



## **2015 Collegiate Design Series**

# **Baja SAE<sup>®</sup> Mexico Rules**

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**2015 Baja SAE® Rules**  
**“Partial” List of Rule Updates/Changes**

This introduction list to the 2015 Baja SAE® Rules is intended to highlight certain areas of the rules where a significant change/update or clarification has been made.

**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. We cannot stress this enough.

**Read the Rules, thoroughly!**

Please be sure to reference the Baja SAE® News Feed (<http://students.sae.org/cds/bajasae/news>) for all updates.

➤ **“Partial” list of new updates/changes:**

- B3.1 General Electrical System Overview**
- B4.2 Front and Rear Hitch Points**
- B10.7 Seats (new)**
- B12.1 Fuel System Location**
- B5.1 Vehicle Number and Positioning**
- B9.10 Fire Extinguisher –Equipment, Size and Location**
- B12.9 Fuel Containers (new)**
- B8.3.7 Front Bracing Members (FBM)**
- A7.3.1 Failure to Meet Deadlines**
- B5.1 Number Assignment and Positioning**
- B3.1 General Electrical System Overview**
- B3.4 Brake Light**
- D5.8.3.1 Maximum Fuel Container Size for Refueling**



2015 Baja SAE® Mexico Rules  
“Partial” List of Specific Rules for Mexico’s event

This “Partial” list of rules applicable for Mexico’s event is only intended to enable an easier overview of the specific rules for this event, all the modifications or event-specific rules will be **highlighted in yellow** within this document for an easier understanding.

**These are not the complete rules!** Caution! Neither this list of event-specific regulations 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.

**Read the Rules, thoroughly!**

Please be sure to reference the Baja SAE® Mexico News (<http://www.bajasaemexico.com>) for all updates.

➤ “Partial” list of new updates/changes:

**ARTICLE 1: SCORING**

**ARTICLE 8: RULES QUESTIONS**

**A7.2 Entries per University**

**A7.5 Registration Fees**

**B2.1 Briggs & Stratton 10 hp OHV Intek**

**B2.5 Engine Requirement and Restrictions**

**B6.1.1 Vehicle transponder**

**B10.1.2 Safety Harness Expiration**

**B10.5.3 Arm Restraint – Expiration**

**B12.9 Fuel Containers**

**B14.1 Fastening requirements**

**D5.4 Endurance – Command Flags**

# 2015 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, engineer, 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

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 conditions. Performance will be measured by success in the dynamic events which are described in the Baja SAE® Rules, and are subject to event-site 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 seven competitions. Three competitions are held in North America under the sponsorship of SAE International:

Baja SAE® Auburn	Hosted by Auburn University
Baja SAE® Maryland	Hosted by the University of Maryland-Baltimore County
Baja SAE® Oregon	Hosted by the SAE Oregon Section

Baja SAE® competitions held in Africa, Asia, Brazil and Mexico are associated with SAE International, 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 Gerotek Test Facilities
Baja SAE® Mexico	Sponsored and hosted by SAE Mexico

**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® news page (<http://students.sae.org/cds/bajasae/news>) published by SAE International 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® Auburn	English
Baja SAE® Oregon	English
Baja SAE® Maryland	English

Baja SAE® Brazil	English and Portuguese
Baja SAE® Korea	English and Korean
Baja SAE® South Africa	English
Baja SAE® Mexico	English and Spanish

## **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 International University Programs Committee. Official announcements from the Baja SAE® Rules Committee, SAE International 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, National Techs, or SAE International Staff during competition onsite.

### **A3.2 Rules Validity**

The Baja SAE® Rules posted on the SAE International website ([www.sae.org](http://www.sae.org)) 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 International, 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 their entirety for the competition in which they are participating. The section and paragraph headings in these rules are provided to facilitate reading: they do not fully explain all 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, Technical Inspectors or SAE International staff.

### **A3.7 Right to Impound**

SAE International 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 International 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 International Technical Standards Access**

A cooperative program of SAE International's Education Board and Technical Standards Board is making some of SAE International's Technical Standards available to teams registered for any North American Collegiate Design Series (CDS) competition at no cost. The Technical Standards referenced in the CDS 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 affiliated to the team on SAE International's website ([www.sae.org](http://www.sae.org)).

**Access Procedure** - Once your team has registered, there will be a link to the SAE Digital Library to access the technical standards under "Design Standards" on your profile page where all the required onsite team information is added. On the SAE Digital Library, 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 International or an SAE International 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 International competition. Those interested may join SAE International at: <http://www.sae.org/membership/join>.

#### **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. This will be required onsite for proof.

#### **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 participants.

#### **A4.8 Individual Registration Requirements – ACTION REQUIRED**

**A4.8.1** All participating team members and faculty advisors must be sure that they are individually affiliated to their respective school/university on the SAE International website ([www.sae.org](http://www.sae.org)) through their teams profile page for each event they are participating in.

**A4.8.2** If you are not an SAE International member, go to <http://www.sae.org/membership/join> and click Join SAE for Students. Please note all student participants must be SAE International members to participate in the events; this is not mandatory for faculty advisors. Faculty members who wish to become SAE International members should choose an option under the "Professional Membership" link.

**A4.8.3** All international student participants, or unaffiliated faculty advisors, who are not SAE International members, are required to sign up for an [SAE International Customer Account](#) using their email address. Contact Customer Service and provide the Customer Number received to be correctly affiliated to the university.

**A4.8.4** All student participants and faculty advisors must affiliate themselves to the appropriate team(s) online. To affiliate, refer to the [Online Registration Guide](#).

**A4.8.5** **Once you have associated yourself to your respective university team(s), all affiliated students and faculty must complete all requested information (i.e. Emergency Contact Information) on the team registration page.** All students must affiliate prior to the competition.

### **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 Registration-** North American competition registration for Baja SAE® events held in North America must be completed online. Online registration must be done by either (a) an SAE International member or (b) the official faculty advisor connected with the university and recorded as such in the SAE International database.

**A7.2 Entries per University-**Registration for Baja SAE® competitions held in North America has maximum of (3) vehicles per university depending on available space to begin at 10:00 am CST on Tuesday, September 1<sup>st</sup>, 2015. For the first two (2) weeks of online registration, universities will only be able to register two (2) vehicles per university, per competition in the Baja SAE® Mexico competition series.

On Tuesday, September 15th, 2015 at 10:00 AM CST (exactly two weeks after registration initially opens), registration will open to those universities with one entry who wish to register a third vehicle, should there be any slots remaining.

### A7.3 Registration Limit and Wait List

Baja SAE Auburn is limited to 100 vehicles.	(Plus 40 waitlist teams)
Baja SAE Maryland is limited to 100 vehicles.	(Plus 40 waitlist teams)
Baja SAE Oregon is limited to 100 vehicles.	(Plus 40 waitlist teams)
Baja SAE Mexico is limited to 80 vehicles.	(Plus 10 waitlist teams)

When any of the Baja SAE Events (Auburn, Maryland or Oregon) have reached their maximum team limit, there will be 40 waitlisted spots available for teams to sign up, Mexico event will have 10 spots for the same purpose. The waitlist will remain open until all 40/10 spots are filled or the registration deadline of October 30th, 2015 is reached.

### How The Waitlist Works?

If you are in the process of registering your team when the event sells out, you will be informed that registration is closed and asked if you would like to be added to the waitlist. Response is required; teams will not automatically be added to the waitlist. Teams that accept the offer will continue through the standard online registration process so SAE International can capture needed information. However, the registration fee will not be charged to their credit card until the team is moved off the waitlist onto the participating registered team list.

Teams registered on the waitlist will be sequentially assigned a vehicle number starting with the next number after the last team on the "Registered Teams" list. That number will then be the cars number when and if the team advances to the "Registered Teams" list. Teams are to use this number with all required submissions.

If registered teams notify SAE International that they are withdrawing from the competition, or if the organization ultimately decides the total amount of vehicles can be raised we will contact the waitlisted teams in the sequential order assigned and give them the option to advance. Once a team passes on the opportunity to become a registered team, they will be removed from the waitlist. Once a team accepts the opportunity, they will be moved to the Registered Teams list and have 48 hours to complete payment.

### Things to Consider:

1. **NO GUARANTEE:** Please be advised that if your team chooses to build, you accept full responsibility that you are building at your own risk. There is no assurance your team will be pulled from the waitlist onto the "Registered Teams" list to compete in 2015.

2. **REGISTRATIONS NON-TRANSFERRABLE:** If you add your team to any of the Baja SAE® events waitlists and register for another, registration fees WILL NOT be transferable. We will also not transfer teams or registration fees between competitions. If your team has the option to become active on the registered team list for any Baja SAE® Event you will be required to pay a second registration fee and vice versa.

3. **DEADLINES AND REPORTS:** Teams will be required to meet all report deadlines for submission online at [www.bajasae.net](http://www.bajasae.net) at the time reports are due. Teams will be added to the online system once registration is completed.

4. **WITHDRAWAL NOTIFICATION:** Should your team decide to withdrawal OR to be taken off the waitlist for any competition please notify CDS at [collegiatecompetitions@sae.org](mailto:collegiatecompetitions@sae.org). For Mexico event please notify to [jueces@saemexico.org](mailto:jueces@saemexico.org) Non-Refundable Registration Fees Policy still applies to teams withdrawing from active Registered Team List.

#### **A7.3.1 Failure to Meet Deadlines NOTE!! NEW POLICY!**

**All teams, both Registered and Waitlisted, for any Baja SAE® competition are required to submit all required documents prior to the competition.**

(a) As evidence their car complies with the frame rules and to support the technical inspection process and (b) to provide material that the Cost and Design event judges need to evaluate the team during the competition. When these documents are not submitted our judges cannot properly assess the vehicle or the team.

Additionally, teams that do not submit Cost, Design, or Technical documents typically do not come to the competition. Teams that do not notify us that they are withdrawing create the following problems (1) they are included in the static event schedules and judging time is wasted and (2) their unused registration slot cannot be offered to a team on the waitlist. Additionally, **failure to submit the required Cost, Design, and Technical Documents is a clear violation of the rules.**

**Therefore, SAE International will be placing the policy into effect that failure to submit the required Cost, Design or Technical documents within 10 days of the deadline will constitute an automatic withdrawal of your team.** Your team will be notified after the 10th day of no submission that we have not received your documents and after 11 days your team's registration will be cancelled and no refund will be given.

#### **A7.4 Registration Dates**

Teams must register for each Baja SAE® competition they intend to enter by the specified date on the action deadline webpage.

#### **A7.5 Registration Fees**

North American Competitions – The registration fee must be paid within 30 days of registration. **Registration fees are NOT refundable or transferable.**

Mexico Competition will offer an step-by-step guide for completing the registration form and fees for either international or local teams in the official competition website ( [www.bajasaemexico.com](http://www.bajasaemexico.com) )

#### **A7.6 Withdrawals**

Registered teams for the Baja SAE® North American event that find that they will not be able to attend the competition are required to officially withdraw CDS Staff ([collegiatecompetitions@sae.org](mailto:collegiatecompetitions@sae.org)) no later than (4) weeks before the event. For events outside North America, please visit the respective competition website for contact information.

**Failing to withdraw in the specified terms for the Mexico event may result in banning of the team for up to 2 years from the competition at the sole judgment of the organizing body.**

#### **A7.8 International Participation – Vehicle Shipping/U.S. Customs**

SAE International 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 vehicles. You may want to consider using the services of freight forwarder who is familiar with the international shipping of racing vehicles.

For Mexico event there will be a thorough guide posted in the official website for helping the international teams to temporarily import their vehicles and ship any equipment, the organizing body will assign am specific responsible for helping teams to complete this process and provide any required guidance, please enter the website for details. ( [www.bajasaemexico.com](http://www.bajasaemexico.com) )

## 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 participating university listed as the receiving party.** The competition organizers, SAE International Staff, nor the competition sites can be listed as the receiving party for your vehicle. 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 International 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 rules question to on [www.bajasae.net](http://www.bajasae.net), you and your team agree that both your question and the Committee's answer can be reproduced and distributed by SAE International, 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 (updated information)

An electronic question submission system has been developed for the North American competitions. The current submission instructions are published on [www.bajasae.net](http://www.bajasae.net), accessible by clicking "Submit a Rules Question" on the Quick Links menu on the right.

For Mexico event questions can be sent to [jueces@saemexico.org](mailto:jueces@saemexico.org) and they will be both answered by email and through the official forum and communication channels set by the organizing body.

### 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 any 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 CDS directly at [collegiaticompetitions@sae.org](mailto:collegiaticompetitions@sae.org).

For Mexico's event-related questions please send an email to [jueces@saemexico.org](mailto:jueces@saemexico.org)

## 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 International staff will make every effort to fully review all questions and resolve problems quickly and efficiently.

### 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 International staff's attention for an informal preliminary review.

### **Preliminary Review - Problem Report**

If a team has a question about one of their results/scores they can file a Problem Report using the mobile.bajasae.net website while at the competition site. Additional details about how to file a Problem Report will be available at the competition site or on mobile.bajasae.net. A Problem Report is not a formal protest but should be initiated prior to a formal protest if possible. For Mexico event the "Problem Report" will not be available and any protest should be made per A9.3 Protest Format and Forfeit

### **A9.2 Cause for Protest/appeal**

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. (SAE International staff, judges or volunteers will not review any video footage as part of the protest.)

### **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 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 **but not limited to** 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.

#### B1.3 Vehicle Ergonomic Capacity

As a prototype of a commercial product, the design intent should be to 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 largest driver must 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 smallest driver must 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 \$250.00 for shipping and handling of the required engines.** You must order your engine by December 15, 2014. No exceptions. Each engine will come with a maintenance kit.

**For Mexico event there is NOT engine donation, however significantly lower inscription cost allows the teams to allocate funds for the purchase of the engine.**

#### **A maintenance kit includes the following parts (NEW)**

- 5 - Air Filters
- 5 - Air Filter Pre-Filters
- 5 - Fuel Filters
- 5 - Spark Plugs

### **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 where it will be held for the team's arrival at the competition.

Or

B. To an address in the United States provided by the participating team.

**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, due to a team's third party shipper, 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 International assume any responsibility for the delivery of engines.**

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, to use their facility if necessary.

### **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 2015 Baja SAE competitions:

**No Exceptions**

### **Baja Acceptable Engines**

**20S232 0036-F1**

**205432 0536-E9**

**205332 0536-E9**

**205332 0536-B1**

**\*\*Exceptions for Mexico event can only be granted proven that the engine specs are equivalent and does not constitute any advantage over the above mentioned B&S models. Only Briggs&Stratton engines of the 1450 series are allowed in the competition. Exceptions can only be granted at least 15 days prior to the event start via email ( [jueces@saemexico.org](mailto:jueces@saemexico.org) ) and team is responsible of taking a printed copy of the deviation to the tech inspection.**

The required engine must remain completely stock in all ways.

**NOTE:** Blueprinting (reworking an engine to a manufacturer's exact specifications) is considered to be a modification and it's prohibited.

#### **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 venture is prohibited.

### **B2.5.10 Air Cleaner (updated)**

The air intake may be relocated, but Briggs & Stratton parts must be used to relocate the air filter:

**592251** Remote kits, **695329** Choke shaft and **699960** bases. No other previous versions will be allowed starting in 2015 competition. 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 (NEW)**

Supports for the exhaust pipe and muffler are required. Supports **must** be attached exclusively to the engine.

**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 (updated)**

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. Available charging system includes 3, 10 and 20 AMP systems.

**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. Ultimate governor position can be modified by the Briggs&Stratton official team for each particular engine so it does not exceed the 3,800rpm, and any alternative position should be documented in the signed tech inspection sheet.**

**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. Hydraulic power systems must be properly shielded and documentation of the shielding made available for review.

Flywheels and similar types of rotating inertia storage devices are prohibited.

Compressed Gas systems are allowed to change transmission states (i.e. shift gears), but not to provide additional Power.

#### **Compressed Gas Cylinders and Lines**

Any system on the vehicle that uses a compressed gas as an actuating medium must comply with the following requirements:

- a. Working Gas- The working gas must be nonflammable, e.g. air, nitrogen, carbon dioxide.
- b. Cylinder Certification- The gas cylinder/tank must be of proprietary manufacture, designed and built for the pressure being used, certified by an accredited testing laboratory in the country of its origin, and labeled or stamped appropriately.
- c. Pressure Regulation- The pressure regulator must be mounted directly onto the gas cylinder/tank.
- d. Protection – The gas cylinder/tank and lines must be protected from rollover, collision from any direction, or damage resulting from the failure of rotating equipment.
- e. Cylinder Location- The gas cylinder/tank and the pressure regulator must be located either rearward of the Main Roll Hoop and within the envelope defined by the Main Roll Hoop and the Frame or in a structural side-pod.
- f. Cylinder Mounting- The gas cylinder/tank must be securely mounted to the Frame, engine or transmission.
- g. Cylinder Axis- The axis of the gas cylinder/tank must not point at the driver.
- h. Insulation- The gas cylinder/tank must be insulated from any heat sources, e.g. the exhaust system.
- i. Lines and Fittings- The gas lines and fittings must be appropriate for the maximum possible operating pressure of the system.

### **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 International or Briggs & Stratton.

## ARTICLE 3: ELECTRICAL SYSTEM

### B3.1 General Electrical System Overview **NEW**

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 or reverse light. The brake light must operate regardless of the kill switch setting. **The brake light, and any reverse light and alarm, must be powered and functional at all times. Cut-out or disabling switches to the brake light and reverse light (if so equipped) are prohibited.**

### 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:** Instrumentation that is used to relay data back to driver or pits must be included in the cost report. If no live feedback is provided, then it does not need to be included in the cost report.

**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.

#### 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. The Kill switch must not de-energize the Brake.

#### 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/catalogsearch/result/?q=01-171+Ski-Doo+>

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

(C) A Stock Polaris # 4110106

**\*No exceptions for Mexico event**

### 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 (it can be mounted between the RRH and FAB tubes) to the firewall (+/- 15 degrees) 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. BR. The switch must be within easy reach of track workers, the switch must be mounted rigidly, with no sharp edges nearby. It must not be necessary to reach inside the roll cage to actuate the switch.

**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 **and will not be accepted during tech inspection.**)

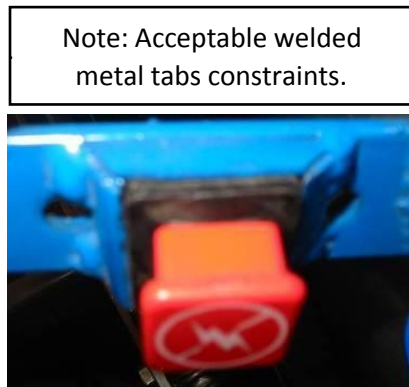


Figure 1

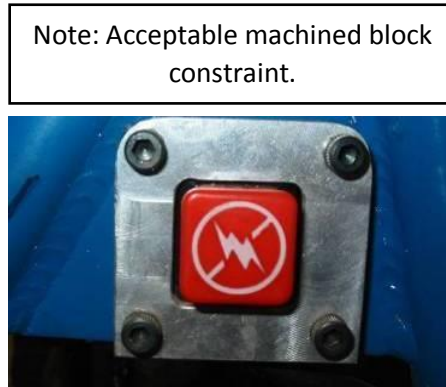
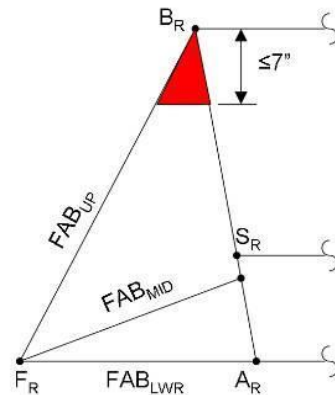


Figure 2



### 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 **at least one** red brake light, of LED design that is SAE “S” or “U” rated as marked on the lens. Brake light must not be modified or altered from original, purchased design. The brake light must be clearly visible and appear bright in daylight. The brake light shall be illuminated when the brake system is actuated, and completely extinguished when the brakes are released. (i.e. No running lights rear of the firewall). 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 or pitched slightly downward, not up at an angle.

### B3.5 Brake Light Switch

The brake light must be activated by hydraulic pressure switches. Each independent brake hydraulic circuit must be equipped with a brake light switch, so that no brake, including cutting brakes may be activated without lighting the brake light. This means each vehicle is required to have a minimum of two (2) hydraulic pressure switches.

Note: **Push style or momentary switches are not allowed.**

### B3.6 Reverse Light and Alarm

Vehicles with reverse must be equipped with a backup 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](http://www.waytekwire.com) part #48001 and part #48020.

**The reverse alarm shall be mounted at a minimum of 70 cm above the ground and at or aft of the vehicle's RRH and firewall."**

## 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.

### B4.2 Front and Rear Hitch Points

The hitch points must be strong enough to serve as a vertical lift points for the vehicle. The hitch points, when not attached to a tow rope, may not present a danger of penetration in the event of a collision.

#### B4.2.1 Front Hitch Point Requirements – Maximum and Minimum

Maximum diameter 31.75 mm (1.25 in.), Minimum diameter 25.4mm (1in.)

Minimum wall thickness of 0.89 mm (.035 in)

Hitch point height must be no higher than the SIM and no lower than the LFS

Minimum bearing space inboard of the hitch point 50.8 mm (2 in.) by 203.2 mm (8in.)



## B4.2.2 Rear Hitch Point Requirements – Maximum and Minimum

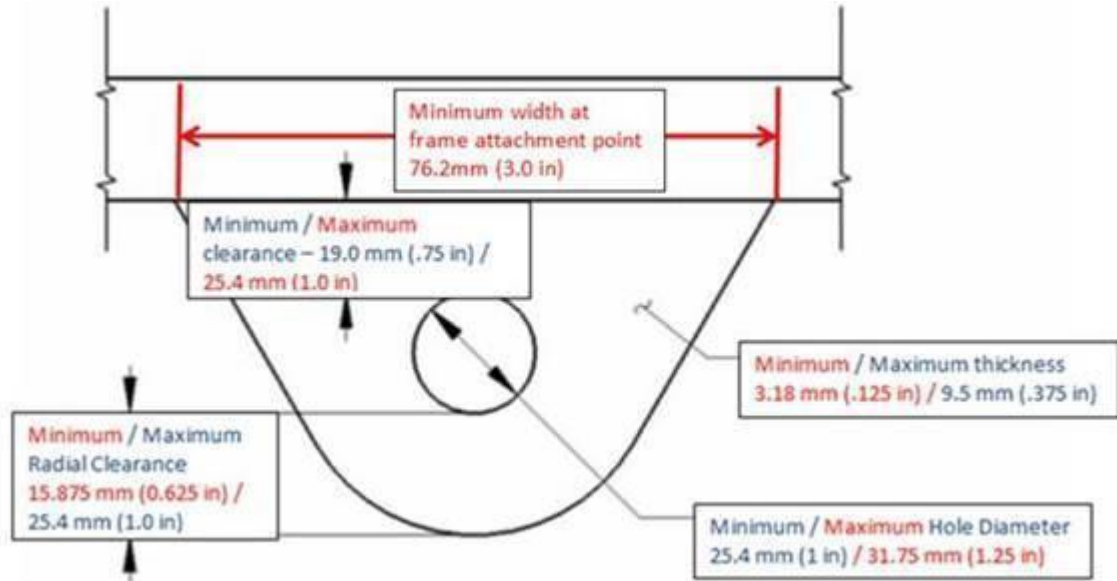
Towing plate Minimum / Maximum thickness – 3.18 mm (.125 in) / 9.5 mm (.375 in)

Hole diameter Minimum / Maximum – 25.4 mm (1 in) / 31.75 mm (1.25 in)

Radial clearance Minimum / Maximum from hole – 15.875 mm (0.625 in) / 25.4 mm (1.0 in)

Hole to tube Minimum / Maximum clearance – 19.0 mm (.75 in) / 25.4 mm (1.0 in)

Hitch plate Minimum width where connected to frame – 76.2 mm (3.0 in)



## ARTICLE 5: VEHICLE IDENTIFICATION

### B5.1 Number Assignment and Positioning

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. Mexico event will assign the first 5 numbers to the last year’s winners (1<sup>st</sup> through 5<sup>th</sup> position) and subsequently the numbers will be automatically and consecutively assigned in strict order of registration starting with number six.

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

**B5.1.2** Three primary numbers are required to be securely affixed to the car. One on both of the upper sides of the frame behind the roll hoop, clearly visible in a side view. One must also be visible from a front view. For numbers mounted above the SIM, the angle between the plane of the front-facing numbers and the vertical must be less than or equal to 45°. For numbers mounted below the SIM, this angle must be less than or equal to 15° from vertical.

**Numbers that are not easily read might not be scored during the endurance event. And will not be accepted during tech inspection.**

### B5.1.3 Number Location

Three primary numbers are required to be securely affixed to the car. One on both of the upper sides of the frame behind the roll hoop, clearly visible in a side view. One must also be visible from a front view.

### B5.1.4 Number Size

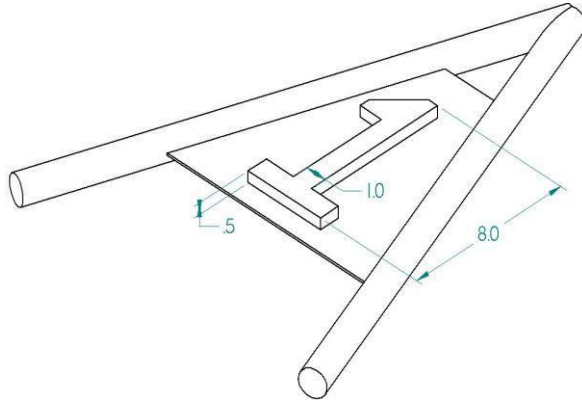
The primary cutout numbers must be at least 203 mm (8 in) high. These have a minimum line width of 25 mm (1 in.) and 102 mm (4 in) wide. The numbers must strongly contrast with the numeral background color.

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

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

## B5.2 Vehicle Number – Primary Cutout

**B5.2.1** Each vehicle must have numbers where the outer face is a minimum of (one half inch) .5 inches from the backing panel of contrasting color an example of which is shown in the figures. 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. It is recommended that the numbers be outlined as well to further provide contrast.

## B5.3 SAE International Logo

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

## B5.4 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. SAE International may require all entrants to display advertising from the competition sponsors.

# ARTICLE 6: TRANSPONDERS

## B6.1 Transponders – US and Canadian Competitions

Transponders may 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. For Mexico event the transponder will be provided by the organization for the endurance event and its cost will be included in the inscription cost, each team is responsible of picking up, installing and returning the transponder at the end of the endurance race.

## 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. It is the orange unit!



#### 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.

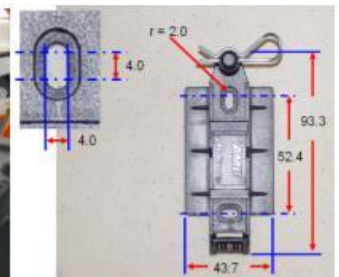
C. Unobstructed – There must be an open, unobstructed line between the antenna on the bottom of the transponder and the ground. (Do not mount the transponder inside the vehicle if sight line is obstructed.) Metal and carbon fiber may interrupt the transponder signal. The signal will normally transmit 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 a straight edge applied to any two points on the roll cage; an example is shown. The driver's helmet shall have 152 mm (6 in.) clearance, while the driver's shoulders, torso, hips, thighs, knees, arms, elbows, and hands shall have 76 mm (3 in.) clearance. Clearances are relative to any driver selected at technical inspection, seated in a normal driving position, and wearing all required equipment.

For any member to be a part of the roll cage, that member must conform to B8.3.1, otherwise it is assumed to have no contribution (a-arms are an example of members which do not conform to B8.3.1). If there are any triangulating members joining 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 from any two points among those members that make up to top of the roll cage. These members are: 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 envelope 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) in Rule B8.3.3
- Front Lateral Cross Member (FLC) in Rule B8.3.4
- Lower Frame Side Members (LFS)

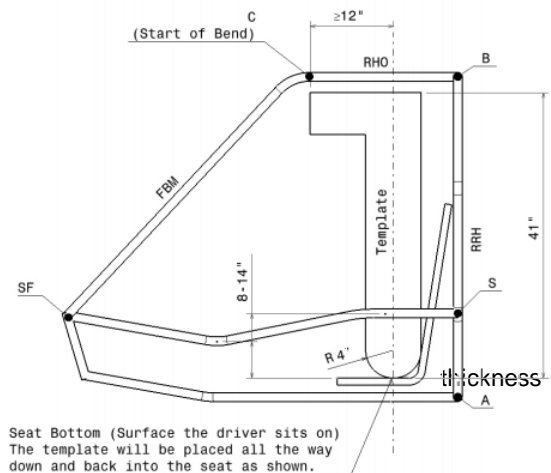
Secondary members must be steel tubes having a minimum wall of 0.89 mm (.035 in) and a minimum outside diameter of 25.4 mm (1.0 in):

Secondary members are:

- Lateral Diagonal Bracing (LBD)
- 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 expected, 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.



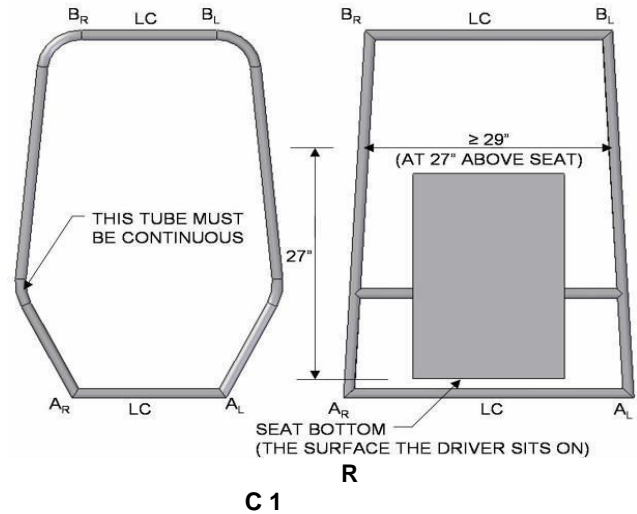
### B8.3.1.1 Lateral Cross member Requirements

Lateral cross members cannot be less than 203.5 mm (8 in) long. They cannot have a bend; however they can be a part of a larger, bent tube system, between bends. The LC's which connect the left and right points of AF, SF, and C must be made of primary materials.

### B8.3.2 Rear Roll Hoop (RRH)

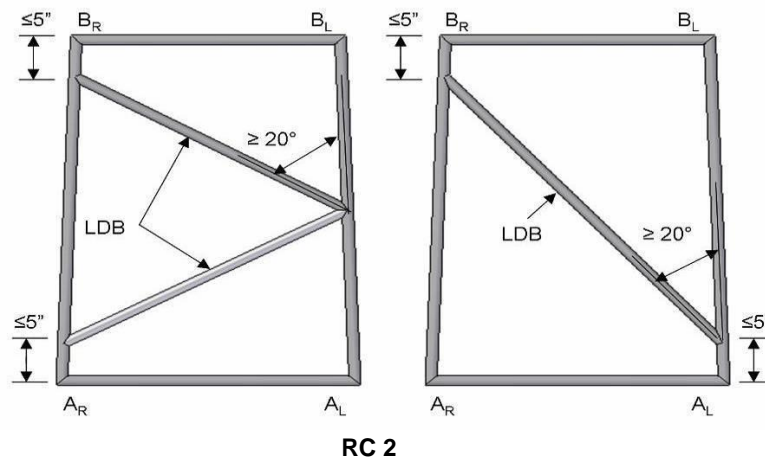
The RRH is a structural panel behind the driver's back, and defines the back side of the roll cage. The driver and seat must be entirely forward of this panel. The RRH is substantially vertical, but may incline by up to 20° from vertical.

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<sub>R</sub> and A<sub>L</sub>, and B<sub>R</sub> and B<sub>L</sub> 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.



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

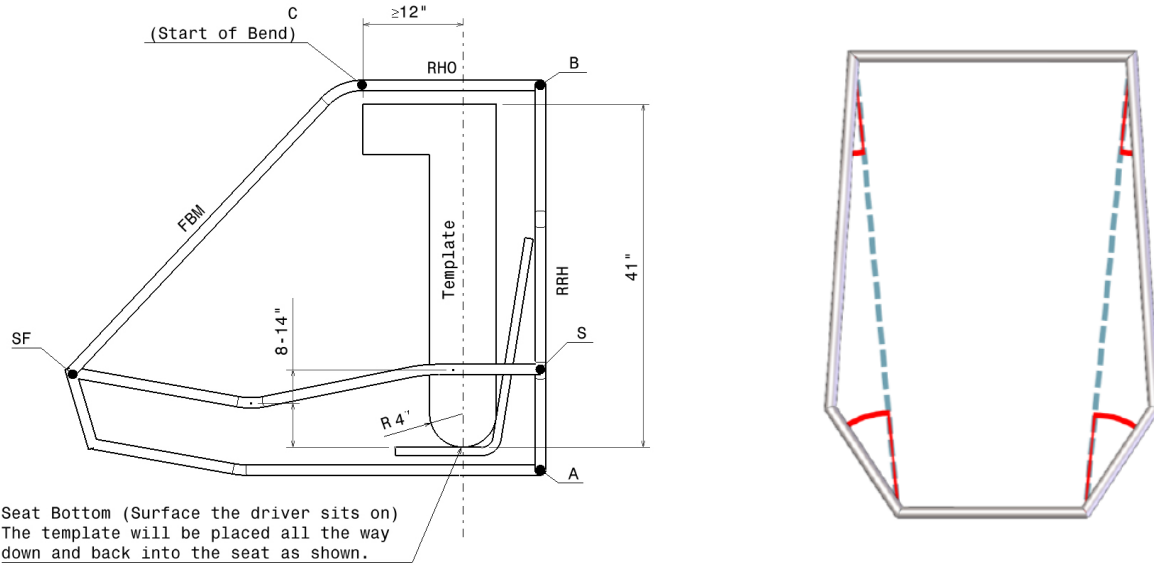
The RRH must be diagonally braced. The diagonal brace(s) must extend from one RRH vertical member to the other. The top and bottom intersections of the LDB members and the RRH vertical members must be no more than 127 mm (5in.) from the RRH top and bottom horizontal planes, respectively. The angle between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



### B8.3.3 Roll Hoop Overhead Members (RHO)

The forward ends of the RHO members (intersection with the LC) define points CR and CL (Fig.RC3). Points CR and CL 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. The top edge of the template is exactly horizontal with respect to gravity.

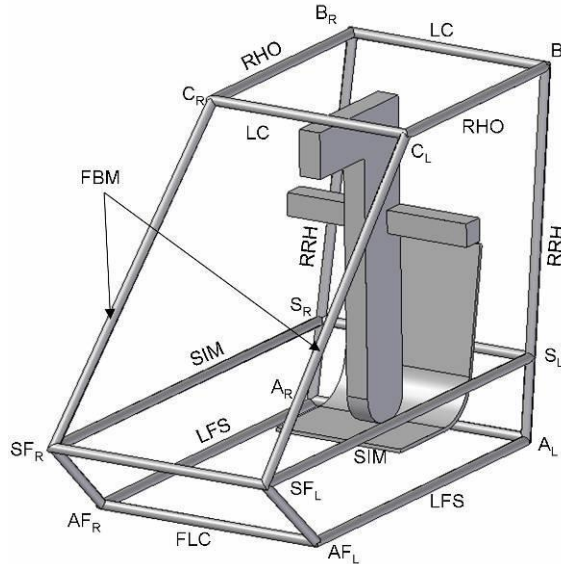
Points CR and CL must also be no lower than the top edge of the template, 1041.4 mm (41 in) above the seat.  
 Note: the top edge of the template is exactly horizontal with respect to gravity.



RC3

**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<sub>R</sub> and AF<sub>L</sub>.



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<sub>R,L</sub> and SF<sub>L</sub>. 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<sub>R,L</sub> and SF<sub>R,L</sub>. If the LC between SF<sub>R,L</sub> is below the driver's toes then an additional LC must run between the FBM members above the driver's toes.

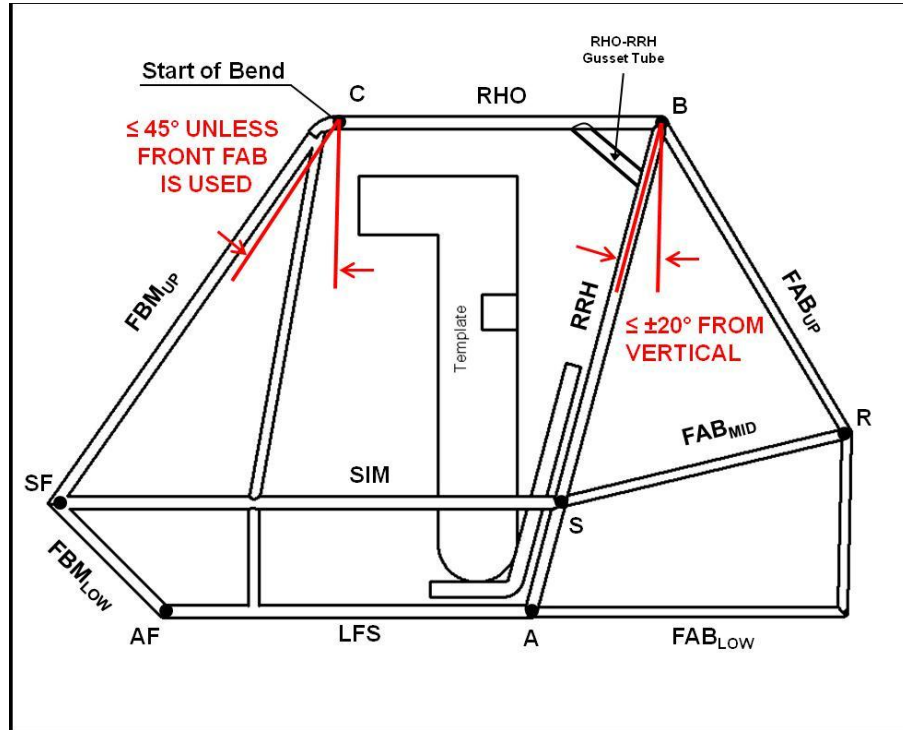
### B8.3.6 Under Seat Member (USM)

The two LFS members must be joined by the Under Seat Members. The USM must 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 (FBMUP) must join points C on the RHO to the SIM at or behind points SF. The lower Front Bracing Members (FBMLOW) must join points AF to points SF. The FBM must be continuous tubes. The angle between the FBMUP and the vertical must be less than or equal to 45 degrees.

If Front FAB is used there is no angle requirement between FBM and vertical.



RC5

### 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 be at least 20°.

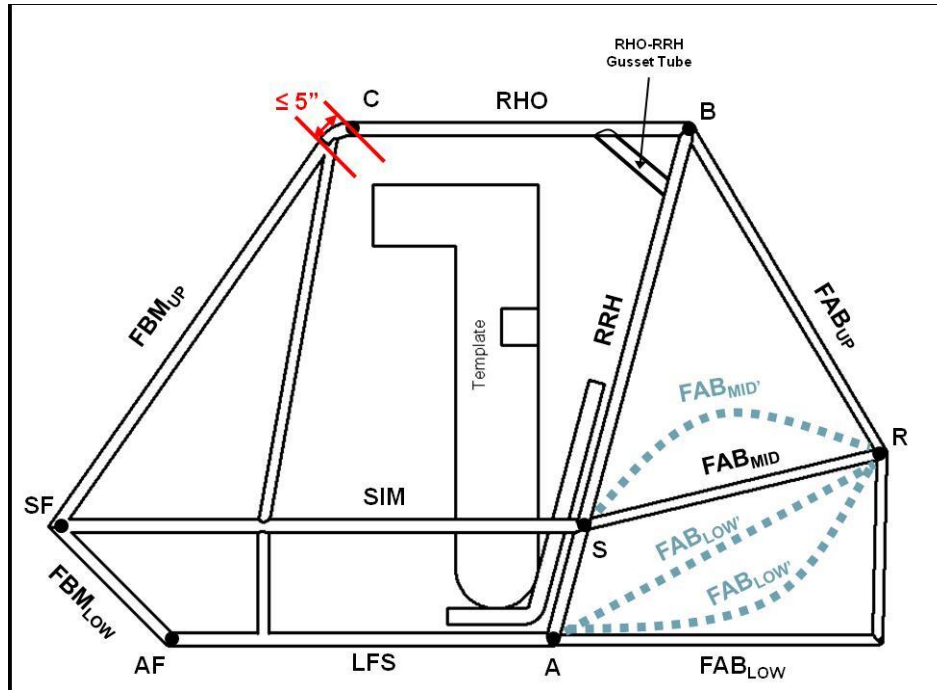
#### B8.3.8.1 Front Bracing

Front systems of FAB must connect the FBMUP members to the SIM members (on the same sides). The intersection with the FBMUP members must be within 127 mm (5 in.) measured as a straight line distance from centerline to centerline 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 (aft) vertex of each rear bracing triangle, Point R (Fig. RC6), 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. Distances measured as a straight line distance from centerline to centerline 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.



RC6

### 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. The total weld length of the gusset must be 2 times the tubing circumference (of the primary material). Thus, if a tube is used to brace the FBM and RHO, it must be a primary tube.

Thus, if a tube is used to brace the FBM or RHO or if the RHO and RRH require a gusset to achieve the 6" Lateral Clearance in Rule B8.2, the added tubes must be a primary member.

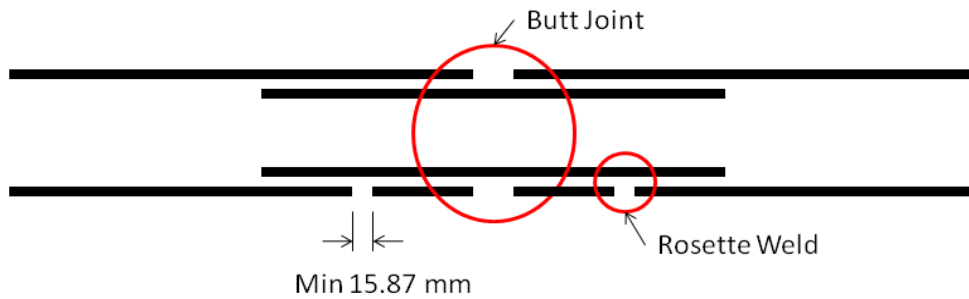
### B8.3.10 Tube Joints

**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:**

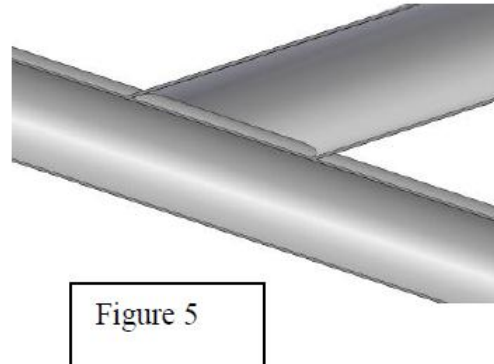
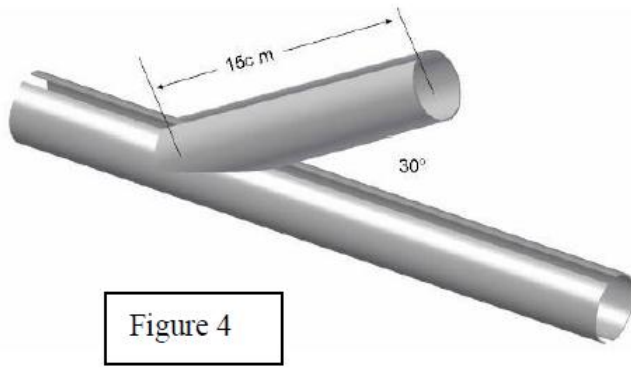
A 90 degree joint, the leg length free (Fig 3). This joint must be destructively tested causing the joint to fail in the base material (as opposed to the weld metal). The testing method is free-either tensile or bending failure may be induced; however the peak stress must be located at the weld. In the case of bending failure, take care that the largest bending moment is located at the weld.



**Figure 3**

**(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** ).



**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. Documentation of the equivalency must include:

1. Calculations must be presented at Technical Inspection which proves sufficient bending stiffness and bending strength. All calculations must be in SI units, to three significant figures to the nominal tube sizes as specified by the invoice.
2. Invoices of the roll cage materials
3. Material tests or certifications, which specify the carbon content and yield strength.

**(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

### 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

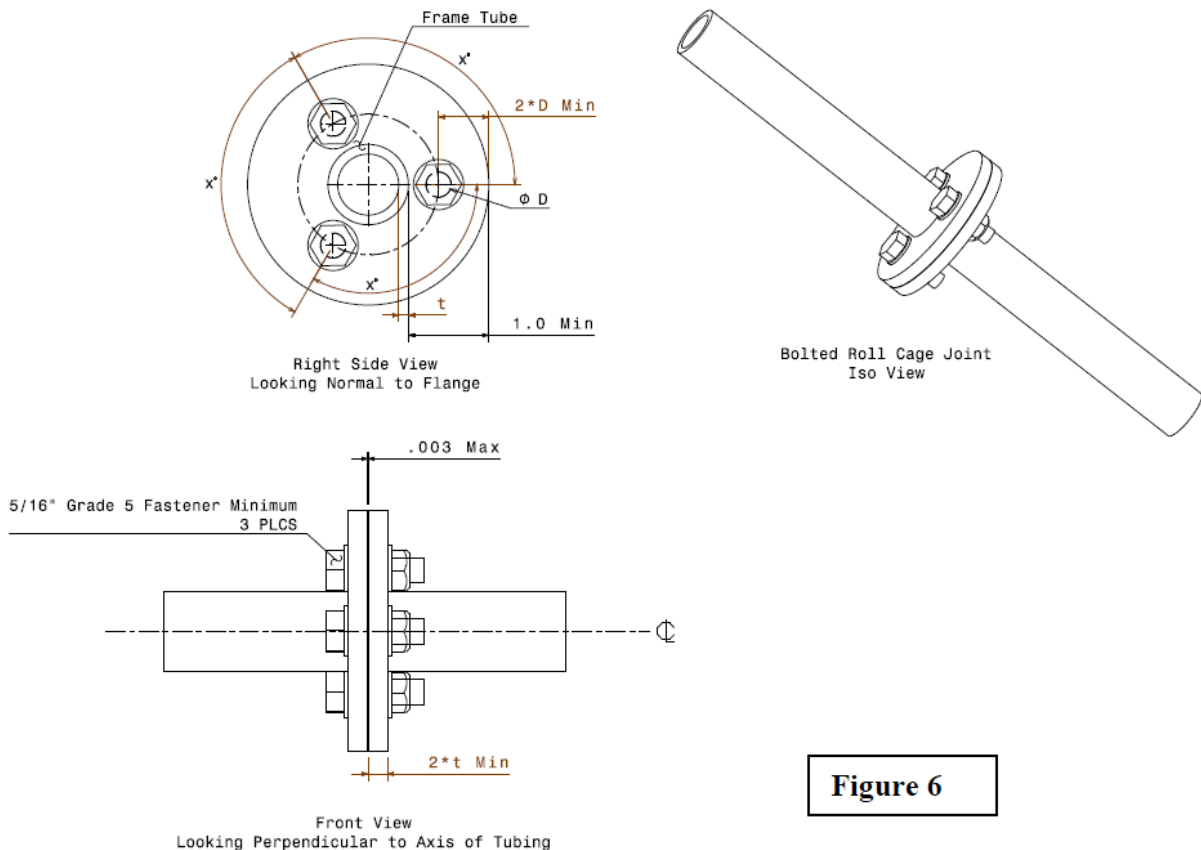
### B8.4 Sharp Edges on Roll Cage

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 Frame Pre-Check (new)**

### **B8.6.1 Documents required for submittal**

Roll Cage Specification Sheet & frame material documentation (invoices, certifications, calculations, etc.)  
Engineering Drawings of your frame from several specific views

### **B8.6.2 Documents submittal process**

- Download the form and template from [bajasae.net](http://bajasae.net) download section
- All files that are uploaded must be in a .PDF format
- Upload the Frame Documentation Package (max size 5MB)
  - o Roll Cage Specification Sheet
  - o Frame Material Documentation
  - o Invoice of roll cage material
  - o Material Test of Certification
  - o Any Required Calculation per rule B8.3.12
- Upload the Frame Drawing Package (max size 5MB)
  - o Package consists of engineering drawings (CAD renderings, etc.) of your frame in the following standard views
    - At a minimum of a Front, Side, Top and Isometric views.
    - More detailed views are allowed as needed.
    - Callouts indicating the material that is used in the frame
  - o The major dimensions and angles required to meet the frame rules in B8.3
    - This includes the driver's seat bottom so that the SIM height, the RRH width, and the RHO LC (point C) can clearly be defined.

## **ARTICLE 9: COCKPIT AND THROTTLE**

### **B9.1 Design Objective**

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

### **B9.2 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.

### **B9.3 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.

**B9.4** 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.

**B9.5** 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.

### **B9.6 Front or Mid-engine vehicles**

If the mounting points of the engine are completely in front of the RRH, 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)** All engine compartment venting must be directed away from driver area.
- (E)** Driver must be able to still egress from either side of the vehicle.
- (F)** The exhaust must not exit towards the driver and must be shielded.

**(G)** 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.

**Note:** Engine enclosures must prevent fuel from spilling onto driver area during any vehicle upset.

### **B9.7 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).

### **B9.8 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.

### **B9.9 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.

A Universal joint in the steering system near the driver's feet shall be shielded or booted such that the driver may not become entangled in the joint.

### **B9.10 Fire Extinguisher –Equipment, Size and Location (NEW)**

Each team shall equip the vehicle with a primary fire extinguisher and have a spare secondary extinguisher meeting the following requirements:

- Each team must have two identical fire extinguishers with a minimum UL rating of 5 B-C.
- Fire extinguishers must be labeled with school name and vehicle number
- 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.
- This mount must be securely fastened to the Rear Roll Hoop (RRH) with metal tab(s) that are a minimum of 0.125 inch thick utilizing at least two mounting bolts. **Tabs cannot be longer than 2 inches from the RRH.**
- All fire extinguishers must be equipped with a manufacturer installed dial pressure gauge. The gauge must be readable.
- The only acceptable fire extinguisher mount is the [Drake FIREX-MNT-DOR](#).
- The fire extinguisher must be mounted to the Drake mount with proper metal hose clamps.
- The pull handle must be oriented towards the right side of the vehicle to allow easy access by track workers.

**\*No exceptions for Mexico event**

**We recommend that each team have a backup mount in the event of damage or loss during the event.**



### B9.11 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

### B9.12 Throttle Controls

Only mechanical foot operated throttle controls are allowed. A wide-open throttle stop must be mounted at the pedal. 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.

**Your throttle must remain set at the as-passed condition, so return to idle and ensuring full throttle is achievable must be set prior to arriving at tech.**

### B9.13 Throttle Extensions

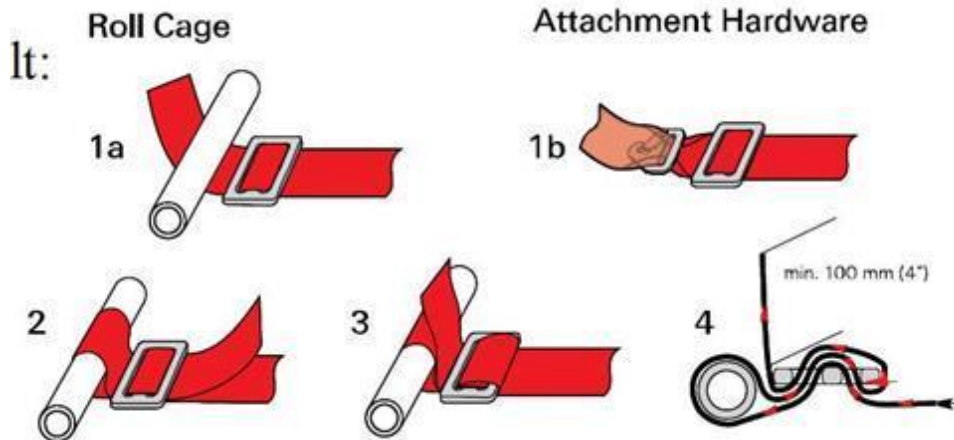
Mechanical extensions such as thick pads or blocks may not be attached to control surfaces or the driver's feet.

## ARTICLE 10: DRIVER RESTRAINT AND SEATING (NEW)

### 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).

[http://www.gforce.com/pdf/Harness\\_Install\\_Info.pdf](http://www.gforce.com/pdf/Harness_Install_Info.pdf)



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. For Mexico event the safety harness can be accepted being older than one year as long as it's in good condition and does not present any wear, cuts, repairs, etc.

**NOTE.** Safety harnesses that are presented to the tech inspection dirty, painted, stained or in any way degraded in such a way that the integrity evaluation cannot be performed effectively will not be accepted.

### 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).

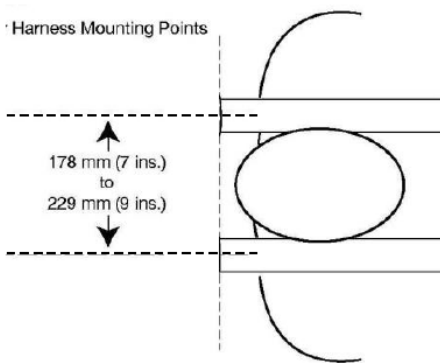


Figure 7



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 by something other than the firewall. See Figure 8A. The firewall must protect the entire shoulder belt. The firewall may be pocketed to facilitate this, as long as no open gaps result.



### 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

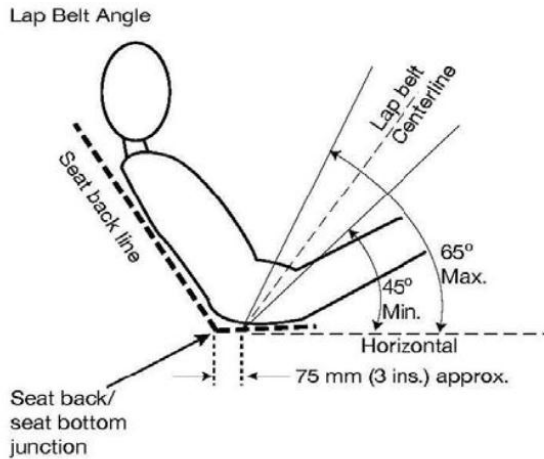


Figure 9

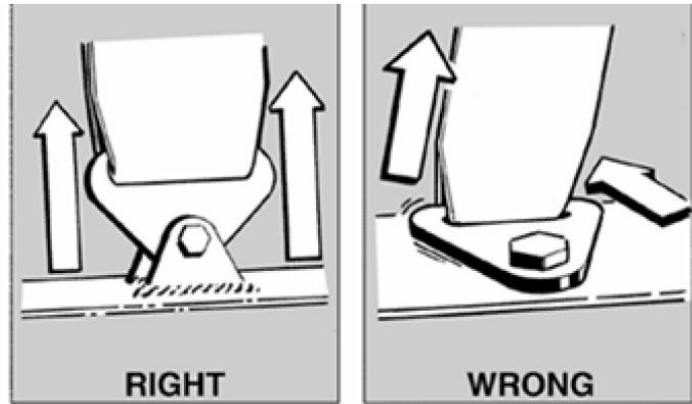


Figure 10

**Eye bolt lap belt connections are specifically prohibited.** The lap belts must freely pivot to fit drivers of differing statures correctly. The lap belt bracket must not be loaded in bending (see Fig.10 above).



### 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).
- 6) 6 and 7 point mountings should meet manufactures' requirements.
- 7) **No cutouts are allowed on the seatbelt tab other than the hole for the lap belt mounting bolt.**

8) All hardware in the driver restraint system shall match the nominal diameter of the mounting holes in the tabs. For example, a seat belt tab with a 0.5 inch hole may only use a bolt with a 0.5" diameter.

## 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.

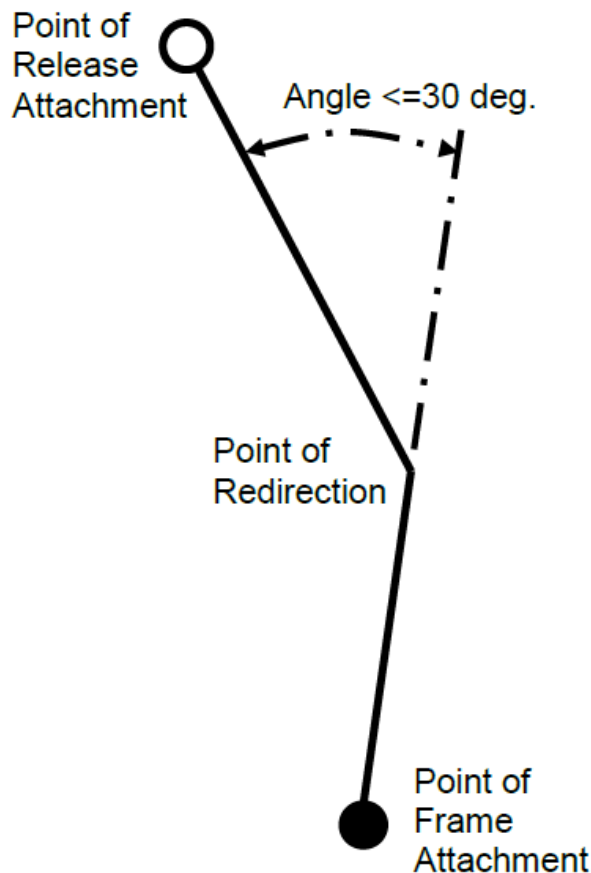
**B10.4.1.1** If mounted to a frame tab, then the tab must conform to the rules for the lap belt tabs above.

#### B10.4.1.2 If wrapped around a frame member, then:

1. The mounting tube must have features designed to limit lateral belt movement along the tube to less than 1 inch.
2. The webbing of the anti-submarine belt must be protected from exposure to the ground and not in contact with the belly pan.
3. The anti-sub mount must be directly connected to a LC, it cannot be "cantilevered" off another tube or otherwise create a torque from an offset mounting point.

### 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.



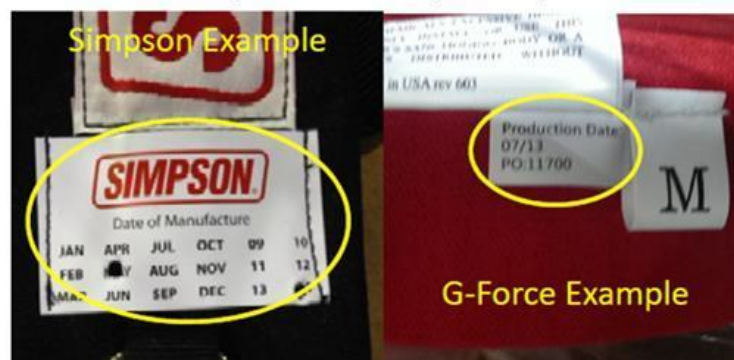
### B10.5.2 Arm Restraint – Installation

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 (New)

The belts must be in overall good condition and show no signs of wear, no cuts chaffing or wear. The belts must bear the appropriate dated labels, and on January 1st of the competition year be no more than three years old. For Mexico event the arm restraint can be accepted being older than three years as long as it's in good condition and does not present any wear, cuts, repairs, etc. NOTE. Arm restraints that are presented to the tech inspection dirty, painted, stained or in any way degraded in such a way that the integrity evaluation cannot be performed effectively will not be accepted.

### Example of an acceptable products



**NOTE:** Manufactures are **required** to ensure they have labeled the belts with a date of manufacturing.



### B10.6 Installations – General

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

### B10.7 Seats (NEW)

The seat shall work in concert with the safety harness to secure the driver within the envelope of the roll cage. Seats may be of conventional or suspension (sling) design. All seats shall be designed for the upright seating position. The upright seating position is defined by the angle of the driver's back to a horizontal line. The back angle for an upright seating position is more than 65 degrees. As a reference, a completely upright driver will have a back angle of 90 degrees.

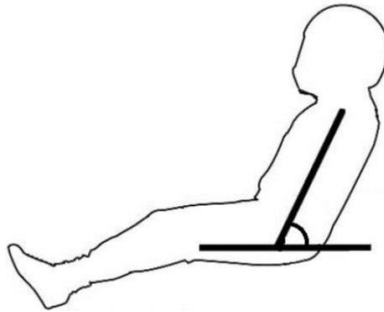


Figure 10 B

#### B10.7.1 Seat Construction

Conventional seats shall be generally rigid and be of metal or composite construction. Conventional seats may also have a removable seat cover and foam padding. Suspension seats shall be constructed of resilient, durable, woven materials. Stitching shall be neat and sufficient to effectively join all seat parts and safely direct forces from the driver to the vehicle frame. Seats may be purchased from a manufacturer or constructed in-house.

#### B10.7.2 Seat Design

Seats shall be designed to have at least two generally planar surfaces when the driver is seated in the vehicle. The seat back plane shall be inclined between 65 and 90 degrees from horizontal (as viewed from the side). The seat bottom plane shall be underneath the driver and be horizontal or generally sloped such that the leading edge of the seat bottom plane is level with or higher than the intersection with the back plane. Seats may also include material oriented vertically along the sides of the seat bottom plane and the seat back plane designed to assist in laterally restraining the driver.

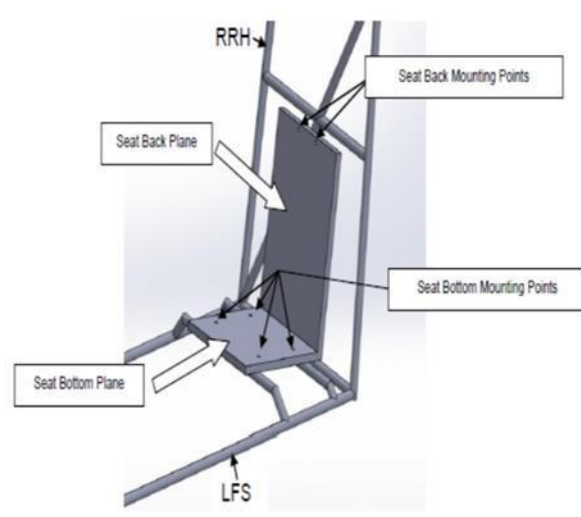


Figure 10 C

### B10.7.3 Seat Mounting

All seats shall have no less than six total mounting points to the vehicle frame. Seats shall have no less than four mounting points from the seat bottom plane and no less than two mounting points from the seat back plane. The seat bottom plane and seat back plane mounting points shall be generally symmetrical about the longitudinal center line of the seat itself or the vehicle. Seat back plane mounting points shall be at or near the plane of the RRH. Seat bottom plane mounting points may attach to the LFS or the USM or other lateral tubes having met the requirements of secondary frame members. Any tabs utilized in mounting the seat shall be a minimum thickness of 0.090 inches and have at least 1.5 inches of weld length per tab. Mounting Tabs shall not visibly deform when a load is applied. The average distance from the tab hole to the main tab weld line shall not exceed 1.0 inches.

### B10.7.4 Seat Mounting (Suspension Seats)

Suspension seats shall be mounted in a manner to meet the requirements of 10.7.3. Suspension seat mounting points from the seat back plane attaching to the vehicle RHO shall not be more than 4 inches forward of the plane of the RRH along the RHO tube.

Suspension Seat bottom plane mounting points attached to the SIM shall be within 2 in. of a frame node or have bracing to route forces to frame nodes. Nodes with suspension mounting tubes that connect the SIM and LFS are acceptable. Figure 10D depicts the bracing required. Bracing shall be steel tubing not less than 0.5 in. in diameter and 0.049 in. wall thickness.

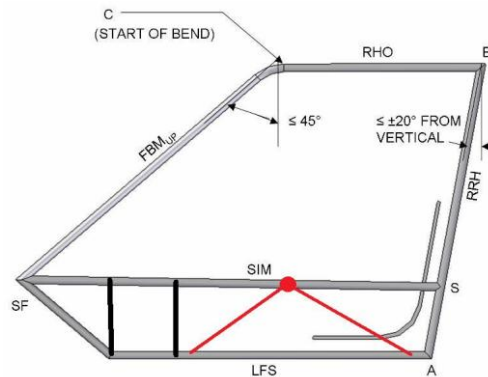


Figure 10 D

## 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.

### 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.

### B11.5 Brake Lines

All brake lines must be securely mounted and not fall below any portion of the vehicle (frame, swing arm, A-arms, etc.) Ensure they do not rub on any sharp edges. Plastic brake lines are prohibited

## ARTICLE 12: FUEL SYSTEM AND FUEL

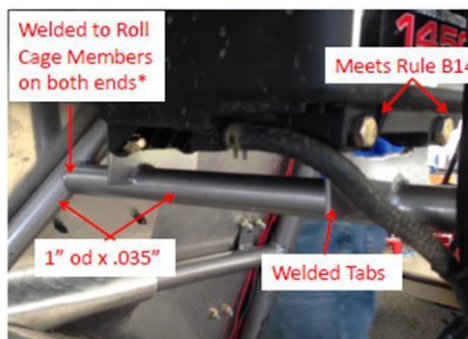
### B12.1 Fuel System Location (new/revised)

The entire fuel system, including splash shield, drip pan, and engine (excluding intake air hoses) must be located within the envelope of the vehicle's roll cage (members defined in B8.3.1, and any extra primary or secondary members). The fuel tank mountings must be designed to resist shaking loose. All fuel tank mounting points shall be used.

**Fasteners must meet rule B14 – Fasteners**

**Fuel tanks must be mounted on the original OEM mounts with OEM fasteners or directly to the roll cage directly using at a minimum, secondary members. Cantilever mounts are specifically prohibited. The tabs that mount the fuel tank must be welded to the roll cage secondary members and hold the tank rigid. Tabs must be less than 2" in length from the mounting hole to the outside of the secondary member it is welded to.**

Example of an acceptable design



\* Member can be removable if it meets rule B8.5.1

### 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 mounting of the tank box must be mounted to secondary members using a minimum of 4 points that are at a similar spacing as the fuel tank OEM mounts.

**B12.2.3** 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).

**B12.2.4** 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).

**Latch design shall be rubber draw latch or over-center latches, such that the latch is easily actuated by track workers with gloves on.**

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](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

**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.



Figure 11



Figure 12



Figure 13

### 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. Tubing and fittings shall be rated for fuel use, and shall have appropriate fuel rated markings. Fuel may not be released onto the belly pan, flotation, or any other part of the vehicle. The drain line shall be robust and be mechanically fastened to the drip pan with a threaded connection or a hose barb and hose clamp, or a combination of the two. Adhesive connections are specifically prohibited. All materials in the drip pan system shall be rated for fuel or fuel resistant.

The nominal minimum inside diameter for the drain hose shall be 12.7 mm (.5 in.). Matching fittings shall have a minimum inside diameter of 9.5mm (.375 in.).

### 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 (new)

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.

**Note:** Splash shields are required with either the stock tank with a drip pan, or the removable tank.

#### B12.7.1

The splash shields shall be mounted such that they are effective at all times, and are not adjustable by the driver or team members. Splash shields shall be of resilient mounting and protect against fuel being poured on the hot surfaces of the engine.

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



**(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 or corrosion inhibitors.

**“Lead alkyl compounds such as tetra-ethyl lead” are prohibited!**

**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.

## B12.9 Fuel Containers

All fuel must be transported in, and put into vehicle fuel tanks, from approved, unmodified containers. Approved, unmodified containers shall:

**1) Have a volume of 1.5 gallons or less for fueling vehicles during endurance event.**

2) Have a volume of 5 gallons or less for all other capabilities.

3) Be equipped with an original cap to prevent spills when not in use.

4) Be labeled with school name and car number.

Teams are required to bring all fuel to the fueling zone during the endurance event, see rule D5.8.

**\*In an effort to improve the safety and homologate the fuel usage, in Mexico event fuel is provided by the organization for the endurance race and no fuel containers are allowed in pits or other event areas.**

## ARTICLE 14: FASTENERS

**B14.1** Fasteners in the driver restraint systems and fuel system mounting must meet the following guidelines. **As well as any fastener for suspension, steering and brake systems or any other safety-related system/component.**

### 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.

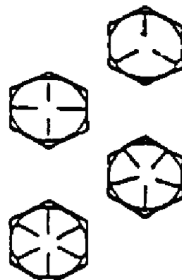
Acceptable SAE Bolt Grades:

Grade 5: 3 radial dashes 120° apart

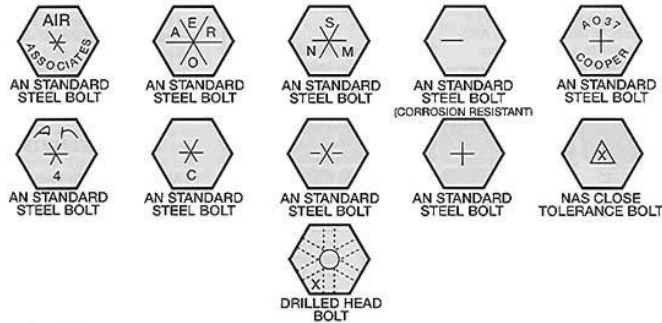
Grade 6: 4 radial dashes 90° apart

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** 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.

Required Materials:

Made of at least AISI 1010 strength steel at least 1.5 mm (0.06 in) thick – 16 Gauge is allowed.

-Or-

Made of at least 6061-T6 strength aluminum at least 3.0 mm (0.12 in) thick

### 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. **Non rigid, fabric coverings such as “Frogskin”, Ceconite, and neoprene are unacceptable for use as finger guards.**

A complete cover around the engine and drivetrain is an acceptable shield



### B15.3 Factory Stock Guards

Factory stock guards must meet the requirements in B15.1. OEM Polaris CVT covers that are not modified are exempt to rule B15.1. OEM Polaris CVT covers must meet the requirements of B15.2 in way of the vent.

## ARTICLE 16: DRIVER EQUIPMENT (Updated)

### 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 M2010 SA 2010, 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





**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.

**B16.1.1 Neck Support/Collar (New/Updated)**

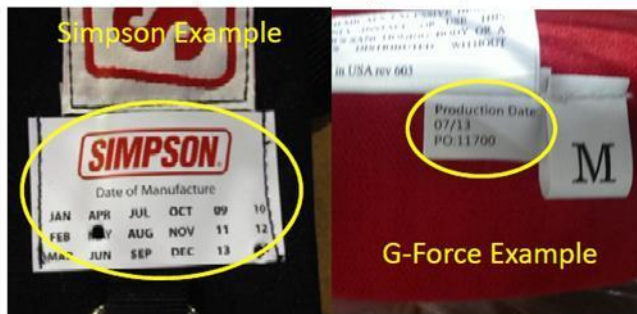
All drivers must wear a neck support/collar. The neck support must be a full circle (360°) and SFI 3.3 rated.

- Horseshoe collars are not allowed (see figure). Simpson, RCI, GForce, Deist or Leaf Racing Products supply neck collars that meet this requirement.

The support/collar must be in overall good condition and show no signs of wear, no cuts chaffing or wear. The support/collar must bear the appropriate dated labels, and on Jan 1st of the competition year be no more than three years old. For Mexico event the neck support/collar can be accepted being older than three years as long as it's in good condition and does not present any wear, cuts, repairs, etc

**NOTE: Manufactures are required to ensure they have labeled the support/collar with a date of manufacturing.**

Example of an acceptable products



Neck Support Permitted



Neck Support Not Permitted



**B16.2 Clothing (NEW)**

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

**B16.2.1 Upper Garment**

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

**B16.2.2 Synthetic Material – Prohibited**

Jerseys, gloves, socks or other garments made from nylon or any other synthetic material which will melt when exposed to high heat, are expressly prohibited

## PART C: DYNAMIC EVENTS-STATIC EVENTS- (North American Events)

### ARTICLE 1: SCORING

#### SCORE SUMMARY-STATIC EVENTS – 300 points

	Auburn	Maryland	Oregon	Mexico
Design Evaluation	150	150	150	150
Cost Report	15	15	15	15
Prototype Cost	85	85	85	85
Sales Presentation (for all events)	50	50	50	50

#### DYNAMIC EVENTS – 700 points (900 for Mexico)

Acceleration	75	75	75	80
Hill Climb or Traction	75	75	75	80
Land Maneuverability	75	75	75	80
Rock Crawl	-	-	75	90
Suspension	75	75	-	90
Mud Bath	-	-	-	80
Endurance	400	400	400	400

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**TOTAL POINTS**    1000                      1000    1000    1200

### 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)

**The governor check (with entire vehicle) must be passed first, before a team may apply for Part 2 (Tech) or Part 3 (Brake) Check.**

### 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 with a valid license.

**(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.

### C2.4 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. 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 web site, <http://students.sae.org/competitions/bajasae/rules/>),
3. Have the completed inspection list signed by the faculty advisor and team captain. Required reading includes for news and important information includes: <http://students.sae.org/cds/bajasae/news>.

**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 Event Overview and Objective**

**C3.1.1** The objective of the engineering design event is to evaluate the engineering effort that went into the design of the vehicle and how the engineering meets the intent of the market, as detailed in the Program Objective A1.1 and the Design Subject A1.2. Students will be judged on the creation of design specifications and the ability to meet those specifications, computer aided drafting, analysis, testing and development, manufacturability, serviceability, system integration and how the vehicle works together as a whole. Each of these parts of the engineering product development cycle will be judged within the following subsystems: Suspension, Steering, Brakes, Drivetrain/Powertrain, Chassis and Ergonomics.

**C3.1.2** The vehicle that illustrates the best use of engineering to meet the design goals and the best understanding of the design by the team members will win the design event.

**Comment:** Teams are reminded that Baja SAE® is an engineering design competition and that in the Engineering Design Event; teams are evaluated on their design. Components and systems that are incorporated into the design as finished items are not evaluated as a student designed unit, but are only assessed on the team’s selection and application of that unit. For example, teams that design and fabricate their own shocks are evaluated on the shock design itself as well as the shock’s application within the suspension system. Teams using commercially available shocks are evaluated only on selection and application within the suspension system.

**C3.1.3** The engineering design event student guide and score sheet can be found at [www.bajasae.net/go/downloads](http://www.bajasae.net/go/downloads).

**C3.1.4** The engineering design event consists of two parts: Design Evaluation and a Design Report that will be used as a part of the design evaluation

### **C3.2 Design Report – Required Submission**

**C3.2.1** Design Report – The design evaluation judging will start with submission, before the event, of a Design Report. The Design Report will be reviewed by the design judges who will ultimately judge the team and vehicle at on-site Design Evaluation.

**C3.2.2** The Design Report must not exceed eight (8) pages, consisting of not more than four (4) pages of text, three (3) pages of drawings (see C3.4, “Vehicle Drawings”) and one (1) optional page containing content to be defined by the team (photo’s, graphs, etc.). All pages must be either 8 ½” x 11” or A4.

**C3.2.3** The Design Report should contain a brief description of the vehicle with a review of your team’s design objectives, vehicle concepts, and a discussion of any important design features. Note or describe the application of analysis and testing techniques (FEA, part/system/vehicle testing, etc.). Evidence of this analysis and back-up data should be brought to the competition and be available, on request, for review by the judges.

**C3.2.4** The Design Report will be used by the judges to sort teams into the appropriate design groups based on the quality of their review.

**Comment:** Note that while the Design Report is not explicitly scored, it may be considered to be the “resume of your car”, preparing your on-site Design Evaluation judges to view your design effort in its most positive light. Failure to convincingly point out your design success in the Design Report will almost certainly lead to failure of your design judges to be impressed by your success.

### **C3.3 Design Spec Sheet – Required Submission**

**C3.3.1** Design Spec Sheet – A completed Baja SAE® Design Spec Sheet must be submitted.

**C3.3.2** The Baja SAE® Design Spec Sheet template can be found at [www.bajasae.net/go/downloads](http://www.bajasae.net/go/downloads). Do not alter or re-format the template prior to submission.

**C3.3.3** The design judges realize that final design refinements and vehicle development may cause the submitted figures to diverge slightly from those of the completed vehicle. For specifications that are subject to tuning, an anticipated range of values may be appropriate.

**C3.3.4** The Design Report and the Design Spec Sheet, while related, are independent documents and must be submitted as two (2) separate files.

### **C3.4 Design Report - Vehicle Drawings**

**C3.4.1** The Design Report must include one set of three (3) view drawings showing the vehicle, from the front, top, and side.

**C3.4.2** Each drawing shall appear on a separate page. The drawings can be manually or computer generated.

**C3.4.3** Photos should be placed on the optional page and will not be counted as drawings.

### **C3.5 Design Report and Design Spec Sheet Formats**

**C3.5.1** The Design Report must be submitted electronically in Adobe Acrobat Format (PDF). The document must be a single file (text, drawings and optional content are all inclusive). The maximum size for the file is 5 megabytes.

**C3.5.2** Design Spec Sheets must be submitted electronically in Microsoft Excel® Format (\*.xlsx file). The format of the Spec Sheet MUST NOT be altered.

**WARNING:** Failure to exactly follow the above submission requirements may result in exclusion from the Design Event. If your file is not submitted in the required format then it cannot be made available to the Design Judges and your team will be excluded from the Design Event.

**C3.5.3** Design reports must be submitted to the individual/address listed on the Action Deadlines page on the SAE International website ([www.sae.org](http://www.sae.org)) and described in Part E of these rules. Reports must be received by the due date listed in the Action Deadlines. Design Report submission will be acknowledged either on the competition website. Teams should have a printed copy of this acknowledgement available at the competition as proof of submission in the event of discrepancy.

#### **C3.5.4 Penalty for Late Submission or Non-submission**

Late submission or failure to submit the Design Report will be penalized ten (10) points per day. **If your Design Report is received more than ten (10) days late it will be classified as “Not Submitted” and your team will not participate in the Design Event and will receive zero (0) points for design. Additionally your team will be excluded from the event per rule A7.3.1 Failure to Meet Deadlines and inscription fees will not be reimbursed.**

#### **C3.5.5 Penalty for Unsatisfactory Submissions**

At the discretion of the judges, teams that submit a Design Report which, in the opinion of the judges does not represent a serious effort to comply with the requirements of Rules C3.1 and C3.2 will also not compete in the design event, but may at the design judges’ discretion receive between five (5) and twenty (20) points for their efforts.

### **C3.5.6 Excess Size Design Reports**

If a team submits a Design Report that exceeds four (4) pages of text, three (3) pages of drawing and one (1) optional page, then only the first four pages of text, three pages of drawings and first optional page will be read and evaluated by the judges. Note: If included, cover sheets and tables of contents will count as text pages.

## **C3.6 On-Site Design Evaluation**

**C3.6.1** The design judges will evaluate the engineering effort based upon the team's Design Report, responses to questions, and an inspection of the car.

**C3.6.2** The design judges will inspect the car to determine if the design concepts are adequate and appropriate for the application (relative to the objectives set forth in the rules).

**C3.6.3** It is the responsibility of the judges to deduct points if the team cannot adequately explain the engineering and construction of the car.

**C3.6.4 Design Judging Score Sheet.** The Design Judging Score Sheet is available at [www.bajasae.net/go/downloads](http://www.bajasae.net/go/downloads). The judges strongly urge all teams to read and study the score sheet and all other documents related to design judging that are available on the website.

### **C3.6.5 Support Material**

Teams may bring with them to Design Evaluation any photographs, drawings, plans, charts, example components, or other materials that they believe are needed to support the presentation of the vehicle and the discussion of their development process. Use of laptop or notebook computers, posters, and binders is allowed, but projectors may not be used.

## **C3.7 Judging Sequence**

**C3.7.1** The actual format of Design Evaluation may change from year to year as determined by the organizing body. The engineering design event student guide can be found at [www.bajasae.net/go/downloads](http://www.bajasae.net/go/downloads).

**C3.7.2** Design Evaluation is typically organized as follows:

1. Initial judging of all vehicles
2. Final judging ranking the top 3 to 10 vehicles.

## **C3.8 Design Finals**

**C3.8.1** 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 then judged as described in section C3.8.2. 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.

### **C3.8.2 Design Finals Presentation- Format (NEW)**

One or more team members may make the presentation to the judges. The presentation itself is limited to a maximum of nine (9) minutes. Following the presentation there will be approximately one (1) minute for clarification questions from the judges. Only the judges are permitted to ask questions. Any team member on the presentation floor may answer the questions even if that member did not speak during the presentation itself.

### **Equipment**

It is recommended that teams bring a laptop, binders or posters to show documentation or the engineering they have completed, but no projectors will be allowed.

### **C3.9 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, using the template described below, of their current design with their previous year's design even if the current design is entirely new.

**C3.9.1** As part of the design event, the judges will evaluate the comparison documentation of the Top Ten Teams. Team representatives may be required to 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.

### **C3.9.2 Redesign/Design Comparison Document (NEW)**

The design comparison report must follow the template found at [www.bajasae.net/go/downloads](http://www.bajasae.net/go/downloads) and should be accompanied with your design report as an addendum

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
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. The comparison report must be attached to the design report as an addendum and submitted electronically in Adobe Acrobat Format (PDF). The document (design report and the design comparison document as an addendum) must be a single file (text, drawings and optional content are all inclusive)

### **C3.10 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.

### **C3.11 Scoring**

**C3.11.1** The engineering design event will be worth 150 points at the competitions.

**C3.11.2** The judges may at their discretion award the highest placing team less than the maximum noted above.

## **ARTICLE 4: COST EVENT (REVIEW SUBMISSION PROCEDURE)**

**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 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 – See Part E**

This section includes copies of receipts, invoices, price tags, catalog pages, online 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 use of foreign receipts, purchases from discount sites such as Craigslist, EBay or junk yards are not allowed. The report is expected to be comprehensive, well documented, truthful and accurate.

#### **C4.2.4 Cost Report – Electronic Format See Part E** **Electronic version**

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.

#### **C4.2.5 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.

#### **C4.2.6 Multi-competition Cost Reports – U. S. and Canadian competitions only**

Teams that are entering more than one North American 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.

#### **C4.2.7 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. **Additionally your team will be excluded from the event per rule A7.3.1 Failure to Meet Deadlines and inscription fees will not be reimbursed**

**COMMENT:** It is the responsibility of the team to verify when the report was received on [www.bajasae.net](http://www.bajasae.net); submission time will be the time the report is received on [www.bajasae.net](http://www.bajasae.net). Teams will be cost audited at competition.

#### **C4.2.8 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. Failure to report by the scheduled appointment time will result in an automatic zero for the event. If teams need to reschedule their appointment it must be done prior to their appointment. Teams selected for cost audits will be notified prior to the event by SAE International as well at registration.



#### C4.2.9 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

#### C4.2.10 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.

#### C4.2.11 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. Upon review of the data, the cost judge reserves the right to disqualify cost reports that have not been sufficiently validated (i.e. either through lack of documentation or outdated receipts), are determined to not be complete based on review, or are outside a reasonable level of cost based on the other cars in the competition (i.e. either too high or too low)

#### C4.2.12 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 – all competitions – 50 Points

**\*All 2015 Baja SAE® Competitions will have a Sales Presentation event**

#### 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 purpose of the presentation, teams are to assume that the judges are 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. Organizers cannot be held responsible if a team uses provided projector and programs are not compatible

## 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.

### **C5.4.3 Sales Presentation - Scoring – Bonus**

The presentation judges shall apply bonus points to the top three (3) teams of the presentation event in the event of a tie. This bonus can range from 0-5 points and is applied at the discretion of the presentation judges.

## **PART D: DYNAMIC EVENTS- (U.S. Canadian and Mexico 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.

### **ARTICLE 1: ACCERLATION – 80 Points**

The Acceleration Event is designed to measure each vehicle's ability to come up to speed quickly from a standing start.

#### **D1.1 Acceleration – Objective**

Acceleration is measured as the time to complete a 30.48 m (100 ft) or 45.72 m (150 ft) flat, straight course from a standing start. The course surface may vary from pavement to loose dirt.

**D1.1.1** The choice of course length is at the organizer's discretion.

**D1.2** Acceleration – Procedure: Each vehicle may make two (2) attempts.

- |                                  |        |                      |
|----------------------------------|--------|----------------------|
| ➤ False Start or Stall at Start: | First  | Rerun at end of line |
|                                  | Second | Run DQ'd             |
| ➤ Driving off Course:            |        | Run DQ'd             |

**D1.2.1** Scoring will be based on the better of the two attempts. Timing will be done using an electronic timing system.

#### **D1.3 Acceleration – Penalties**

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

#### **D1.4 Acceleration – Scoring**

**Vehicles with acceleration times that are more than 1.5 times that of the fastest vehicle will not receive a score for this event.**

**D1.4.1** Teams attempting the event, but exceeding the time limit will be classified as "Excess Time."

**D1.4.2** The following equation will be used for the acceleration score:

$$\text{Acceleration Score} = 80 \text{ points} \times \frac{t_{\text{longest}} - t_{\text{yours}}}{t_{\text{longest}} - t_{\text{shortest}}}$$

where:

$t_{\text{shortest}}$  fastest time by any vehicle  
 $t_{\text{yours}}$  time for the vehicle to be scored  
 $t_{\text{longest}}$  the lesser of : a) slowest time by any vehicle; b)  $1.5t_{\text{shortest}}$

## **ARTICLE 2: HILL CLIMB or TRACTION EVENT- 80 POINTS**

The Hill Climb Event is designed to measure each vehicle's ability to transmit excess (climbing) force to the ground. If local terrain does not support a significant Hill Climb, a Traction Event may be substituted, usually involving pulling an excess load.

### **D2.1 Hill climb or Traction Event – Objective**

This event tests the vehicle's relative ability to climb an incline from a standing start or pull a designated object, e.g. "eliminator skid", vehicle, or chain, along a flat surface. The organizer will determine the hill height steepness and surface or object to be pulled.

### **D2.2 Hill Climb or Traction Event – Procedure**

Each vehicle may make two (2) attempts with the best time or distance counting for score. If a vehicle cannot complete the course and get a time, it will be scored on the distance that it travels before stopping. Once the vehicle stops moving forward the attempt is over and the attempt is scored for distance at that point. Vehicles may not continue the attempt after they have stopped on the course.

Driving off Course Score as maximum progress at point of DOC

False Start: First - Rerun at end of line  
Second – Run DQ'd

### **D2.3 Traction Event – Penalties**

The organizer may modify the penalty imposed for different violations to account for differences in the length or design of specific short event courses. Although not recommended for this type of short event, a maximum of one (1) type of penalty may be defined by the event organizers

### **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:

$$\text{Hill Climb or Traction Score} = 80 \text{ points} \times \frac{d_{\text{yours}} - d_{\text{shortest}}}{d_{\text{longest}} - d_{\text{shortest}}}$$

**where:**

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

$$\text{Hill Climb or Traction Score} = 80 \text{ points} \times \frac{t_{\text{longest}} - t_{\text{yours}}}{t_{\text{longest}} - t_{\text{shortest}}}$$

**where:**

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

#### 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

$$\text{Hill Climb or Traction Score} = 80 \text{ points} \times \frac{t_{\text{shortest}}}{t_{\text{yours}}}$$

**where:**

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

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

$$\text{Hill Climb or Traction Score} = \text{lowest score from group I} \times \frac{d_{\text{yours}}}{d_{\text{course}}} \text{ lowest score}$$

where:

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

## ARTICLE 3: MANEUVERABILITY EVENT –80 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.

Excessive Driving Off Course:	Run DNF	
False Start	First -	Rerun at end of line
	Second -	Run DQ'd

### 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** \*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.

$$\text{Maneuverability Score} = 80 \text{ points} \times \frac{t_{\text{longest}} - t_{\text{yours}}}{t_{\text{longest}} - t_{\text{shortest}}}$$

where:

$t_{\text{shortest}}$     fastest time by any vehicle

$t_{\text{yours}}$        time for the vehicle to be scored

$t_{\text{longest}}$     the lesser of : a) slowest time by any vehicle ; b)  $2.5t_{\text{shortest}}$

## ARTICLE 4: SPECIALTY EVENTS –80 points each

**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; and Suspension. Specialty events will be announced at the time of opening of registration for a competition.

The scoring system and penalties employed by the organizer must adhere to one of the options defined for either (a) the Maneuverability short event, or (b) the Traction short event.

## 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 International) 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. Mexico event will define the endurance starting order based on the "Acceleration Event" result, assigning the pole position to the quickest time and subsequent grid slots in the same order than acceleration event.

**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 **OVERTAKING**, 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 **OVERTAKING**, unless directed by the course workers.



#### D5.4.4 Red Flag

**Very likely the course could be BLOCKED.** 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.

**NOTE.** Displaying the black flag to a vehicle IS NOT a call for the team to discuss with the organization whether they deserve a penalty or not, IT IS an order for the vehicle to stop immediately at the penalty box, failing to stop in the penalty boxes within 2 laps from the first black flag display will result in disqualification of that team from the endurance event.



**D5.4.8 Checkered Flag** – The run or session has been completed. Exit the course at the first opportunity. It only applies to each single vehicle as it crosses the point where the checkered flag is being displayed.



**D5.4.9 Blue Flag, Waved** – A much quicker car is approaching to you from the rear and will inevitably overtake you, keep your driving lane, avoid aggressive lane changes and allow enough space for the other car to overtake you. This is for everybody's safety and prevent collisions, the blue flag will be displayed regardless of whether the vehicles are disputing a place or are being lapped.









### D5.8.3 Refueling in Fueling Area

The fueling area is to be clear of anyone not immediately servicing a car.

Before removing the fuel tank cap or, in the case of a removable fuel tank, before unlatching the cover, the vehicle must be completely stopped, the engine must be shut off, the driver must be completely out of the vehicle, and a fire extinguisher must be pointed at the fuel transfer. The driver must not be tethered to the vehicle in any way (e.g. a cable connecting a headset to a radio mounted in the car). Any team found refueling with a driver in the vehicle or without a fire extinguisher present and pointed at the fuel transfer will be assessed a penalty as per Rule D5.8.5.

A fire extinguisher must be present and pointed at ANY transfer of fuel, including re-filling removable tanks or re-filling a smaller container from a larger one when a vehicle is not present.

#### D5.8.3.1 Maximum Fuel Container Size for Refueling Vehicles (NEW)

Vehicles must be refueled using a fuel container no larger than 1.5 gallons in volume.

Any size of approved fuel container (refer to rule B12.9) may be used to refill a removable fuel tank when not installed in a vehicle, or to refill a smaller approved container on the ground.

#### D5.8.3.2 Removal of the Fuel Cap (NEW)

**When refueling during the endurance event, the driver exiting the vehicle must be the one to remove the fuel cap prior to fueling.**

**In the case of a removable fuel tank, the latch holding down the cover is considered equivalent to the fuel cap.**

### D5.8.4 Driving in Fueling Area

**All cars must operate at a walking speed while in the Fueling Area and when entering/exiting the area. Any team found speeding in the fueling area will be assessed a penalty as per rule D5.8.5.**

**Cars may not be pushed into the Fueling Area (FA) without a driver present and prepared to drive (i.e. wearing all required safety equipment).**

### D5.8.5 Fuel Penalties

Fuel cans in the paddock (not impounded) during the Endurance Event – 10 minute penalty first time or fuel removed from impound during endurance event without an escort 20 minute penalty second time

Fueling with any part of the driver in the car – 30 minute penalty first time  
DQ second time

Fueling with extinguisher not present/pointed at the refueling exchange-  
10 min penalty first time  
20 minute penalty second time

### 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 1<sup>st</sup> to 4<sup>th</sup> 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** 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 as designated; Attendance at meetings is mandatory. Failure to attend meetings can result in disqualification of members or the entire team.

### D6.2 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.

### D6.3 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.

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

#### **D6.5 Refueling**

Refueling of vehicles must be performed with (1) the engine shut-off and (2) the driver out of the vehicle and (3) fire extinguisher (other than that carried in the vehicle) must be on hand and pointed toward the vehicle/fuel tank whenever a vehicle is being refueled.

Teams found fueling improperly in the paddocks during the static or dynamic events days will be gridded for endurance in the fueling area and assessed a time penalty as per rule D5.8.5.

Refueling of vehicles must be performed with

1. Engine shut-off
2. Driver out of the vehicle
3. Fire extinguisher (other than that carried in the vehicle) must be on hand and pointed toward the vehicle/fuel tank whenever a vehicle is being refueled

#### **D6.6 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.

#### **D6.7 Engine Recall Option**

The organizers and SAE International 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.

#### **D6.8 Practice Area**

Practice may only take place in officially designated areas.

### **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.

#### **D7.5 Compressed Gas Storage**

Teams shall properly store compressed gas cylinders. Cylinders shall be upright and properly secured by chain or other method, capped when not in use, and stored such that cylinder temperature is below 125 degrees F.

All teams' members should be wearing eye protection in the paddock when performing any activity involving fuel, grinding welding or cutting.

## **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 and only after

**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**

**D9.1** 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** An incident of unsportsmanlike conduct, the organizer or SAE International Staff 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 International 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. 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. 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 a specified distance back decided by SAE International and the organizers, 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**

### **D11.1 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.

**D11.2** Drivers not wearing the proper equipment will not be permitted to drive, and may have their competition driver's privileges revoked.

## **ARTICLE 12: SAFETY – TEAM RESPONSIBILITY**

**D12.1** Safety is the primary consideration in the design of Baja SAE® vehicles and the conduct of the competitions.

**D12.2** Teams need to include safety considerations in all parts of their program.

**D12.3** 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.

## **ARTICLE 13: VISA REQUESTS**

### **Visa Requests**

Affiliated CDS Student Team Members will have the ability to print out a Registration Confirmation Letter for the individual event(s) that they are attending. Once a student team member affiliates themselves to their teams profile page under their individual edit section. They will have the opportunity to print out their personalized letter with the following information: Student's Name, School's Name, the CDS Event Name, Official Dates and Location(s).

Please be advised that SAE International cannot intervene with, or call or send personal letters to, the State Departments, Embassies or Consulates of the United States or other governments on behalf of any meeting or event participant.

### **United States Visas**

Teams requiring visas to enter to the United States are advised to apply at least sixty (60) days prior to the competition. Although most visa applications seem to go through without an unreasonable delay, occasionally teams have had difficulties and in several instances visas were not issued before the competition.

**Do not wait - apply early for your visa.**

## **SAE does not issue letters of invitation or participation certificates**

Neither SAE International staff nor any competition organizers are permitted to give advice on visas, customs regulations or vehicle shipping. Nor will they intervene on either matter concerning the United States or any other country.

For additional information: <http://www.sae.org/events/travelvisa.htm>

### **PART E: DESIGN AND COST SUBMISSION PROCEDURES**

#### **ARTICLE 1: ONLINE SUBMISSIONS (new procedure)**

New document submission process for Baja SAE® competitions.

Design and Cost Report Submission Process - <http://www.bajasae.net/go/submit>

**\*For Mexico event Design Report, Cost Report and the rest of the required technical documents will be sent via email to [jueces@saemexico.org](mailto:jueces@saemexico.org) by the deadlines specified earlier in this document and in the official website [www.bajasaemexico.com](http://www.bajasaemexico.com)**

**Forms** - The standard forms that are required for documentation and submissions at Baja SAE® competitions have been relocated

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

**Web Based Submission** - All three Baja SAE® competitions -the required documents must now be submitted online through <http://www.bajasae.net>

**Account Signup for Online Submission**- Teams must comply with certain requirements when registering at <http://www.bajasae.net/go/signup> and submitting documents online.

#### **ONLINE SUBMISSIONS (New)**

##### **Web Based Submission -**

Teams competing in any North American Baja SAE® competition must submit the following documents online through <http://www.bajasae.net>

"Design Report"	(C 3.2.3)
"Cost Report"	(C4.2.1 & C4.2.2)
"Cost Documentation"	(C 4.2.3)
"Design Spec Sheet"	(C3.3)

- The Design Report and the Design Spec Sheet, while related, are independent documents and must be submitted as two (2) separate files.
- Documents may be uploaded to the website from the time your Baja SAE online account has been created and accepted until the "No Submissions Accepted After" deadline (which is 10 days after the "Due Date").
- Submissions may be replaced with new (updated) uploads at any time before the "Due Date" without penalty.
- Teams have the option to replace uploaded documents with a new file at any time, however between the
- "Submission Due Date" and the "No Submissions Accepted After" date such replacements are classified as late submissions and the appropriate penalties will be applied.
- Documents may not be uploaded or replaced following the "No Submissions Accepted After" deadline and late submission penalties will be applied.

**Account Signup for Online Submission** - Account creation for online document submission through Baja SAE® online requires the following steps:

- (1) Visit: <http://www.bajasae.net/go/signup>
- (2) Follow the account signup instructions on the website. Select "Your Affiliation" as either "Team Captain/Team Advisor" or "Team Member (non-captain)."
- (3) Your "authentication number" for Baja SAE® online signup is the confirmation number that was issued when your team registered on [www.sae.org](http://www.sae.org).

**Note** - There may be a delay of up to three (3) business days between the time your team registers for a competition and [www.bajasae.net](http://www.bajasae.net) recognizes the validity of your authentication number and the captain can create his account.

Once your team captain has created an account it will remain valid until your team becomes dormant or no longer registers to compete.

- (4) Responsibilities and Restrictions

#### **Team Captain Role**

Each team must have at least one person with an account at BajaSAE.net and identified as the Team Captain. The Team Captain(s) have unique responsibilities on the site including accepting other team members for site access.

Until the captain accepts a member's signup request that person cannot upload or view team documents. Team captains automatically have the same roles and privileges as their team members.

**Team Member Restrictions** - Team members must be approved by the Team Captain or the Faculty Advisor before being able to view or upload team documents.

**Note - All team members are not required to be affiliated on bajasae.net, just the person uploading documents**

**Uploading Documents** - All team members and the team captain have equal authority to upload and/or replace documents in the name of the team.

**Document Access** - Uploaded documents can only be viewed by (1) members of the submitting team, (2) authorized judges, technical inspectors and officials and (3) CDS staff.

**Reminder** - The website does not know what you intended to submit or what you thought you were doing. Anything your team uploads to the site is considered to be an official action by your team.



## **ARTICLE 2: NOTICE OF “POSSIBLE” RULE CHANGES FOR 2016:**

- Powertrain Guards and Rotating parts rule
- A rule defining suspension seats
- Energy Storage Devices
- Frame requirements to be evaluated yearly

## **ARTICLE 4: 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

#### **SAE 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

#### **SAE 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 SAE 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)