

Guidelines for Formula SAE and Mini Baja Projects

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This document is to assist the team members in preparing the information required by VR3 to manufacture tubing kits for Formula SAE and Mini Baja projects that are 'ready to weld out of the box'. With complete and organized information, VR3 can produce these one off kits quickly and economically.

Our 'Cartesian Tube Profiling' specialty is the accurate profiling of tubing components and kits ready for weld assembly including the bending of these profiled tubes in most cases. Our profiled tube kits are ideal for the welded tubing structures of the Formula projects. Both ends of each tube are profiled in a single setup with one simple tool thereby holding the profile shapes, length of tube and orientation of the ends within tolerances of less than .005".

Our cnc process combined with our ability to extract the profile data direct from a 3D solid model CAD file produces unprecedented accuracies and repeatability in a convenient process. Our process and resulting quality far surpass any other methods of fitting and welding tubes into a structure. Our tube kits save many hours of tedious and frustrating manual labour or skilled labour with expensive tooling, fitting tubes one at a time. This allows the team to concentrate on the design and then produce an accurate fabrication in a clean, quiet shop where progress is steady with simple fixturing devices.

Our goal is to produce accurate tubing kit components ready to weld, right out of the box. Pricing covers our basic material and manufacture costs and is intended to be excellent value for these educational projects. In exchange, we expect some exposure or advertising on you finished project. As per SAE rules and regulations, we offer no design or fabrication advice; we profile tubes per the information supplied by the student teams.

Notes:

1. Materials:

Our tube profiling is a cnc machining process. Therefore any available and machine able materials can be processed. The preferred material is 4130N 'chrome-moly' tubing. This material has excellent weight to strength ratio, weld ability, formability, dimensional accuracy and is readily available in the widest range of tube od and wall thickness sizes. For these reasons, it is also the most economical and preferred material for our profiling process.

2. Solid Model:

The tube structures must be designed and accurately modeled using a 3D cad program. Each tube must have the proper tube od and wall thickness properties. Each tube must be accurately trimmed at both ends to nest into the tube clusters. Each tube component must be a single solid body entity. Most 3D solid model programs are designed to model tube structures effectively. We use 'Solidworks' for our solid modeling software and create the tube structures as a 'weldment' part.

Each tube component must be assigned a separate, unique part number. Mirrored parts have different profiles and require a separate number for processing.

Ideally, a dimensioned assembly drawing with isometric, front, side and top views along with the material list should be created. This will be required by the design team for checking, setup and assembly purposes. Until this information is properly organized and presented, the tube structure is basically a cartoon.

3. Component Files:

Depending on which software is being used; different types of files can be provided.

SEE Solid Modeling Document available on our resources page for complete model requirements (particularly step 16).

4. Material List:

We require a material list itemizing each tube and identifying the following information. This is preferably in an excel spreadsheet format.

- a) Assembly Name / Description
- b) Tube No / Tube OD / Tube Wall Thickness / Aprox Length (+/-2") / Qnty/Ass'y for each tube
- c) Total number of pieces required
- d) Identify any special features such as formed or bent tubes, holes or slots

5. Formed and Bent Tubes:

VR3 can profile and then bend a tube to the designed configuration ready to weld, in most cases. Tubes are formed and bent using bending dies with specific radii. The 3D model must be drawn with the bend radii corresponding to the bend dies available. There are also minimum requirements and preferences for formed and bent tubes such as minimum wall thicknesses, bend angles, bend radii and minimum straight lengths to support the tube during bending. Contact us to ensure compatability with bending constraints before the final design is approved.

It is also recommended that a dimensioned part drawing be produced for each formed tube to save time and minimize confusion.

6. Square Tubes:

Square tubes can be profiled and nested together with the round tubes. Square tubing is much more expensive (chrome moly) and is more difficult to program than round tubes. It is recommended to use square tubes only as required to suit specific design features. Square tubes must also be modelled accurately with radiused corners to better represent nesting details at the tube clusters. Contact us with your specific square tube and we will send you the profile.

7. Proposal Requirements:

With a material list and an isometric assembly drawing (pdf format, parasolid, etc) showing the overall configuration of the tube structure(s), we can prepare a proposal to supply a tube kit. This assembly drawing helps understand the formed or bent tube constraints and the overall scope of the tube kit. Note that component files are not required for this proposal and will only be required to proceed with manufacturing.

SEE 39125.demochassis.pdf on our resources page for an isometric drawing example.

8. Team Contact Information:

Assign a team contact member responsible for the chassis / tube design and 3D modelling of the tube structures. This is required to resolve any issues in an efficient manner.

9. Proceeding with Manufacture:

With the above information organized and supplied in clean condition, VR3 can efficiently convert the data into the profiling code for the cnc profiler and therefore produce this kit economically.

Allow 1 to 3 weeks for preparation and manufacture of one set of tubes. Delivery is subject to the quality of the information supplied, material availability and our workload at the time of the order.

10. Visit our Facility:

When and where practical, we encourage team members to visit our facility to better understand our unique tube profiling process. It can also be arranged that team members produce some of the profiled tube components during this visit and return home with a completed kit of tubes.