



VIRTUAL GUIDELINES

Organized by



SEVC 2024

EMERGING FUTURE MOBILITY



SEVC 2024

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NOTE

This document aims to guide you through the different aspects of your virtual round. This contains 2 parts in total.



SOLAR ELECTRIC VEHICLE CHAMPIONSHIP

"Emerging Future Mobility"



OUTLINE OF VIRTUAL ROUND

- The purpose of conducting a virtual round for the SEVC 2024 event is as follows:
 - The team should have a basic understanding of automotive engineering concepts such as Chassis, Body, Suspension, Steering, Brakes, Motors, Transmission, Electricals and electronics, Design Criteria, Manufacturing Criteria, Materials, Calculations, CAD/CAE Analysis, Vehicle Dynamics, Ergonomics for the above components/systems for the SEVC vehicle.
 - The teams must be aware of the technical criteria and constraints for the design of the SEVC Vehicle as specified in the current rulebook.
 - To understand and determine the complete technical specifications for the proposed SEVC vehicle, including a CAD model, CAE analysis, subsystem selection, and team plan implementations.
 - To interpret Make or Buy Decisions based on available facilities, and to do estimated Cost Analysis, Weight Analysis, Team Building, Project Planning, and other related tasks
- The SEVC 2024 virtual round is planned to be conducted in 2 parts.
 - The first part will comprise a virtual presentation in which teams have to explain an overview of their SEVC vehicle to the judging panel.
 - The second part will comprise a virtual report in which teams have to provide vehicle subsystem calculations and innovations in a detailed manner.





GENERAL GUIDELINES

- Teams should prepare the virtual report in Word (.docx) format, however, it must be submitted to us in a (.pdf) file format(Maximum size 2MB).
- Teams must save the virtual report file name in the format Teamname_Virtual Report_SEVC2024 as a separate '.pdf' file.
- Virtual Presentation round will be conducted offline. (The finalized date and venue are mentioned in the last section of this document)
- In a Virtual Presentation round, Maximum of 5 team members per team will be allowed to explain the contents of the slide. It is expected that all the team members to be well prepared for any questions that can be asked by the judges as overall involvement of team members will also be considered for evaluation.
- Teams should prepare the virtual presentation in PowerPoint (.ppt) file format, however, it must be submitted to us in a (.pdf) file format(Maximum size 5MB).
- Teams must save the virtual presentation file name in the format Teamname_Virtual Presentation_ SEVC2024 as a separate '.pdf' file.
- Submit the documents in report page under team login ID in sevc.in.
- The last date for submitting the report and presentation is 15th December 2023.

OVERALL VIRTUAL SCORE

Virtual Round Events	Maximum Points
Virtual Presentation	100
Virtual Report	100
Total Virtual Score	200



VIRTUAL PRESENTATION

Slide No	Particulars
S.1	Team Introduction
S.2	Team Structure
S.3	Project Abstract & Project Plan (Action Plan)
S.4	3D Assembly vehicle views (Iso, Front, side and Plan)
S.5	CAE Analysis of Vehicle/Frame
S.6	Suspension-front/rear
S.7	Steering and wheel geometry
S.8	Brakes
S.9	Powertrain Calculations & Electrical
S.10	Solar Panel & Solar Charge Controller (For SEV Category)
	Body Panels & Spoilers (For BEV Category)
S.11	Schematic Circuit Layout of Tractive and SLI System
S.12	Ergonomics and Aesthetics
S.13	Autonomous Driving
S.14	Innovation
S.15	Supplier Readiness and Budget Estimation
S.16	Technical and Performance Specifications
S.17	Images of all the subsystem components

Note:

- Teams must follow the proper sequence of topics and stick on to the count of slides
- Maximum of 45 mins will be allotted per team to present their vehicle.
(Allowing team members to join and set up their presentation: 5 minutes
Team presentation to show off their vehicle status: 20 minutes
Questions put up by the panel to be answered by the Team: 20 minutes)



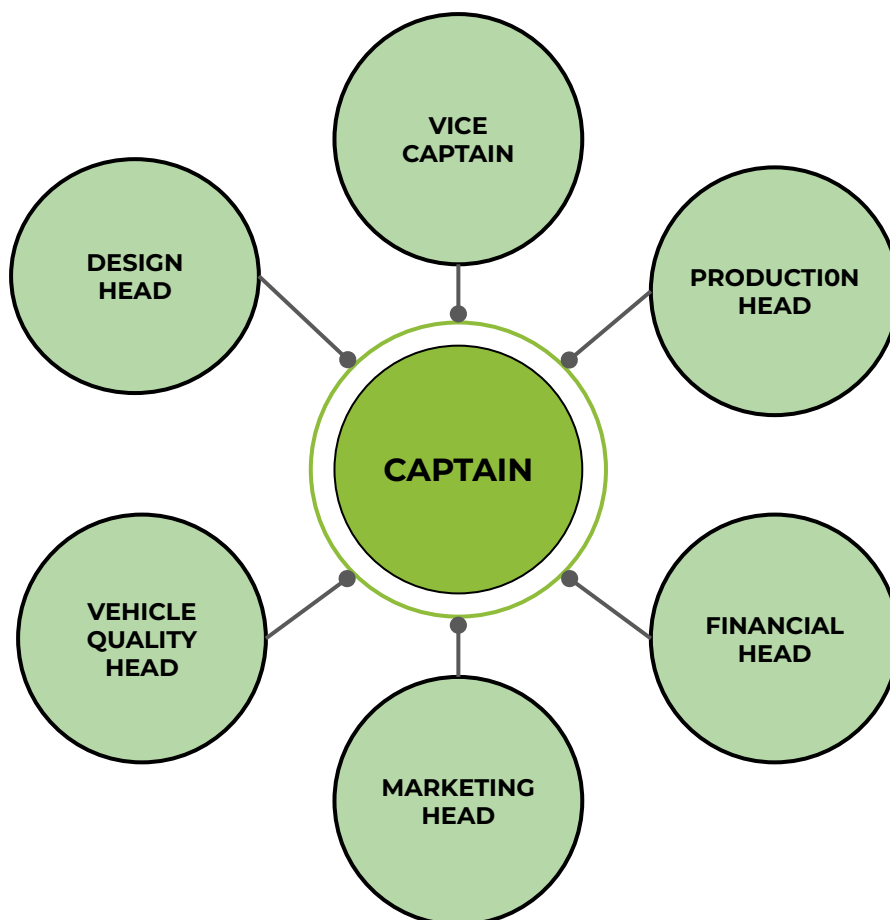
S.1 TEAM INTRODUCTION:

Team Name, Team Logo, College Name, 3D Model of vehicle assembly image, vehicle category must be mentioned in this slide.

S.2 TEAM STRUCTURE:

This slide must have detailed classification of team members working in various departments along with their designations.

Every team must have the following roles mentioned below:



(One Team Member must not carry two lead positions in their team)

Hereafter, for every report submission in SEVC, there must be a digital signature from the responsible head. For Example, in the case of submission of design report, digital signature of Captain, Vice-Captain and Design Head is Mandatory.



S.3 Project Abstract & Project Plan (Action Plan):

Team must give brief abstract about their vehicle to be made for SEVC-2024 along with their project plan.

S.4 Vehicle Views:

This slide must have a front view, top view, Side view & Isometric view. In which image in the isometric view must contain colour coding for primary and secondary members to differentiate it. This slide must also have dimensions of the member used in the chassis along with the bending strength, stiffness, the material used and Yield strength (in tabular format).

S.5 CAE Analysis of Vehicle/Frame:

- This slide must have a frontal impact and side impact images along with the failure criteria that have been considered or assumed for each analysis (e.g., Yield strength limit, deformation limit, FOS).
 - Yield strength limit, deformation limit, FOS must be presented in the tabular format along with the side of the respective impact images.
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S.6 Suspension:

Show the calculated results of

- Type of suspension,
- Linkage type/Total wheel travel - jounce and bounce,
- Toe-In & Toe-Out,
- Sprung and un-sprung mass targets,

Also, produce the CAD model for the suspension system.



S.7 Steering and wheel geometry:

Show the calculated results of

- Steering system proposed,
- Understeer or Oversteer /Steering Geometry – Ackerman percentage,
- Steering angles – Inside and outside,
- Turning circle radius, • Steering ratio,
- Rack travel mm/steering wheel rotation,
- Steering column type,
- Steering wheel diameter,
- Steering wheel torque.

Selection parameters for wheel & tyres of specific sizes, specifications for front & rear wheels should be given in tabular format.

S.8 Brakes:

Show the calculated results of

- F/R split or X-split,
- Brake master cylinder bore size x stroke,
- Brake disc
- Area and friction coefficient,
- Stopping distance (m)
- Pedal force(N) & Pedal travel(mm).

Also, produce a schematic layout of the braking system.



S.9 Powertrain Calculations & Electrical:

Show the calculated results of

- Max power on wheel,
- Max Torque on wheel,
- Type of Transmission unit,
- Geared / Hub,
- Transmission Ratio,
- Tyre sizes,
- NVH considerations,
- Max speed,
- Acceleration,

Provide specifications and selection criteria of Motor

- Type,
- Nominal voltage,
- Transmission type and gear ratio (if flange type),
- Continuous and peak current,
- Rated and Max power,
- Rated and Max Speed,
- Rated and Max Torque

Provide specifications and selection criteria of Motor controller

- Nominal voltage,
- Continuous and Peak current,
- Power

Provide specifications and selection criteria of Tractive and SLI Battery Pack

- Type,
- Number of battery packs,
- Nominal voltage of the battery pack,
- Capacity



If teams are using DC-DC converters, the following details are required:

- Type
 - Reliability percentage
 - Input voltage
 - Output voltage and current
 - Efficiency
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S.10 Solar Panel & Solar charge controller:

Solar Panel(For SEV Category):

- Type,
- No of panels,
- Voltage
- Current
- Expected power output of the system,
- Efficiency

Solar Charge controller:

- Type,
- Input and output voltage,
- Maximum output current,
- Load voltage,

Body Panels & Spoilers

- Selection of material,
- Design of vehicle body and spoiler,
- Justification of spoiler design,
- Actual modelled vehicle design image with body panels



S.11 Schematic Circuit Layout of Tractive and SLI system:

Schematic layout of the Tractive system including motor, controller, battery bank, kill switches, relay, Fuses and circuit breaker should be provided compulsorily. For SEV category & HEV with Solar Powered, Teams must include solar panels and charge controller in this layout along with the above-mentioned components.

S.12 Ergonomics:

In this slide, the team must explain the ergonomics provided for the driver concerning the chassis member (Clearances mentioned in the rulebook is mandatory). Teams must show that their ergonomics are based on SAE 95th percentile male and 5 percentile female as per our rulebook through measurements and posture in their cad model. Apart from this, the team must also explain how the vehicle was designed ergonomically. What are the considerations of it? (Note: Team must also be asked for the ergonomics that they considered for each part mounted in their vehicles)

S.13 Autonomous Driving:

- Level of Autonomous Driving Implemented.
- Features covered in the chosen level.
- Components (Electronics, Electrical and Mechanical) specifically used for Autonomy along with its specification.
- Block diagram and circuit diagram of implemented Autonomous features.
- Feasibility of changeover from Manual to Autonomous mode and Vice Versa.
- Include mechanical design made for Autonomous Driving i.e, steering linkages etc.
- Substantial usage of chosen Autonomous Level and its scope in the market.



S.14 Innovation:

This part must contain a brief explanation of each innovation concept that the team wants to implement.

Teams can have as many innovations as they like, but they must be relevant to their vehicle and, ideally, implementable inside the vehicle.

The innovation should have:

- Innovation Idea Title
 - Abstract of Innovation
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S.15 Supplier Readiness and Budget Estimation:

Teams must identify vendors for their vehicle components and shortlist components from their vehicle (such as the battery, motor, and roll-cage material). Arrange the information in the following order: component name, Material/services required, supplier information, Estimated cost of the component/service. Finally teams must mention estimated budget of their Vehicle.

S.16 Technical and Performance Specifications:

Teams are asked to present their vehicle commercially and explain why your vehicle is needed in the future. & How your vehicle is meant to be a future considering recent trends? Teams are expected to present their vehicle as a commercial advertisement along with the technical and performance specifications.

S.17 Images of all the subsystem components:

These slides must include all the images of the subsystems like roll cage, brakes, steering, battery, motor, controller etc. Teams shall also include photos of the current status of their vehicle (If fabrication has been started).



VIRTUAL REPORT

1.1 Basic Calculation

This part should contain basic calculations of the following:

- Drivetrain selection
- Brakes
- Suspension
- Steering

Suspension:

The detailed calculations, consideration and selection criteria for each and every point mentioned in S.6.

Steering:

The detailed calculations, consideration and selection criteria for each and every point mentioned in S.7.

Brakes:

The detailed calculations, consideration and selection criteria for each and every point mentioned in S.8.

Drivetrain selection & Calculations:

The detailed calculations, consideration and selection criteria for each and every point mentioned in S.9.

Electrical:

Teams must provide the necessary detailed calculations that made them decide the specifications of the tractive components mentioned in S.9. Teams must also explain the reason behind the choice of the type of components and their specifications that they have selected in a brief descriptive manner. Schematic layout of the tractive power system including all the components must be clearly provided.



Solar Panel & Solar charge controller: (For SEV Category)

Solar Panel:

Teams must provide the necessary detailed calculations that made them decide the specifications of the solar panel mentioned in S.10.

Solar Charge Controller:

Teams must provide the specifications of the Solar Charge controller mentioned in S.10.

1.2 CAE

Frame Material Details:

Team must give the material data which is used in the CAE. The material data must contain, density, young modulus, yield strength and Poisson's ratio in tabular format. Note: Teams must choose materials that are qualified as per the rulebook

Bending Strength & Bending Stiffness:

Provide the full calculation of bending strength & bending stiffness of all material options in tabular format.

CAE Analysis Of Vehicle/Frame:

- CAE Analysis on the frame should be performed to evaluate the safety offered by the frame to the driver in impact conditions including Frontal Impact, Side Impact along with the analysis in case of bending load case on frame.
- The failure criteria that have been considered or assumed for each analysis (e.g., Yield strength limit, deformation limit, FOS) must be included against each analysis report/image.
- The results obtained via FEA software must be validated against empirical formula/codes and must be shown in the report for each analysis performed. Thus, to ensure that the software shows correct and realistic results.



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Body Panels & Spoilers (For BEV category)

Teams must provide detailed explanation and for each point mentioned in S.10.

1.3 Innovation

Teams must include detailed explanation of the Innovations to be implemented.

The innovation should have:

- Innovation Idea Title
- Abstract of Innovation

NOTE:

Each team will be allotted a particular time for their presentation by the organizing committee and details will be sent through mail

Virtual Round Mode: **Online**

