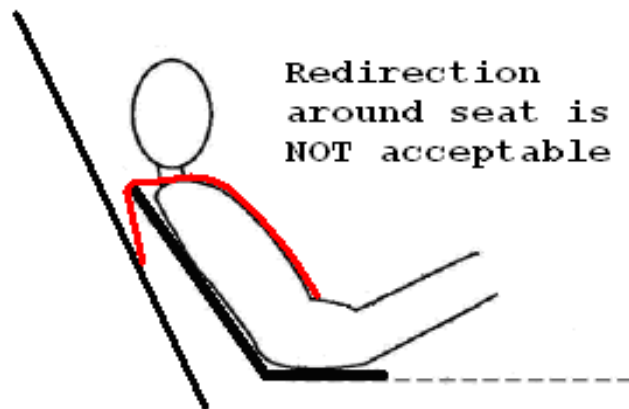


Figure 8

B10.2.3 Harness Attachment Points

The shoulder belts must be looped around a horizontal tube welded within the RRH that meets the Roll Cage Secondary Member requirements of B8.3.1. Lateral motion of the belts along their mounting tube must be restrained. The firewall must protect the entire shoulder belt. The firewall may be pocketed to facilitate this, as long as no open gaps result.

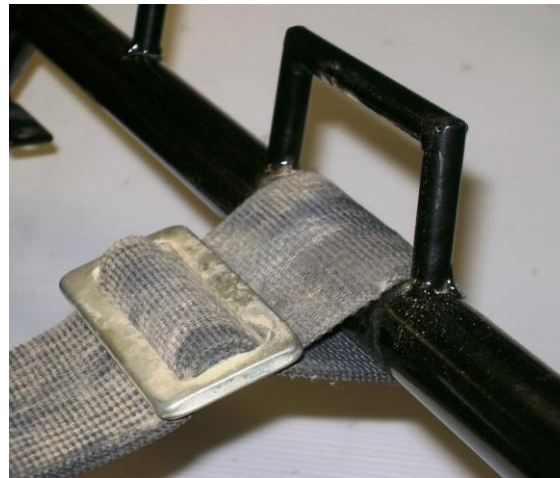


Figure 8A

B10.3 Lap Belts

B10.3.1 The lap belt must pass around the driver’s pelvic area below the Anterior Superior Iliac Spines (the hip bones – Fig.9). The lap belt must not be worn over the driver’s intestines or abdomen. In side view, the lap belt must be at an angle of between 45 degrees and 65 degrees to the horizontal (Fig.9). This means that the centerline of the lap belt at the seat bottom should be approximately 76 mm (3 in.) forward of the bottom of the seat back. The lap belt halves must run directly from the driver’s hips to their mounting points without redirection by any part of the vehicle or its equipment (including the seat). The lap belt halves must be mounted to frame tabs using the bracket supplied with the safety harness (Fig.10). The lap belt halves must freely pivot to fit drivers of differing statures correctly. The lap belt bracket must not be loaded in bending (Fig.10).

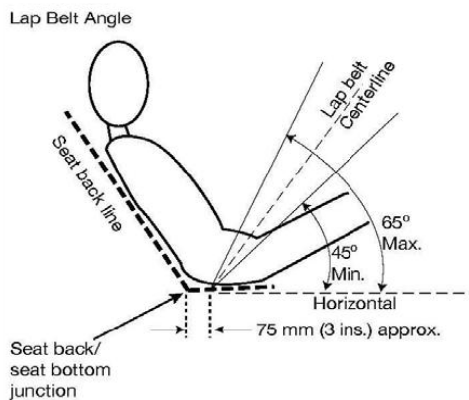


Figure 9

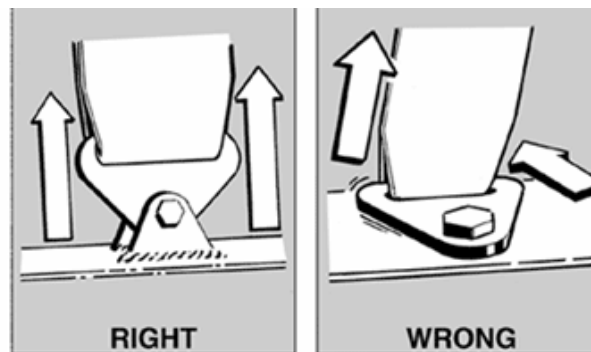


Figure 10

B10.3.2 Lap Belt Mounting

The frame tabs which accept the lap belt mounting brackets must meet the following requirements:

- 1) The lap belt tabs and anti submarine belt tabs must be mounted in double-shear. Tab material must be no less than 2.3 mm (0.090 in.) thick.
- 2) Tabs must be attached to the frame with no less than 38 mm (1.5 in.) of weld length per tab.
- 3) Tabs must have no less than 6.4 mm (0.25 in.) of material width from the edge of the mounting hole to the outside edge of the tab.
- 4) Mounting bracket must pivot freely (i.e., not bear on screw threads, or be pinched by the tab).
- 5) Tab mounting must be stiff (i.e., not noticeably deform when pulled).

B10.4 Anti-Submarine Belts**B10.4.1 Mounting**

Anti-submarine belts must be mounted aft of a vertical plane that intersects the leading edge of the seat, and must be mounted a minimum of 254 mm (10 in.) forward of the lap belt mounting points. The anti-submarine belt may be mounted either to a frame tab, or wrapped around a frame member.

B10.4.1.1

If mounted to a frame tab, then the tab must conform to the rules for the lap belt tabs above.

B10.4.1.2

If wrapped around a frame member, then: 1) the mounting tube must have features designed to limit the lateral belt movement along the tube to less than 25 mm (1 in.); 2) the webbing of the anti submarine belt must be protected from exposure to the ground, and not in contact with the belly pan.

B10.4.2 Redirection

Redirection of the anti submarine belt by a one rigid frame or seat member is allowed. Redirected belt webbing must not contain a bend of more than 30 degrees (Fig.10A). The redirecting member must be designed to prevent chaffing of the belt webbing by use of edge treatment to sharp edges with molding, plastic, heavy duty tape or other similar material.

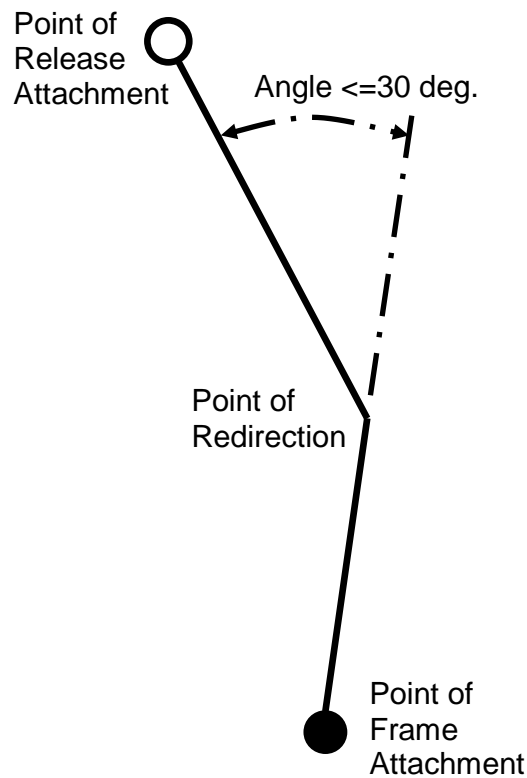


Figure 10 A

B10.4.3 Six and Seven Point Harnesses

6-point and 7-point harness mountings must meet the requirements in items 1, 6, & 7 (both mounts), and the mounting points must be laterally spaced by at least 203 mm (8 in.).

B10.5 Arm Restraints

B10.5.1 In the event of a rollover, the driver’s arms must be kept within the limits of the roll cage space (B8.2) by use of arm restraints. Arm restraints must be securely fastened to the driver restraint system. Only commercially available arm restraints meeting SFI 3.3 are allowed. The arm restraints must independently connect to the safety belts.



B10.5.2 Arm Restraint – Installation

Arm restraints must be installed such that the driver can release them and exit the vehicle unassisted, regardless of the vehicle’s position. The arm restraint must be worn by the driver on the forearm just below the elbow. The driver must be able to reach the cockpit kill switch and steering wheel, but not allow their arms to exit the cockpit.

B10.5.3 Arm Restraint – Expiration

The belts must bear the appropriate dated labels, and on Jan 1st of the competition year be no more than three years old.

B10.6 Installations – General

All installations must prevent accidental unfastening from a direct pull, rollover or slide along the side.

ARTICLE 11: BRAKING SYSTEM**B11.1 Foot Brake**

The vehicle must have hydraulic braking system that acts on all wheels and is operated by a single foot pedal. The pedal must directly actuate the master cylinder through a rigid link (i.e., cables are not allowed). The brake system must be capable of locking ALL FOUR wheels, both in a static condition as well as from speed on pavement AND on unpaved surfaces.

B11.2 Independent Brake Circuits

The braking system must be segregated into at least two (2) independent hydraulic circuits such that in case of a leak or failure at any point in the system, effective braking power shall be maintained on at least two wheels. Each hydraulic circuit must have its own fluid reserve either through separate reservoirs or by the use of a dammed, OEM-style reservoir.

Note: Plastic brake lines are not allowed

B11.3 Brake(s) Location

The brake(s) on the driven axle must operate through the final drive. Inboard braking through universal joints is permitted.

Braking on a jackshaft through an intermediate reduction stage is prohibited

B11.4 Cutting Brakes

Hand or feet operated “cutting brakes” are permitted provided the section (B11.1) on “foot brakes” is also satisfied. A primary brake must be able to lock all four wheels with a single foot. If using two separate pedals to lock 2 wheels apiece; the pedals must be close enough to use one foot to lock all four wheels. No brake, including cutting brakes, may operate without lighting the brake light.

ARTICLE 12: FUEL SYSTEM AND FUEL**B12.1 System Location**

The entire fuel system must be located within the envelope of the vehicle’s frame (generally, roll cage, FAB, and non-FAB structural members). The fuel tank mountings must be designed to resist shaking loose.

B12.2 Removable Fuel Tank**B12.2.1** Removable fuel tanks are allowed for the purpose of rapid and spill-free refueling.

Removable fuel tanks must be equipped with a quick disconnect coupling on the fuel line. The tank must mount by sliding onto two dowel pins (Fig.11) which fit tightly into the two holes in the bottom of the Briggs and Stratton fuel tank. Removable tank mountings **must** also meet the following guidelines:

B12.2.2 The fuel tank must be mounted in a container that has two dowel pins located in the center that the fuel tank will securely slide onto (Fig 11).**B12.2.3** The cover of the container when closed must contact the gas cap or tank to prevent the tank from moving vertically on the dowel pins. The container/cover must be made out of metal and mounted using sound engineer practices (Fig12).

One of the following quick disconnect couplings must be used (Fig 13). The female fitting must be installed on the fuel tank side

http://www.colder.com/Downloads/IndCat_REV_FINAL.pdf

- Female coupling, Colder P/N: PLCD170-04-V (P. 20) or Briggs & Stratton P/N: 189117GS

- Male coupling, Colder P/N: PLCD220-04-V (P. 21) or Briggs & Stratton P/N: 192695GS

<http://www.jiffytite.com/motorsports.cfm?sublevel=398&subpage=397>

- Socket with Hose Barb Adapter P/N 21504

- Plug with Hose Barb Adapter P/N 22504



Figure 11



Figure 12



Figure 13

Note: Removable tanks still must meet the splash shield and spill prevention rules. The cost for two tanks, two check valves, and all couplings must be included in the engine section of the cost report.

B12.3 Fuel Tank

B12.3.1 Only a single fuel tank is permitted on the vehicle. Fuel tanks are restricted to the stock tank provided by Briggs & Stratton. No holes are allowed in the tank even if they have been repaired. Fuel pumps may not be used.

B12.3.2 A standard Briggs and Stratton gas cap with a built in check valve (Part # B4325GS) is required. The retail price must be included in the cost report.

B12.4 Fuel Lines

All fuel lines must be located away from sharp edges, hot engine components and be protected from chafing. Grommeting is required where the lines pass through any member of the vehicle. Fuel lines are not allowed in the cockpit.

B12.5 All lines must be SAE rated fuel lines and attached securely to prevent minimum line movement using sound engineering practices. Lines must be no larger than the stock lines supplied with the engine (i.e. 12.7 mm (0.5 in.) outer diameter and 6.3 mm (0.25 in.) inner diameter). The Briggs and Stratton fuel line is 1/4" SAE J30R14 or 30R7-RP. Bulk fuel line can be ordered through Briggs and Stratton and is part number 395051R.

If a fuel filter is used, it must be a Briggs and Stratton stock filter.

B12.6 Spill Prevention

The fuel tank must be mounted so that if fuel spills it will not come in contact with the driver or the engine. Complying with this rule requires a drip pan that is at least 203.2 mm (8 in) in diameter (or equivalent area) and has sides at least 38 mm (1.5 in) high above the top edge of the tank.

B12.6.1 Drip Pan Mounting

Drip pans must be mounted using sound engineering practices. A drip pan mounting comprised only of fastening to the fuel tank filler neck is insufficient, and is not allowed. Drip pans must be graded or inclined such that all spilled fuel drains from the drip pan – fuel must not pool anywhere in the pan.

B12.6.2 Drip Pan Drain

Fuel must drain from the drip pan through a drain line composed of pipe or tubing that carries fuel to the bottom of the vehicle and releases under the vehicle. Fuel may not be released onto the belly pan, flotation, or any other part of the vehicle. The clear diameter of the drain line system must be no less than 9.5 mm (3/8 in.) at any point, including fittings.

B12.6.3 Drain Line Material

Drains lines must be made of either fuel line material, or other pipe or tubing which is not weakened or dissolved by fuel. The drain line connection to the drip pan must be sealed and robust.

B12.7 Splash Shields

Splash shields are required to prevent fuel from accidentally being poured directly on the engine or exhaust while refueling or preparing to refuel the vehicle.

B12.7.1 The splash shields must be mounted.

Note: (BELOW) The following are examples of approved spill/splash shields:



Note: (BELOW) The following spill/splash shield is NOT acceptable:



B12.8 Fuel

The only fuels permitted in the vehicles are grades of automotive gasoline consisting of hydrocarbon compounds. The fuel may contain anti-oxidants, metal deactivators, corrosion inhibitors, or lead alkyl compounds such as tetra-ethyl lead.

B12.8.1 The addition of nitrogen bearing additives, or additives designed to liberate oxygen is strictly prohibited.

B12.8.2 Specific gravity of the fuel may not exceed 0.75 for leaded gasoline or 0.80 for unleaded gasoline when measured at 60 degrees Fahrenheit. See Section “Competition Fuel Supply.”

B12.9 Fuel Containers (new)

All fuel must be carried in, and put into vehicle fuel tanks, from approved unmodified containers.

Approved unmodified containers shall:

- 1) Have a volume of 5 gallons or less.
- 2) Be equipped with an original cap to prevent spills when not in use.
- 3) Be labeled with school name and car number.”

ARTICLE 13: STEERING, SUSPENSION AND FLOTATION SYSTEMS

B13.1 Floatation Systems – Water Competitions Only

Vehicles participating in water events must be statically stable in roll and pitch while floating. Floatation buoyant cavities must be closed (non-floodable), with a maximum cell diameter of 10 mm (0.4 in.). Tires, frame tubes, casings, and other vehicle equipment must also be closed if contributing to buoyancy, but are exempt from the maximum cell diameter requirement.

ARTICLE 14: FASTENERS

B14.1 Fasteners in the engine, steering, suspension, braking (rotors and bias bars are exempt); throttle pedal and driver restraint systems must meet the following guidelines.

B14.2 Fasteners Captive

Fasteners must be made captive through the use of NYLON locknuts, cottered nuts or safety wired bolts (in blind applications). Lock washers or thread sealants do not meet this requirement.

B14.3 Fastener Grade Requirements

Threaded fasteners utilized must meet or exceed either, SAE Grade 5, Metric Grade 8.8 and/or AN/MS specifications. See Figures below.

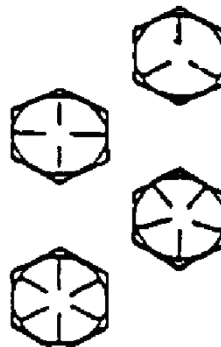
Acceptable SAE Bolt Grades:

Grade 5: 3 radial dashes 120° apart

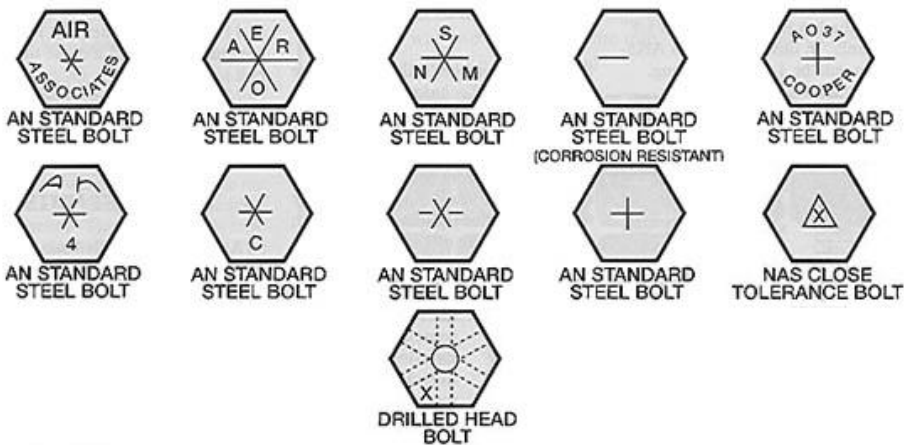
Grade 6: 4 radial dashes 90° apart

Grade 7: 5 radial dashes 72° apart

Grade 8: 6 radial dashes 60° apart



Acceptable Military Specification Bolt Grades:



B14.4 Thread Exposure

Threaded fasteners used must have at least two (2) threads showing past the nut.

B14.5 Socket Head Cap Screws

B14.5.1 Socket head cap screws, also known as “internal wrenching bolts” or “allen head bolts”, must meet one of the following requirements:

B14.5.2 The bolt head is clearly marked with the letters “NAS”, “12.9”, or “10.9” indicating a military / aircraft or high-strength metric fastener. No other markings will be accepted.

B14.5.3 Proper documentation is supplied, which must include a purchase receipt, and manufacturer’s documentation indicating bolt strength equivalent to the above.

B14.6 Unmarked Fasteners / Shop Manufactured Fasteners

Any threaded fastener (threaded rod, eye bolts, titanium bolts, etc.) that is unmarked, or does not have any markings as listed, must be documented by either:

(A) A purchase receipt and manufacturer’s documentation indicating that the fastener meets or exceeds Grade 5 standards for that size.

OR

(B) Equivalency calculations with a purchase receipt or test data showing that the fastener exceeds the strength for a Grade 5 fastener of the same size.

B14.7 Modified Fasteners

Fasteners which have been modified in any way other than: (1) drilling for safety wire or (2) shortening of the shank (threads) shall be subject to all requirements set forth.

ARTICLE 15: GUARDS

B15.1 Powertrain Guards

All rotating parts such as belts, chains, and sprockets that rotate at the rate of the drive axle(s) or faster, must be shielded to prevent injury to the driver or bystanders should the component fly apart due to centrifugal force. These guards/shields must extend around the periphery of the belt or chain and must be wider than the rotating part they are protecting. They must be mounted with sound engineering practice, in order to resist vibration. They must be either

a) Made of AISI 1010 steel at least 1.5 mm (0.06 in) thick or

(b) An alternate material having equivalent energy absorption at rupture per unit width of shield. Equivalency calculations for the alternative material must meet the following requirements:

- All calculations must be shown in SI units.
- Calculations must use the following material properties for the 1010 steel:
 - Yield Strength = 305 MPa
 - Ultimate Strength = 365 MPa
Elongation at Break = 20.0%,
 - Modulus of Elasticity = 205 GPa
- Documentation from the material manufacturer showing the Ultimate Strength, Elongation at Break, and Modulus of Elasticity of the alternative material must be provided.
- If a stress-strain curve for the alternative material is not provided then it must be assumed that the stress strain curve is linear to the yield point and linear from the yield point to the ultimate strength, where strain = elongation at break (See Fig14)

Notes:

1. Driveshafts moving faster than the drive axles may use a securely mounted driveshaft loop in lieu of a scatter shield.
2. No Polycarbonate materials (such as Lexan) are allowed.
3. In order to show equivalency the calculation must show that the area under the stress-strain curve for AISI 1010 Steel, multiplied by the minimum 1010 thickness, is met or exceeded by the area under the stress-strain curve for the alternate material, multiplied by its thickness

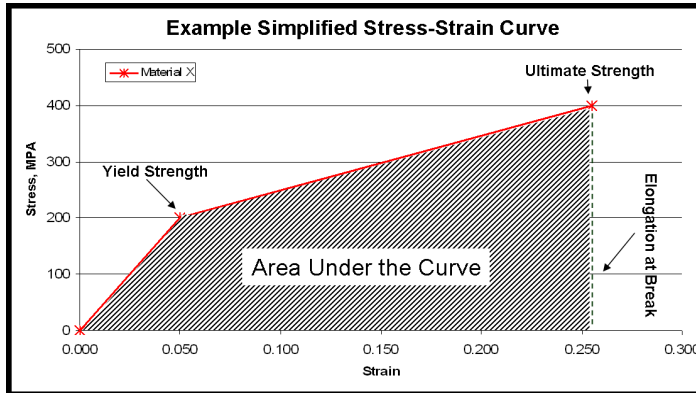
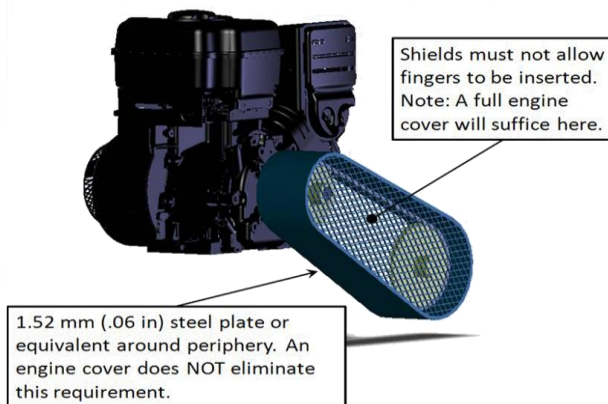


Figure 14

B15.2 Finger Guards

Rotating parts must also be guarded all around, in addition to the guard around the periphery. All around guarding (finger guards) must prevent small, searching fingers from getting caught in any rotating part. A complete cover around the engine and drivetrain is an acceptable shield.



B15.3 Factory Stock Guards

Factory stock guards must be demonstrated to be equal to those described in B15.1. OEM Polaris CVT covers that are not modified are allowed. These covers must still meet the finger guard requirements and need a periphery guard (meeting the requirements of B15.1) in way of the vent.

B15.4 Propeller Guards

Propellers, if used for water propulsion, must be located or shrouded so that direct contact with the propellers is not possible, with the vehicle in an position

ARTICLE 16: DRIVER EQUIPMENT

B16.1 Helmet, Neck Support/Collar & Goggles

All drivers must wear a well-fitting Motocross style helmet with an integrated (one piece composite shell) chin/face guard and a rating of: Snell M2005, SA 2005, British Standards Institution BS 6658-85 types A or A/FR. Goggles must incorporate the use of tear-offs or roll-off systems.



MOTOCROSS STYLE



Full Face Helmets

All drivers must wear a neck support/collar. The neck support must be a full circle (360°) and SFI 3.3 rated. Horseshoe collars are not allowed (see figure). Simpson, RCI, GForce, Deist or Leaf Racing Products supply neck collars that meet this requirement. Neck support must bear the appropriate dated labels, and on Jan 1st of the competition year be no more than three years old.



Neck Support Permitted



Neck Support Not Permitted

WARNING: Some Motocross helmets have extended chin guards that will not contact the required neck collars when the head is flexed forward. This combination of helmet/collar system is prohibited. Any non-specification helmets will be confiscated until after the competition. This rule has no exceptions and it will be strictly enforced. Helmets certified to other rating systems may not be worn.

B16.2 Clothing

Drivers must wear long pants (cotton/Nomex), socks, shoes, gloves, and a long sleeved fire resistant upper garment.

B16.2.1 The upper garment must have a factory label showing that it is SFI rated, FIA rated or fire resistant.

B16.3 Life Jacket Required – Water Competition Only

For deep water events, each driver must wear a U.S. Coast Guard approved Inherently Buoyant Type III life jacket.



AN EXAMPLE OF TYPE III LIFE JACKET, OTHERWISE KNOWN AS A WATERSPORT VEST

PART C: STATIC EVENTS- (U.S and Canadian Events)

ARTICLE 1: SCORING

SCORE SUMMARY-STATIC EVENTS – 300 points	Birmingham	Kansas	Illinois
Design Report	75	75	50
Design Evaluation	125	125	100
Cost Report	15	15	15
Prototype Cost	85	85	85
Presentation	-	-	50
DYNAMIC EVENTS – 700 points			
Acceleration	60	75	75
Hill Climb or Traction	60	75	75
Land Maneuverability	60	75	75
Water Maneuverability	60	-	-
Rock Crawl	-	-	75
Suspension	60	75	-
Endurance	400	400	400
TOTAL POINTS	1000	1000	1000

ARTICLE 2: TECHNICAL INSPECTION

C2.2 Technical Inspection – Pass/Fail

All Baja SAE vehicles must pass a technical inspection before they are permitted to operate under power.

C2.2.1 The inspection will determine if the vehicle satisfies the requirements and restrictions of the Baja SAE rules.

C2.2.2 If vehicles are not ready for technical inspection when they arrive at the inspection site, they will be sent away.

C2.2.3 Any vehicle may be re-inspected at any time during the competition and correction of any non-compliance will be required.

C2.3 Technical Inspection

Technical inspection will consist of four (4) separate parts as follows:

C2.3.1 Engine inspection and governor setting- Governor Setting Check

Briggs & Stratton Technical Representatives will set the governors of all vehicles. Vehicles must be presented for governor setting with the engine output shaft bare, the drivetrain disconnected and the throttle cable disconnected from the engine and working kill switches. Each vehicle engine must be inspected by Briggs and Stratton technical staff that will:

- (1) Confirm its compliance with the rules and
- (2) Set the governor to the specified rpm. (3800)

Part 1 must be passed before a team may apply for Part 2 or Part 3 inspection.

C2.3.2 Technical Inspection

Each vehicle will be inspected to determine if it complies with the requirements and restrictions of the Baja SAE rules. This inspection will include an examination of the driver's equipment including helmet and arm restraints, a test of driver exit time and to ensure that all drivers meet the requirements of the rules. Each team **must** bring the following items to inspection.

- (A) **Frame Material Documentation:** Receipts documenting the materials purchased, or otherwise acquired, and used to build the frame.
- (B) **Roll Cage Specification Sheet:** A completed copy of the Roll Cage Specification Sheet
- (C) **Technical Inspection Sheet:** A properly completed Technical Inspection Sheet

<http://students.sae.org/competitions/bajasae/rules/>

- (D) **Drivetrain Check Sheet:** A properly completed Drivetrain Check Sheet
- (E) **Drivers Present:** All drivers must be present at technical inspection.
- (F) Technical inspection must be passed before a team may apply for kill switch and dynamic braking inspection.

C2.3.3 Kill switch and dynamic brake testing

Both the external and cockpit kill switches will be tested for functionality. If both switches pass the test then the vehicle will be dynamically brake tested. Each vehicle must demonstrate its ability to lock all four wheels and come to rest in an approximately straight line after acceleration run specified by the inspectors. If a vehicle fails to pass any part of the inspection it must be corrected/modified and brought into compliance with the rules before it is permitted to operate.

C2.3.4 Inclining Test – Water Competitions Only

Vehicles must demonstrate, in an Inclining Test, a range of floating static roll stability of at least 30 degrees (i.e., recover to upright from a 30 degree induced roll angle) with the team's heaviest driver seated in the normal driving position. Vehicles must pass the Inclining Test while in a fully flooded condition. Vehicles may not participate in water events until they have passed the Inclining Test.

C2.4 Inspection Stickers

C2.4.1 A multi-part inspection sticker will be issued in sections to each vehicle as each of the three parts of technical inspection is completed (an additional sticker will be issued for passing inclining). The inspectors will place the inspection sticker on the right side of the firewall above the driver's shoulder. The inspection sticker must remain on the vehicle throughout the competition. Vehicles without all parts of the inspection sticker may not be operated under power.

C2.4.2 Any or all parts of the inspection sticker may be removed from any vehicle that has been damaged or which is reasonably believed may not comply with the rules.

C2.5 Technical Inspection Sheet – Pre-inspection Required

C2.5.1 Before bringing their vehicle to technical inspection each team **must** (1) pre-inspect the vehicle for compliance with the rules, (2) complete the official technical inspection sheet (available on the Baja SAE Rules and Important Documents website, <http://students.sae.org/competitions/bajasae/rules/>), (3) have the completed inspection list signed by the faculty advisor and team captain.

C2.5.2 Teams must download the most current version of the technical inspection sheet within two weeks of the competition and thoroughly inspect their vehicle in accordance with the sheet.

C2.5.3 All drivers must be at technical inspection or they will be removed from the list of drivers.

NOTE: Teams presenting Technical Inspection Sheets that are (1) incomplete, (2) inaccurate (i.e. do not correspond to the actual condition of the vehicle) (3) are found to have 4 items not in accordance with the rules, or (4) do not represent a serious effort at pre-inspection will be denied inspection at that time and sent back to the end of the inspection line.

C2.6 “As-approved” Condition

C2.6.1 Once a vehicle has passed technical inspection its configuration may not be modified. All accessory components such as roofs, wings, bumpers, etc. are considered part of the configuration and must remain on the vehicle at all times.

C2.6.2 Approved vehicles must remain in “as-approved” condition throughout the competition. Any repairs of a part that is not identical as the broken part must be approved prior to the repair.

C2.6.3 Non-identical parts not approved will be subject to an appropriate performance penalty.

C2.6.4 Minor adjustments permitted by the rules and normal vehicle maintenance and tuning are not considered modifications.

ARTICLE 3: ENGINEERING DESIGN EVENT

C3.1 Engineering design assessment consists of two events: Written Design Report and Design Evaluation.

C3.2 Design Report

The design report should clearly explain the engineering and design process that was used in developing each system of the team’s Baja SAE vehicle. The process for each system could include: Objectives, customer requirements, alternatives considered (e.g. independent rear suspension vs. single rear swing arm, manual transmission vs. CVT, etc.), improvements over last year’s design, the result(s) of design calculations, stress analysis, testing, etc.

C3.2.1 Design Report – Format

(A) **Format** – Design reports must follow the format for SAE Technical Papers found at <http://www.sae.org/products/papers/paprinto/present.htm>.

(B) **Electronic version** – The design report must be submitted electronically in Adobe Acrobat Format. The document must be a single file (text, drawings and optional content are all inclusive). The design report file must be named as follows: Vehicle #_school name (full name)_competition.
EXAMPLE: Vehicle #141_University of East Mudge Baja Oregon.

(C) **File Size** – The maximum size for the file is **5 megabytes**.

C3.2.2 Design Report – Page Limit

The technical paper segment of the design report is limited to ten (10) pages, excluding the cover page. Additionally the report may, at the team’s option, include up to four (4) non-text pages of plans, graphics, photographs or other data for a maximum of fourteen (14) pages of information. The only text permitted on the four (4) optional pages is captions. All pages must be either 8 ½” x 11” or A4.

NOTE: If a report exceeds 10 pages of technical report or 4 pages of graphics, then only the first 10 technical and 4 graphic pages will be evaluated.

C3.2.3 Design Report – Deadline and Submission

Design reports must be submitted to the individual/address listed in the Action Deadlines page at the end of the Rules. Reports must be received by the due date listed in the Action deadlines. Any Design Report not received by the due date will be subject to a penalty of ten (10) points for each day after the deadline.

COMMENT: It is recommended that a printed copy of the design report be brought to each competition along with proof of submission.

C3.3 Design Evaluation

C3.3.1 Design evaluation will involve two steps. The first step will be the initial design judging of all vehicles. After initial judging is complete and the design evaluation scores recorded, the top cars (number determined by SAE and the organizers) will move onto Design Finals.

C3.3.2 During design evaluation, team members are expected to fully explain and discuss all aspects of their vehicle’s design and the rationale behind their design decisions.

C3.3.3 Design Points

Design will be evaluated, and points awarded in the following areas:

Design Category	Birmingham	Kansas	Illinois
Originality, Innovation, Craftsmanship	31.25	31.25	25
Suspension, Steering, Brakes	31.25	31.25	25
Structural Design, Operator Comfort, Mass Production	31.25	31.25	25
Powertrain, Serviceability, Floatation	31.25	31.25	25
Total	125	125	100

Vehicles presented in an unfinished condition may receive lower, or zero points for any incomplete area that cannot be fully assessed by the design judges.

C3.4 Design Finals

C3.4.1 The purpose of Design Finals (DF) is to reward, and call attention to, those vehicles judged to have the best engineering designs. DF are held after the conclusion of Design Evaluation so that the finalists may be chosen, and judged together by all of the design judges. The number of finalists may vary from as few as three to as many as ten, as determined by the number of entries and the results of Design Evaluation

C3.4.2 Scoring for DF is as follows:

After the DF vehicles have been selected, all of their design evaluation scores will be reduced to that of the lowest scoring finalist. This score is considered “DF Initial” (DFI) score. The difference between the highest and lowest of the finalists’ initial Design Evaluation scores is divided by the number of vehicles in DF. DF Bonus (DFB) is this number or 1, whichever is greater.

Vehicles in DF are then judged. The final rankings are determined and the bonuses awarded. The vehicle judged last in DF receives no bonus. The next car receives DF Initial plus 1 × DF Bonus, the next receives DFI + 2 × DFB, etc.

Example:

Min in DF	90
Bonus	1.8

Car #	Initial Score	DF Initial Score	DF Rank	DF Bonus	DF Final Score
45	99	90	2	5.4	95.4
23	97	90	3	3.6	93.6
10	95	90	1	7.2	97.2
5	93	90	4	1.8	91.8
4	90	90	5	0	90

C3.5 Top Ten Teams – Design Comparison Requirement

Teams with vehicles that finished in a top ten position in any of the previous year's Baja SAE competitions are classified as having created a "successful design". Teams that created such successful vehicles are required to provide a comparison of their current design with their previous year's design even if the current design is entirely new.

C3.5.1 As part of the design event, the judges will evaluate the comparison documentation of the top ten teams. Team representatives must be present during the comparison to discuss the design changes. If the judges find that the design changes are (A) not significant, (B) not supported by a detailed analysis, or (C) have not been sufficiently documented, then a penalty of up to one hundred (100) points may be assessed against the design score.

C3.6 Redesign/Design Comparison Document

The redesign/design document may be in the form of either or both (A) posters or (B) report. The documentation should be a year to year comparison of the major structure and/or systems of the vehicle and may consist of any, or all, of the following, supported by appropriate captions: (1) plans, (2) drawings or (3) photographs. Design changes to correct failures of the previous design should be accompanied by a thorough analysis of why the failure occurred and the theoretical data supporting the new design, etc.

C3.7 Duplicate Design

Teams are reminded that the objective of Baja SAE is to provide students with a design challenge that will enhance their engineering and engineering project management skills. Participating teams must be able to demonstrate their engineering knowledge either by designing a vehicle from scratch or by making significant changes to a previously entered vehicle. If a school brings two vehicles that the design judges find to be either identical, or to exhibit only insignificant differences, then the cars will be treated as a single entry with a duplicate car for parts. In such case only one car will be evaluated and permitted to compete in the dynamic events.

ARTICLE 4: COST EVENT

C4.1 Cost consists of two related sections: Cost Report and Prototype Cost. The cost report provides all the background information to verify the vehicle's actual cost. The prototype cost is the actual cost and the points and the points related thereto.

C4.2 Cost Report

The Cost Report may contain a maximum of three sections.

C4.2.1 Report Section 1 – Overview (Optional) –

The optional overview is intended to give each team the opportunity to point out, and briefly comment on, any design features or fabrication processes that are innovative or are expected to result in significant cost savings. Teams may also use the overview to explain items or processes that might appear to be discrepancies within the report. The overview section is limited to a maximum of four (4) pages and is optional. This should be included as part of the Cost Documentation .pdf file.

C4.2.2 Report Section 2 – Costing Sheets –

The core of the report is the series of costing sheets. This section must contain the one-page summary sheet broken up into the individual subsystems. Each subsystem needs an individual sub-assembly sheet (Form A). Note that Vehicle Assembly Labor cost is for the labor it takes to assemble a subassembly to the frame. All fabricated parts on the sub-assemblies sheets (Form A) require a Form B. Note that the sub-system assembly time is the time it takes to assemble all the parts in that assembly together.

C4.2.3 Report Section 3 – Cost Documentation –

This section includes copies of receipts, invoices, price tags, catalog pages, on-line prices, or other documentation, to substantiate the costs of the parts and materials of any item costing more than \$30. Cost documentation must be at full retail US prices. The report is expected to be comprehensive, well documented, truthful and accurate.

C4.2.4 Cost Report – Electronic Format (updated)

Electronic version – The cost report must be submitted electronically to bajasae@sae.org in two different documents:

1. The Microsoft Excel format (with the extension .xls(no macros) or .xlsx), using the supplied template posted on the Baja SAE Important Documents page. This document may not be modified from its current form. This

includes password protecting and embedding macros. Teams will receive zero (0) points for Cost if the report is in the incorrect format or the files have been modified.

2. A PDF file with all of the cost documentation described above. The cost report file must be named as follows: vehicle number (3 digits), school name (full name), and team name (if more than one vehicle is entered). For example: 001 University of Alaska Polar Bears. If the vehicle is participating in more than one competition use the vehicle number of the first competition.

C4.2.5 Cost Report – File Size

The maximum size for the Excel template is **1.0 megabytes** and **4 megabytes** for the PDF file. Files larger than this will be penalized.

C4.2.6 Cost report Hard copy

Teams must bring a hard copy of their cost report to the cost judges on site. Teams that fail to bring a hard copy to judging may receive zero (0) for their cost.

C4.2.7 Multi-competition Cost Reports – U. S. and Canadian competitions only

Teams that are entering more than one of the U. S. and Canadian Baja SAE competitions must submit a single multi-competition cost report.

Multi-competition cost reports must (1) Identify all the competitions to which the report applies AND the vehicle number at each event. (2) Contain a unique event form documenting all differences between competitions.

C4.2.8 Penalty for Late or Non-Submission

Cost reports arriving after the deadline will be penalized ten (10) points per day up to a maximum of one hundred (100) points. Failure to submit a cost report will result in zero (0) points for the cost event.

COMMENT: It is the responsibility of the team to verify when the report was received by SAE; submission time will be the time the report is received at SAE. Teams will be cost audited at competition.

C4.2.9 Cost Correction

The judges may increase costs and/or fabrication times if they believe that the figures submitted are below current prices for the item, source, or process involved. Prices or times that are higher than the judge expects will not be corrected. Mathematical errors will be penalized. Reports that are highly inaccurate, highly incomplete, or in which the costs cannot be substantiated, may be rejected in their entirety and scored accordingly. Teams that are required to bring their car to on-site cost judging must do so by their scheduled appointment.

C4.2.10 Prototype Cost – 85 points

Prototype cost is scored on the cost, as corrected by the judges, to produce the finished vehicle brought to the competition.

Prototype cost score will be calculated as follows:

$$\text{Prototype Cost} = 85 \text{ points} \times \frac{C_{max} - C_{your}}{C_{max} - C_{low}}$$

where:

- C_{your} Vehicle cost, as corrected
- C_{low} lowest vehicle cost, as corrected
- C_{max} highest vehicle cost, as corrected

C4.2.11 Cost Adjustment Form

The purpose of the cost adjustment form is to make additions to previously submitted report. Items may be deleted, but the total adjustment for the individual component categories must be positive (cost will not be subtracted). This gives the team the chance to add items that were not previously planned. It is not an opportunity to redo the entire

report. For teams that are cost-audited and going to multiple races, the items found during the cost audit cannot be included in this sheet. The total amount of adjustments may not exceed 10% of the total cost of the vehicle previously submitted. If the adjustment exceeds 10%, the additional amount will be added with a multiplier of 3 times (3x). If the adjustment exceeds 25%, the report will be considered incomplete and will not be graded

C4.2.12 Cost Eligibility

Teams that do not successfully pass technical inspection by 12:00 PM on the first day of dynamic events will not receive any points for prototype cost.

C4.2.13 Cost Component Categories

Teams must put items that are specified in the correct component categories and sub categories or the items will not be considered. See Cost Template for these.

ARTICLE 5: SALES PRESENTATION EVENT – Baja SAE ILLINOIS only – 50 Points**C5.1 Presentation – Objective**

The objective of the Presentation is for the team to convince the “executives” of a hypothetical manufacturing company to purchase the team’s Baja SAE vehicle design and put it into production at the rate of 4000 units per year.

C5.1.1 For the purposes of the presentation assume that the judges are assumed to be a mixed group of corporate executives who may have experience in marketing, production and finance as well as engineering.

C5.2 Presentation – Format

One or more team members may make the presentation to the judges. The presentation itself is limited to a maximum of ten (10) minutes.

C5.2.1 Following the presentation there will be an approximately five (5) minute question period.

C5.2.2 Only the judges are permitted to ask questions. Any team member on the presentation floor/stage may answer the questions even if that member did not speak during the presentation itself.

C5.3 Projection Equipment

Teams planning to use data projection are responsible for bringing, or otherwise arranging for their own data projectors. Some data projectors may be provided by the organizers; however, teams should not rely on either the availability or functionality of such equipment.

C5.4 Presentation – Scoring

C5.4.1 The presentation event will be scored based on such categories as

- (1) The content of the presentation,
- (2) The organization of the presentation,
- (3) The effectiveness of the visual aids,
- (4) The speaker’s delivery, and
- (5) The team’s responses to the judge’s questions. The team’s score will be the average of the individual judge’s scores.

C5.4.2 The team that makes the best presentation will receive the highest score regardless of the finished quality of their actual vehicle.

ARTICLE 6: TIE BREAKERS**C6 Tie breakers**

There will be no tie-breakers for static events.

PART D: DYNAMIC EVENTS- (U.S and Canadian Events) TOTAL – 700 POINTS

The dynamic events are intended to determine how the Baja SAE vehicles perform under a variety of conditions. Note that the organizers may modify the dynamic events to address local conditions, weather or resources.

D2.3 Traction Event – Penalties

The organizer may modify the penalties imposed for different violations to account for differences in the length or design of specific event courses.\

D2.3.1 Driving off Course Score as maximum progress at point of DOC

D2.3.2 False Start First - Rerun at end of line
Second - Run DNS

D2.4 Hill Climb or Traction Event – Scoring

D2.4.1 Method A: “Different Distances” – If none of the vehicles are able to complete the course, then:

$$\text{HillClimborTractionScore} = 60\text{or}75 \text{ points} \times \frac{d_{yours} - d_{shortest}}{d_{longest} - d_{shortest}}$$

where :

$d_{shortest}$ shortest distance traveled by any vehicle
 d_{yours} distance traveled by the vehicle to be scored
 $d_{longest}$ longest distance traveled by any vehicle

D2.4.2 Method B: “Fixed Distance-All Succeed” – If there is (a) a set maximum distance and (b) all teams succeed in completing a full distance hill or pull, then the score will be based on the time for the full distance

$$\text{HillClimborTractionScore} = 60\text{or}75 \text{ points} \times \frac{t_{longest} - t_{yours}}{t_{longest} - t_{shortest}}$$

where :

$t_{shortest}$ fastest time by any vehicle
 t_{yours} time for the vehicle to be scored
 $t_{longest}$ the lesser of : a) slowest time by any vehicle ; b) $2.5t_{shortest}$

D2.4.3 Method C: “Fixed Distance-Some Succeed” –

If there is (a) a set maximum distance and (b) at least one team climbs the hill or makes a full pull and others do not, then the vehicles going the full distance (Group I) will be scored based on time and the vehicles that fail to climb the hill or make a full pull (Group II) will be scored based on distance.

Group I – Teams that make the full distance will be scored

$$\text{HillClimborTractionScore} = 60\text{or}75 \text{ points} \times \frac{t_{shortest}}{t_{yours}}$$

where:

$t_{shortest}$ fastest time by any vehicle
 t_{yours} time for the vehicle to be scored

Group II – Teams that do not make the full distance will be scored by the following:

$$\text{HillClimborTractionScore} = \text{lowestscorefromgroupI} \times \frac{d_{yours}}{d_{course}} \text{lowestscore}$$

where :

d_{yours} distance traveled by the vehicle to be scored
 d_{course} distance from start line to finish line

ARTICLE 3: MANEUVERABILITY EVENT – 60 or 75 points

D3.1 Maneuverability – Objective

Maneuverability is designed to assess each vehicle’s handling ability over typical Baja terrain. The course may consist of a variety of challenges at the organizer’s option, possibly including tight turns, pylon maneuvers, ruts and bumps, drop-offs, sand, rocks, gullies, logs, and inclines.

D3.2 Maneuverability – Procedure

Each vehicle may make two (2) runs with the best time including penalties, counting for score.

D3.3 Maneuverability – Penalty Default Values

The organizer may modify the penalties imposed for different violations to account for differences in the length or design of specific event courses.

D3.3.1	Obstacle/Pylon moved	2 seconds
D3.3.2	Missed gate*	10 seconds
D3.3.3	Excessive Driving Off Course	Run DNF
D3.3.4	False Start	First - Rerun at end of line Second - Run DNS

*Missed gate is when 2 or more wheels are outside the gate

D3.4 Maneuverability – Time Limit

Only vehicles that complete the maneuverability course within a time not exceeding 2.5 times that of the fastest vehicle will receive a score. If a vehicle is on the course for a time that exceeds 2.5 times the fastest time recorded to that point then the attempt may be declared over and the vehicle may be removed from the course and scored as “Excess Time”.

D3.5 Maneuverability – Scoring

Maneuverability scoring is based on the vehicle’s time through the course including any penalties.

$$\text{ManeuverabilityScore} = 60\text{or}75 \text{ points} \times \frac{t_{\text{longest}} - t_{\text{yours}}}{t_{\text{longest}} - t_{\text{shortest}}}$$

where :

- t_{shortest} fastest time by any vehicle
- t_{yours} time for the vehicle to be scored
- t_{longest} the lesser of : a) slowest time by any vehicle ; b) $2.5t_{\text{shortest}}$

ARTICLE 4: SPECIALTY EVENTS – 60 or 75 points

D4.1 Specialty events are designed to test the vehicle under unique off-road conditions that might be available at some Baja SAE competition sites.

D4.1.1 Examples of specialty events are: Rock Crawl; Mud Bog; Suspension and Water Maneuverability. Specialty events will be announced at the time of opening of registration for a competition. Organizers will describe the event and define the procedure, penalties, and scoring system to be followed.

ARTICLE 5: ENDURANCE – 400 Points

D5.1 Endurance – Objective

General: The endurance event assesses each vehicle’s ability to operate continuously and at speed over rough terrain containing obstacles in any weather conditions.

D5.2 Endurance – General Description

Endurance may be run for either time or distance. Endurance events for time usually run for four (4) hours. Endurance events for distance continue until at least one car has gone the specified distance.

- D5.2.1** Endurance will be run as either (A) a single four (4) hour race, (B) a predetermined and published distance, or as (C) elimination heats followed by a final in which the total time of one elimination heat plus the final is 4 hours. The organizer (with approval from SAE) will announce the structure of the event prior to the start.
- D5.2.2 Determining the winner of the endurance race:**
- A The team that completes the distance of the competition first, or the greatest distance in the time set for the competition will be declared the winner.
 - B In competitions of a given distance, the checkered flag will be given first to the leading car, then to the other finishers as they cross the finish line.
 - C In competitions of a timed length, the checkered flag will be given first to the leading car as it crosses the finish line at or after the expiration of the specified duration, then to the other finishers as they cross the finish line.
 - D If the leading car is not running at the expiration of the time limit, the checkered flag will be given to the next highest running car in the same manner.
- D5.3 Endurance – Starting**
- D5.3.1** The starting grid for endurance will be based on each team’s performance in a previous dynamic event, or set of dynamic events, to be determined by the organizer.
- D5.3.2** All vehicles will be considered to have begun the race simultaneously at the time when the starter releases the first vehicle onto the course regardless of their actual position in the grid.
- D5.4 Endurance – Command Flags**
Command flags are just that – flags that the competitor must immediately obey without question.
- D5.4.1 Green Flag –**
- (1) At a starting line or when reentering the course: Your run or session has started; enter the course under the direction of the starter. (NOTE: If you stall the vehicle, restart and await another green flag as the opening in traffic may have closed.)
 - (2) While running on the course: Course is clear, proceed.
- D5.4.2 Yellow Flag, Steady –** Danger, SLOW DOWN, be prepared to take evasive action, something has happened beyond the flag station. NO PASSING, unless directed by the course workers.
- D5.4.3 Yellow Flag, Waved –** Great danger, SLOW DOWN, evasive action is likely to be required, BE PREPARED TO STOP, something has happened beyond the flag station. NO PASSING, unless directed by the course workers.
- D5.4.4 Red Flag –** Come to an immediate safe and controlled stop on the course. Pull to the side of the course as much as possible to keep the course open. Follow course worker directions. NO PASSING.
- D5.4.5 Black Flag, Furled and Pointed –** Warning, the officials are watching this vehicle’s driving – obey the event rules.
- D5.4.6 Black Flag, Displayed –**
- (1) Pull into the penalty box for a discussion with the Director of Operations or other official concerning an incident. A time penalty may be assessed for the incident.
 - (2) Pull into the penalty box for a mechanical inspection of the car; something has been observed that needs closer inspection.
- D5.4.7 White Flag –** In specified-distance endurance events, the white flag will be displayed to the leader as the leader begins the final lap.
- D5.4.8 Checkered Flag –** The run or session has been completed. Exit the course at the first opportunity.
- D5.5 Endurance – Stalled or Disabled Vehicles**

- D5.5.1** Disabled or stalled vehicles must be immediately removed from the roadway. It is the driver’s responsibility to assist and cooperate with the course marshals in removing the vehicle.
- D5.5.2** Vehicles may only be started with the driver seated with all belts properly fastened.
- D5.5.3** The driver may not exit the vehicle to execute a restart. Course marshals, volunteers or team members may assist drivers in restarting their vehicles.
- D5.5.4** Officials and course marshals may stop any vehicle, at any time, if they believe it no longer complies with the requirements and restrictions of the rules.
- D5.5.5** If a vehicle is stopped by officials for a mechanical fault, the fault must be corrected/repared before it may reenter the event.
- D5.6 Endurance – Repairs**
The organizer will announce the rules governing repairs that are permitted to be made during the endurance event.
- D5.6.1** If repairs along the course are permitted then vehicles under repair must be removed well off the course, away from the outside of turns and away from any natural run-off areas.
- D5.7 Endurance Event – Penalty Default Values**
- D5.7.1** The organizer may modify the penalties imposed for different violations to account for differences in the length or design of the course. Note that all time penalties are enforced from when the vehicle is in the black flag area, i.e. the time spent being towed back to the pits does NOT count towards the penalty
- D5.7.2** Passing under a Yellow Flag 1 lap penalty
- D5.7.3** Failure to stop for Black Flag 10 minutes
- D5.7.4** Leaving course and advancing 5 minutes
- D5.7.5** Failure to yield to traffic on entering track 5 minutes
- D5.7.6** Driving in an unauthorized area 10 minutes
- D5.7.7** Speeding in pit area
First time = 5 minutes
Second time = 20 minutes
- D5.7.8** Running out of fuel on the track 20 minutes
- D5.7.9** Deliberate ramming
First time = 10 minutes
Second time = Disqualification
- D5.7.10** Deliberate forcing another vehicle off course
First time = 10 minutes
Second time = 20 minutes
Third time = Disqualification
- D5.7.11** Refueling on the track First time = Disqualification
- D5.8 Fueling:**
Fueling will not be allowed until the engine is turned off, the driver is out of the vehicle, and a fire extinguisher is ready.
- D5.8.1** No work will be done on the vehicle while fueling.
- D5.9 Endurance – Scoring**
- D5.9.1 General:** The endurance event score is determined by (a) the number of laps each team completes during the endurance final and (b) the finish order of teams at the end of the event.

- D5.9.2** “Scored laps” are the number of full laps actually completed during the endurance event final. Only full laps count, partial laps do not count for score. A vehicle must cross the counting/timing line under its own power for a lap to be counted.
- D5.9.3** “Finish order” is the sequence in which vehicles cross the finish line after the lap scoring period has ended. Finish order determines the ranking of teams completing the same number of laps. For example, if the top four teams finish with the same number of laps, then they will be ranked 1st to 4th based on their finish order.
- D5.9.4** “Bonus points” are additional points awarded to the first ten (10) vehicles on the leading (winning) lap, as separated by finish order as required, in part to differentiate teams finishing with the same number of scored laps. Up to 10 bonus points will be awarded in the inverse order of finish. Thus, the first vehicle to cross the finish line in the highest lap group will receive bonus points equal to the number of cars on the lead lap (max of 10); the second vehicle will receive one less bonus point etc. Example:

Position	Lap	Bonus Points
1	48	4
2	48	3
3	48	2
4	48	1
5	47	0

- D5.9.5** Endurance scoring is based on number of laps the vehicle completes in the allowed time:

$$\text{Endurance Score} = 400 \text{ points} \times \frac{L_{yours} - L_{lowest}}{L_{highest} - L_{lowest}} + \text{bonus points}$$

where :

- $L_{highest}$ highest number of laps completed by any vehicle
- L_{yours} number of laps completed by the vehicle to be scored
- L_{lowest} lowest number of laps completed by any vehicle

- D5.10 Endurance Heats plus a Final – Point Distribution:** When endurance is run as heats plus a final, the points for the event will be distributed between the heats and the final in proportion to the time/distance of each stage.
- D5.10.1** Thus, if endurance is run as one (1) hour eliminations plus a three (3) hour final, the four hundred (400) total points will be allocated as one hundred (100) points to each elimination heat plus three hundred (300) points to the final.

D5.10.2 Tie-breakers

Tie-breakers for dynamic events will be the second best run time or score for the given tied event. If both scores for tied teams in the event are equal then the tie remains.
 Ties in the endurance race will be judged by the endurance event judge and may remain a tie.
 Ties for overall winner will be broken by the following criteria:
 Endurance score
 Total dynamic events score
 Total static events score

If a tie remains after all the above tie-breakers then the tie remains for the overall winner(s).

ARTICLE 6: COMPETITION PROCEDURES AND REGULATION – GENERAL

D6.1 Meetings

All team members identified as captains or drivers and all faculty advisors MUST attend all meetings so designated (captains, drivers and/or faculty advisors). Attendance at meetings is mandatory. Failure to attend meetings can result in disqualification of members or the entire team.

D6.2 Pre-inspection Operation Prohibited

Vehicles may not be started or driven prior to passing technical inspection, except as required as part of the inspection process itself.

D6.3 Engine governors are subject to check and resetting.**D6.4 Refueling**

Refueling of vehicles must be performed done with (1) the engine shut-off and (2) the driver out of the vehicle. A fire extinguisher (other than that carried in the vehicle) must be on hand whenever a vehicle is being refueled.

D6.5 Engine and Drivetrain Inspection

Any vehicle may be inspected anytime during the competition. Any vehicle found to have: (1) altered or substituted its parts or equipment since passing technical inspection or (2) an engine in violation of the rules may receive a point deduction of 75 points each time it is found in violation.

D6.6 Engine Recall Option

The organizers and SAE may, recall the engine from any vehicle in the competition in exchange for a new Briggs and Stratton engine. Recalled engines will not be returned and will be inspected at Briggs and Stratton's facilities to confirm compliance with the rules.

ARTICLE 7: PADDOCK RULES**D7.1 Vehicle Movement – Walking Pace Required**

When a vehicle is driven anywhere except within the practice area or on event courses it must move at walking speed with a team member walking along side at a normal pace. During the performance events when the excitement is high, it is particularly important that vehicles move at a walking pace in the paddocks. The walking speed rule will be strictly enforced and point penalties will be assessed for violations.

Under no circumstances may anyone other than the driver, ride on a vehicle.

D7.2 Team Work Area

The team's work area should be clearly defined and should be kept uncluttered at all times. When a team leaves their area, it must be left clean.

D7.3 Vehicles in the Paddocks

Only the Baja SAE vehicles themselves and the teams' support trucks and trailers are allowed in the paddocks.

D7.4 Occupancy Restrictions

The organizers may limit the paddocks to team members, faculty advisors and competition officials.

ARTICLE 8: DRIVING RESTRICTIONS**D8.1** During the competition, Baja SAE vehicles may only be driven between the paddocks and an event site, during official practice or in the events themselves.

DRIVING OFF-SITE IS ABSOLUTELY PROHIBITED. TEAMS FOUND TO HAVE DRIVEN THEIR VEHICLE AT AN OFF-SITE LOCATION MAY BE EXPELLED FROM THE COMPETITION.

ARTICLE 9: RULES OF CONDUCT**D9 Sportsmanship****D9.1** All Baja SAE participants can be proud of the excellent sportsmanship and cooperation among teams that are two of the hallmarks of the series. Good conduct and compliance with the rules and the official instructions are expectations and requirements for every team member.

- D9.1.1** On those extremely rare occasions where there is an incident of unsportsmanlike conduct the organizer is authorized to impose an appropriate penalty.
- D9.1.2** Unsportsmanlike conduct can include arguments with officials, disobedience of official instructions and the use of abusive or threatening language to any official or other participant. Depending on the seriousness of the infraction the penalty for such actions can range from a deduction of up to fifty percent (50%) of the team's points to expulsion of the entire team. Penalties of this type will only be imposed after a complete review of the incident by the organizer and SAE staff.
- D9.2 Alcohol and Illegal Material**
Alcoholic beverages, firearms, weapons of any type and illegal materials are prohibited at Baja SAE sites during the competition. The penalty for violation of this rule is the immediate expulsion of the entire team, not just the individual(s) involved. This rule applies to team members, advisors and any individuals working with the team on-site.
- D9.3 Smoking – Prohibited**
Smoking is prohibited in all competition areas.
- D9.4 Parties**
Disruptive parties either on or off-site must be prevented by the faculty advisor or team captain.
- D9.5 Trash Clean-up**
Clean-up of trash and debris is the responsibility of the teams. Please make an effort to keep your paddock area clean and uncluttered. At the end of the day, each team must clean their work area.
- D9.6 Site Condition**
Please help the organizers keep the site clean. The sites used for Baja SAE are generally private property and should be treated as such. Competitors are reminded that they are guests of the owners. All trash should be placed in the receptacles provided. Glass is not allowed on the grounds. Failure to clean the premises will result in an unsportsmanlike conduct penalty (see-D 11). Competitors are encouraged to police their areas after meals.
- D9.7 Motorcycles, Bicycles, Rollerblades, etc.—Prohibited**
The use of motorcycles, quads, bicycles, scooters, skateboards, rollerblades or similar person-carrying or motor driven devices by team members and spectators in any part of the competition area, including the paddocks is prohibited.

ARTICLE 10: SPECTATOR RULES

- D10.1 General**
The organizers typically do not have a direct line of communication with spectators other than on-the-spot at the competition; thus, the competitors, faculty and volunteers are expected to help inform the spectators of the safety rules and help restrict spectators to the spectator areas.
- D10.2 Alcoholic Beverages**
Spectators may not drink or possess alcoholic beverages at any competition location.
- D10.3 Access Restrictions**
Spectators must keep well back from the event and practice tracks and from any area where vehicles are operating under power. Motor vehicle competitions are potentially dangerous and safety rules will be strictly enforced.
- D10.4 Children**
A competition site is not a safe place for children and unsupervised young people. Spectators who fail to strictly control their children will be asked to leave the site.
- D10.5 Removal of Spectators**
The course officials and organizers have the absolute right to restrict spectator access to any parts of the site and to eject anyone who violates safety rules or ignores the instructions of officials.
- D10.6 Unsafe Practices and Conduct**

All participants are required to exercise safe practices and avoid unsafe activities at all times during the competition. The event organizer has the discretionary authority to impose a just penalty for any conduct deemed unsafe. All team members will be held to this rule.

ARTICLE 11: MISCELLANEOUS

11.1 Driver Equipment

Drivers must wear all of the equipment specified in "Driver Equipment Requirements" and a properly fastened restraint system at all times when the vehicle is running in any event or on the practice track.

11.2 Drivers not wearing the proper equipment will not be permitted to drive, and may have their competition driver's privileges revoked.

11.3 Water Competitions Only – Driver equipment rules for water events may be adjusted by the organizer and SAE depending on the characteristics of the site.

11.4 Practice Area

Practice may only take place in designated areas.

ARTICLE 12: SAFETY – TEAM RESPONSIBILITY

12.1 Safety is the primary consideration in the design of Baja SAE vehicles and the conduct of the competitions.

12.2 Teams need to include safety considerations in all parts of their program.

12.3 At all performance events, it is the responsibility of the team to ensure both the vehicle and driver meet and follow all the requirements and restrictions of the rules.

NOTICE OF POSSIBLE RULE CHANGES FOR 2012:

B15.1 Powertrain Guards and Rotating parts rule

- A rule defining suspension seats

**BAJA SAE ROLL CAGE SPECIFICATION SHEET
2011 BAJA SAE COMPETITIONS**

SCHOOL NAME _____ CAR NUMBER _____

Circle competition in which you are competing: **Kansas - Illinois - Birmingham**

**This sheet MUST be completed and submitted in accordance with the competition rules.
Failure to do so will result in penalty.**

Purpose: The purpose of this sheet is to facilitate verification of roll cage materials/construction, and to provide a means of tracking the age of older vehicles. This is being done in the interest of good engineering practice and confirming the fabrication techniques of the team.

1. Academic year the cage was constructed? _____
2. Material Type (i.e.: 4130): _____ OD: _____ Thickness: _____
3. Primary Welder: _____ Welding Method Used: _____
Type of Filler Material: _____ Shielding Gas Used: _____
4. Equivalency calculations if needed (attach to this sheet).
5. All welds and/or other attachment methods must be checked for integrity. Faculty advisor and team captain are requested to do destructive testing on sample joints that represent the integrity of similar welds on their frame.

Date of inspection _____

NOTE: It is extremely important that such an inspection be made to ensure the welds have good penetration and joints are completely welded.

WE HAVE EXAMINED THE ABOVE INFORMATION AND TO THE BEST OF OUR KNOWLEDGE DEEM IT TO BE ACCURATE.

TEAM CAPTAIN _____ <div style="text-align: center;">(SIGNATURE)</div>	_____ <div style="text-align: center;">(DATE)</div>
FACULTY ADVISOR _____ <div style="text-align: center;">(SIGNATURE)</div>	_____ <div style="text-align: center;">(DATE)</div>

Bring a completed copy of this form with you to technical inspection FOR EACH COMPETITION your team is entering.

ACTION DEADLINES: BAJA SAE Kansas

Hosted by the Pittsburg State University, Kansas
Pittsburgh, Kansas
May 26-29, 2011

Registration – Opens OCTOBER 4, 2010 at 10:00 AM Eastern Daylight Savings Time
Register online at: <http://www.sae.org/students/student.htm>

Registration Fee - \$1000.00 USD
Registration Deadline – Monday, December 20, 2010, 11:59 pm EST

Engine Orders – Available online upon completion of registration beginning October 4, 2010
Engine Order Deadline – Monday, December 20, 2010

Engine Shipping Charge - \$150.00 USD per engine

Design Reports

(1) ELECTRONIC REPORTS (e-mailed) -must be received at SAE by 11:59 PM Eastern Standard Time on Monday, April 04, 2011

Send to: bajasae@sae.org

A confirmation will be sent upon receiving your report within 48 hours. If you do not receive a confirmation it is your responsibility to follow up.

Cost Reports

1) COST REPORT (emailed) –must be received at SAE by 11:59 PM Eastern Standard Time on Friday, February 18, 2011

Send to: bajasae@sae.org

A confirmation will be sent upon receiving your report within 48 hours. If you do not receive a confirmation it is your responsibility to follow up.

Technical and safety inquiries must be sent via email to: bajarules@sae.org

ACTION DEADLINES: BAJA SAE Illinois

Hosted by SAE Central Illinois Section
Peoria, Illinois, USA
June 8-11, 2011

Registration – Opens OCTOBER 4, 2010 at 10:00 AM Eastern Daylight Savings Time
Register online at: <http://www.sae.org/students/student.htm>

Registration Fee - \$1000.00 USD
Registration Deadline – Monday, December 20, 2010 at 11:59 pm EST

Engine Orders – Available online upon completion of registration beginning October 4, 2010
Engine Order Deadline – Monday, December 20, 2010

Engine Shipping Charge - \$150.00 USD per engine**Design Reports**

(1) ELECTRONIC REPORTS (e- mailed) must be received at SAE by 11:59 PM Eastern Standard Time on Monday, April 18, 2011

Send to: bajasae@sae.org

A confirmation will be sent upon receiving your report within 48 hours. If you do not receive a confirmation it is your responsibility to follow up.

Cost Reports

1) COST REPORT (emailed) –must be received at SAE by 11:59 PM Eastern Standard Time on Friday, February 18, 2011

Send to: bajasae@sae.org

A confirmation will be sent upon receiving your report within 48 hours. If you do not receive a confirmation it is your responsibility to follow up.

Technical and safety inquiries must be sent via email to bajarules@sae.org

ACTION DEADLINES: BAJA SAE Birmingham... (water event)

Hosted by University of Alabama at Birmingham
Birmingham, Alabama----
April 14-17, 2011

Registration – Opens OCTOBER 4, 2010 at 10:00 AM Eastern Daylight Savings Time
Register online at: <http://www.sae.org/students/student.htm>

Registration Fee - \$1000.00 USD
Registration Deadline – Monday, December 20, 2010 at 11:59 pm EST

Engine Orders – Available online upon completion of registration beginning October 4, 2010
Engine Order Deadline – Monday, December 20, 2010

Engine Shipping Charge - \$150.00 USD per engine**Design Reports**

(1) ELECTRONIC REPORTS (e-mailed)- must be received at SAE by 11:59 PM Eastern Standard Time on Thursday, February 24,, 2011

Send to: bajasae@sae.org

A confirmation will be sent upon receiving your report within 48 hours. If you do not receive a confirmation it is your responsibility to follow up.

Cost Reports

1) COST REPORT (emailed) –must be received at SAE by 11:59 PM Eastern Standard Time on Wednesday, February 18, 2011

Send to: bajasae@sae.org

A confirmation will be sent upon receiving your report within 48 hours. If you do not receive a confirmation it is your responsibility to follow up.

Technical and safety inquiries must be sent via email to: bjarules@sae.org

ACTION DEADLINES: INTERNATIONAL COMPETITIONS**2011 BAJA SAE SOUTH AFRICA – INFORMATION
UNIVERSITY OF PRETORIA, SOUTH AFRICA
OCTOBER, 2011**

Note: All Submissions Must Be RECEIVED By the Deadline-NOT POSTMARKED

Registration – Opens FEBRUARY 1, 2011
Contact schalk.els@up.ac.za for a registration form

Early Registration Fee – Check with organizer website
Early Registration deadline – Check with organizer website

Late Registration Fee - Check with organizer website
Late Registration Deadline – Check with organizer website

Engine Orders – Free for local teams (contact organizer Schalk Els, schalk.els@up.ac.za)
Engine Order Deadline – Check with organizer website

DESIGN, COST AND ROLL CAGE REPORTS DUE – Check with organizer website

DESIGN, COST AND ROLL CAGE REPORTS (2 copies of each) ARE TO BE MAILED TO:

Schalk Els
University of Pretoria Main Campus
Department of Mechanical and Aeronautical Engineering
Engineering 1 Building
Room 10-18
Lynnwood Road
Pretoria, 0002
South Africa

Rules questions and inquiries regarding the organization of the South African Baja SAE event specifically go to Schalk Els at:
schalk.els@eng.up.ac.za

BAJA SAE BRASIL 2011 - Information

March, 2011
ECPA – Piracicaba
São Paulo, Brazil
FOR INFORMATION REGARDING BAJA SAE BRASIL 2011, CHECK THE OFFICIAL WEBSITE at
[http://www.saebrasil.org.br/](http://www.saebrasil.org.br) or contact the organizer at baja@saebrasil.org.br.

**2011 BAJA SAE KOREA
Yeungnam University, Gyongsan, Republic of Korea
July 6 – 9, 2011**

Note: All Submissions Must Be RECEIVED By the Deadline-NOT POSTMARKED

Registration – Opens April 1, 2011
Contact phwang@ynu.ac.kr a registration form

Early Registration Fee – \$150.00 USD (150,000 Korean Won)
Early Registration deadline – May 24, 2011

Late Registration Fee - Check with organizer website
Late Registration Deadline – Check with organizer website

Engine: Check with organizer website

DESIGN, COST, ROLL CAGE AND CO-OP REPORTS DUE – June 10, 2011

DESIGN, COST, ROLL CAGE AND CO-OP REPORTS (1 copy of each and 1 CD) ARE TO BE MAILED TO:

Pyung Hwang
Room 412
School of Mechanical Engineering
Yeungnam University
Gyongsan, Gyongbuk 712-749
South Korea

A confirmation will be sent upon receiving your report within 48 hours. If you do not receive a confirmation it is your responsibility to follow up.

Rules questions and inquiries regarding the organization of the Korean Baja SAE event specifically go to Pyung Hwang at: phwang@ynu.ac.kr

ARTICLE 13: APPENDIX S- SAE TECHNICAL STANDARDS

The SAE Technical Standards Board (TSB) has made the following SAE Technical Standards available on line, **at no cost**, for use by Collegiate Design teams. Standards are important in all areas of engineering and we urge you to review these documents and to become familiar with their contents and use.

The technical documents listed below include both (1) standards that are identified in the rules and (2) standards that the TSB and the various rules committees believe are valuable references or which may be mentioned in future rule sets. All Collegiate Design Series teams registered for competitions in North America have access to all the standards listed below - including standards not specific to your competition.

SAE Technical Standards included in the CDS Rules

Baja SAE

J586 - Stop Lamps for Use on Motor Vehicles Less Than 2032 mm in Overall Width
J759 - Lighting Identification Code
J994 - Alarm - Backup – Electric Laboratory Tests
J1741 - Discriminating Back-Up Alarm Standard

Clean Snowmobile Challenge

J192 - Maximum Exterior Sound Level for Snowmobiles
J1161 - Sound Measurement – Off-Road Self-Propelled Work Machines Operator-Work Cycle

Formula Hybrid

J1318 - Gaseous Discharge Warning Lamp for Authorized Emergency, Maintenance and Service Vehicles
J1673 - High Voltage Automotive Wiring Assembly Design

Formula SAE

SAE 4130 steel is referenced but no specific standard is identified
SAE Grade 5 bolts are required but no specific standard is identified

Supermileage

J586 - Stop Lamps for Use on Motor Vehicles Less Than 2032 mm in Overall Width

SAE Technical Standards for Supplemental Use**Standards Relevant to Baja SAE**

J98 – Personal Protection for General Purpose Industrial Machines – Standard
J183 – Engine Oil Performance and Engine Service Classification - Standard
J306 – Automotive Gear Lubricant Viscosity Classification - Standard
J429 – Mechanical and Material Requirements for Externally Threaded Fasteners – Standard
J512 – Automotive Tube Fittings - Standard
J517 – Hydraulic Hose - Standard
J1166 – Sound Measurement – Off-Road Self-Propelled Work Machines Operator-Work Cycle
J1194 – Rollover Protective Structures (ROPS) for Wheeled Agricultural Tractors
J1362 – Graphical Symbols for Operator Controls and Displays on Off-Road Self-Propelled Work Machines - Standard
J1614 – Wiring Distribution Systems for Construction, Agricultural and Off-Road Work Machines
J1703 - Motor Vehicle Brake Fluid - Standard
J2030 – Heavy Duty Electrical Connector Performance Standard
J2402 – Road Vehicles – Symbols for Controls, Indicators and Tell-Tales – Standard

Standards Relevant to Clean Snowmobile Challenge

J44 – Service Brake System Performance Requirements – Snowmobiles - Recommended Practice
J45 – Brake System Test Procedure – Snowmobiles – Recommended Practice
J68 – Tests for Snowmobile Switching Devices and Components - Recommended Practice
J89 – Dynamic Cushioning Performance Criteria for Snowmobile Seats - Recommended Practice
J92 – Snowmobile Throttle Control Systems – Recommended Practice
J192 – Maximum Exterior Sound Level for Snowmobiles - Recommended Practice
J288 – Snowmobile Fuel Tanks - Recommended Practice
J1161 – Operational Sound Level Measurement Procedure for Snowmobiles - Recommended Practice
J1222 – Speed Control Assurance for Snowmobiles - Recommended Practice
J1279 – Snowmobile Drive Mechanisms - Recommended Practice
J1282 – Snowmobile Brake Control Systems - Recommended Practice
J2567 – Measurement of Exhaust Sound Levels of Stationary Snowmobiles - Recommended Practice

Standards Relevant to Formula SAE

J183 – Engine Oil Performance and Engine Service Classification - Standard
J306 – Automotive Gear Lubricant Viscosity Classification - Standard
J429 – Mechanical and Material Requirements for Externally Threaded Fasteners – Standard
J452 - General Information – Chemical Compositions, Mechanical and Physical Properties of SAE Aluminum Casting Alloys – Information Report
J512 – Automotive Tube Fittings - Standard
J517 – Hydraulic Hose - Standard
J637 – Automotive V-Belt Drives – Recommended Practice
J829 – Fuel Tank Filler Cap and Cap Retainer
J1153 - Hydraulic Cylinders for Motor Vehicle Brakes – Test Procedure
J1154 – Hydraulic Master Cylinders for Motor Vehicle Brakes - Performance Requirements - Standard
J1703 - Motor Vehicle Brake Fluid - Standard
J2045 – Performance Requirements for Fuel System Tubing Assemblies - Standard
J2053 – Brake Master Cylinder Plastic Reservoir Assembly for Road Vehicles – Standard

Standard Relevant to Formula Hybrid

J1772 – SAE Electric Vehicle and Plug in Hybrid Conductive Charge Coupler

Standard Relevant to all CDS Competitions

J1739 – Potential Failure Mode and Effects Analysis in Design (Design FMEA) Potential Failure Mode and Effects Analysis in Manufacturing and Assembly Processes (Process FMEA) and Potential Failure Mode and Effects Analysis for Machinery (Machinery FMEA)

