

# Making Robot Bumpers

## Check we have everything;

- Wood backing, cut to 36" and 26" lengths (5") wide. (4x36", 4x26").
- Aluminium angle, 2 per wood backing, of equal length – check against wood backing.
- Aluminium strip, 4x36" – check against wood backing to ensure correct length.
- Pool noodles.
- Fabric 2 colours – red, blue.
- Paint – get some YELLOW, make sure it will adhere to the fabric.

## Assembly

- Mark the centre line of the wood for the bumpers (i.e. 2 1/2" up from a long edge).
- Mark the centre line of the Al strips.
- For each set of bumpers (sides, front/back) use a piece of Al angle as a template.
- Mark the centre line of a flat side, mark the 1/4, 1/2, 3/4 points along this line.
- Drill small guide holes at these 3 points (<3 mm?). This is the template for all further drilling. There will be a 36" template and a 26" template.
- Use the templates to drill 3x5.3 mm holes through each of the bumpers, on the centre lines – you may be able to drill through a stack of similar boards at once.
- Use the templates to drill 3x5.3 mm holes through each of the Al strips, on the centre lines.
- Drill a recess for the cap head bolts using an oversize bit. These should be centred on the existing holes and be 5mm deep. Adjust the pillar drill so that you can control the depth of the hole. We want a 30mm M5 bolt and a washer to sit inside this hole, the head must not stand proud of the wood. The threaded bolt should not extend more than 15mm from the other side of the wood backing.
- Place washers and 30mm M5 bolts in each hole and secure an Al strip over them using 1/2 " wood screws. It should be possible to turn the bolts freely using an allen key passed through the Al strip.
- Use the template to mark where on the chassis the mounting inserts have to be placed. (We will have to wait until Dave brings his set of inserts before we finally drill the frame).

*Check that each set of bumpers are entirely interchangeable within themselves.*

- Cut Pool noodles to the correct lengths, including 5" sections to fill the corners.
- Hot glue the noodles to the backing board – making sure that you do this on the correct side, i.e. the one without the protruding M5 bolts.
- Cut access routes through the noodles to the heads of the M5 bolts. (Do not assume that you will be able to force the allen keys between the noodles when they are fully constructed).
- Cut fabric to the right size to fit over the noodles, around to the back of the wooden support and about 1" onto the back side. Remember that some of the bumpers will have vertical extensions to fill in the corners – the fabric must be cut to cover these neatly as well). On the centre line, cut small holes in the fabric for the allen keys to fit through.
- Paint team numbers on the middle of the fabric, at least 4" high. Use stencils and do this with the fabric flat!
- Glue the fabric to the back and top surfaces of the wood backing, pull tight over the noodles and glue to the bottom edge and back of the wood.
- With the two bumpers which have the vertical extensions (to fill in the corners of the robot bumpers), make sure that these verticals are securely fixed to the rest and make neat covers with the fabric. (Make sure that the lettering is on the OUTSIDE of each bumper and that pairs of bumpers have the correct orientations so the team number will be vertical when assembled).
- Screw the Al angle to the tops and bottoms of each bumper to secure everything tightly.