

## Chassis Team

Original Product Design Course# 034353/4  
Amit Aknin, Doris Pitilon, Raz Schweitzer

Client: Nimrod Meller

Advisor: Dr. Zvi Fruchter

### Abstract

The **FormulaSAE** teaches university students to design and manufacture a marketable vehicle for racing. The Technion Formula consists of 7 subgroups whom, together, designed and built this vehicle.

Chassis Group is required to plan and build a race car chassis, the body that is required to meet the dynamic loads generated from the vehicle, as a basis for integrating all of the vehicle's systems and driver protection cage.

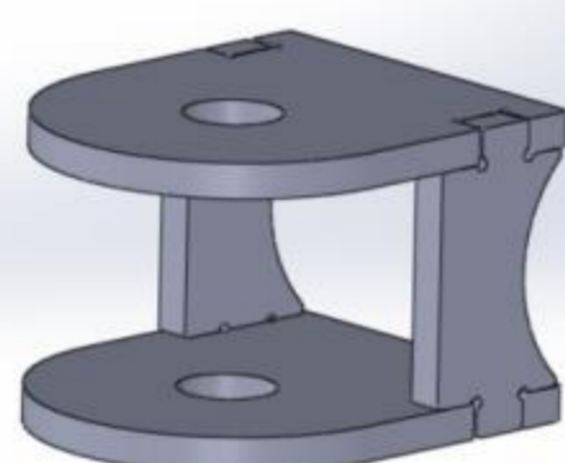
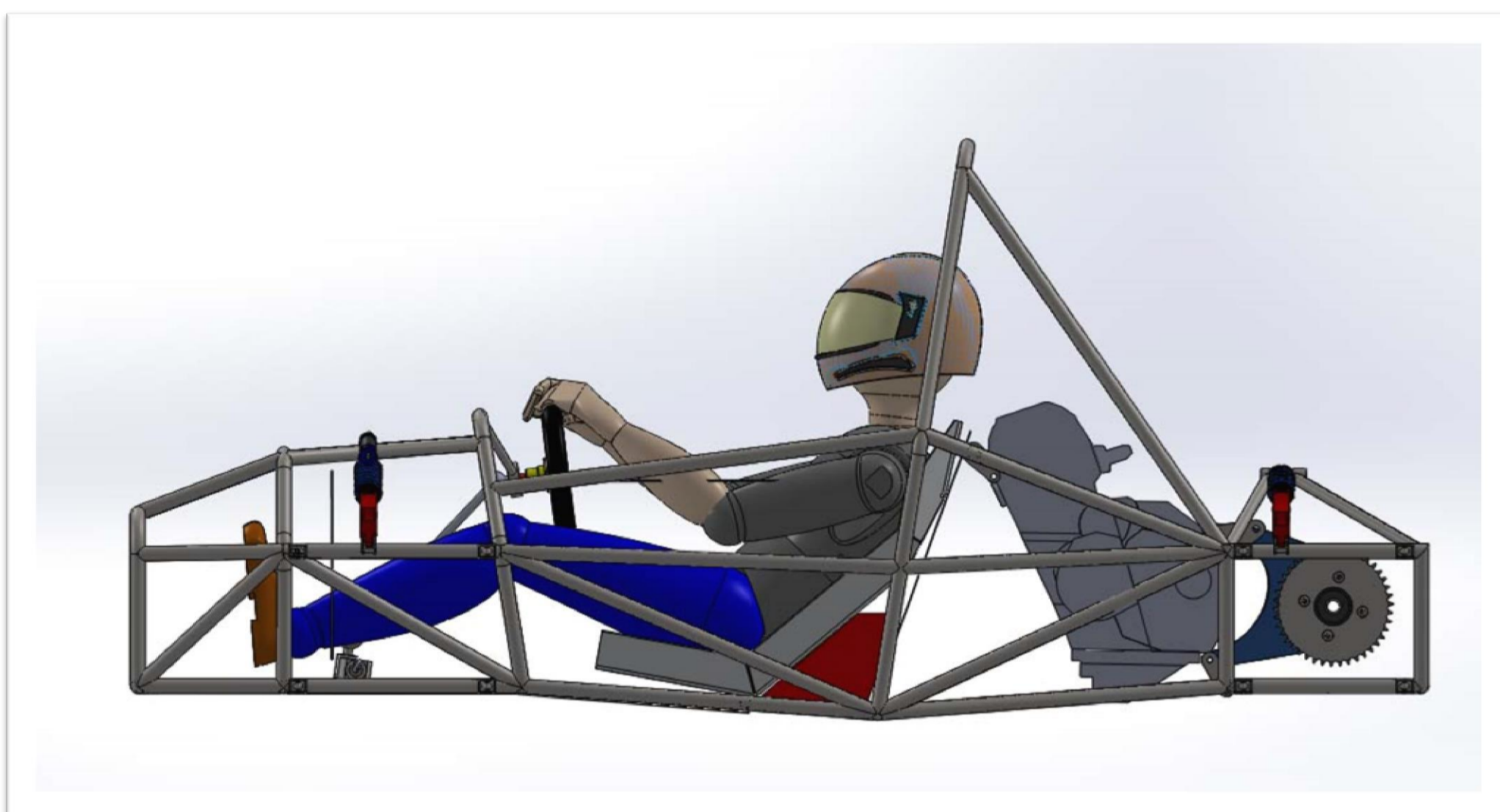
### Project Objective and Requirements

The **Technion Formula Teams'** objective is to design, manufacture, market and race a vehicle according to the FormulaSAE guidelines. The goal is to design pipe truss according to the settings stringent regulations, while trying to optimize strength and stiffness against weight. The chassis must be simple enough for construction with the means and facilities designed do to so, and make it possible for all automotive systems to combine and operate optimally in accordance with the specification requirements.

### Product Description

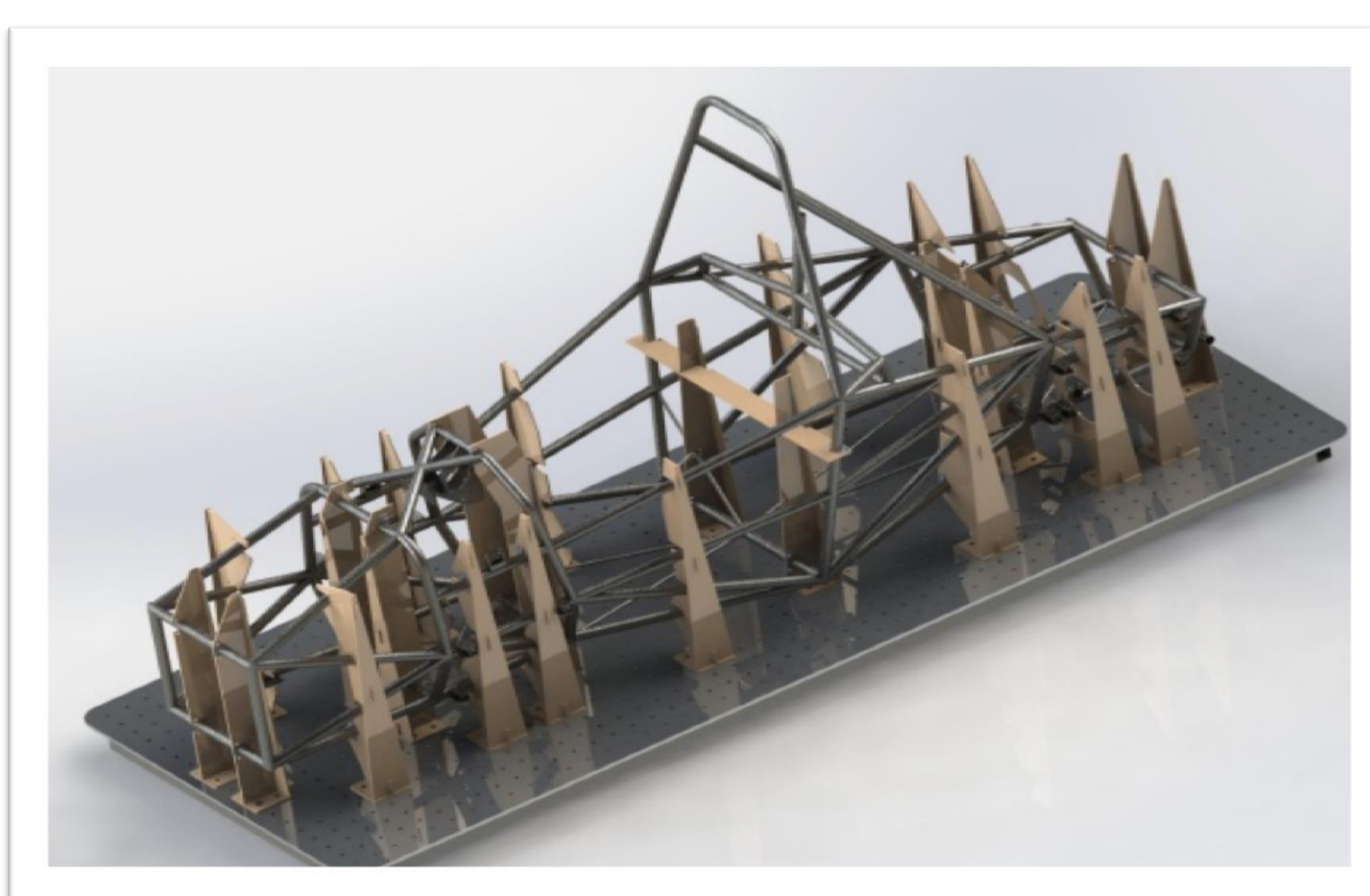
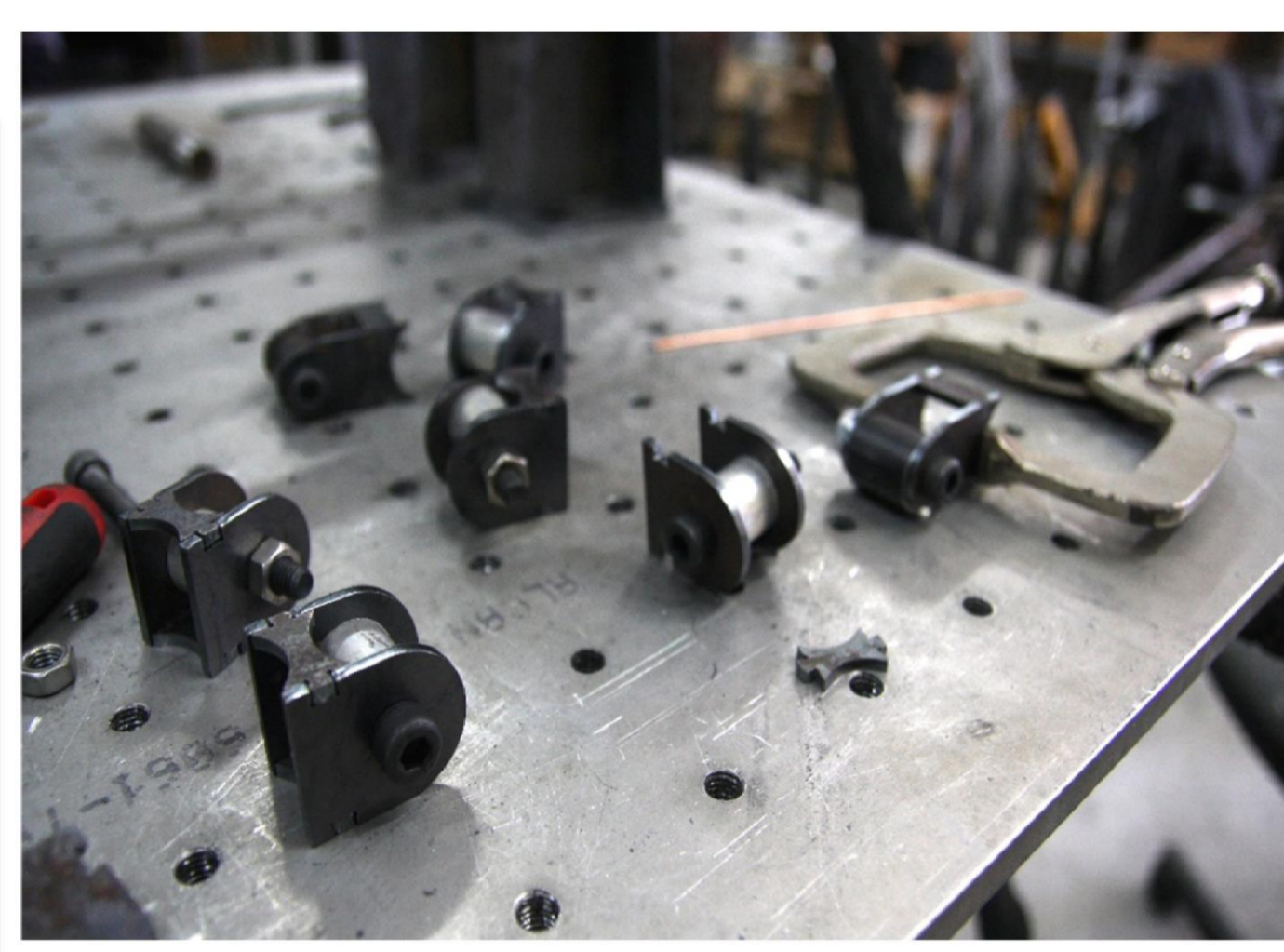
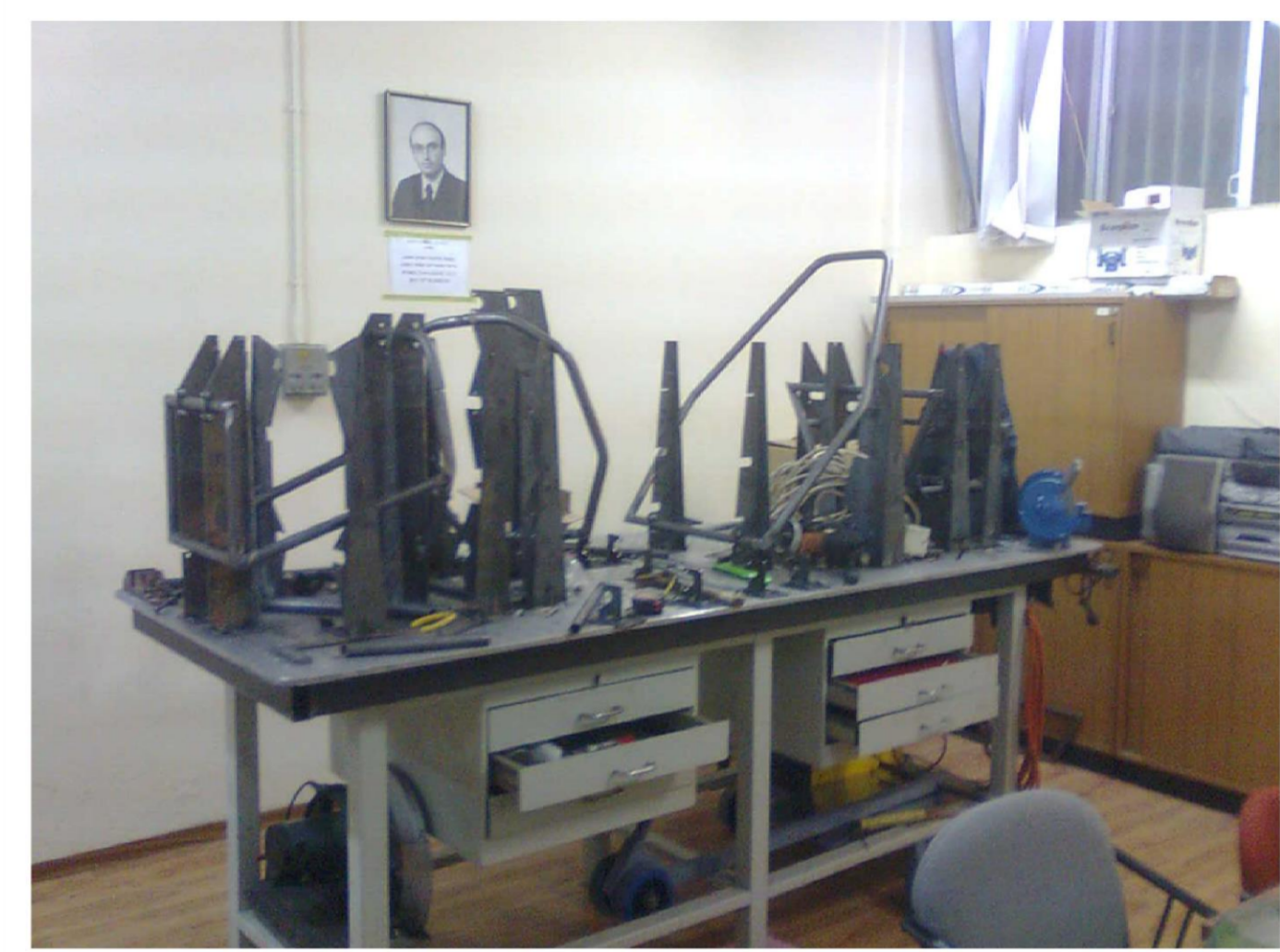
The chassis is constructed of the chromoly 4130 because of the material strength. The goal was to build the chassis to be in the appropriate torsion stiffness, maximum strength and minimum weight, which creates a conflict. Therefore, we had to find a geometry that will provide the desired torsion stiffness while keeping the weight of the chassis desirable.

The chassis is constructed of round profiles with wall thickness of 2.5, 1.6 mm when selection is based on the strength analysis.



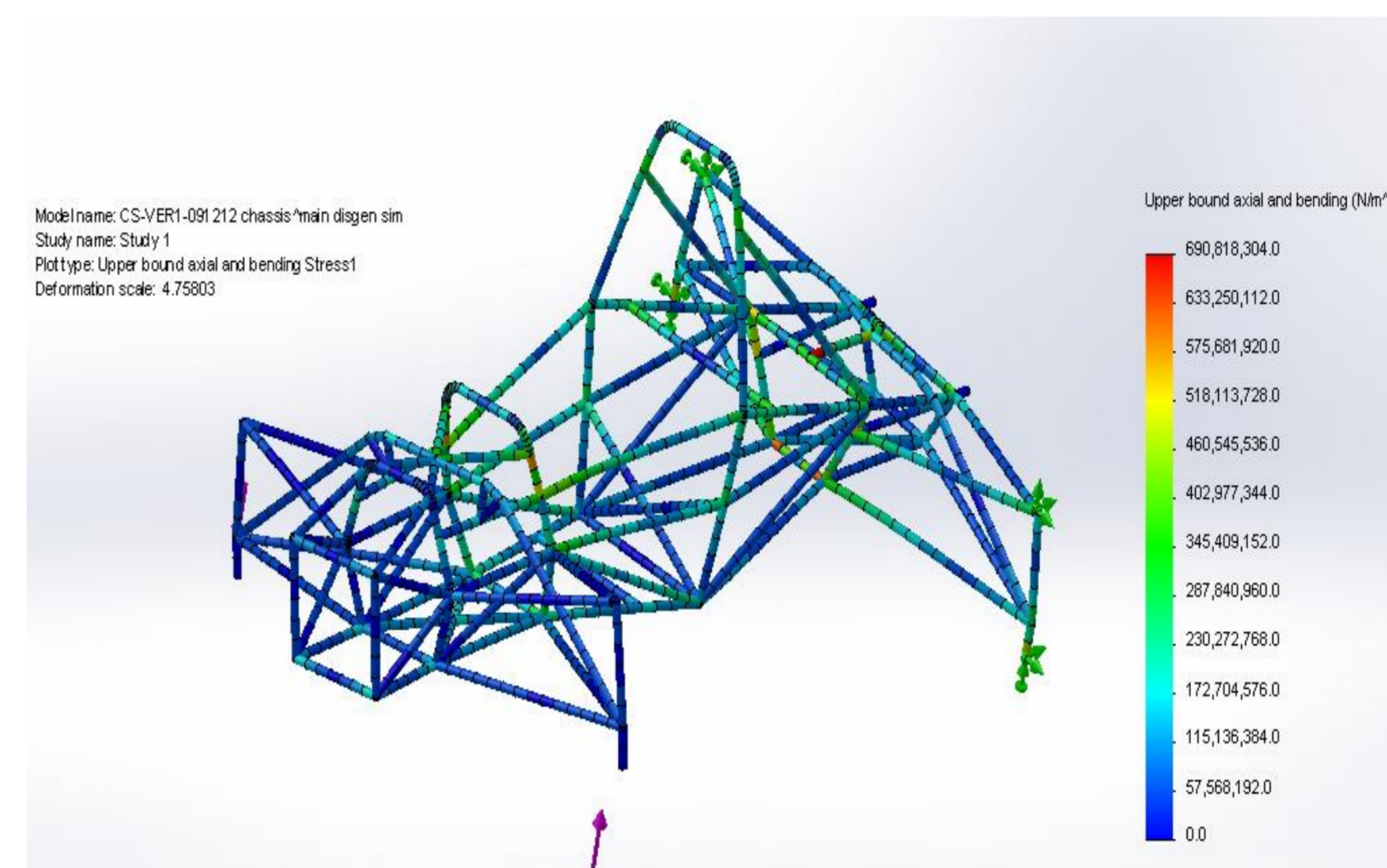
All the brackets are generic and put together like a puzzle where each bracket is composed of four parts.

Frame manufacturing in an economic efficiency technologies, including cutting pipes and sheets with laser according to computer models.



### Analysis

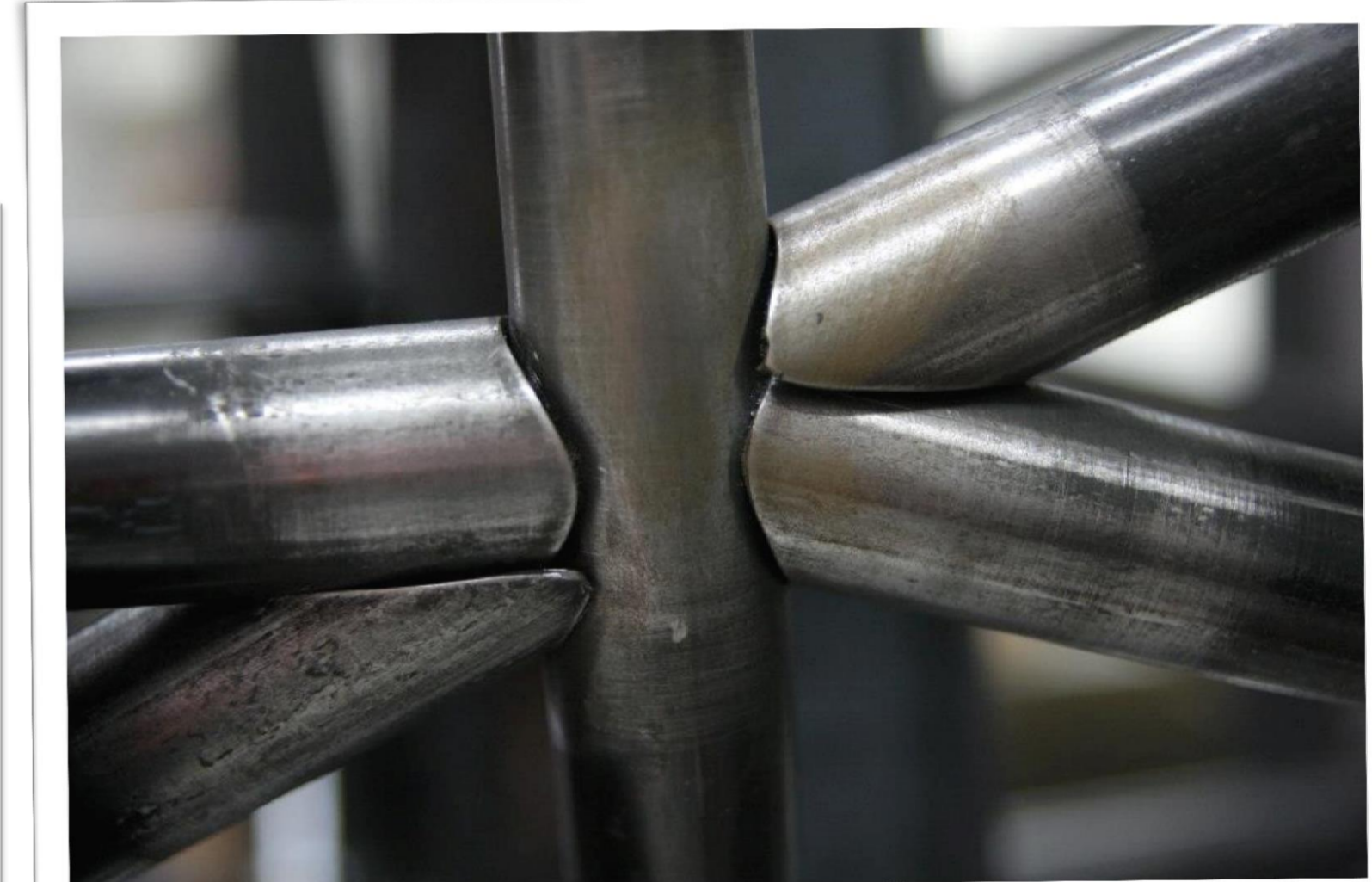
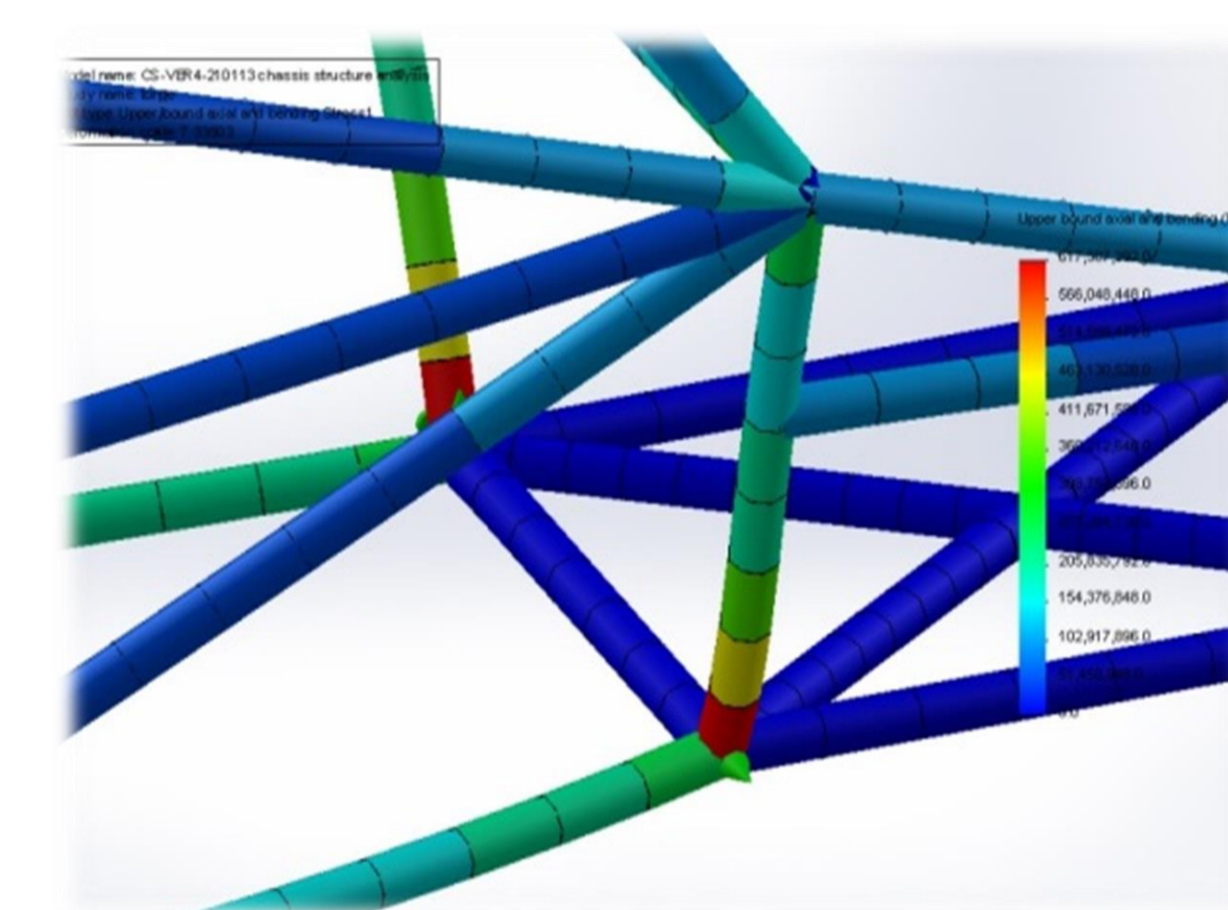
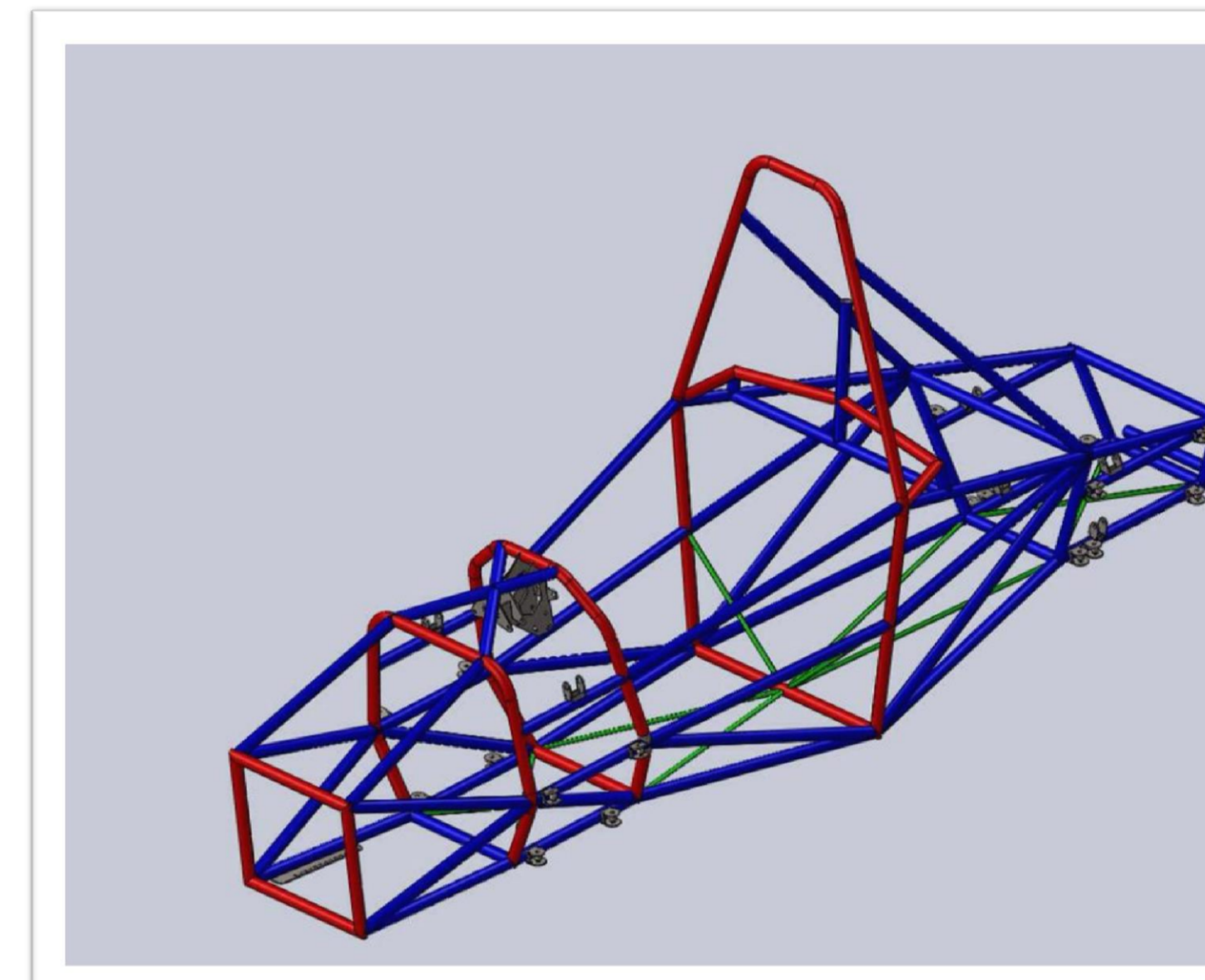
During the whole design process analysis was performed using Finite Element Analysis software and SOLIDWORKS SIMULATION. From the concept stage through the PDR and the CDR stage. The analysis helped identify suspicious points that are over stressed. This led to a creative solution of a one-axial loading principle tubes for hardening of the structure.



As is customary in the automotive world, the chassis was analyzed under various working scenarios including static loads, acceleration and braking.

As expected, the most extreme case is twisting the frame length as a result of changes in the position of the center of gravity when the vehicle is in a tight corner.

This scenario analysis taught us which one of the nodes are in risk of high loads.



Production process included TIG welding of structural parts made of chromoly 4130 tubes and st-52 steel sheets that was cut by laser according to a computer model and placed by a specially designed jig. This solution was selected to achieve a high precision structure in an inexpensive way.



### Acknowledgements

We would like to thank all the people that contributed to the success of this project: Prof. Reuven Katz, Nimrod Meller, Dr. Zvi Fruchter, Lior Alfasi (Tapix), Tzachi Primak (Primtec), Ido Luria (Armadillo Racing), Yossi Bluvstein (Binot Topaz), Gal Segal (Alubin - Segal Bikes), Yuval Teerosh (Weiner garage)