PROJECT REPORT GUIDELINES

It is universally acknowledged that a design, efficaciously addressing its intended purpose or quandary, will only consistently fulfill its objectives when meticulously documented. SEVC posits that each design originating from the students will undeniably exert a discernible influence on the future. Nevertheless, this potential impact is contingent upon the meticulous documentation thereof. The reports must be consistent and have a clear structure of explaining its purpose of use. Incorrect documentation is better than no documentation. SEVC insists all the teams to come up with their best report as they can.

General Guidelines:

- Every team is instructed to strictly follow the format of the report given by the organizing committee of the SEVC.
- Teams must make these reports in a detailed manner to showcase your consideration and idea behind your design and calculations.
- Teams are instructed to make this report similar to your project report submitted in your academic curriculum, but the team must adhere to the format mentioned by SEVC.
- In all the sections teams must include the relevant calculations and data sheets if required.

- Teams not following the report format will not be considered for the Design Award.
- Teams are instructed to upload the softcopy of the Project Report document in their login page in the website **sevc.in,** before **12:00 pm** of **15th March 2024.**
- Teams should submit the project report in **(.pdf)** file format.
- Teams should save the project report file name in the format **TeamID_teamname_ProjectReport** as a separate '.pdf' file
- Teams must bring the two hard copies of the report to the dynamic event with proper calico binding.
- There is no restriction on the number of pages, apart from the content mentioned in the below format, the report must contain only the relevant information related to vehicle's specifications, design, analysis along with the technical justifications and the corresponding calculations.
- Teams can also include images of the components/parts wherever necessary.

CONTENTS:

Teams must follow the proper sequence of topics:

ANNEXURE-A

FRONT PAGE:

Title of your report, Team Name along with Team Logo, SEVC name along with the logo, CAD image or real image of your vehicle, Team ID and vehicle category.

TABLE OF CONTENTS:

- It must contain all the content heading in the report along with the page number.
- It must also contain Annexure A,B and C.

ABSTRACT:

- Team must provide the abstract of the project in a detailed manner.
- An abstract should include a statement of the problem you are trying to solve and the purpose of your research, the methods used to find the solution, and the implications of your findings. And how it will be going to impact the future requirements.

SCOPE OF ELECTRIC & SOLAR VEHICLE:

- In this section, teams must explain the scope of electric & solar vehicle in their perspective.
- Teams must also enlist the reasons behind the creation of electric vehicle and showcase the uniqueness of their vehicle in all possible ways (Both technical and non-technical).

MARKETING STRATEGY:

This segment must clearly state the total expected demand for the product. It must describe the mode of distribution of the product from the production unit to the market.

- Type of Customers
- Target markets
- Nature of market
- Market segmentation
- Marketing strategy
- Future prospects of the market.
- Sales objectives
- Marketing cost of the project.
- Demand for the product in the local, national and the global market.

SOURCE OF FINANCE:

In this section team have to explain the list of requirements mentioned below:

- Budget Plan
- Method and sources of investment.
- Sponsorship details
- Proposed Vs Actual Budget Deviation.
- Financial maintenance record (Have to attach the finance record starting from Day 1 up to the vehicle finishing. It may be of handwritten or documented).

Note: Team has to include the source of finance for the vehicle they manufactured only for SEVC.

TEAM STRUCTURE:

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

Every team must have the following roles mentioned below:

- Captain
- Vice-Captain
- Design Head
- Production Head
- Vehicle Quality Head (VQH)
- Financial Head
- Marketing Head

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

- 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.
- Many of the teams are not following this format in your Virtual presentation. Teams must include each member position in this report.
- If teams would like to add the photograph of the person who is responsible for the position, It is advised to upload the professional passport photo of the team member in this section. (Note: It would be an added advantage if you present this report Infront of the interview panel by letting them know that you have also involved in such a work).

ROLES AND RESPONSIBILITIES:

- In this section, team must list out the detailed roles and responsibilities of each head appointed in the team. The details given in this section will be of individual thoughts appointed in the team. Responsibilities and roles taken directly from the search engine will not be considered.
- It must also contain how he/she contributes to the particular position?

ANNEXURE-B

MATERIALS USED AND ITS PROPERTIES:

- In this section, teams must include the material information, which is used in their vehicle and mention the reason to choose that particular material and its technical properties.
- For the primary and secondary members, technical properties must include i.e…, density, young's modulus, diameter, thickness, thermal properties, tensile strength, ultimate yield strength, percentage of elongation etc., along with the stress-strain diagram.
- Teams can also add, their copy of the material testing report with this document.(if they conducted material testing report already).

VEHICLE CAD MODEL AND STRUCTURAL ASSESSMENT:

- Teams have to include all the different views of their completely assembled vehicle model with proper dimensions.
- The primary, secondary, and tertiary members of the vehicle frame should be differentiated using proper color coding. Also show some plots of the welded junction in the model.
- All the static structural analysis of the roll cage including meshing and load plots (Front & Rear crash, Side crash, Roll over) with proper results (Stress, Strain, Deformation and Factor of Safety plots) and proper validation must be provided.
- Teams are also instructed to provide their consideration for deciding the impact force for each case. Validation for their consideration is also to be mentioned.
- Provide the full calculation of bending strength & bending stiffness of roll cage materials in a tabular format.

- In addition, dynamic analysis, modal analysis, and fatigue analysis can also be provided.

SUSPENSION:

- Teams are expected to deliver their design consideration during the calculation of this part in a detailed manner.
- Teams should include the suspension geometry, reason for choosing that particular geometry.
    - Type of suspension
    - CG Height
    - Ground clearance
    - Linkage type/Total wheel travel-jounce and bounce.
    - Toe-In & Toe-Out
    - Sprung and un-sprung mass targets.
    - Suspension travel rate
    - Camber, castor, KPI angle and Scrub radius.
- Analysis of steering and suspension system under the LOTUS SHARK/ADAMS or other similar software and providing the plots taken from that software is also considered.
- Teams going for customized parts such as Hub, Knuckle, A-Arms and Stay rod under this section must include the CAD drawing of the parts designed separately and its static analysis (Stress, Strain, Deformation and Factor of Safety plots).

STEERING:

- Teams are expected to deliver their design consideration during the calculation of this part in a detailed manner.

- Teams should include their steering geometry used, reason for choosing the geometry.
- The parameters obtained, design outcomes and results of calculation on their steering system.
    - Steering system proposed
    - Understeer or Oversteer / Steering Geometry–Ackerman percentage
    - Steering angles – Inside and outside
    - Turning circle radius (outer, inner, and mean)
    - Steering ratio
    - Rack travel in mm / steering wheel rotation (Lock-lock turn)
    - Steering column type
    - Steering wheel diameter
    - Steering wheel torque
- If teams going for customized parts under this section should include the CAD drawing of the parts designed separately and its relevant static analysis (Stress, Strain, Deformation and Factor of safety plots).

TRANSMISSION:

- Teams are expected to deliver their design consideration during the calculation of this part in a detailed manner.
- This section must contain the details of the transmission system.
    - Max power on wheel
    - Max Torque on wheel
    - Type of Transmission unit
    - Geared/ Hub

- Transmission Ratio
- Tyre sizes
- NVH considerations
- Max speed
- Acceleration
- Gradeability %

- If teams going for customized parts such as Sprockets, shafts under this section must include the CAD drawing of the parts designed separately and its static analysis both hand calculation and simulation (Stress, Strain, Deformation and Factor of safety plots).

BRAKES:

- Teams are expected to deliver their consideration during the calculation of this part in a detailed manner.
  - F/R split or X-split.
  - Brake master cylinder bore size * stroke.
  - Brake disc
  - Area and friction coefficient.
  - Stopping distance in m.
  - Pedal force in N, Pedal ratio & Pedal travel in mm.
  - Type of brake fluid to be used.
  - Brake torque required per wheel.
  - Force required by the caliper cylinders.
- Teams are instructed to provide the schematic layout of their braking system.
- Static and thermal analysis of disc and caliper must be done and results must be provided here.

ERGONOMICS AND AESTHETICS:

- Teams are instructed to present how their design is created by ergonomic consideration.
- Teams should present their driver's ergonomic posture as per SAE 95th percentile male and 5 percentile female guideline by showing their driving posture sitting in their vehicle either CAD.
- Teams are encouraged to perform ergonomics simulation using software.
- Mention, what are all the aesthetic features added by the team to the vehicle.
- Teams are instructed to provide the following details
    - Selection of material.
    - Design of vehicle body and spoiler.
    - Justification of spoiler design.
    - Actual model led vehicle design image with body panels.
    - Analysis relevant to body design (CFD/aerodynamics) etc..,

ELECTRICAL SUBSYSTEM:

Motor:

- Type
- Nominal voltage
- Transmission type and gear ratio.
- Continuous and peak current.
- Rated and Maximum power.
- Rated and Maximum Speed.
- Rated and Maximum Torque.

- Selection criteria with calculations.
- Calculations pertaining to selection of motor.
- Calculations for the motor under dynamic running conditions.

Motor controller:

- Nominal voltage
- Continuous and Peak current.
- Power
- Type of Controller
- Pin diagram or wiring diagram of controller separately.
- Selection criteria
- Teams using programmable type controllers must mention the details of dynamic parameters that can be changed along with the appropriate justification.

Battery Pack:

- Type
- Number of battery packs.
- Dimensions of each battery pack.
- Nominal voltage of the battery pack.
- C – rate (charging and discharging)
- Capacity
- SOH & DOD
- Number of BMS used
- Type of BMS
- Battery pack connection diagram (Cell Orientation).
- In case of using more than 1 pack, the specific connection between each battery pack must be provided.

- SLI Battery - Specifications.
- Selection Criteria with calculations.
- Calculations for charging and discharging time of battery pack (both tractive and SLI).
- Calculations to justify the range of the vehicle with respect to capacity.
- If teams are using DC-DC converters should mention the details of the converter used, mechanism involved along with the data sheet and appropriate calculations.

SOLAR PANEL & SOLAR CHARGE CONTROLLER:

Solar Panel:

- Type
- Number of panels.
- Voltages (Voc, Vmpp ,Vrated, Vmax).
- Current (Isc, Impp , Irated, Imax).
- Expected power output of the system.
- Efficiency
- Solar cell specifications.
- Panel Connection Diagram.
- Calculation of Solar irradiance and Solar irradiation (Take standard values).
- Calculation of running the vehicle with solar panel alone.

Solar Charge Controller:

- Type
- Input and output voltage.
- Maximum output current.

- Load voltage
- Type of algorithm used.
- Basic level circuit of charge Controller (Any power Value).

VEHICLE CIRCUIT DIAGRAM:

Teams should provide the entire circuit diagram of the electrical system including both the tractive and SLI circuits. The circuits must be created using any 2D circuit design software like PROTEUS, KI-CAD, EAGLE, E-CAD, MATLAB, Simulink, PSIM, etc..,

DFMEA AND DVP CHART:

- Teams are instructed to make their own DFMEA (Design Failure Mode and Effect Analysis) and DVP (Design Validation Plan) chart as per their willingness by following proper template.
- Teams are also advised to understand the need of DFMEA and DVP in the design process.
- SEVC encourages the profound analysis of every part of their vehicle.

ANNEXURE-C

IMAGES OF COMPLETELY FABRICATED VEHICLE:

Teams should include the original photo of the completely fabricated vehicle in this section showing all the possible views of the vehicle.

CONCLUSION:

- Teams should provide a valid inference for their report in a detailed format.
- Teams are also expected to provide their learning outcomes by participating in SEVC 2024 as budding engineers.

ADDITIONAL INFORMATION:

Team can also include any other technical information pertaining to their vehicles apart from the above-mentioned details. This information, if found credible will be appreciated.

FINAL PAGE:

In this page, teams must include the photograph of their entire team along with the completed vehicle.