ESP – Common Mechanical Mistakes

This document summarises the information discussed during the design review and FAQs.

Tolerances and Clearances

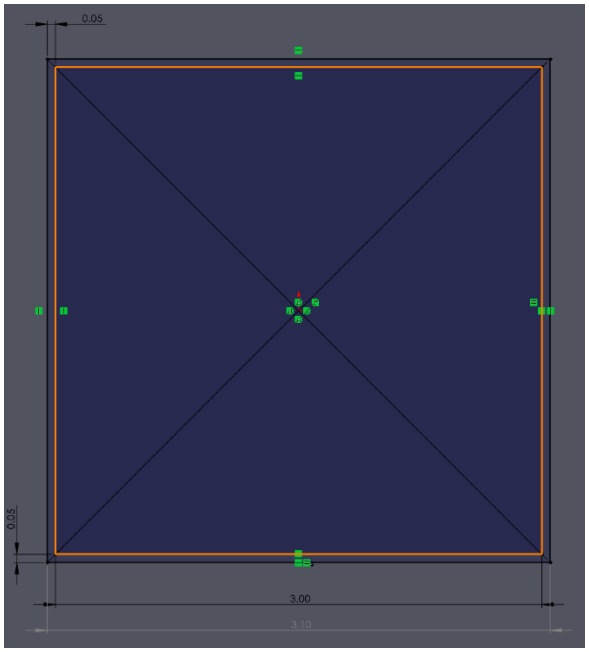
When fitting two parts together, leaving a small gap in-between is essential. This gap is known as a *clearance*. The value depends on the materials, the manufacturing process and the type of fit you need.

We primarily use acetyl material (hard plastic) and laser cutting for ESP manufacturing. As a general rule:

Interference/tight fit: 0.1mm (good for gearbox)

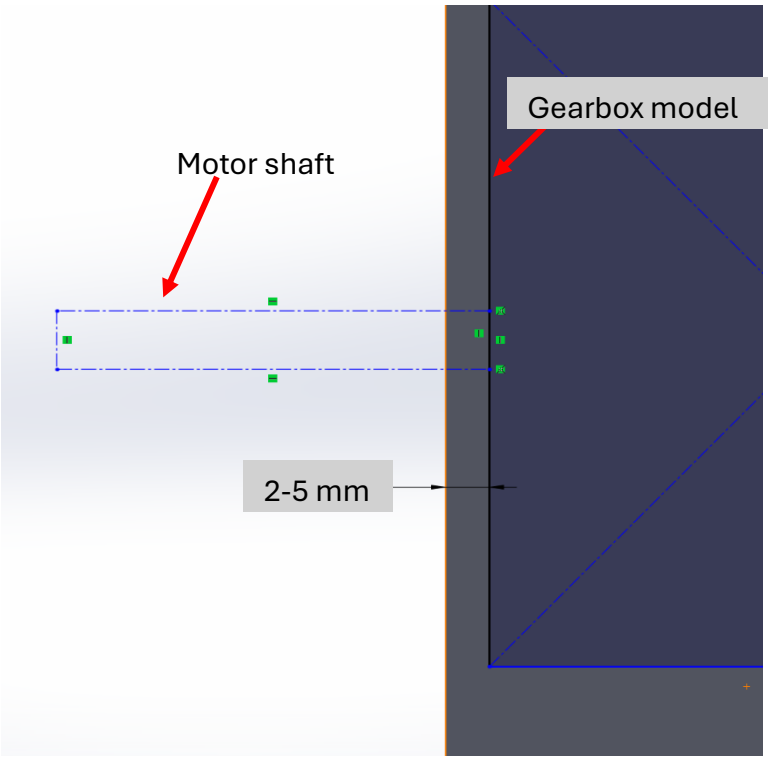
Normal: 0.2mm

Loose: 0.3mm (Good for screw holes)



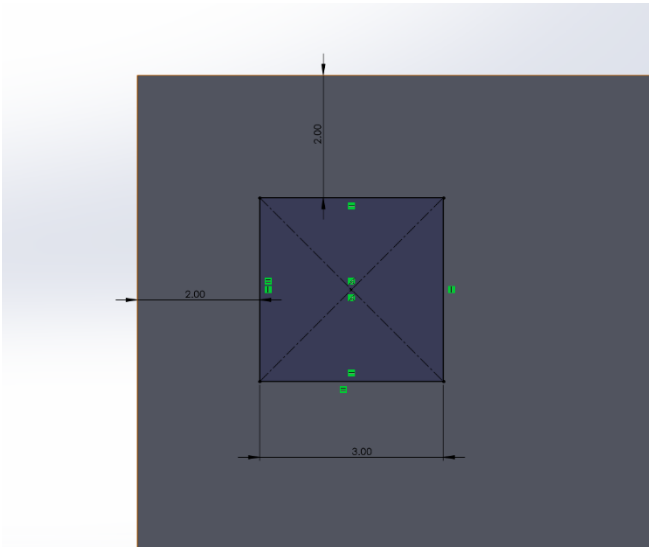
Gearbox/Wheel Clearance

The face of the gearbox that is parallel to the edge of the chassis should be between 2-5mm to ensure the wheel doesn't catch.



Edge Clearance:

Holes placed too close to the edge of the material are likely to break. Make sure to offset the line by a minimum of 2 mm.



Gearbox Fastening Hole

The gearbox includes a fastening hole in addition to the square lugs – don't forget to include this in the model.

Screw Heads

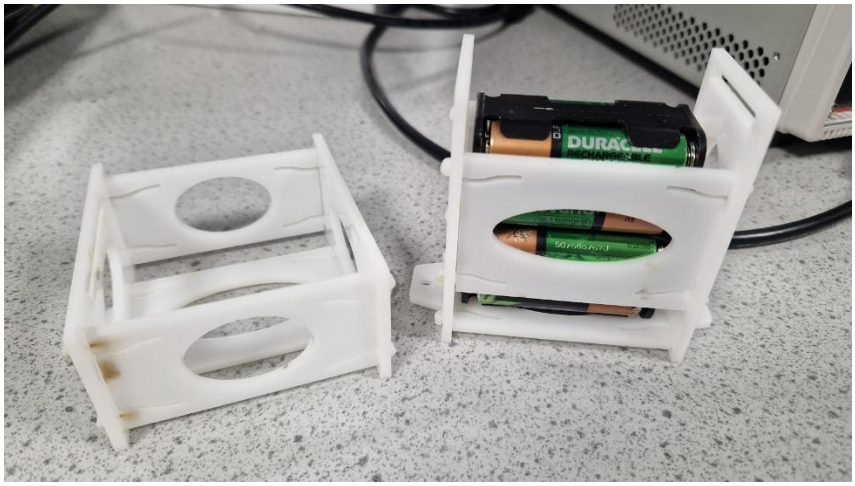
When placing holes for screws – always remember to leave room for the screw head or nuts (roughly 2*diameter)

Battery Pack Placement

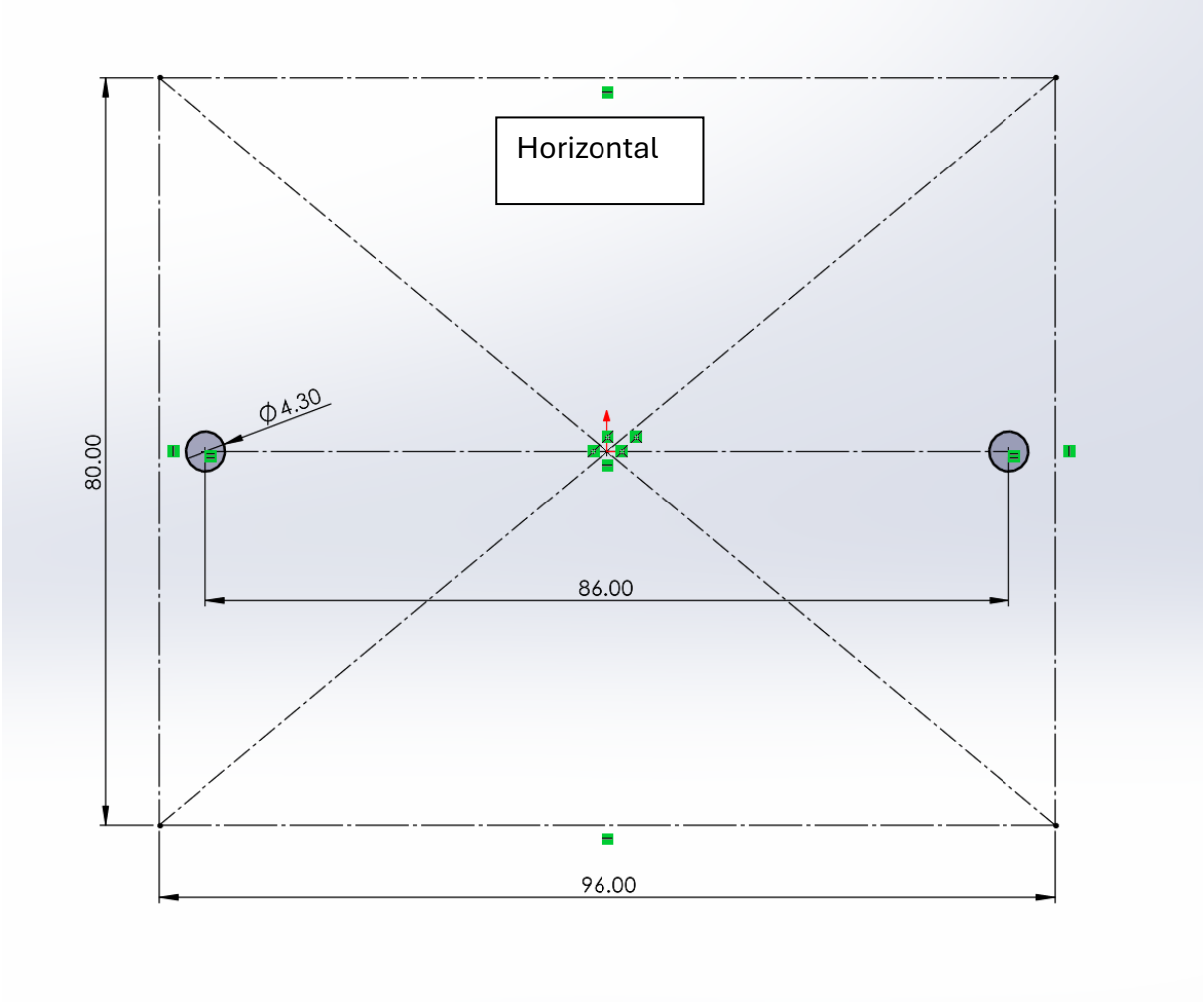
The workshop provides battery holders in horizontal and vertical orientations. The CAD file for these can be found here:

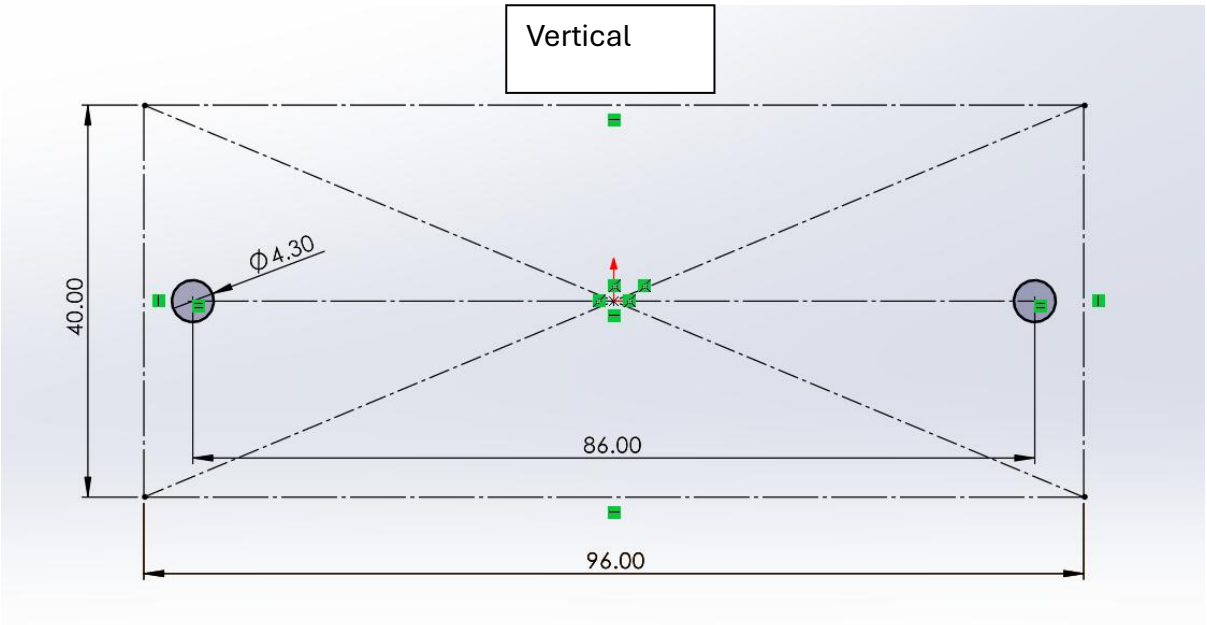
Envelope dimensions: 86 x 96 x 40 mm

I apologise for not being aware of this earlier. Do not worry if you choose not to include these in the design; the options discussed during design reviews (Velcro straps, etc.) will still work.



A quick way to make these components compatible with your design is shown below. Add the two mounting holes 86mm apart and allow a space of 80 x 96 mm for the box.





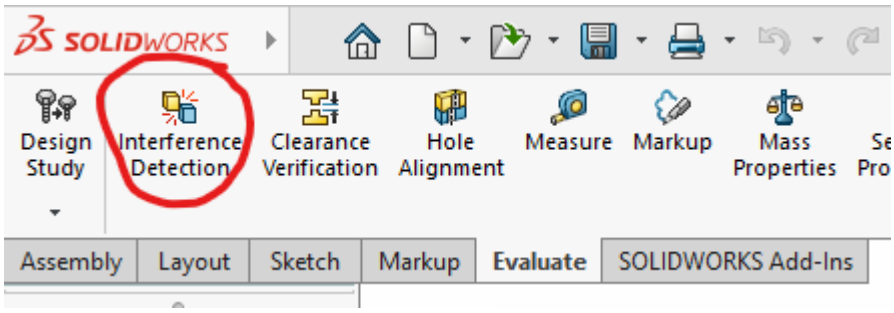
General Tips

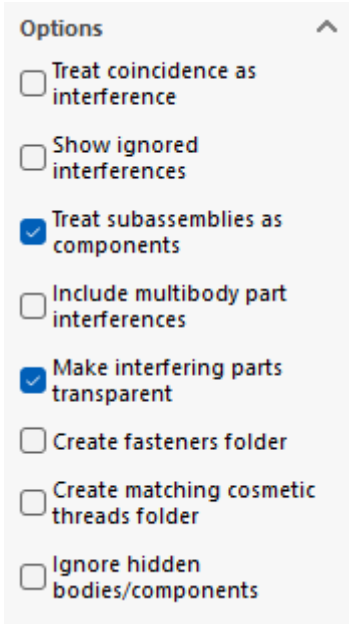
SolidWorks Assembly

Spend time creating a full, detailed, and accurate assembly of the buggy, including any PCBs. This process will highlight areas for improvement; this may seem like a significant undertaking, but it will reduce errors during manufacture, which are harder, more expensive, and time-consuming to fix.

Interference Detection

When building the assembly, make use of the Interference Detection Tool in SolidWorks. This will highlight parts that foul each other and issues like misaligned holes that are difficult to spot. Add the option “Treat subassemblies as components” to make sure only the high-level design is tested.





Avoid Dependence on Glue

Glue does not work well with Acetyl; avoid using it for anything structural.

Wiring Diagram and Strain Relief

Create a high-level wiring diagram to visualise the assembly. Consider adding slots to route the cables neatly and include some strain relief to prevent cables from accidentally disconnecting.

Materials Used

The material supplied for the main chassis components is 3mm thick Acetyl.

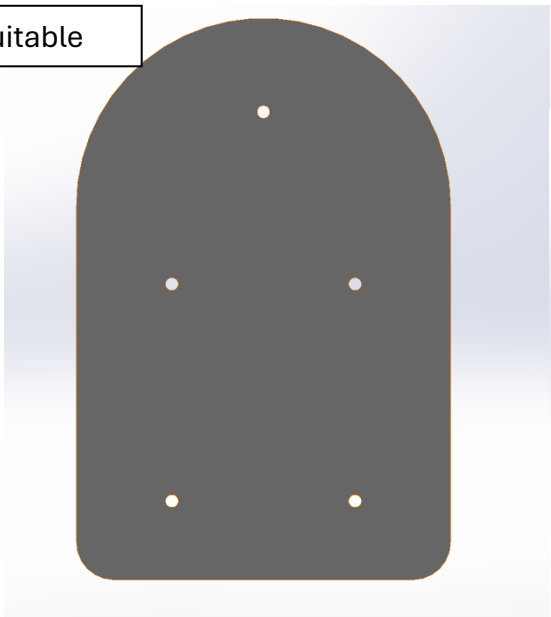
Standoffs

Standoffs are common components available at the workshop; they come in various sizes and are usually threaded or contain studding. Typically supplied in 5mm height increments.

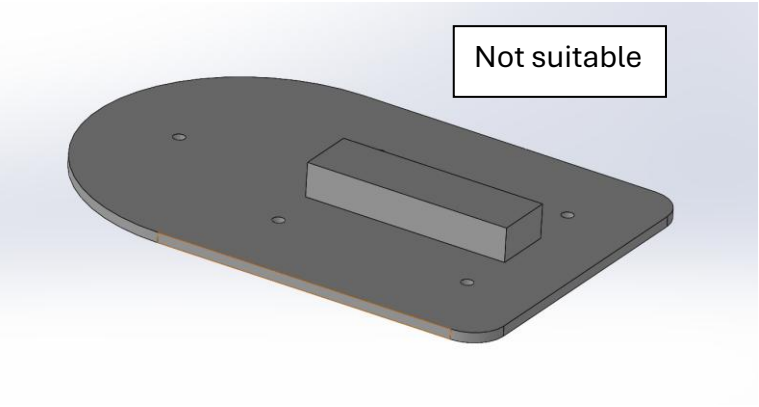
Manufacturing

The chassis will be laser cut as a series of 2D plates; you are responsible for assembling them. Do not include 3D geometry, as height information will be lost.

Suitable



Not suitable



Exporting as DXFs:

Right-click the surface you wish to export and click “Export to DXF”. When prompted to save, click Options and select Version 2000-2002. Include your group number, the envelope size, and the quantity required in the file name.

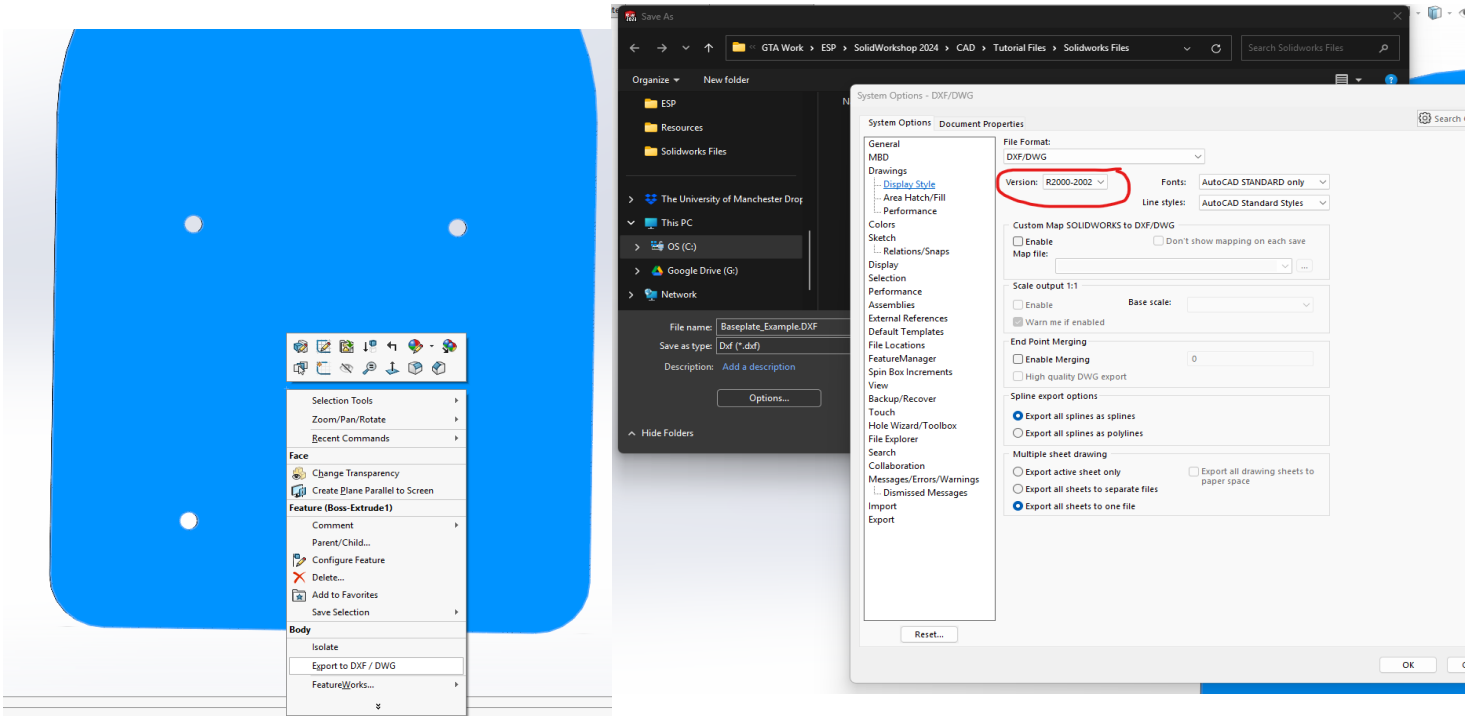


Figure 1 - Exporting to DXF

Submission Area:

The DXF submission is located on Blackboard under:

Assessments - Design Report (DR2) - DXF File Submission

You can submit a zip file containing all DXF files