2016 Collegiate Design Series

Baja SAEINDIA® Rules

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Baja SAEINDIA® Rules
Table of Contents

PART A: ADMINISTRATIVE REGULATIONS 03
  ARTICLE 1: BAJA SAE OVERVIEW 03
  ARTICLE 2: BAJA SAE SERIES 03
  ARTICLE 3: BAJA SAE RULES AND ORGANIZER AUTHORITY 04
  ARTICLE 4: INDIVIDUAL PARTICIPATION REQUIREMENTS 05
  ARTICLE 5: FACULTY ADVISOR 06
  ARTICLE 6: ELIGIBILITY – VEHICLES 06
  ARTICLE 7: REGISTRATION 07
  ARTICLE 8: RULES QUESTIONS 08
  ARTICLE 9: PROTESTS 09

PART B: TECHNICAL REQUIREMENTS 09
  ARTICLE 1: GENERAL DESIGN REQUIREMENTS 09
  ARTICLE 2: REQUIRED ENGINE 10
  ARTICLE 3: ELECTRICAL SYSTEM 14
  ARTICLE 4: TOWING HITCH POINT 16
  ARTICLE 5: VEHICLE IDENTIFICATION 17
  ARTICLE 6: TRANSPONDERS 18
  ARTICLE 7: ROLL CAGE 21
  ARTICLE 8: COCKPIT AND THROTTLE 30
  ARTICLE 9: DRIVER RESTRAINT AND SEATING (NEW) 33
  ARTICLE 10: BRAKING SYSTEM 39
  ARTICLE 11: FUEL SYSTEM AND FUEL 40
  ARTICLE 12: FASTENERS 43
  ARTICLE 13: GUARDS 45
  ARTICLE 14: DRIVER EQUIPMENT (UPDATED) 46

PART C: DYNAMIC EVENTS-STATIC EVENTS 47
  ARTICLE 1: SCORING 47
  ARTICLE 2: TECHNICAL INSPECTION 48
  ARTICLE 3: ENGINEERING DESIGN EVENT 49
  ARTICLE 4: COST EVENT (REVIEW SUBMISSION PROCEDURE) 53
  ARTICLE 5: SALES PRESENTATION EVENT – 50 Points 55
  ARTICLE 6: TIE BREAKERS 55

PART D: DYNAMIC EVENTS – TOTAL – 700 POINTS 55
  ARTICLE 1: ACCELERATION 55
  ARTICLE 2: HILL CLIMB or TRACTION EVENT 56
  ARTICLE 3: MANEUVERABILITY EVENT 57
  ARTICLE 4: SPECIALTY EVENTS 58
  ARTICLE 5: ENDURANCE – 400 Points 58
  ARTICLE 6: COMPETITION PROCEDURES AND REGULATION – GENERAL 63
  ARTICLE 7: Paddock Rules 63
  ARTICLE 8: DRIVING RESTRICTIONS 64
  ARTICLE 9: RULES OF CONDUCT 64
  ARTICLE 10: SPECTATOR RULES 65
  ARTICLE 11: MISCELLANEOUS 65
  ARTICLE 12: SAFETY – TEAM RESPONSIBILITY (VISAS) 65

PART E: DESIGN AND COST SUBMISSION PROCEDURES (NEW PROCEDURES) 66
  ARTICLE 1: ONLINE SUBMISSIONS (new procedure) 66
  ARTICLE 2: APPENDIX S- SAE TECHNICAL STANDARDS 68
Read the Rules, thoroughly!

Please be sure to reference the Baja SAE India Website (http://www.bajasaeindia.org) for all updates.

2016 Baja SAE India 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:

<table>
<thead>
<tr>
<th>Baja SAE</th>
<th>Sponsored by</th>
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<tbody>
<tr>
<td>Auburn</td>
<td>Hosted by Auburn University</td>
</tr>
<tr>
<td>Maryland</td>
<td>Hosted by the University of Maryland-Baltimore County</td>
</tr>
<tr>
<td>Oregon</td>
<td>Hosted by the SAE Oregon Section</td>
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</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Baja SAE</th>
<th>Sponsored by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>SAE BRASIL</td>
</tr>
<tr>
<td>Korea</td>
<td>Yeungnam University</td>
</tr>
<tr>
<td>South Africa</td>
<td>Sasol and hosted by the Gerotek Test Facilities</td>
</tr>
<tr>
<td>India</td>
<td>Mahindra &amp; Mahindra Ltd. and SAEINDIA and hosted by NATRiP</td>
</tr>
</tbody>
</table>

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

A2.2.1 Teams are required to visit www.saeindia.org/student-activities or www.bajasaeindia.org for the rules pertaining Baja SAE India® Rules and for the dynamic events.
A2.3 Official Announcements and Competition Information
Teams are required to read the articles posted on the Baja SAE India homepage (www.bajasaeindia.org) published by Baja SAE India Organizing Committee. Teams must also be familiar with all official announcements concerning the competitions and rule interpretations released by the Baja SAE India Organizing 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 India English and Hindi

ARTICLE 3: BAJA SAE INDIA RULES AND ORGANIZER AUTHORITY

A3.1 Rules Authority
The Baja SAE India Rules are the responsibility of Baja SAE India Organizing Committee and are issued under the authority of Baja SAE India Organizing Committee. Official announcements from Baja SAE India Organizing Committee 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 Baja SAE India Organizing Committee during competition onsite.

A3.2 Rules Validity
The Baja SAE India Rules posted on the Baja SAE India website and dated for the calendar year of the competition are the rules in effect for the competition. Rule sets dated for other years are invalid.

A3.3 Rules Compliance
By entering a Baja SAE India 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 Baja SAE India Organizing Committee. 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 India, 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 Baja SAE India Organizing Committee or Technical Inspectors.

A3.7 **Right to Impound**
Baja SAE India Organizing Committee reserves 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**
Baja SAE India Organizing Committee reserves 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.

A3.9 **Penalties**
Organizers have the right to modify the penalties listed in the various dynamic event descriptions (part D) to better reflect the design of their event courses, the course lengths or any special conditions unique to the site. The standard dynamic event penalties in these rules are default values that will be applied unless there is a change by the organizer.

A3.10 **SAE Technical Standards Access**
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 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 student in a college or university. Team members who have already graduated prior to the competition (Feb. 2016) are NOT eligible to participate.

A4.3 **Society Membership**
Team members must be members of SAE or an SAE affiliate society. Proof of membership, such as a membership card, is required at the event. Those interested may join SAE at: [www.sae.org/students](http://www.sae.org/students) and SAEINDIA at: [www.saeindia.org](http://www.saeindia.org).

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 participant.

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

A4.8.1 All participating team members and faculty advisors must be sure that they are individually linked to their respective school/university on the SAEINDIA website through their team’s profile page for each event they are participating in.

A4.8.2 A team can have a maximum of 25 and a minimum of 10 eligible members. The team having less than 10 and more than 25 members should not register, and if registered will not be allowed to participate.

**NOTE:** Teams are advised to take proper care while forming the team and refrain from further modification at
a later date. Any change in team composition i.e. addition of new members or deletion of old members is NOT ALLOWED after registration. Any exceptional cases like death, natural calamity etc. could be dealt with separately. For such cases a letter of declaration is due from the Institution Head / Principal on institution letter head. Backing-out or withdrawal of any member from the team, due to any reason other than exceptional ones mentioned above, is NOT allowed and entire team will be responsible for consequences, if any, arises due to this.

A4.8.3 If you are not an SAE member, go to www.sae.org and select the “Join SAE/Membership Renewal” link under “Quick links”, and then select the “Join SAE” link in the top right column. Students will need to select the “Student Membership” link and then follow the series of questions that are asked. Faculty members who wish to become SAE members should choose the “Professional Membership” link. Please note all student participants must be SAE members to participate in the events; this is not mandatory for faculty advisors. Faculty members who wish to become SAE members should choose the “Professional Membership” link.

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/ indirect involvement from professional engineers, faculty or professionals in the off-road and racing communities. Proof of manufacturing location will be essentially required to be furnished by the teams on-site upon being so asked for by the officials.

A6.2 Professional Fabrication Limits
1. Only those teams, whose management gives an undertaking to allow them to use the workshop facilities, would be allowed to participate without exception. Also teams need to submit a list of facilities / equipment in operating condition with the college facilities which will be used to fabricate & assemble the vehicle as per design presented in Virtual Baja SAE India event.

2. During the actual manufacturing and fabrication process, the video clips that cover students working in college facility need to be taken and written in a CD, to be furnished anytime throughout the course of project. The clip is required to cover each of the manufacturing processes carried out in college.

3. Extensive use of readymade subassemblies may invoke penalties. Vehicles, which have been professionally fabricated, may be penalized up to 400 points or even disqualified from the competition. The decision of the organizers committee in this regard will be final. The registration fee would NOT be
returned in such case.

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. Extensive use of readymade subassemblies may invoke penalties. List of pre-fabricated parts allowed are – shock absorbers, spring, brake drum, brake disc, brake calipers and brake holding assembly, master cylinder, steering gear box, steering column, steering wheel, wheel rims & tires, seat frame, tie rod ends.

Engine, fuel tank and exhaust system - complete assembly supplied from B&S to be used. All other parts need to be fabricated in house and not allowed to outsource from professional manufactures/designers.

ARTICLE 7: REGISTRATION

A7.1 Registrations for Baja SAE India event held in India must be completed online. Online registration must be done by either (a) An SAE member or (b) the official faculty advisor connected with the university and recorded as such in the SAE record system. Active SAEINDIA collegiate club is required to register the team.

A7.2 Entries per university-Registration for Baja SAE India competition allows a maximum of 1 (ONE) vehicle per college / university location.

To begin at 10:00 am IST on April 1st 2015.

A7.3 Registration Limit
There is no limit to number of registrations for Baja SAE India.

A7.3.1 Failure to Meet Deadlines NOTE!! NEW POLICY!
All teams, which are registered, for Baja SAE India competition are required to submit Documents prior to the competition.
(a) SCCS - As evidence their car complies with the SCCS and to support the technical inspection process and
(b) Roll Cage specification sheet and Frame material documentation as per B7.6.
(c) Cost Report to be provided by team.
(d) Design Report - To provide details of Virtual and Actual Design of BAJA buggy.
During the event judges need to evaluate the team with respect to all above these submissions. 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 (SCCS) typically do not come to the competition. Teams that do not notify us that they are withdrawing create the following problems they are included in the static event schedules and judging time is wasted, failure to submit the required Cost, Design, and Technical Documents (SCCS) is a clear violation of the rules.

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 Baja SAE India competition they intend to enter by the specified date on the action deadline webpage – www.bajasaeindia.org . Registration dates are available online.

A7.5 Registration Fees
The registration fee for Baja SAE India must be paid by challan form at the time of registration. Registration fees may not be paid by any other means. Registration fees are NOT refundable or transferable. Registration fees is classified in two stages 1) Before Virtual & 2) After Virtual. The dates will be declared on BAJA official web site.

Mentoring fees: If in case team desire and expect mentoring for technical inspection, they are free to hire the advisory session from technical inspection team before event by paying a nominal fees (Non-refundable). For this need, team has to register along with second phase of registration after virtual event. The dates will be
announced by Baja organizing committee for registration. Challan form can be downloaded from [http://www.bajasaeindia.org/downloads.html](http://www.bajasaeindia.org/downloads.html).

A7.6 **Withdrawals**
Registered teams that find that they will not be able to attend the competition are requested to officially withdraw by notifying the following not later than two weeks before the event.

Baja SAE India event withdrawals: saeindia_indore@saeindia.org.

A7.7 **International Participation – Vehicle Shipping/Indian Customs**
Baja SAE India Organizing Committee strongly recommend international teams ship their vehicles early in order to allow enough time to compensate for any delays that may occur in clearing Indian Customs. Please check with the Indian 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.

**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 Staff, nor the competition sites can be listed as the receiving party for your vehicle.

Vehicle shipping procedure for the Baja SAE India competition is published on the Baja SAE India website and is incorporated into these Rules by reference.

Baja SAE India Organizing Committee members are not permitted to provide advice on Indian Customs matters.

**ARTICLE 8: RULES QUESTIONS**

A8.1 **Questions**
By submitting a question to Baja SAE India, you and your team agree that both your question and the Committee’s answer can be reproduced and distributed by SAE, in both complete and edited versions, in any medium or format anywhere in the world.

A8.2 **Question Types**
Baja SAE India Organizing 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)*
The teams can send their technical queries and doubts to the official Email ID – bajatechteam@saeindia.org for the clarification on any rule.

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. Organizing Committee will respond as quickly as possible, however responses to questions presenting new issues, or of unusual complexity, may take more than two weeks.
NOTE: Please keep in mind that final operating approval of a Baja SAE India vehicle can only be given on site at the competition.

A8.5 Event Related Questions
Questions pertaining to the operation and schedules of Baja SAE India competition should be emailed to saeindia_indore@saeindia.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. Baja SAE India Organizing Committee 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 Baja SAE India Organizing Committee’s attention for an informal preliminary review before a protest can be filed.

A9.2 Cause for Protest
A team may protest any rule interpretation, score or official action (unless specifically excluded from protest) which they feel has caused some actual, non-trivial harm to their team, or has had a substantive effect on their score. Teams may not protest rule interpretations or actions that have not caused them any substantive damage.

A9.3 Protest Format and Forfeit
All protest must be filed in writing and presented to the Baja SAE India Organizing Committee 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 India 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 India courses are designed for vehicles with the maximum dimensions of 162 cm (64 in) width by 274 cm (108 in) length. Vehicles exceeding the width will NOT be allowed to run in any event. “GO-NO-GO” device is made available by the organizers at the Technical Inspection area during the On-Site Technical Inspection to check the width.

B1.2 All-Terrain Capability

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

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

B1.3 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
Since the year 2012, the Briggs & Stratton India has generously provided engines to the Baja SAE India teams with subsidized charges. In addition, teams are required to pay for the shipping & handling charges. You must order your engine by 10th Sep, 2015 along with necessary payment to B&S. No exceptions each engine will come with a maintenance kit.

A maintenance kit includes the following parts (NEW)
- 5 - Air Filters
- 5 - Air Filter Pre-Filters
- 5 - Fuel Filters
- 5 - Spark Plugs

B2.2.1 Engine Shipment outside India
Teams from countries outside India will need to write to B&S directly and the engine can be procured from any worldwide location of B&S. Correct part number has to be ensured. For any assistance required, SAEINDIA could be contacted at saeindia_indore@saeindia.org.

B2.2.2 Briggs & Stratton India will not ship engines outside Indian borders.

B2.2.3 Neither Briggs & Stratton nor SAEINDIA assume any responsibility for the delivery of engines.

B2.3 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.

B2.4 Engine Requirement and Restrictions
To provide a uniform basis for the performance events, all vehicles must use the same engine: a stock four cycles, air cooled, Briggs & Stratton OHV Intake Model.

The following Briggs & Stratton engine is the only acceptable engine for the 2015 Baja SAE India competition:

No Exceptions

Baja Acceptable Engine

<table>
<thead>
<tr>
<th>Engine Number</th>
<th>Description</th>
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<tbody>
<tr>
<td>20S232 0036-F1</td>
<td></td>
</tr>
<tr>
<td>205432 0536-E9</td>
<td></td>
</tr>
<tr>
<td>205332 0536-E9</td>
<td></td>
</tr>
<tr>
<td>205332 0536-B1</td>
<td></td>
</tr>
</tbody>
</table>

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 modification and prohibited.
B2.4.1 **Replacement Parts**
Only Original Equipment Briggs & Stratton replacement parts may be used.

B2.4.2 **Piston Rings**
Only standard size original Briggs & Stratton piston rings may be used.

B2.4.3 **Intake Ports**
No cleaning or removing of aluminum flashing from intake or exhaust ports may be done.

B2.4.4 **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.

B2.4.5 **Shafts and Rods**
Camshaft, crankshaft, connecting rod and flywheel must not be altered or modified.

B2.4.6 **Spark Plugs**
Must use RC12YC Only.

Before carrying out any welding activity, it is recommended that the spark plug cable is removed and battery terminal cables are disconnected. This will prevent burning of wiring harness and HT Coil.

B2.4.7 **Armature**
Any armature air gap setting is allowed. No slotting or elongating of armature mounting holes to increase or retard ignition timing.

B2.4.8 **Flywheel Rotation**
No flywheel rotation to advance or retard timing is permissible.

B2.4.9 **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.

B2.4.10 **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 2016 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.

**A fresh air cleaner element & paper filter are required during On-site Technical Inspection - Engine at Baja SAE India 2015.**
B2.4.11 Exhaust System

- **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.

- **Muffler Support (NEW)**
  Supports for the exhaust pipe and muffler are required. Supports **must** be attached exclusively to the engine.

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

- **Exhaust Pipe – Length**
  Any exhaust pipe length is allowed, however pipe length may not be adjustable.

- **Exhaust Pipe – Holes & Tubes**
  No extra holes or tubes are allowed in the exhaust pipe.

- **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.

- **Exhaust System Complete**
  The complete exhaust system shall be located such that its extremities lie at least 100 mm within the perimeter of the vehicle. (The perimeter of the vehicle stands for the envelope formed by the planes of the roll cage members).

- **GO GREEN AWARD**
  Regarding GO GREEN Award, concept model & system need to be separately worked out for presentation during the event. Details for GO GREEN Award will be separately put on the official Baja SAE India 2016 website.

B2.4.12 Starter

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

B2.4.13 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.

B2.4.14 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 grounds for immediate disqualification.

**GOVERNOR SETTING NOT TO EXCEED 3800 RPM.**

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

**NOTE:** The governor spring must be placed in **hole # 6.**
B2.4.15 Hybrid Electric Power Systems
Hybrid electric power systems are specifically prohibited.

B2.4.16 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.

B2.5 Engine Use Restriction
Briggs & Stratton generously provides engines to the teams for the exclusive purpose of use on their Baja SAE India 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 Briggs & Stratton.

B2.6 Transmission
Teams are free to use any transmission, such that maximum speed of the vehicle on a plain terrain is recommended to be no more than 60 km/h in top gear. Continuously Variable Transmission (CVT) is also permitted with appropriate shielding as in Article 15. Teams can plan to install reverse gear for reverse drive of vehicle. Teams need to safely install gear shifting cables. Lever and shifting mechanism are to be installed at such locations which will not be a hindrance for driver and his safety. The adapter for Engine & Transmission is to be designed and installed by students as per the type of transmission used. Engine drive / output shaft side details are available on Baja SAE India official website – www.bajasaeindia.org. The decision of the Head of the Technical Committee of Baja SAE India in this regard will be final and binding to all.

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. 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. There should not be any positive contact with the exhaust unit of the fuel system. The battery must be safely placed & concealed. Failing this, the technical inspectors may debar the team from the dynamic events.

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 drive-train, 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 Re-charging batteries
Only batteries which are recharged by an engine alternator may be used to power control or actuation functions in the drive-train, 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 Light and Reverse Light.

B3.3.1 Kill Switch – Type
The kill switches must be one of the following:

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


(C) A Stock Polaris # 4110106

B3.3.2 Kill Switch – Locations and Orientation

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

(B) External Switch – The external switch must be mounted on the driver’s right side of the vehicle, on a panel generally perpendicular (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.
Note: Rotary type kill switches are not allowed (neither rotate to kill, nor rotate to release).

B3.3.3  Wiring
All wiring must be sealed, protected and securely attached.

B3.4  Brake Light

B3.4.1  The vehicle must be equipped with a red brake light that is SAE “S” or “U” rated or it must be equal to or exceed these standards (e.g.: OEM brake light assemblies)/ AIS and ISI rated brake lights are also permitted. They 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, not up at an angle, up to a distance of 10 meters.

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, part #48001 and part #48020. OEM reverse light and alarm assembly are also acceptable with proper documentation.
The reverse alarm shall be mounted at a minimum of 70 cm above the ground and at 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 Hitch Point (Updated)
The front hitch point must be strong enough to serve as a vertical lift point for the vehicle. The front hitch point, when not attached to a tow rope, may not present a danger of penetration in the event of a frontal collision. For example, if a hitch plate as described in B4.4 is used, then it must be free to pivot down so as to not present a narrow protrusion.

Front Hitch Point Requirements – Maximum and Minimum
- Maximum diameter 31.75 mm (1.25 in.), Minimum diameter 25.4mm (1 in.)
- 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 (8 in.).

Examples of acceptable Front Hitches:

Note: Bumper can’t be considered as hitch point. If tubes are being used, they must be made of primary members. In addition, there must be lateral constraints for the hook or clevis to be properly in place which is
optimum for the effective transmission of vehicle loads while lifting.

B4.3 **Rear Hitch Plate**
The rear hitch point must be a plate complying with the requirements of B4.4

B4.4 **Rear Hitch Plate Requirements – Maximum and Minimum**
Towing plate **Maximum** thickness – 9.5 mm (.375 in)
Hole diameter **Minimum** – 25.4 mm (1.0 in)
Radial clearance **Maximum** from hole – 25.4 mm (1.0 in)
Hole to tube **Minimum** clearance – 19.0 mm (.75 in)
Hitch plate **Minimum** width where connected to frame – 76.2 mm (3.0 in)

Figure 8

ARTICLE 5: VEHICLE IDENTIFICATION

B5.1 **Number Assignment**
Numbers are automatically assigned as part of the final list of selected teams after Virtual Baja. Assigned numbers may be found on the Baja SAE India website [www.bajasaeindia.org](http://www.bajasaeindia.org) after the declaration of results.

B5.1.1 It is each team’s responsibility to provide its vehicle number markings. These markings include primary cutout numbers (side) and body numbers (front/rear). The numbers must be clearly visible from all sides, front, and rear of the vehicle. The numbers must remain readable throughout the competition.

**Numbers that are not easily read might not be scored during the endurance event.**

B5.1.2 **Number Location**
Three primary numbers are required to be affixed 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.

B5.1.3 **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:** 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) 0.5 inches (12.7 mm) 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.

Figure 9

Figure 10

B5.3 All vehicles must display their college name or initials, in roman characters, on each side in characters at least 2.5 cm (1 in) high and 1 cm (0.4 in) wide.

B5.4. SAEINDIA and Event Sponsor Logo
SAEINDIA logos would be provided to the teams at the event site only. These are required to be pasted on both sides of the vehicle, at the centre of the side panels, and above the head of the driver, at the firewall.

Event sponsor’s logos must be displayed in a prominent space on each side of the vehicle. These will be distributed during registration at the event site.

B5.4.1 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 may require all entrants to display advertising from the competition sponsors.

ARTICLE 6: TRANSPONDERS

B6.1 Transponders
Transponders will be used as part of the primary timing system for all closed loop dynamic events at Baja SAE India competition.

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.

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](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.

Figure 11
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.

Figure 12

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.

Figure 13
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)
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 7: ROLL CAGE

B7.1 Objective
The purpose of the roll cage is to maintain a minimum space surrounding the driver and to support all subsystems. The cage must be designed and fabricated to prevent any failure of the cage’s integrity.

B7.2 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 B7.3.1, otherwise it is assumed to have no contribution (A-arms are an example of members which do not conform to B7.3.1).

If there are any triangulating members joining the RHO to the vertical members of the Rear Roll Hoop (RRH-B7.3.2), and these triangulating members conform to B7.3.12, 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.

NOTE: When minimal dimensions are given that is to the centerline of the members, and when a clearance for the driver is given, it is defined by the outside edges of the roll cage members less the padding installed.

B7.2.1 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 envelop of the roll cage.

B7.3 Roll Cage Structure

B7.3.1 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 B7.3.12.
Primary members are:

Rear Roll Hoop (RRH)
Roll Hoop Overhead Members (RHO)
Front Bracing Members (FBM)
Lateral Cross Member (LC) in Rule B7.3.3
Front Lateral Cross Member (FLC) in Rule B7.3.4
Lower Frame Side Members (LFS) (Updated)

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

Secondary members are:

Lateral Diagonal Bracing (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.

Note: No holes are allowed to be drilled on the roll cage tubing. Also, no tube should show any cracks or deformation. Final judgment rests with Baja SAE India Organizing Committee.

B7.3.1.1 Lateral Cross Member Requirement
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.

B7.3.2 Rear Roll Hoop (RRH)
The RRH is a structural panel behind the driver’s back, and defines the back side of the roll cage. The driver and seat must be entirely forward of this panel. The RRH is substantially vertical, but may incline by up to 20° from vertical. The minimum width of the RRH, measured at a point 686 mm (27 in.) above the inside seat bottom, is 736 mm (29 in.). The vertical members of the RRH may be straight or bent, and are defined as beginning and ending where they intersect the top and bottom horizontal planes (points A_R and A_L, and B_R and B_L in Fig.RC1). The vertical members must be continuous tubes (i.e. not multiple segments joined by welding). The vertical members must be joined by LC members at the top and bottom. The LC members must be continuous tubes.

Note: The RRH will have an additional member for seat belt mounting without violating triangulation rule. (B10.2.3)
B7.3.2.1 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 (5 in.) 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.

B7.3.3 Roll Hoop Overhead Members (RHO)
The forward ends of the RHO members (intersection with the LC) define points C_R and C_L (Fig.RC3). Points C_R and C_L must be at least 305 mm (12 in.) forward of a point, in the vehicle’s elevation view, defined by the intersection of the RHO members and a vertical line rising from the after end of the seat bottom. This point on the seat is defined by the seat bottom intersection with a 101 mm (4 in.) radius circle which touches the seat bottom and the seat back. The top edge of the template is exactly horizontal with respect to gravity. Points C_R and C_L 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.
B7.3.4 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>.

B7.3.5 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 defines the points SF<sub>R</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</sub> and SF<sub>R</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.
**B7.3.6 Under Seat Member (USM)**
The two LFS members must be joined by the Under Seat Members. The USM must and pass directly below the driver where the template in RC3 intersects the seat bottom. The USM must be positioned in such a way to prevent the driver from passing through the plane of the LFS in the event of seat failure.

**B7.3.7 Front Bracing Members (FBM)**
Front bracing members must join the RHO, the SIM and the LFS (Fig. RC5). The upper Front Bracing Members (FBM_{UP}) must join points C on the RHO to the SIM at or behind points SF. The lower Front Bracing Members (FBM_{LOW}) must join points AF to points SF. The FBM (FBM_{UP} and FBM_{LOW}) must be continuous tubes. The angle between the FBM_{UP} 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.*

**RC 5 - FBM**

**Figure 24**

**B7.3.8 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; and 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.

RHO must be braced on both right and left sides. From a side view, the bracing must be triangulated. 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°.

**B7.3.8.1 Front Bracing**
Front systems of FAB must connect the FBM_{UP} members to the SIM members (on the same sides). The intersection with the FBM_{UP} members must be within 127 mm (5 in.) 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.

**B7.3.8.2 Rear Bracing**
Rear systems of FAB must create a structural triangle, in the elevation view, on each side of the vehicle. Each triangle must be aft of the RRH, include the RRH vertical side as a member, and have one vertex near Point B and one vertex near either Point S or Point A.

The third (after) vertex of each rear bracing triangle, 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 B7.3.1, 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 (5 in.) 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.

**B7.3.9 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.

Gussets shall be made of steel plate, be triangular from a side view, have length at least 3 times the tube diameter and have a minimum thickness of 3.2 mm (0.13 in) The gussets shall be welded to the sides of the tubes and not directly in the plane of the tubes making up each joint.

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.

**B7.3.10 Tube Joints**

**B7.3.10.1** 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.

**B7.3.10.2** 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.

B7.3.10.3 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.

B7.3.10.4 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.

![Butt Joint and Rosette Weld](image)

**RC 9**

Figure 28

B7.3.11 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 frees (Fig 24). 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.

![Sample 1](image)

Figure 29

(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 25). The sample must be sectioned along the length of tube to reveal adequate and uniform weld penetration (Fig 26).
B7.3.12 **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. Document of 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 test reports 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:

\[
E \quad \text{Modulus of elasticity (205 GPa for all steels)}
\]

\[
I \quad \text{Second moment of area for the structural cross section}
\]

Bending strength is given by:

\[
\frac{S_y I}{C}
\]

where:

\( S_y \) Yield strength (365 MPa for AISI 1018 steel*)

\( C \) Distance from neutral axis to extreme fiber

*Bending moment of AISI 1018 steel (for tube dimension of Sec B7.3.12 A) = 387.38 Nm

B7.3.13 **Roll Cage Specification Sheet**

Each vehicle must present a completed Baja SAE Roll Cage Specification Sheet at Technical Inspection. While procuring the tube one should get copy of tube specification and also ensure this is certified from a govt. recognized laboratory. Both copies must be presented during Tech Inspection at College level and during the final event.

**NOTE:** Latest Material Specification Check Report is essential for used material.

B7.4 **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.).
B7.5 Bolted Roll Cages

B7.5.1 Bolted Roll cages joints are acceptable only if the following requirements are met (Fig. 27):

(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 32

B7.6 Frame Pre-Check (new)

B7.6.1 Documents required for submittal
Roll Cage Specification Sheet & frame material documentation (invoices, certifications, calculations, etc.)
B7.6.2 Documents submittal process

- Download the form and template from www.bajasaeindia.org download section.
- All files that are uploaded must be in a .PDF format.
- Upload the Frame Documentation Package (max size 5MB)
  - Roll Cage Specification Sheet
  - Frame Material Documentation
  - Invoice of roll cage material
  - Material Test of Certification
  - Any Required Calculation per rule B8.3.12

Upload the Frame Drawing Package (max size 5MB)
- 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
- The major dimensions and angles required to meet the frame rules.
  - 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 8: COCKPIT AND THROTTLE

B8.1 Design Objective
The cockpit must be designed to (1) protect the driver and (2) permit easy driver exit in an emergency.

B8.2 Driver Exit Time
All drivers must be able to exit on either side of the vehicle within five (5) seconds. Exit time begins with the driver in the fully seated position, hands in driving position on the connected steering wheel, and wearing the required driver equipment. Exit time will stop when the driver has both feet on the ground. Driver’s exit time must be demonstrated by a team driver, as selected at technical inspection.

B8.3 Firewall
There must be a firewall between the cockpit and the engine and fuel tank compartment. It must cover the area between the lower and upper lateral cross members on the Rear Roll Hoop.

B8.4 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.

B8.5 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. Firewall can be bolted or riveted using metal brackets welded on frame. Welding of firewall on frame is also acceptable.

B8.6 Front or Mid-engine vehicles
If the engine is not placed in the rear of the vehicle, then a firewall is not required to cover the area between the RRH lateral cross members. Instead, the firewall must meet the following standards:

(A) Fuel tank must be in a sealed container that prevents fuel from leaking in the event of fuel tank failure.

(B) Splash shields must prevent fuel from being poured anywhere in the cockpit area during fueling. (See rule B12.6 “Spill Prevention”)

(C) Engine must be completely enclosed and protect the driver in the event of an engine failure. Shielding must meet guarding requirements. This shielding must be made of metal. (See rule B15.1”Powertrain Guards”)

(D) 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.

B8.7 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).

B8.8 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. Minimum thickness of the belly pan should be 0.5mm (0.020 in.). It can be bolted or riveted using metal brackets welded on frame. Welding of firewall on frame is also acceptable.

B8.9 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. No gaps can exist that are larger than 6.35 mm (0.25 in) are allowed. The driver’s feet must be completely within the roll cage.

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.

B8.10 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.
• 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.

We recommend that each team have a backup mount in the event of damage or loss during the event.
Note: ISI rated fire extinguishers are also permitted.

Aftermarket fire extinguisher brackets are acceptable; an example is shown below. The use of an aftermarket mount still requires a second, identical mount. Acceptable aftermarket mounts have a single metal pin or draw latch, with half the mount staying with the vehicle, and half staying with the extinguisher.

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

1. The following brands/models currently meet the requirements:

2. Some of the brands/models do not come with the metal bracket that is required to meet the rules, so be sure to purchase the additional bracket.

Amerex-B417 (ABC) Fire Extinguisher 2.5 LB. w/ Wall Bracket:

U.L. Listing: 1A:10B: C

First Alert:
http://www.firstalert.com/fire-extinguishing/fire-extinguisher/fire-extinguishers/febra2-6
http://www.firstalert.com/fire-extinguishing/fire-extinguisher/fire-extinguishers/febra5-6
http://www.firstalert.com/fire-extinguishing/fire-extinguisher/fire-extinguishers/FE5GO

Kiddie:
http://www.amazon.com/Kidde-466400-Extinguisher-Compatible-Extinguishers/dp/B001U0PF1Q/ref=pd_sim_auto_2
http://www.amazon.com/Kidde-FA110-Purpose-Extinguisher-1A10BC/dp/B00002ND64/ref=sr_1_1?ie=UTF8&qid=1314041847&sr=8-1

Bracket
B8.11 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.

B8.12 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.

B8.13 Throttle Extensions
Mechanical extensions such as thick pads or blocks may not be attached to control surfaces or the driver’s feet.

ARTICLE 9: DRIVER RESTRAINT AND SEATING (NEW)

B9.1 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 snuggly (one finger width maximum gap).

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.

![Roll Cage](http://www.amazon.com/Extinguisher-Mounting-Bracket-Strap-2-5/dp/B0036AQBL8/ref=sr_1_1?ie=UTF8&qid=1314042017&sr=1-1)

![Attachment Hardware](http://www.amazon.com/Extinguisher-Mounting-Bracket-Strap-2-5/dp/B0036AQBL8/ref=sr_1_1?ie=UTF8&qid=1314042017&sr=1-1)

**Figure 36**

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

B9.1.1 Release Mechanism
All belts must join with a single metal-to-metal quick release lever type buckle as per below figure. No cam-lock systems are allowed.
B9.1.2 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.

B9.2 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).

B9.2.1 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.31).

B9.2.2 Lateral Spacing
The shoulder harness mounting points must be between 178 mm (7 in) and 229 mm (9 in) apart (Fig 30).

B9.2.3 Harness Attachment Points
The shoulder belts must be looped around a horizontal tube welded within the RRH that meets the Roll Cage Secondary Member requirements of B8.3.1. Lateral motion of the belts along their mounting tube must be restrained. The firewall must protect the entire shoulder belt. The firewall may be pocketed to facilitate this, as long as no open gaps result.
B9.3 Lap Belts

B9.3.1 The lap belt must pass around the driver’s pelvic area below the Anterior Superior Iliac Spines (the hip bones, Fig. 33). 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. 33). 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.

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).

B9.3.2 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 manufacturers' 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.

**B9.4 Anti-Submarine Belts**

**B9.4.1 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.

**B9.4.1.1** If mounted to a frame tab, then the tab must conform to the rules for the lap belt tabs above.

**B9.4.1.2** If wrapped around a frame member, then:
1. The mounting tube must have features designed to limit the lateral belt movement along the tube to less than 25 mm (1 in.)
2. The webbing of the anti-submarine belt must be protected from Exposure to the ground, and not in contact with the belly pan.
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.

**B9.4.2 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. 36). 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 43**

**B9.4.3 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.).

**B9.5 Arm Restraints**

**B9.5.1** 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.

![Image of arm restraints](https://www.bajasaeindia.org/images/fig44.png)

**Figure 44**

**B9.5.2 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.

**B9.5.3 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 **Jan 1st** of the competition year be no more than three years old.

![Image of dated belts](https://www.bajasaeindia.org/images/fig45.png)

**Figure 45**

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

**B9.6 Installations - General**

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

**B9.7 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 46

B9.7.1 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.

B9.7.2 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 47

B9.7.3 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.

B9.7.4 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.

ARTICLE 10: BRAKING SYSTEM

B10.1 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.

B10.2 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.

B10.3 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

B10.4 Cutting Brakes
Hand or feet operated “cutting brakes” are permitted provided the section (B10.1) 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.

B10.5 Brake Lines
All brake lines must be securely mounted and not fall below any portion of the vehicle (frame, swing arm, A-arms, etc.). Wheel ends should be connected with flexible pipe only. Ensure they do not rub on any sharp edges.

Note: Plastic brake lines are not allowed

ARTICLE 11: FUEL SYSTEM AND FUEL

B11.1 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 frame (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 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](image)

**Figure 49**

**B11.2 Removable Fuel Tank**

**B11.2.1 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:

- **B11.2.2** 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.

- **B11.2.3** 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 50).

- **B11.2.4** 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 (Fig 51). 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 52). The female fitting must be installed on the fuel tank side

- 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

- Socket with Hose Barb Adapter P/N 21504
- Plug with Hose Barb Adapter P/N 22504

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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

- 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.

B11.3 Fuel Tank

B11.3.1 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.

B11.3.2 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.

B11.4 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.

B11.5 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.

B11.6 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.

B11.6.1 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.

B11.6.2 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 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 of the drain line is 12.7 mm (.5 in.) and minimum inside diameter of fittings is 9.5mm (.375 in.).**

B11.6.3 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.

**B11.7 Splash Shields**

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

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

**B11.7.1**

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:

![Figure 53](image1)

![Figure 54](image2)

![Figure 55](image3)

![Figure 56](image4)

![Figure 57](image5)

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

![Figure 58](image6)
B11.8 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

B11.8.1 The addition of nitrogen bearing additives, or additives designed to liberate oxygen is strictly prohibited.

B11.8.2 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.

B11.9 Fuel Containers

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

1) Have a volume of 1.5 gallons (5.678 liter) or less for fueling vehicles during endurance event.
2) Have a volume of 5 US gallons (18.927 liter) or less.
3) Be equipped with an original cap to prevent spills when not in use.
4) Be labeled with “college name and car number.”

You are required to bring all of your fuel to one area (fueling area) during the endurance event. See section D5.8 Fueling

ARTICLE 12: FASTENERS

B12.1 Fasteners in the driver restraint systems, fuel systems and all vehicle systems (except body panels) mounting must meet the following guidelines.

B12.2 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.

B12.3 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:
**B12.4 Thread Exposure**
Threaded fasteners used must have at least two (2) threads showing past the nut.

*Note: Axle or half shaft and steering tie rods to be fastened with castle nuts with split pins. For axle shafts standard self-locking nuts can be used. Wheel nuts could be OEM cap nuts with appropriate (1.5d) engagement length.*

**B12.5 Socket Head Cap Screws**

**B12.5.1** Socket head cap screws, also known as “internal wrenching bolts” or “Allen head bolts”, must meet one of the following requirements:

**B12.5.2** The bolt head is clearly marked with the letters “NAS”, “12.9”, or “10.9” indicating a military/aircraft or high-strength metric fastener. No other markings will be accepted.

**B12.5.3** Proper documentation is supplied, which must include a purchase receipt, and manufacturer’s documentation indicating bolt strength equivalent to the above.

**B12.6 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.

**B12.7 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 13: GUARDS**

**B13.1 Power-train Guards**
All rotating parts such as belts, chains, and sprockets that rotate at the rate of the drive axle(s) or faster, must be shielded to prevent injury to the driver or bystanders should the component fly apart due to centrifugal force. These guards/shields must extend around the periphery of the belt or chain and must be wider than the rotating part they are protecting. They must be mounted with sound engineering practice, in order to resist vibration.
They must use:

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

B13.2 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.

B13.3 Factory Stock Guards
Factory stock guards must meet the requirements in B13.1. OEM Polaris CVT covers that are not modified are exempt to rule B13.1. OEM Polaris CVT covers must meet the requirements of B13.2 in way of the vent.

Note: In case of 4 wheel drive and / or if drive shaft is taken from cockpit, then it must be covered with proper guard.

ARTICLE 14: DRIVER EQUIPMENT (UPDATED)

B14.1 Helmet, Neck Support/Collar & Goggles

All drivers must wear a well-fitting Motocross style helmet with an integrated (one piece composite shell) chin/face guard and a rating of; Snell M2005 SA 2005, British Standards Institution BS 6658-85 types A or A/FR. ISI rating is also acceptable.

Goggles must incorporate the use of tear-offs or roll-off systems.
**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.

**B14.1.1 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.

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

**Example of an acceptable products**

![Simpson Example]

![G-Force Example]

**B14.2 Clothing**

Drivers must wear long pants (cotton/Nomex), socks, shoes, gloves, and a long sleeved fire resistant upper
The upper garment must have a factory label showing that it is SFI rated, FIA rated or fire resistant. In addition, British/European ratings are also acceptable provided it bears appropriate labels and documentations.

**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**

**ARTICLE 1: SCORING**

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

<table>
<thead>
<tr>
<th>Category</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Evaluation</td>
<td>150</td>
</tr>
<tr>
<td>Cost Report</td>
<td>15</td>
</tr>
<tr>
<td>Prototype Cost</td>
<td>85</td>
</tr>
<tr>
<td>Sales Presentation</td>
<td>50</td>
</tr>
</tbody>
</table>

**DYNAMIC EVENTS – 700 points**

<table>
<thead>
<tr>
<th>Category</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceleration</td>
<td>75</td>
</tr>
<tr>
<td>Hill Climb or Traction</td>
<td>75</td>
</tr>
<tr>
<td>Land Maneuverability</td>
<td>75</td>
</tr>
<tr>
<td>Rock Crawl</td>
<td>---</td>
</tr>
<tr>
<td>Suspension</td>
<td>75</td>
</tr>
<tr>
<td>Endurance</td>
<td>400</td>
</tr>
</tbody>
</table>

**TOTAL POINTS**  **1000**

**ARTICLE 2: TECHNICAL INSPECTION**

C2.2 **Technical Inspection - Pass/Fail**
All Baja SAE India 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 India 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 must be passed before a team may apply for Part 2 (Tech) or Part 3 (Brake) inspection.
C2.3.2 Technical Inspection

Each vehicle will be inspected to determine if it complies with the requirements and restrictions of the Baja SAE India 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) **Self Certification Check Sheet:** A properly completed Self Certification Check Sheet.

(D) **Drive-train Check Sheet:** A properly completed Drive-train 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.

C2.3.4 Inclining Test - Water Competitions Only (there will be no water event for the 2015 competition season)

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

C2.4 Inspection Stickers

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

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

C2.5 Self Certification Check 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 Self Certification Check Sheet (available on the Baja SAE India Rules and Important Documents website, [http://www.bajasaeindia.org/downloads.html](http://www.bajasaeindia.org/downloads.html)), (3) have the completed check sheet signed by the faculty advisor and team captain.

C2.5.2 **Teams must download the most current version of the Self Certification Check Sheet within two weeks of the college level technical inspection and thoroughly inspect their vehicle in accordance with same.**

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

**NOTE:** Teams presenting Self Certification Check Sheets that are (1) incomplete, (2) inaccurate (i.e. do not correspond to the actual condition of the vehicle) (3) are found to have the 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, Drive-train/Power-train, 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 India 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 http://www.bajasaeindia.org/downloads.html.

C3.1.4 The engineering design event consists of two parts: Design Evaluation and an un-scored 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 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 8½” 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 India Design Spec Sheet must be submitted.

C3.3.2 The Baja SAE India Design Spec Sheet template can be found at http://www.bajasaeindia.org/downloads.html. 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 design report file must be named as follows: Vehicle #_school name (full name)_competition_DesignReport. EXAMPLE: Vehicle # 001_XYZ University_Baja SAE India 2015_DesignReport.pdf. 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. Similar to the Design Report, the Design Spec Sheet file must be named as follows: Vehicle #_school name (full name)_competition_specs. EXAMPLE: Vehicle # 001_XYZ University_Baja SAE India 2015_specs.xlsx.

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 or is not properly named 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 website 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 or by email. 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 at negative 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.

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 http://www.bajasaeindia.org/downloads.html. 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 http://www.bajasaeindia.org/downloads.html.

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. Design Finals 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 six (6) minutes.

Following the presentation there will be approximately three (3) minutes for 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 for 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 India 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 (150) points may be assessed against the design score.

C3.9.2 Redesign/Design Comparison Document (NEW)
The design comparison report (i.e. first report at Virtual v/s Actual vehicle, which is participating in the event) must follow the template found at http://www.bajasaeindia.org/downloads.html 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 or (3) photographs. Design changes to correct failures of the previous design should be accompanied by a thorough analysis of why the failure occurred and the theoretical data supporting the new design, etc. 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 India 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, on-line prices, or other documentation, to substantiate the costs of the parts and materials of any item costing more than Rs. 200. Cost documentation must be at full retail Indian prices. The use of foreign receipts, purchases from discount sites such as Craig's List, 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. The cost report file must be named as follows: Vehicle #_school name (full name) _competition_ Cost Report. For example: Vehicle # 001_XYZ University_Baja SAE India 2015_CostReport.

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

COMMENT: It is the responsibility of the team to verify when the report was received by organizers; submission time will be the time the report is received by organizers. 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 SAEINDIA 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:

Prototype Cost = 85 points x \((C_{\text{max}} - C_{\text{your}})/(C_{\text{max}} - C_{\text{low}})\)

where:

- \(C_{\text{your}}\) Vehicle cost, as corrected
- \(C_{\text{low}}\) lowest vehicle cost, as corrected
- \(C_{\text{max}}\) 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 are not complete based on review, or are outside a reasonable level of cost based on 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 – 50 Points

C5.1 Presentation - Objective
The objective of the Presentation is for the team to convince the “executives” of a hypothetical manufacturing company to purchase the team’s Baja SAE India 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. This bonus point applied based on decision of BAJA organizing committee.

ARTICLE 6: TIE BREAKERS

C6.1 Tie breakers
There will be no tie-breakers for static events.

PART D: DYNAMIC EVENTS – 700 POINTS

The dynamic events are intended to determine how the Baja SAE India 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: ACCELERATION – 60 or 75 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.

D1.2.1 Scoring will be based on the better of the two attempts. Timing may be done using either electronic systems or stop watches.

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.

D1.3.1 False Start or Stall at Start
First - Rerun at end of line
Second - Run DNS

D1.3.2 Driving off Course
Run DNF

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:

\[
\text{Acceleration Score} = 60 \text{ or } 75 \text{ points } \times \frac{(t_{\text{longest}} - t_{\text{yours}})}{(t_{\text{longest}} - t_{\text{shortest}})}
\]

where:
- \( t_{\text{shortest}} \): fastest time by any vehicle
- \( t_{\text{yours}} \): time for the vehicle to be scored
ARTICLE 2: HILL CLIMB or TRACTION EVENT – 60 or 75 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.

D2.3 Traction Event - Penalties
The organizer may modify the penalties imposed for different violations to account for differences in the length or design of specific event courses.

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

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

D2.4 Hill Climb or Traction Event - Scoring

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

Hill Climb or Traction Score = 60 or 75 points x \(\frac{dyours - d_{\text{shortest}}}{d_{\text{longest}} - d_{\text{shortest}}}\)

where:
- \(d_{\text{shortest}}\) shortest distance traveled by any vehicle
- \(dyours\) 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.

Hill Climb or Traction Score = 60 or 75 points x \(\frac{t_{\text{shortest}}}{t_{\text{yours}}}\)

where:
- \(t_{\text{shortest}}\) fastest time by any vehicle
- \(t_{\text{yours}}\) time for the vehicle to be scored
- \(t_{\text{longest}}\) 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

Hill Climb or Traction Score = 60 or 75 points x \(t_{\text{shortest}} / t_{\text{yours}}\)
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:

Hill Climb or Traction Score = lowest score from group I x \((d_{\text{yours}} / d_{\text{course}})\) lowestscore

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 – 60 or 75 points

D3.1  Maneuverability - Objective
Maneuverability is designed to assess each vehicle’s handling ability over typical Baja terrain. The course may consist of a variety of challenges at the organizer’s option, possibly including tight turns, pylon maneuvers, ruts and bumps, drop-offs, sand, rocks, gullies, logs, and inclines.

D3.2  Maneuverability - Procedure
Each vehicle may make two (2) runs with the best time including penalties, counting for score.

D3.3  Maneuverability - Penalty Default Values
The organizer may modify the penalties imposed for different violations to account for differences in the length or design of specific event courses.

D3.3.1  Obstacle/Pylon moved
2 seconds

D3.3.2  Missed gate*
10 seconds

D3.3.3  Excessive Driving Off Course
Run DNF

D3.3.4  False Start
First - Rerun at end of line
Second - Run DNS

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

D3.4  Maneuverability - Time Limit
Only vehicles that complete the maneuverability course within a time not exceeding 2.5 times that of the fastest vehicle will receive a score. If a vehicle is on the course for a time that exceeds 2.5 times the fastest time recorded to that point then the attempt may be declared over and the vehicle may be removed from the course and scored as “Excess Time”.

D3.5  Maneuverability - Scoring
Maneuverability scoring is based on the vehicle’s time through the course including any penalties.

Maneuverability Score = 60 or 75 point x \((t_{\text{longest}} - t_{\text{yours}})/(t_{\text{longest}} - t_{\text{shortest}})\)

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) 2.5 \( t_{\text{shortest}} \)

ARTICLE 4: SPECIALTY EVENTS – 60 or 75 points

D4.1  Specialty events are designed to test the vehicle under unique off-road conditions that might be available sometimes at Baja SAE India competition sites.
D4.1.1 Examples of specialty events are: Rock Crawl; Mud Bog; Suspension and Water Maneuverability. Specialty events will be announced at the time of opening of registration for a competition. Organizers will describe the event and define the procedure, penalties, and scoring system to be followed.

ARTICLE 5: ENDURANCE - 400 Points

D5.1 Endurance - Objective
General: The endurance event assesses each vehicle’s ability to operate continuously and at speed over rough terrain containing obstacles in any weather conditions.

D5.2 Endurance - General Description
Endurance may be run for either time or distance. Endurance events for time usually run for four (4) hours. Endurance events for distance continue until at least one car has gone the specified distance.

D5.2.1 Endurance will be run as either (A) a single four (4) hour race, (B) a predetermined and published distance, or as (C) elimination heats followed by a final in which the total time of one elimination heat plus the final is 4 hours. The organizer will announce the structure of the event prior to the start.

D5.2.2 Determining the winner of the endurance race:
A Team that completes the distance of the competition first, or the greatest distance in the time set for the competition will be declared the winner.
B In competitions of a given distance, the checkered flag will be given first to the leading car, then to the other finishers as they cross the finish line.
C In competitions of a timed length, the checkered flag will be given first to the leading car as it crosses the finish line at or after the expiration of the specified duration, then to the other finishers as they cross the finish line.
D If the leading car is not running at the expiration of the time limit, the checkered flag will be given to the next highest running car in the same manner.

D5.3 Endurance - Starting
D5.3.1 The starting grid for endurance will be based on each team’s performance in a previous dynamic event, or set of dynamic events, to be determined by the organizer.

D5.3.2 All vehicles will be considered to have begun the race simultaneously at the time when the starter releases the first vehicle onto the course regardless of their actual position in the grid.

D5.4 Endurance - Command Flags
Command flags are just that - flags that the competitor must immediately obey without question.

D5.4.1 Green Flag -
(1) At a starting line or when reentering the course: Your run or session has started; enter the course under the direction of the starter. (NOTE: If you stall the vehicle, restart and await another green flag as the opening in traffic may have closed).
(2) While running on the course: Course is clear, proceed.

D5.4.2 Yellow Flag, Steady - Danger, SLOW DOWN, be prepared to take evasive action, something has happened beyond the flag station. NO PASSING, unless directed by the course workers.

D5.4.3 Yellow Flag, Waved - Great danger, SLOW DOWN, evasive action is likely to be required, BE PREPARED TO STOP, something has happened beyond the flag station. NO PASSING, unless directed by the course workers.

D5.4.4 Red Flag - Come to an immediate safe and controlled stop on the course. Pull to the side of the course as
much as possible to keep the course open. Follow course worker directions. NO PASSING.

D5.4.5 **Black Flag, Furled and Pointed** - Warning, the officials are watching this vehicle’s driving - obey the event rules.

D5.4.6 **Black Flag, Displayed** -

(1) Pull into the penalty box for a discussion with the Director of Operations or other official concerning an incident. A time penalty may be assessed for the incident.
(2) Pull into the penalty box for a mechanical inspection of the car; something has been observed that needs closer inspection.

D5.4.7 **White Flag** - In specified-distance endurance events, the white flag will be displayed to the leader as the leader begins the final lap.

D5.4.8 **Checkered Flag** - The run or session has been completed. Exit the course at the first opportunity.

D5.5 **Endurance - Stalled or Disabled Vehicles**

D5.5.1 Disabled or stalled vehicles must be immediately removed from the roadway. It is the driver’s responsibility to assist and cooperate with the course marshals in removing the vehicle.

D5.5.2 Vehicles may only be started with the driver seated with all belts properly fastened.

D5.5.3 The driver may not exit the vehicle to execute a restart. Course marshals, volunteers or team members may assist drivers in restarting their vehicles.

D5.5.4 Officials and course marshals may stop any vehicle, at any time, if they believe it no longer complies with the requirements and restrictions of the rules.

D5.5.5 If a vehicle is stopped by officials for a mechanical fault, the fault must be corrected/repaird before it may reenter the event.

D5.6 **Endurance - Repairs**
The organizer will announce the rules governing repairs that are permitted to be made during the endurance event.

D5.6.1 If repairs along the course are permitted then vehicles under repair must be removed well off the course, away from the outside of turns and away from any natural run-off areas.

D5.7 **Endurance Event - Penalty Default Values**

D5.7.1 The organizer may modify the penalties imposed for different violations to account for differences in the length or design of the course. Note that all time penalties are enforced from when the vehicle is in the black flag area, i.e. the time spent being towed back to the pits does NOT count towards the penalty.

D5.7.2 Passing under a Yellow Flag
First time = warning
Subsequent times = Discretionary penalties

D5.7.3 Failure to stop for Black Flag
10 minutes

D5.7.4 Leaving course and advancing
5 minutes

D5.7.5 Speeding in pit area
First time = 5 minutes
Second time = 20 minutes

D5.7.6 Running out of fuel on the track
5 minutes

D5.7.7 Aggressive driving
First time = 10 minutes
Second time = Disqualification
D5.7.8 Refueling on the track
First time = Disqualification

D5.7.9 Endurance Event Enforcement

A. All cars must remain in the as-approved condition in order to compete; any condition that is deemed to not meet this requirement will be flagged to make necessary repairs.

B. Any driver that is not using all of the approved and required drivers’ equipment will be flagged.

C. Certain areas of the track have been identified as difficult obstacles. If your team is assisted 2 times on the same obstacle you will be black flagged and warned that one more assist will result in removal for the rest of the event.

D. If the vehicle rolls over (ex. end over end) anywhere on the track 3 times you will be removed from the event. Your team will be warned after the second roll over. What constitutes a roll over is up to the discretion of the National Techs.

D5.8 Fueling Area and Fueling Zone (new)
The Fueling Zone (FZ) consists of the Fueling Area (FA), Fuel Quarantine Area (FQ), Crew Area (CA) and Harness Check Area (HC).

Only three (3) people from any given team, including drivers, are allowed within the Fueling Zone (FZ) at any one time.

D5.8.1 Fuel Storage Requirements (NEW)
Each team shall have no more than two (2) approved fuel containers (refer to rule B12.9) in the Fueling Area (FA). Any additional fuel containers shall be placed in the Fuel Quarantine area (FQ) for the duration of the endurance event. All fuel must be in the Fueling Zone (FZ) by the time endurance griding closes. Any team found with fuel in the paddocks during the endurance event or found removing fuel from the Fueling Zone (FZ) without an escort from a National Tech Inspector prior to the end of the endurance event will be assessed a penalty as per Rule D5.8.5.

If a team wishes to remove their fuel from the Fueling Zone and leave the event site prior to the end of the endurance event, they must remove their “Passed Tech” sticker and provide it to a National Tech Inspector in exchange for their fuel.

All removable fuel tanks in the fueling area must comply with Rule B12.3.2 and have a cap with a check valve installed.

D5.8.1.1 Fuel Penalties
Fuel cans in the paddock (not impounded) during the Endurance Event – 10 minute penalty first time
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

Fueling will not be allowed until the engine is turned off, the driver is out of the vehicle, and a fire extinguisher is ready.

D5.8.2 Work in fuel Area
No work requiring a tool may be performed in the Fueling Area. Teams are allowed to make adjustments that do not require any tools. Example (seat position, shock pre load, etc.) Teams may only have approved fuel containers (refer to Rule B12.9), removable fuel tanks, fire extinguishers, and funnels, if required, in the Fueling Area. Tools of any kind, backpacks, wagons, extra driver equipment, and coolers are specifically prohibited.

D5.8.3 Refueling in Fuel Area (NEW)
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 the Fuel 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).

D5.9 Endurance - Scoring

D5.9.1 General: The endurance event score is determined by (a) the number of laps each team completes during the endurance final and (b) the finish order of teams at the end of the event.

D5.9.2 “Scored laps” are the number of full laps actually completed during the endurance event final. Only full laps count, partial laps do not count for score. A vehicle must cross the counting/timing line under its own power for a lap to be counted.

D5.9.3 “Finish order” is the sequence in which vehicles cross the finish line after the lap scoring period has ended. Finish order determines the ranking of teams completing the same number of laps. For example, if the top four teams finish with the same number of laps, then they will be ranked 1st to 4th based on their finish order.

D5.9.4 “Bonus points” are additional points awarded to the first ten (10) vehicles on the leading (winning) lap, as separated by finish order as required, in part to differentiate teams finishing with the same number of scored laps. Up to 10 bonus points will be awarded in the inverse order of finish. Thus, the first vehicle to cross the finish line in the highest lap group will receive bonus points equal to the number of cars on the lead lap (max of 10); the second vehicle will receive one less bonus point etc. Example:

<table>
<thead>
<tr>
<th>Position</th>
<th>Lap</th>
<th>Bonus Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>48</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>48</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>48</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>48</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>47</td>
<td>0</td>
</tr>
</tbody>
</table>
D5.9.5  Endurance scoring is based on number of laps the vehicle completes in the allowed time:

\[
\text{Endurance Score} = 400 \times \frac{(L_{\text{yours}} - L_{\text{lowest}})}{(L_{\text{highest}} - L_{\text{lowest}})} + \text{bonus points}
\]

where:
- \(L_{\text{highest}}\) highest number of laps completed by any vehicle
- \(L_{\text{yours}}\) number of laps completed by the vehicle to be scored
- \(L_{\text{lowest}}\) 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 Drive-train 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 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 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 India 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 India 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 India 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 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 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.

D9.2 Alcohol and Illegal Material
Alcoholic beverages, firearms, weapons of any type and illegal materials are prohibited at Baja SAE India site 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 India is generally private property and should be treated as such. Competitors are reminded that they are guests of the owners. All trash should be placed in the receptacles provided. Glass is not allowed on the grounds. Failure to clean the premises will result in an unsportsmanlike conduct penalty. 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 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.
Drivers not wearing the proper equipment will not be permitted to drive, and may have their competition driver’s privileges revoked.

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

ARTICLE 12: SAFETY - TEAM RESPONSIBILITY (VISAS)

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

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

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.

VISAS

Visa Requests
Affiliated 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, the School’s Name, the SAEINDIA Event Name, Official Dates and Location(s).

Please be advised that SAEINDIA 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.

Indian Visas
Teams requiring visas to enter India 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.

Note - If your team has registered for a Baja SAE India competition held in India then you may print out your online registration page as an acknowledgement of your registration.

SAEINDIA does not issue letters of invitation

Neither SAE 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 India or any other country.

PART E: DESIGN AND COST SUBMISSION PROCEDURES

ARTICLE 1: ONLINE SUBMISSIONS

New document submission process for Baja SAE India competition.
Design and Cost Report submission process

Forms - The standard forms that are required for documentation and submissions at Baja SAE India competition can be downloaded from http://www.bajasaeindia.org/downloads.html.

Web Based Submission - The required documents must be submitted online through www.bajasaeindia.org.
Account Signup for Online Submission - Teams must comply with certain requirements when registering at www.bajasaeindia.org and submitting documents online.

ONLINE SUBMISSIONS

Web Based Submission -
Teams competing for Baja SAE India competition must submit the following documents online through www.bajasaeindia.org.

“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 India 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 India online requires the following steps:

(1) Visit: www.bajasaeindia.org

(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 India online signup is the SAE confirmation number that was issued when your team registered.

Note - There may be a delay of up to three (3) business days between the time your team registers for a competition and the Baja SAE India online site 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 www.bajasaeindia.org 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 www.bajasaeindia.org, 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) members of Baja SAE India OC.

**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: 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 will their contents and use.

The technical documents listed below include both (1) standards that are identified in the rules and (2) standards that the TSB and the various rules committees believe are valuable references or which may be mentioned in future rule sets.

All Collegiate Design Series teams registered for competitions in North America have access to all the standards listed below - including standards not specific to your competition.

**SAE Technical Standards included in the CDS Rules**

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

**Clean Snowmobile Challenge**
- J192 - Maximum Exterior Sound Level for Snowmobiles
- J1161 - Sound Measurement - Off-Road Self-Propelled Work Machines Operator-Work Cycle

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

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

**Super-mileage**
- J586 - Stop Lamps for Use on Motor Vehicles Less Than 2032 mm in Overall Width
- SAE Technical Standards for Supplemental Use

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

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

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

Standard Relevant to Formula Hybrid
J1772 - SAE Electric Vehicle and Plug in Hybrid Conductive Charge Coupler

Standard Relevant to all CDS Competitions
J1739 - Potential Failure Mode and Effects Analysis in Design (Design FMEA) Potential Failure Mode and Effects Analysis in Manufacturing and Assembly Processes (Process FMEA) and Potential Failure Mode and Effects Analysis for Machinery (Machinery FMEA)