

## Introduction

Stadler Rail is a major commercial train manufacturer throughout Europe and is now an emerging force in the United States market with facilities in Utah. To get their names out to a larger audience, along with showcasing the design of a production train, they would like to build a 1:4 scale model train of their FLIRT H<sub>2</sub> (Figure 1). The model train will be transported to various conferences around the United States and will be capable of running on a 1:4 scale track.



Figure 1: Stadler's FLIRT H<sub>2</sub> production train with passenger train car on either side of "Power Pack" car

## Project Description

Our Capstone team has been tasked with designing a 1:4 scale model that replicates the FLIRT H<sub>2</sub> passenger train car using the original 3-D CAD model as reference. The final deliverables for the project include:

- A complete 3-D CAD model assembly of the passenger train car
- 2-D drawings of critical components
- Detailed manufacturing instructions

Aspects that were out of scope for the project include:

- All interior components (windows will be opaque)
- Brakes, suspension, electrical, plumbing and HVAC
- "Power Pack" (middle car) already completed
- Propulsion system (will be designed by future Capstone team, likely driven by electric motor)

## Methods/Simplification

The project may appear as simple as scaling the existing model down by a factor of four. But due to the overly complicated sub-systems required in the full-scale model (see Figure 2), it was required to start from scratch. Measurements of critical components were collected and reduced by a factor of four and were used as the starting point for all components in the 1:4 scale CAD model.

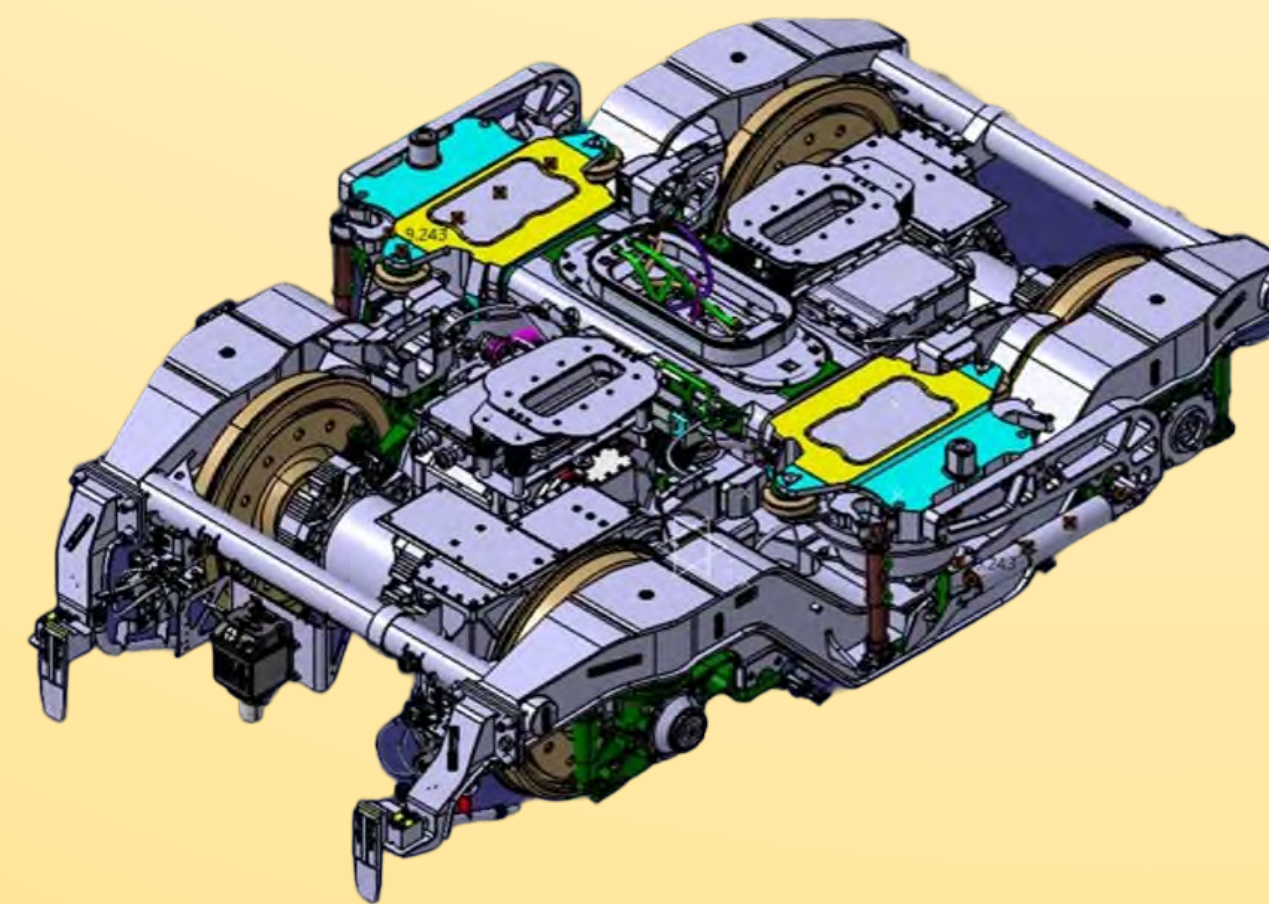


Figure 2: Truck system in full-scale model

## 3-D Model

After the design of individual components was complete (Figure 3), they were compiled together to make a preliminary assembly. Further iterations were required as component interfaces were not immediately perfect, thus requiring updates to various components. Following the completion of the passenger train car assembly, it was combined with the "Power Pack" car to form a complete train system (Figure 4).

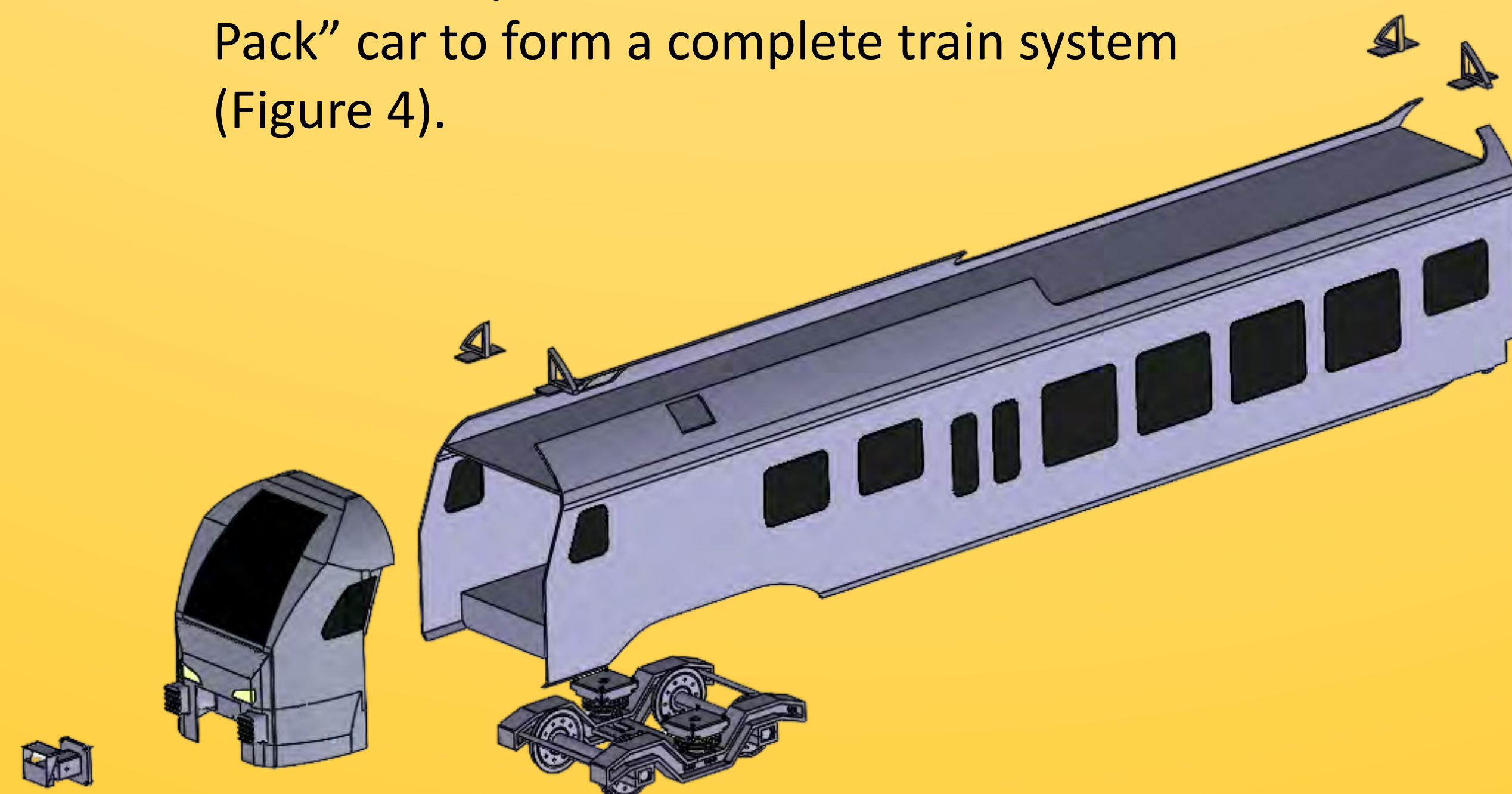


Figure 3: Exploded view of passenger train



Figure 4: Full train assembly, including front and rear passenger train and "power pack" car

## Drawings

After the completion of the 3-D model assembly, 2-D drawings with dimensions were generated for all components. Along with dimensional drawings, welding drawings were also produced for sub-assemblies (Figure 5) that will be used during the manufacturing of the train beside detailed manufacturing instructions.

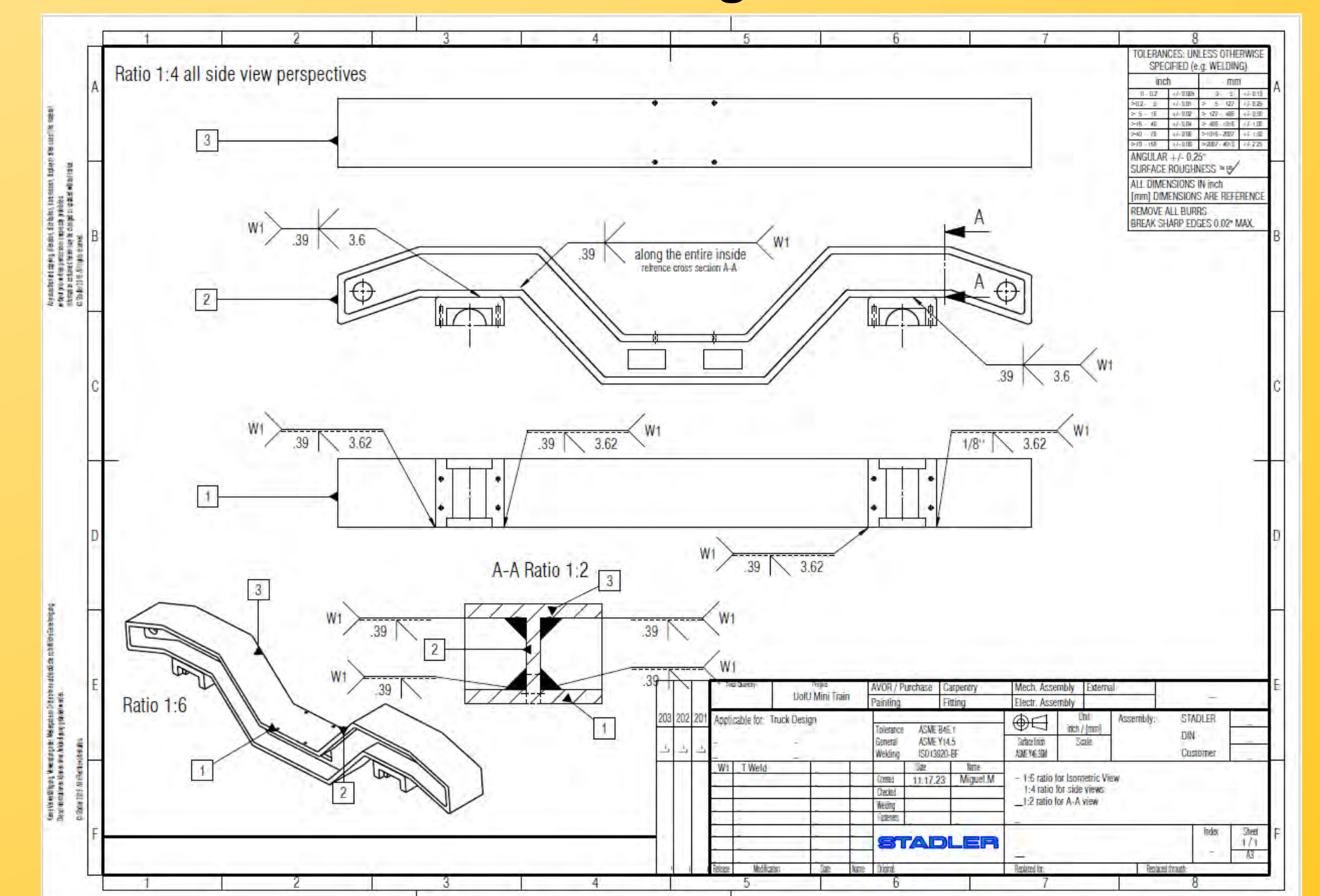


Figure 5: Truck system welding drawing

## Conclusion

Using the team's final deliverables, Stadler will be able to successfully manufacture a 1:4 scale model of their FLIRT H<sub>2</sub> passenger train car. Combined with the work of future Capstone teams, a fully functional train will be achieved.