



North American Solar Challenge 2010 Preliminary Structural Report Instructions

It is the intent of North American Solar Challenge to maintain the safest entries possible while encouraging a wide variety of designs and materials for solar-powered vehicles. The purpose of the structural report is to require each team to document, by calculation or testing, the structural integrity of their vehicle and the protection provided to their drivers. Note that each team is responsible for the safety of its members, and any minimum criteria specified by NASC should not be construed as design specifications for the construction of a “safe” solar vehicle.

The preliminary structural report should outline the basic mechanical and structural design of the vehicle and form the basis for the final structural report. It should be written to be as concise as possible, limited to a total of 10 pages.

Reports can be submitted in PDF format to ascregs@americansolarchallenge.org by Sept 1, 2009. A confirmation email will be sent acknowledging receipt of the report.

The report should describe:

- Brief summary of the vehicle and overall layout.
- Suspension design and arrangement, including steering and braking systems.
- The vehicle frame and construction techniques (aluminum space frame, composite monocoque, etc.), including the materials to be used, important dimensions, and assumed properties.
- Plans for the methods used to prove structural integrity (Beam theory hand calculations, finite element analysis, etc.) for each major component (suspension components, chassis, battery mounting, etc). Final analysis should not be presented, just plans for **how** the analysis is to be accomplished.
- Driver protection and control systems systems, including crush space, roll cage construction, driver harness attachment, and throttle, brake and steering control.
 - Some basic initial analysis should be shown documenting the roll cage for driver protection in the event of a 4G roll over impact, per Appendix B of the Regulations
 - Drawings of the driver in position within the vehicle, showing compliance with the dimensional requirements of Appendix B, crush space, and harness attachment

Info for the final Structural Report Impact Analysis

The final structural report will require documentation of the driver protection in the event of an impact. The report must document the performance of the vehicle regarding front, rear, side, and rollover impact, using appropriate forms of analysis. Front, rear, and side impact with another vehicle assumes a bumper height of 10cm and elevation off the ground of 35cm as shown in Figure 1. Rollover analysis must address loads at a minimum vertical and two increments between horizontal and vertical.

The minimum criteria for these impacts are loads 4 or 5 G, where the G is the total gross mass of the vehicle (including driver and ballast) as illustrated in Figure 1. Emphasis should be placed on how protection is provided for the driver under these conditions. All impact scenarios must take into account movement of body panels and the vehicle's solar array to ensure that these members do not penetrate the space occupied by the driver during the impact.

