Design Event – Formula SAE Michigan June 2022

EVENT CAPTAINS: Dr. David Redszus, Steven Fox
DESIGN JUDGES: Top International Automotive, Aerospace, & Motorsports Engineers
DATE: June 16-18, 2022
VENUE: Michigan International Speedway, Brooklyn, MI, USA
ON-SITE LOCATIONS: Garage G2 (Thursday and Friday), In-Paddock (Fri-Sat), Main Tent (Saturday)

DESIGN JUDGING OVERVIEW:
The Design event is an opportunity for students to demonstrate their engineering knowledge with respect to their FSAE entry. Though the car is required to be presented to judges, it is really the current student teams' knowledge and capability, which is being judged. 2nd-year cars are prohibited.

The June FSAE event is unique, as there are two competitions occurring simultaneously: One for Internal Combustion (IC) and one for Electric Vehicle (EV) teams. Though they share several activities at times, they are separate competitions, including the Design Event. The only exception to this is the 3-View Drawing Award, which all teams are equally eligible for.

Design judging is comprised of six major areas:
- Design Briefing (DB)/ Design Specification Sheet (DSS) / 3-View Drawing (3VD) Previews
- Design Score Sheet
- First Round Judging (Thursday)
- Design Feedback (Friday and Saturday)
- Design Finals (Friday evening)
- Design Review & Winner Announcement (Saturday afternoon)

DB/DSS/3VD Previews
Prior to the design event, student teams are required to submit a Design Briefing (DB), a Design Spec Sheet (DSS) and 3-View Drawings (3VD). Teams that do not provide these items are disqualified from the Design event, and will receive zero points.

The DB is a managerial design review document. This report is technical in nature, and while not marketing oriented, it should be easy for an experienced engineer to comprehend. It is composed of both prose and graphically intense sections, and laid out to permit reviewers to easily scan across sub-systems. This report is utilized by judges to preview team goals/designs/processes, and provide discussion points.

The DSS is a two-page spreadsheet, which contains detailed specifications about the vehicle and its subsystems. This serves as a summary document for judges to quickly compare teams and "tunnel-in" on your knowledge of relationships between subsystems.

The DB and DSS are based upon fixed templates located on the FSAE website.

The 3-View Drawing is an important element to the design review process. The Chief Design Judge reviews all drawings, and presents awards to the best ten drawings. No separate award application is required. Guidelines for 3-View drawings are available on the *FSAEonline.com* website.

Design Score Sheet

Teams and judges have access to the Design score sheet well prior to the event. This document serves several functions beyond a simple scoring rubric. It is a communication device between judges and students as to what judges are looking for and how well teams are doing. It also contains a breakdown of each judging category, with sample questions/sub-topics for discussion, and areas for extensive judge notes. It reduces subjectivity in Design, as it provides useful definitions for these sub-topics. In essence, teams have the exam questions well in advance of the competition, regardless of who their judges are!

Each design judge has a different area of expertise, and will seek out the student responsible for that particular category. Roving judges may also assess cars across queues while also making note of particularly interesting vehicle features and/or flaws.

After comparing/refining their notes, judges provide feedback to teams (see Design Feedback, below). At that time, they return score sheets to teams and explain individual scores. Students are strongly encouraged to approach Design Judges on the days following the Design Event to request additional feedback on their designs, based upon the content and comments on the score sheets.

First Round Judging

Design judging is conducted all day Thursday, typically from 8:30am to 5:30pm in Garage 2. Check the schedule for team-specific start time and queue assignment. Arrive <u>promptly</u>. Each time slot is one hour long, with approximately 45 minutes for the judges to review the vehicle and interact with team members. Remaining time is used by the judges to compile / compare notes and score the car. Teams will be notified by the judges when the car may be released from the queue. Be prepared:

- ⚔ Cars <u>must be weighed prior</u> to First-Round Judging. Teams do not have to complete Tech to be weighed! If you arrive at Design without your weight sticker, you will be sent to the scales, sacrificing valuable Design time.
- ⚔ First-Round judging is conducted as an <u>interview-type process</u>. Ensure that members of your team can cover the basic engineering areas of Frame/Body/Aero, Suspension/Vehicle Dynamics, Cockpit Controls/Safety/Brakes, Electrics/Electronics, Systems Engineering, and Manufacturability/Service-ability. Typically, this requires five or more students to be present for first-round judging.
- ⚔ Remember, we are not judging your car as much as <u>we are judging your team</u>. Roughly, 80% of your design score will be based upon your team's ability to design, construct, refine/validate, and most importantly -- understand your vehicle.
- ⚔ Student teams are encouraged to <u>bring props</u>: Binders/illustrations of design processes, data sets, prototype parts, team organization / project management charts, and special tools (digital or physical) that were employed during the design process.
- ⚔ Remember, judges can only judge based upon what <u>you show and tell them</u>. They are not mind readers! It is up to you to ensure that critical areas of your FSAE vehicle development have been adequately covered during First Round Design Judging.
- ⚔ Teams are <u>only permitted in their own assigned Design Bay</u>. No competitor is allowed to wander and observe judging of other teams. This also applies to teams with both EV and IC cars entered. These are supposed to be independent teams, and be capable of operating independently.
- ⚔ NO AUDIO / VISUAL RECORDINGS are permitted during Design Judging. This applies to First-Round and Design Finals. This a ZERO TOLERANCE policy. Violation results in disqualification.

Design Feedback

Perhaps the most valuable part of the design event occurs in the paddock on Friday and Saturday. Judges visit the teams and give insightful feedback. This may be technical and managerial in nature, and permits students the opportunity to see specifically what judges like or do not like about your designs. It is also an opportunity for teams to ask any questions about improving their design. Do not miss out on this opportunity!

First-round Design judging bay leaders will schedule this feedback time with each team. Note that Design finalists will not be given feedback until Saturday (after Design Finals judging).

Design Finals

Typically, the top 10% or so of competing teams are selected for Design Finals. Finalist teams will be announced late Thursday night. Design Finals are held Friday evening in Garage 2 (see schedule), and is not open to the public, nor to non-finalist teams.

Design Finals is an in-depth technical review with teams, for which all senior judges will see all cars. In essence, judges are reviewing the "best of the best", and expect teams to give their "A" game. Depending upon the number of finalists, Design Finals may last from 2-3 hours. The same constraints and preparation guidelines as above for First-Round judging apply to Finals judging, as well.

To keep Design Finals from becoming congested, only 5-6 students may speak to judges at any time. Students may tag in-out, but we do not want a "congregation" of students speaking to a judge.

Design Review, Design Winner, and 3-View Drawing Awards

Based upon the result of Design Finals, the top three cars are announced on Saturday morning. These cars will be presented at the Public Design Review (in the Main Tent) on Saturday late afternoon (see schedule) where the overall Design winner will be announced. This review is open to all student competitors, and we encourage everyone to attend this review.

Subsequent to this review, the Design Captain and/or Chief Design Judge will also announce the Design winner and recipients of the 3-View drawing awards.

Remember, the Design Event is an important assessment of your team's demonstrated knowledge of the vehicle design process and the various subsystems of your vehicle. It is an opportunity for you to become a better engineer. It is NOT merely a review of how well you can make your car go faster! **GOOD LUCK!**