APPENDICES

Appendix 1-Gantt chart for first semester (FYP1)

No.	Detail/ Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Selection of Project Topic	■	■									Mid-semester break			
2	Preliminary Research Work		■	■	■										
	• Literature review • Identification of target specification														
3	Submission of Preliminary Report				●										
4	Project Work (Engineering task)					■	■	■	■	■	■				
	• Calculation • Modelling • Analysis														
5	Submission of Progress Report									●					
6	Seminar (compulsory)									●					
8	Submission of Interim Report Final Draft													●	
9	Critical design review												■		
10	Oral Presentation														●

● Suggested milestone

■ Process

Appendix 2-Gantt chart for second semester (FYP2)

No.	Detail/ Week	1	2	3	4	5	6	7		8	9	10	11	12	13	14
1	Project Work Continue	■	■	■	■				Mid-Semester Break							
	• Final design optimization															
2	Submission of Progress Report 1			●												
3	Project Work Continue				■	■	■	■								
	• Design optimization using computer tool and/or prototype testing															
4	Submission of Progress Report 2															
5	Seminar (compulsory)									●						
6	Project work continue				■	■	■	■		■	■	■	■			
	• Fabrication task (if any)															
7	Poster Exhibition										●					
8	Submission of Dissertation (soft bound)												●			
9	Oral Presentation													●		
10	Submission of Project Dissertation (Hard Bound)														●	

● Suggested milestone

■ Process

Appendix-3 Formula SAE 2008 Rules and regulation for chassis

3. VEHICLE REQUIREMENTS & RESTRICTIONS

The following requirements and restrictions will be enforced through technical inspection. Noncompliance must be corrected and the car re-inspected before the car is allowed to operate under power.

3.1 General Design Requirements

3.1.1 Body and Styling

The vehicle must be open-wheeled and open-cockpit (a formula style body). There must be no openings through the bodywork into the driver compartment from the front of the vehicle back to the roll bar main hoop or firewall other than that required for the cockpit opening. Minimal openings around the front suspension components are allowed.

3.1.2 Wheelbase and Vehicle Configuration

The car must have a wheelbase of at least 1525 mm (60 inches). The wheelbase is measured from the center of ground contact of the front and rear tires with the wheels pointed straight ahead. The vehicle must have four (4) wheels that are not in a straight line.

3.1.3 Vehicle Track

The smaller track of the vehicle (front or rear) must be no less than 75% of the larger track.

3.1.4 Visible Access

All items on the Inspection Form must be clearly visible to the technical inspectors. Visible access can be provided by removing body panels or by providing removable access panels.

3.2 Chassis Rules

3.2.1 Suspension

The car must be equipped with a fully operational suspension system with shock absorbers, front and rear, with usable wheel travel of at least 50.8 mm (2 inches), 25.4 mm (1 inch) jounce and 25.4 mm (1 inch) rebound, with driver seated. The judges reserve the right to disqualify cars which do not represent a serious attempt at an operational suspension system or which demonstrate handling inappropriate for an autocross circuit.

All suspension mounting points must be visible at Technical Inspection, either by direct view or by removing any covers.

3.2.2 Ground Clearance

The ground clearance must be sufficient to prevent any portion of the car (other than tires) from touching the ground during track events, and with the driver aboard there must be a minimum of 25.4 mm (1 inch) of static ground clearance under the complete car at all times.

3.2.3 Wheels and Tires

3.2.3.1 Wheels

The wheels of the car must be 203.2 mm (8.0 inches) or more in diameter.

Any wheel mounting system that uses a single retaining nut must incorporate a device to retain the nut and the wheel in the event that the nut loosens.

3.2.3.2 Tires

Vehicles may have two types of tires as follows:

- **Dry Tires** – The tires on the vehicle when it is presented for technical inspection are defined as its "Dry Tires". The dry tires may be any size or type. They may be slicks or treaded.
- **Rain Tires** – Rain tires may be any size or type of treaded or grooved tire provided:
    1) The tread pattern or grooves were molded in by the tire manufacturer, or were cut by the tire manufacturer or his appointed agent. Any grooves that have been cut must have documentary proof that it was done in accordance with these rules.
    2) There is a minimum tread depth of 2.4 mms (3/32 inch).

Note: Hand cutting, grooving or modification of the tires by the teams is specifically prohibited.

Within each tire set, the tire compound or size, or wheel type or size may not be changed after static judging has begun. Tire warmers are not allowed. No traction enhancers may be applied to the tires after the static judging has begun.

3.2.4 Steering

The steering system must affect at least two (2) wheels.

The steering system must have positive steering stops that prevent the steering linkages from locking up (the inversion of a four-bar linkage at one of the pivots). The stops may be placed on the uprights or on the rack and must prevent the tires from contacting suspension, body, or frame members during the track events.

Allowable steering system free play is limited to 7 degrees total measured at the steering wheel.

Rear wheel steering is permitted only if mechanical stops limit the turn angle of the rear wheels to ± 3 degrees from the straight ahead position.

The steering wheel must be mechanically connected to the front wheels, i.e. "steer-by-wire" of the front wheels is prohibited.

3.2.5 Brake Systems

The car must be equipped with a braking system that acts on all four wheels and is operated by a single control. It must have two independent hydraulic circuits such that in the case of a leak or failure at any point in the system, effective braking power is maintained on at least two wheels. Each hydraulic circuit must have its own fluid reserve, either by the use of separate reservoirs or by the use of a dammed, OEM-style reservoir.

A single brake acting on a limited-slip differential is acceptable.

The brake system must be capable of locking all four (4) wheels during the test specified below.

"Brake-by-wire" systems are prohibited.

Unarmored plastic brake lines are prohibited.

The braking systems must be protected with scatter shields from failure of the drive train (see 3.5.1.4) or from minor collisions.

3.2.5.1 Brake Test

The brake system will be dynamically tested and must demonstrate the capability of locking all four (4) wheels and stopping the vehicle in a straight line at the end of an acceleration run specified by the brake inspectors.

3.2.5.2 Brake Over Travel Switch

A brake pedal over-travel switch must be installed on the car. This switch must be installed so that in the event of brake system failure such that the brake pedal over travels, the switch will be activated and will stop the engine from running. This switch must kill the ignition and cut the power to any electrical fuel pumps. Repeated actuation of the switch must not restore power to these components, and it must be designed so that the driver cannot reset it. The switch must be implemented with analog components, and not through recourse to programmable logic controllers, engine control units, or similar functioning digital controllers.

3.2.5.3 Brake Light

The car must be equipped with a red brake light of at least 15 watts, or equivalent, clearly visible from the rear. If an LED brake light is used, it must be clearly visible in very bright sunlight. This light must be mounted between the wheel centerline

and driver's shoulder level vertically and approximately on vehicle centerline laterally.

3.2.6 Jacking Points

A jacking point, which is capable of supporting the car's weight and of engaging the organizers' "quick jacks", must be provided at the rear of the car.

The jacking point is required to be:

- Oriented horizontally and perpendicular to the centerline of the car
- Made from round, 25 – 29 mm (1 – 1 1/8 inch) O.D. aluminum or steel tube
- A minimum of 300 mm (12 inches) long
- Exposed around the lower 180 degrees of its circumference over a minimum length of 280 mm (11 in)

The height of the tube is required to be such that:

- There is a minimum of 75 mm (3 in) clearance from the bottom of the tube to the ground measured at tech inspection.
- With the bottom of the tube 200 mm (7.9 in) above ground, the wheels do not touch the ground when they are in full rebound.

3.3 Structural Requirements

Among other requirements, the vehicle's structure must include two roll hoops that are braced, a front bulkhead with support system and Impact Attenuator, and side impact structures.

3.3.1 Definitions

The following definitions apply throughout the Rules document:

Main Hoop - A roll bar located alongside or just behind the driver's torso.

Front Hoop - A roll bar located above the driver's legs, in proximity to the steering wheel.

Roll Hoops – Both the Front Hoop and the Main Hoop are classified as "Roll Hoops"

Frame Member - A minimum representative single piece of uncut, continuous tubing.

Frame - The "Frame" is the fabricated structural assembly that supports all functional vehicle systems. This assembly may be a single welded structure, multiple welded structures or a combination of composite and welded structures.

Primary Structure – The Primary Structure is comprised of the following Frame components: 1) Main Hoop, 2) Front Hoop, 3) Roll Hoop Braces, 4) Side Impact

Structure, 5) Front Bulkhead, 6) Front Bulkhead Support System and 7) all Frame Members, guides and supports that transfer load from the Driver's Restraint System into items 1 through 6.

Major Structure of the Frame – The portion of the Frame that lies within the envelope defined by the Primary Structure. The upper portion of the Main Hoop and the Main Hoop braces are not included in defining this envelope.

Front Bulkhead – A planar structure that defines the forward plane of the Major Structure of the Frame and functions to provide protection for the driver's feet.

Impact Attenuator – A deformable, energy absorbing device located forward of the Front Bulkhead.

3.3.2 Structural Equivalency and Structural Equivalency Form (SEF)

The use of alternative materials or tubing sizes to those specified in Section 3.3.3.1 "Baseline Steel Material," is allowed, provided they have been judged by a technical review to have equal or superior properties to those specified in Section 3.3.3.1.

Approval of alternative material or tubing sizes will be based upon the engineering judgment and experience of the chief technical inspector or his appointee.

The technical review is initiated by completing the "Structural Equivalency Form" (SEF) using the format given in Appendix A-1.

3.3.2.1 Structural Equivalency Form – Submission

a) Address – SEF's must be submitted to the officials at the competition you are entering at the address shown in the Appendix or indicated at the competition website.

b) Due Date – SEF's must be submitted no later than the date given in the "Action Deadlines" in the appendix or the date indicated on the competition website.

c) Acknowledgement – North America competitions – SEF's submitted for vehicles entered into competitions held in North America will be acknowledged upon receipt.

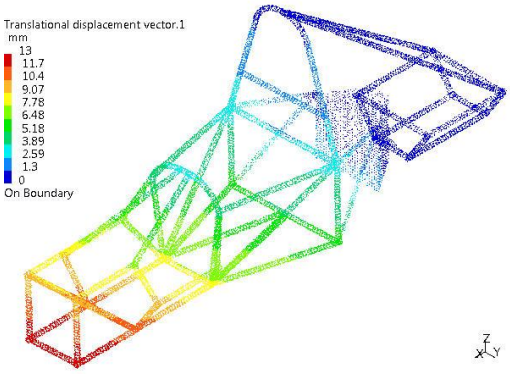
Do Not Resubmit SEF's

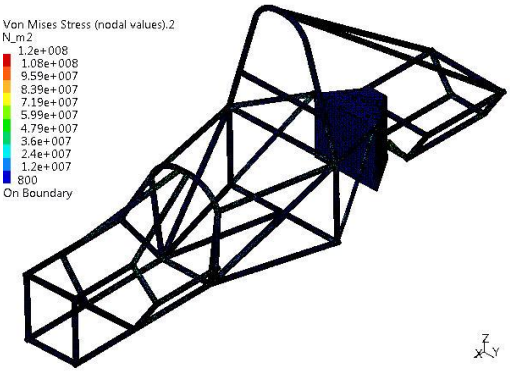
Appendix-4 Properties for material

Properties	Description
Mechanical	
Hardness	High degree of harness
Fatigue	Resistance to fatigue
Tensile	High tensile strength
Impact	High impact strength
Creep	Low creep resistance
Wear	Resistance to wear
Stiffness	High stiffness
Compression	High compression strength
Physical	
Density	Low to medium density
Electric	Not applicable
Magnetic	Not applicable
Thermal Conduction	High thermal conductivity
Expansion	Low thermal expansion
Melting point	High melting point
Chemical	
Environmental resistance	Resistance to weather, soil, solvents
Composition	Not applicable
Bonding	Not applicable
Structure	Not applicable

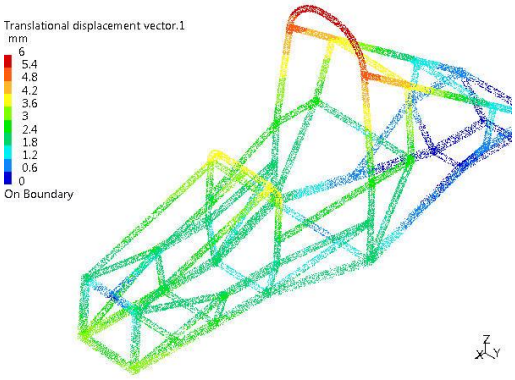
Appendix 5 Translation and von misses stress (taken at 1000N load)

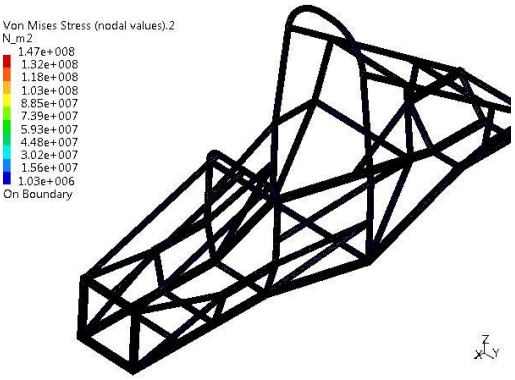
SF-01



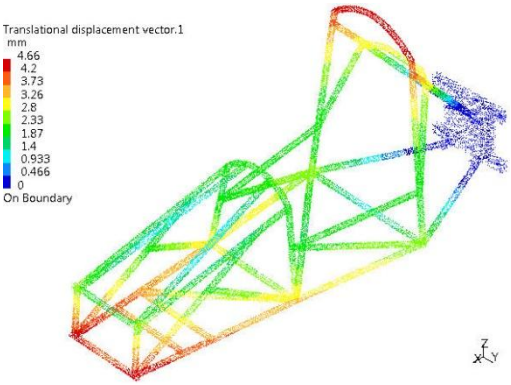


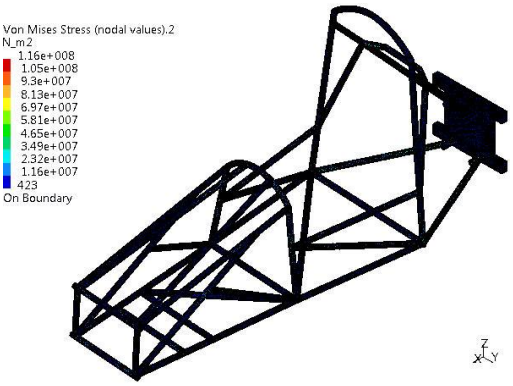
SF-02





SF-03_01





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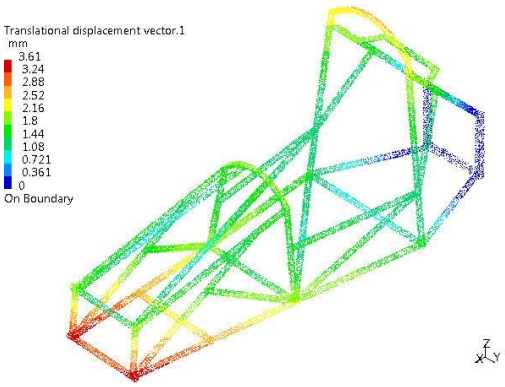

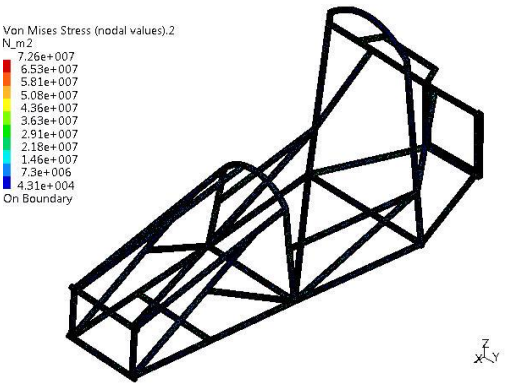

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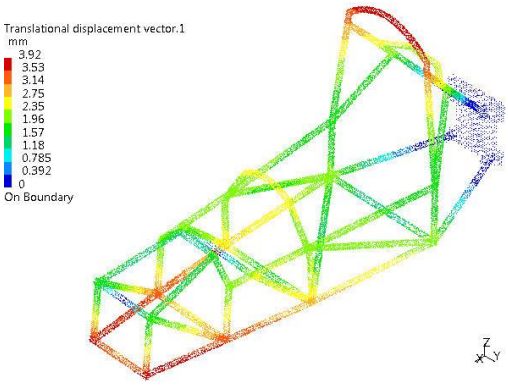
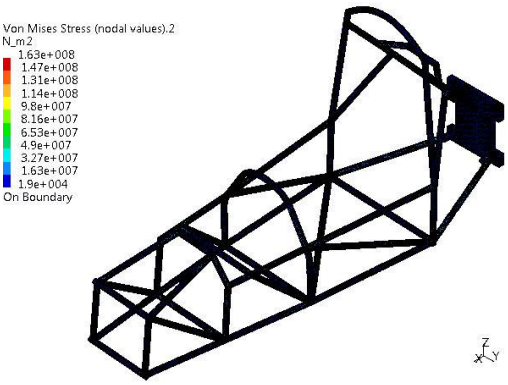
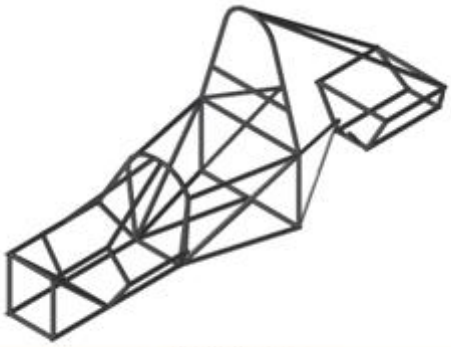




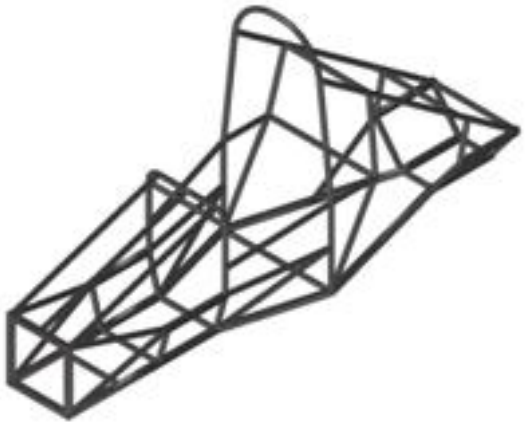
Appendix 6-1 SF-01 design and properties



General		Center of Gravity	
Density:	7700kg_m3	x=	-1298.73mm
Volume:	0.004m3	y=	-0.273mm
Mass:	30.353kg	z=	282.968mm
Surface:	3.079m2		

Inertia Matrix					
Ixx=	3.424kgxm2	Ixy=	-0.004kgxm2	Ixz=	0.817kgxm2
Iyx=	-0.004kgxm2	Iyy=	18.057kgxm2	Iyz=	1.354e-004kgxm2
Izx=	0.817kgxm2	Izy=	1.354e-004kgxm2	Izz=	17.1kgxm2

Appendix 6-2 SF-02 design and properties



General		Center of Gravity	
Density:	7861kg_m3	x=	118.681mm
Volume:	0.004m3	y=	-2.997e-004mm
Mass:	29.531kg	z=	261.293mm
Surface:	3.896m2		

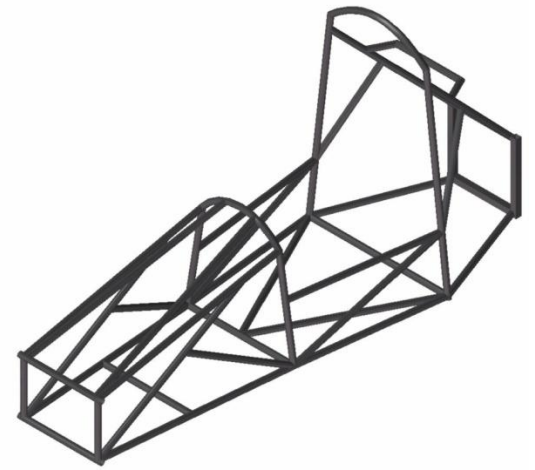
Inertia Matrix					
Ixx=	3.199kgxm2	Ixy=	0kgxm2	Ixz=	0.542kgxm2
Iyx=	0kgxm2	Iyy=	14.287kgxm2	Iyz=	0kgxm2
Izx=	0.542kgxm2	Izy=	0kgxm2	Izz=	13.322kgxm2

Appendix 6-3 SF03_01 design and properties

General		Center of Gravity	
Density:	5664.78kg_m3	x=	142.86mm
Volume:	0.005m3	y=	-0.871mm
Mass:	30.782kg	z=	196.428mm
Surface:	2.941m2		

Inertia Matrix					
Ixx=	1.456kgxm2	Ixy=	-0.013kgxm2	Ixz=	0.571kgxm2
Iyx=	-0.013kgxm2	Iyy=	5.238kgxm2	Iyz=	-0.003kgxm2
Izx=	0.571kgxm2	Izy=	-0.003kgxm2	Izz=	4.963kgxm2

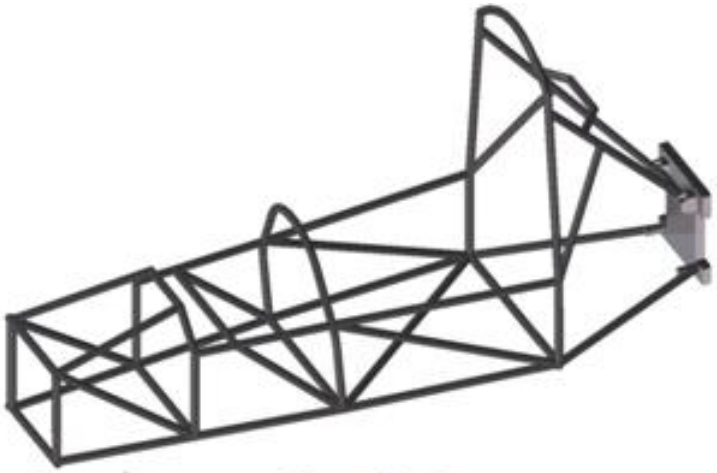
Appendix 6-4 SF03_02 design and properties



General		Center of Gravity	
Density:	7861kg_m3	x=	332.937mm
Volume:	0.003m3	y=	-0.138mm
Mass:	23.936kg	z=	212.716mm
Surface:	2.088m2		

Inertia Matrix					
Ixx=	2.463kgxm2	Ixy=	-0.001kgxm2	Ixz=	0.744kgxm2
Iyx=	-0.001kgxm2	Iyy=	9.8kgxm2	Iyz=	-6.49e-004kgxm2
Izx=	0.744kgxm2	Izy=	-6.49e-004kgxm2	Izz=	9.339kgxm2

Appendix 6-5 SF-03_03 design and properties



General

Density:	5443.369kg_m3
Volume:	0.005m3
Mass:	28.697kg
Surface:	2.754m2

Center of Gravity

x=	114.46mm
y=	-0.532mm
z=	207.448mm

Inertia Matrix

Ixx=	1.268kgxm2	Ixy=	-0.014kgxm2	Ixz=	0.53kgxm2
Iyx=	-0.014kgxm2	Iyy=	4.397kgxm2	Iyz=	-0.003kgxm2
Izx=	0.53kgxm2	Izy=	-0.003kgxm2	Izz=	4.178kgxm2