

**All You Ever Wanted To Know About Design Judging  
and Waited Until Too Late To Ask  
By Carroll Smith, Formula SAE Chief Design Judge 1990-2003**

Editors Note Dec 2009: This document was originally written for the years during which Carroll was chief design judge. The design event captains have elected to leave this document unchanged and trust to the students to take the spirit of Carroll's advice and understand specific references to time and requirements may have changed over the years. Please refer to the rules and announcements for your specific competition to understand those specifics.

FSAE design judging is meant to be a co-operative experience between the students and the judges. The judging experience is:

- 1) An opportunity for the students to explain their concept(s) and to show the results of their efforts to a group of practicing engineers experienced in both passenger and race car engineering and development.
- 2) An opportunity to receive constructive criticism from the judges.
- 3) An opportunity to score points in the competition
- 4) An opportunity for the judges to meet some bright and dedicated young engineers and restore our faith in the educational system

Time constraints limit the judging and scoring envelope to an inadequate 30 minutes for each team. Therefore your design presentation should be as carefully planned, organized and orchestrated as your cost presentation. There is no other way to ensure that the judges get a complete overview of your car, do not miss any of your clever details and, of course, that you end up with the maximum deserved point score.

Design judging starts with the submission of your design review. The review will be read by at least two of the judges prior to the event and will be familiar to at least one of the judges in your judging line. It is often said that you only get one chance to make a first impression. This is it. Too many of the reviews tell us how hard the team worked and how clever they are. We know that! We want to know about your design - and we want to know about it in detail. Statements like, "We maximized the suspension geometry." Don't get it done. We want to know how you maximized the suspension geometry etc. etc. etc. We ask for three view drawings. We expect to see proper detailed engineering drawings – not a crude sketch or a solid works rendering. It is a challenge to completely describe the design of a complex vehicle in four pages – but it can be done. Every year we receive at least four outstanding design reviews. The judges are favorably pre-disposed toward these teams. Make sure that you are among them.

In design judging you get a second chance to make a first impression. The team that arrives with neatly done story boards and complete and indexed documentation has a big advantage going in – as does the team with a neat and tidy race car. While aesthetics is assigned only five points on the scorecard not only are the judges human, but the overall appearance and detail preparation of the car is a strong indication of the quality of the engineering that went into it.

You will be given 5 minutes at the beginning of the period to describe your design. The judges are divided into two groups: power train and chassis/ suspension. You should have an articulate and informed team member address each group. Describe your design philosophy, your goals

and how you met them. Make sure that any innovations or particularly clever solutions are pointed out. The judges will then examine the car in detail. They will ask a lot of questions. Your team members had better have answers. “I don’t understand the question; would you please re-phrase it” is a legitimate answer. So is, “I’m sorry; I don’t know.” You are not going to snow the judges. Don’t try. This is also not the time to argue with the judges.

The cars must be presented for design judging in “ready to race” condition. In 2003, for the first time, we will refuse to judge cars that are presented in an incomplete state. We will critique them, but they will receive no score. In a similar vein significant points will be deducted for loose nuts and bolts, rod end bearings without jam nuts, etc.

Every one of the judges is fully aware of the value computer driven design aids. CAD, CAD/CAM, FEA, CFD etc. We are also aware of their potential shortcomings. The team that performs physical testing to validate their computer analyses will impress us. The team that does not will not.

Engineers are practical people. We design stuff and we build stuff. We have to learn to manage resources, time, money, parts and people. There is an old saying in racing, “The race starts at one o’clock on Sunday afternoon. If you are there, fine. If you are not there, the race starts at one o’clock on Sunday afternoon”. A brilliant design that is not finished on time is useless. Success in engineering owes as much to development as it does to design. That is why the OEMs have test tracks, the bird works employ test pilots, and professional racing teams have separate test teams. The brilliant design that is not finished in time to test is doomed to failure in the contest. A simple design that has been properly developed is a better exercise in engineering.

Every year there are teams who feel that they have been unfairly judged. As lead design judge I do not judge the initial round. I am available to hear complaints about the judging. Over the years I have heard a great many. The usual complaint is, “The judges didn’t notice our brilliant and innovative widget”. It is not the judges’ responsibility to notice your widgets. It is your responsibility to bring them to the judges’ attention. While I have considered most of the complaints to be unjustified, in a few cases I have agreed with the teams and, after consulting with the relevant judges, have adjusted scores. The morning after design judging is too late!

The teams’ opportunities do not end with design judging. For the length of the contest, design judges are wandering the paddock ready and willing to discuss the details of each and every car. This is a priceless learning opportunity that far too many teams fail to take advantage of. The judges will probably not come to you. We are easy to spot. Stop us and ask us to look at your car – we will all enjoy the experience.