



## Simple Arena for ~30kg Combat ROVs

### Disclaimer

The information contained herein carries with it **NO WARRANTY** of any kind, either express or implied.

The reader acknowledges that construction and/or use of a robot combat arena creates some risk of personal injury to reader and third parties, as well as a risk of damage to property, and the reader expressly assumes that risk. The reader assumes **complete responsibility** for any injury or damage claims arising out of the reader's use of this information.

### Goals

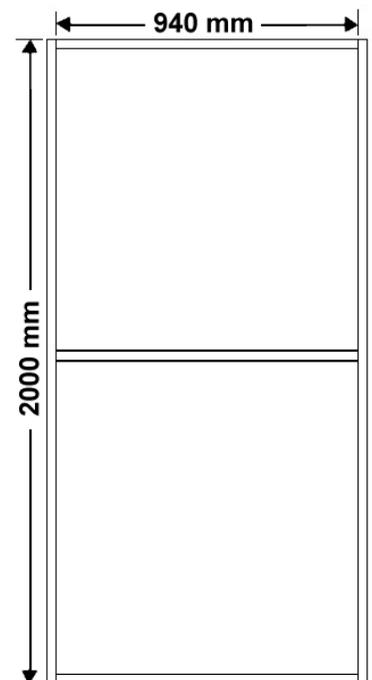
- Secure
- Easy to set up
- Low Cost
- Modular

### Approach

- Steel framed walls
- Wooden floor with optional steel skin
- Steel Tube Bumpers
- Wooden I-Beam Roof (steel or AL truss roof optional)
- Plywood roof skin

### Materials

- Square steel tube: 30mm x 30mm, 2mm wall
- Rectangular Steel Tube: 120mm x 60mm x 3mm wall
- Angle stock, 100mm x 100mm x 5mm
- Short (~1m) section of 25mm solid steel bar
- Plywood sheet (14-16mm floor, 10-12mm roof), "4x8 foot" sized, ~120cm x 240cm.
- Optional steel sheet for floor.
- Engineered wood joists sized for a 6m span.
- Lumber for floor frames and joist carrier, "2x4 sized", ~38mm x 89mm.



### Wall Modules

#### - Frame

Twenty-two wall frames (drawing above) are required for a 6M x 6M arena.

Each wall module is a rectangle 1M wide and 2M tall, constructed of the 30mm square tube, fully welded at each corner. A cross-piece of the same 30mm tube is welded in at the midpoint of the long rails.

#### - Corners

The walls are connected at each of the 4 corners by a 2M tall section of the 100mm angle stock. The angle stock must have holes drilled to match the wall attachment holes. Attach the angle stock to the end wall module of the 1<sup>st</sup> wall such that the corner is in the INSIDE (e.g. open side of angle stock faces

OUT. Now attach the 1<sup>st</sup> panel of the next wall to the matching holes on the unattached side of the angle stock.

## - Polycarbonate Skin

A single sheet of 10mm-13mm polycarbonate must be bolted to the INSIDE SURFACE of each wall module. 9 10mm bolts will secure the polycarbonate to the frame, three into each cross-piece. Fender washers should be used on the inside to spread the load across the polycarbonate.

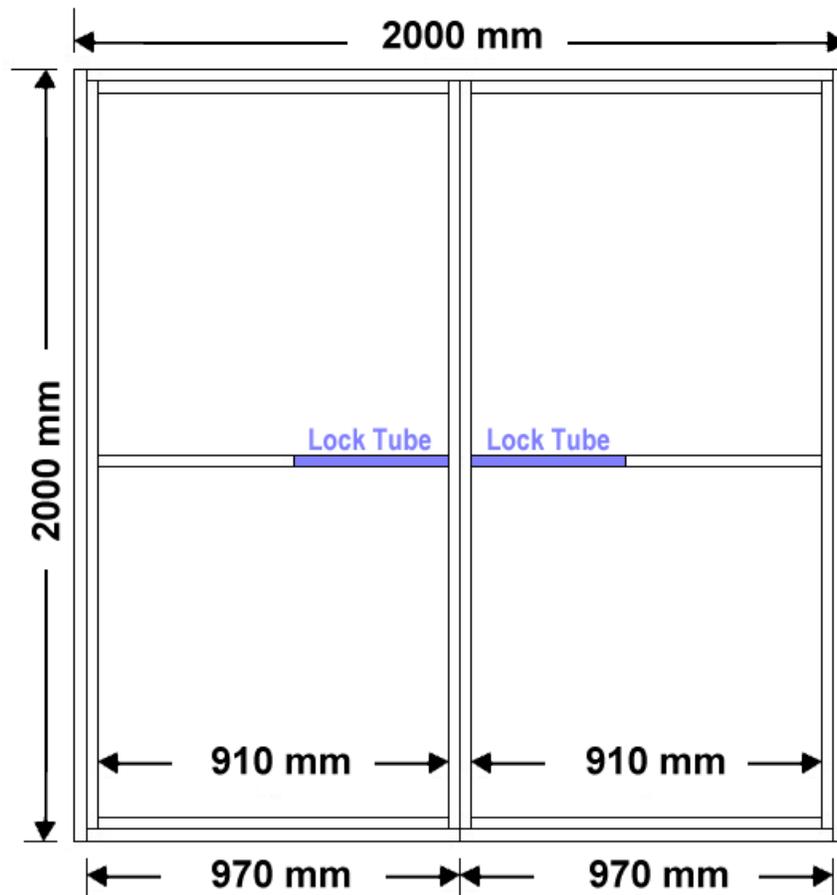
## - Frame attachment

Each frame will attach to the next with 4 10mm bolts: one each at the top and bottom, and two more just above and below the center cross-bar. It is ESSENTIAL that all of the holes be precisely located so the panels are interchangeable.

## Door Module

The door module is 2M wide and 2M high and should be located in one corner of the arena. The door module consists of a 2M x 2M open frame supporting a set of double doors. The outer frame and doors are constructed of the 30mm square tubing.

Steel piano hinge will affix the doors to the frame. The doors will open outward and will be secured, when closed, with a simple sliding-bar lock. Bolt in the outer rails of the door frame holes for attaching to the adjacent walls must be recessed to allow the doors to close.



## - Door Lock

Cut two pieces of the 30mm square tubing, each 40-60cm long. Weld one piece to the OUTSIDE face of the center crossbar on each door, so that each piece is aligned with the inner edge of the vertical rails on the doors that will meet in the center when the door is closed (see attached diagram "Doors-3d.jpg"). To lock the doors, slide a 25mm round steel bar through the 30mm square tubes welded to the doors.

## **Floor**

The easiest and cheapest floor for an arena of this type is a simple plywood deck. A steel skin can be optionally added. For robots up to 30kg a 16-gauge (~2mm) steel skin will be more than enough.

### **- Sub floor**

Construct sub floor frame from 2x4" size lumber, ~38 x 89mm. The sub floor should be a square or rectangular grid with on-center spacing no greater than ~50cm. Build the sub floor inside the arena AFTER the arena walls have been set up; this will save endless pain.

### **- Plywood Decking**

Install the plywood floor sheets onto the subframe with deck screws. All plywood edges MUST be supported by a sub floor beam.

### **- Optional steel floor skin**

If you elect to install a steel floor skin, the easiest way to do this is to lay the sheet steel in place over the plywood and tack-weld the corners. Long edges may need to be tacked as well.

## **Roof**

The basic roof consists of plywood sheets attached to engineered wood joists ("Wooden I-Beams").

The joists rest on a wooden carrier beam (~38x89mm stock) laid along the top of each assembled wall and held in place with bolts passed through the top of each wall frame. The joists should be NO MORE than 50cm on center (13 joists for a 6m arena). Joists are secured to the carrier beam with deck screws to prevent the beams from shifting during roof assembly. Plywood roof sheets are then laid across the joists and likewise secured. The plywood skin provides the structural rigidity; the weight of the roof is carried by the wall frames.

The open ends of the roof must be closed off with additional plywood sheathing to prevent the escape of flying debris.

## **Bumpers**

Once the floor is installed, the arena bumpers can be installed. The bumper keeps combatants from directly hitting the polycarbonate.

The bumper consists of a rectangular 120mm x 60mm x 3mm wall steel tube that rests on the floor and is secured to the wall modules with bolts. The bumper extends completely around the inside of the arena. Rubber shock cushions can be optionally installed between the arena bumper and the wall frame; these are basically large rubber washers that fit over the bolts behind the steel bumper tube.