

Laserventure Arena Construction Notes

Materials

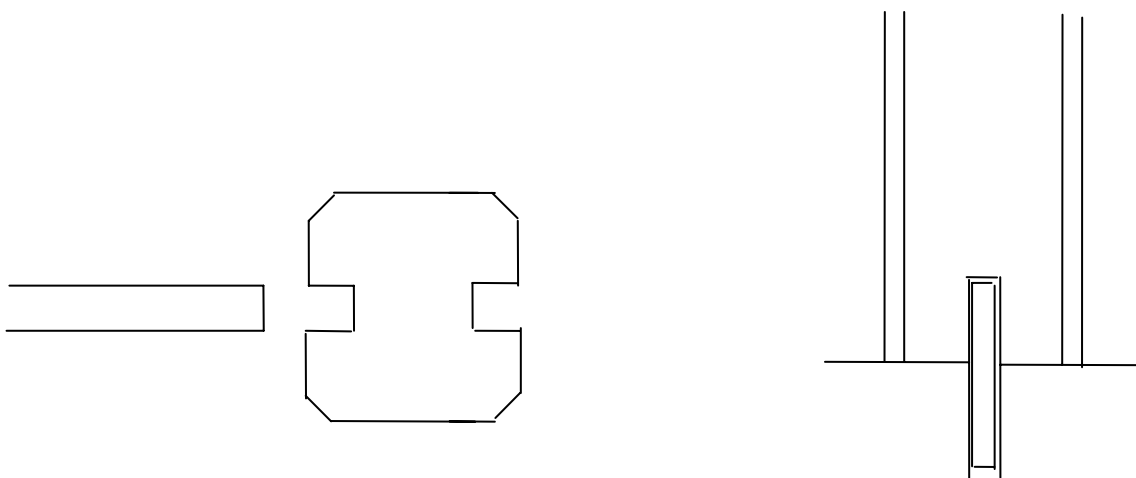
Our quick method of arena construction consists of maze panelling slotted into vertical posts which are held in position at ground level by steel pins.

The **maze panelling** will be either chipboard (particle board, MDF or plywood, 19mm or $\frac{3}{4}$ " thick. MDF is the best material, both from the point of view of working and finishing, and also ability to withstand harsh treatment, but is not available in certain countries. Chipboard may be used but should be good quality with a smooth surface. Plywood is very strong but you have to take especial care to avoid splinters. Where there are 'Murder Holes' (cutouts through which players shoot), MDF is the easiest material to finish, requiring just that the edges of the hole are broken to remove roughness. Chipboard will require filling of the grain (Upol or any other body filler is as good as anything) before painting. The same will apply to ply and in fact it may be necessary with ply to trim the cutouts.

Where the maze is in limited headroom, then the panels may need to be cut down.

The **vertical posts** consist of 4 inch square section timber, the same length as the panelling. The timber should be the 'prepared' type, ie no rough surfaces and the edges need to be broken or chamfered. The posts will need to be slotted with a router full-length to accommodate the panels. The depth of the slot needs to be in the order of 19mm or $\frac{3}{4}$ ". This will give a matrix spacing of 50 $\frac{1}{2}$ " maximum, but will probably be less due to (1) prepared timber being small due to machining, (2) metrication of sheet sizes. Our plans are based on a nominal matrix of 50" or 1270mm. We prepare posts with a heavy duty router mounted in a jig so that there is no need to set up for each post.

The **vertical posts** will be required in four versions: single slot, dual slot (slots on opposing sides of the post), dual slot (slots on faces with a common edge), triple slots and quad slot, this being to accommodate one, two, three, or four panels. All posts (excepting drum maze posts) will require a 3" deep $\frac{1}{2}$ " diameter hole in one end.



If the floor of the site is concrete, you will require one 5 ½" by ½" **steel pin** for each post (excepting posts used for securing barrels, see below). A cheap way to get these is usually to have ½" studding chopped up. The quality of the end of the pins is unimportant. You will need an SDS drill and a supply of ½" bits.

If the floor of the site is timber then you will need to have made some floor plates. The plates will be light gauge (about 0.05") steel 3.5" diameter with two fixing holes on a diameter spaced 1 ¼" each from the centre. The plate will need a ½" stud approx 2 ¾" long welded in the centre. When screwed to the floor, this will allow the post to drop as near to floor level as makes no odds.

Note: When building a second level, the steel pin method can be used as the upper posts must be positioned immediately over the ground floor post.

To stiffen the panelwork you will need (unless you are building a second floor) to add **strutting** to the top of the panelwork. The strutting should be in the order of 3" x 2" CLS (Canadian Lumber Stock) which is prepared timber with the edges broken. The finished size is around 2 ½" x 1 ¾". Purchase in as long sections as possible for minimum wastage. You will need two or three sizes of 5/16" (M8) coach screws to secure the strutting. In places you may have three thicknesses of strutting so obtain screw lengths of, say, 4" (100mm) 6" (150mm) and 8" (200mm).

You will need pilot and clearance drills for the screws and a hex driver head that will fit an electric screwdriver – you will not want to put all the screws in by hand! The screwdriver will need to be a heavy-duty type as the torque required to drive the coach screws home is quite high. Lastly, penny washers (large diameter) for under the heads of the coach screws.

If you are building a **Barrel Maze** then you will not use steel pins to locate the posts but instead will require a post base of the type found at any builders merchants. This is because the bolts that hold the base down will be hidden by the barrels and because the post will need to be tightly secured.

For each post you will require two washed 45 gallon (200l) polyethylene barrels, preferably with indented bases, and preferably ex-foodstuff usage. The posts need to be the same height as those used in the rest of the maze as you will be connecting strutting between the barrel maze and the panel maze.

Panel Maze Assembly

If we have not produced a plan for you, then first draw your maze plan using the following criteria:

- If the shape of the space permits try and create a pattern repeated in quadrants, ie like a swastika. This helps to dis-orient players (they can re-orient themselves by learning the location of signs, Intelligent Targets etc) and makes the maze seem larger.
- Building the maze at 45 degrees to the building walls works well, as the outside of the maze is then zig-zag, providing many ambush points. However if you are building a second level, then it is less work to have the panelling at right angles so that panels can more easily be tied to the walls and cutting of floor panelling is simpler.

- The maze can be free-standing – it does not have to be tied to any of the building structure. This with the proviso that there are the occasional struts at 45 degrees to the panelling. You can of course block off the run around the outside of the maze if you wish.
- Have sufficient exits from the panel maze to the perimeter path and to the barrel maze. Ideally, have an exit every three or four panels.
- At the arena entrance, try to have a double entrance to the maze, so that players in team games can disperse independently of each other.
- Minimise accidents by avoiding long 'rat-runs'. Generally a maximum run of 3 or 4 panels. The exception to this is where the maze is built at 45 degree to the building walls. As long as the distance from the corner of the maze to the wall is no more than about 3 feet, a straight run is acceptable around the outside of the maze.
- A ratio of 70% floor space for the panel maze, 30% for a barrel maze, if you have one, is about right.
- Try and arrange the barrels in an apparently haphazard fashion, not just to avoid rat-runs but to afford players opportunities to shoot right across the maze at certain points.

Assembly can be effected with one person and the use of G-clamps but it is much quicker with two people. Always start from a corner. Use taut string to check and guide installation and work in the same manner as if you are laying floor tiles. Always work outwards from a centre line and fill in the maze as you proceed so that any errors show up early and can be corrected. Make sure you have a square to check that the panels are at right angles. Always check for squareness at floor level.

- It is a good idea to make a simple jig to place at the end of each panel so as to mark the floor for drilling.
- When cutting any materials always wear appropriate dust protection.

For the first post, drill a ½" hole 3" deep where the post is to go. Insert a steel pin into the hole and then drop the post onto it. Rotate the post so that the slots are in the right direction and then run a bead of PVA adhesive down each corner of the slot, stopping about a foot up. If you take the PVA right to the bottom the adhesive may run and pool before you have the panel in place. Offer the first panel up to the post, lifting the lower corner by the post a few inches so that it enters the slot first. The panel can then drop into place.

The completed maze will be self-supporting and very rigid, due to the strutting, but you will need to secure the panels as you proceed. To do this, all that is necessary is to drive home a 2" screw in at the junction of panel and post, somewhere near the top of the panel.

Proceed with the next panel, next post and so on, checking all the time with the square. Refer all the time to the plans so that you can avoid any situation where you have two panels meeting a post. If this does happen then you need to lift the post, angle the panels slightly so the post can be inserted in between and move the panels back in line and then drop the post onto the steel pin.

Strutting (single level)

When the maze is assembled it will need painting and strutting (unless there is to be a raised area in which case see the notes further down). Painting should be done

before the strutting is fitted, also before any floor covering is laid, as there will be overspray.

Paint all the strutting matt black and leave to dry. Cutting to size can be done later.

We recommend that you use an airless sprayer to paint the panelwork. These are relatively cheap to hire, easy to use and very quick. The hirer will give you instructions on how to use the kit but the basic rule is move fast and consistently! Move the nozzle as if you were drawing the crenellations of the battlements of a castle, moving half the width of the spray at a time. This will effectively apply two coats of paint, one after the other. Be sure to wear a good protective masks. The hirer will probably sell these.

The best colour to accept a variety of decorations is light grey. You can easily spend a lot of money on paint, but there is no need. Use white contract emulsion, the cheapest kind available and tint this with black emulsion. A mix of 10% black is usually about right. You may want to make some areas of the maze a little darker for mood. With one operator spraying and the other mixing paint, a 2000 square foot (183 sq m) arena can easily be painted in less than a day. If the paint is applied correctly then two coats will not be necessary. Depending on the porosity of the panels you will need about 10 gallons (45L) of paint per 1000 square feet of arena.

If the size of the arena permits, try to finish all the painting in one session. The panel paintwork will take 24 hours to be touch-dry but at least 48 hours with plenty of ventilation to be fully dry. Until that time fumes will be given off. Ensure that the paint is dry and all fumes cleared before going back to work in the arena.

Cut some, but not all of the strutting to size and touch up the ends with black emulsion. Do not cut them all to size at the start as you may find you need some longer lengths as you develop the strutting.

Struts should be 1 ½" longer at each end (ie 3" overall) than the distance between the centres of the posts. Place a strut in position and drill with the pilot hole through one end, going into the post as well. Open out the strut with the clearance drill and then secure in place with a coach bolt.

Where there is more than one strut on a post it is generally possible to plan it so that the struts are all level. You may have to cut and drill the occasional spacer. Struts do not have to be level, but it looks better.

Murder Holes

This quaint medieval term is given to the cutouts in the panels that allow players to shoot into other areas. The easiest shape to cut is triangular although you may wish to vary this. The cutouts should be central in the width of the panel, but vary in height so that different ages of player can use them.

As mentioned, depending on the material used for the panels, varying amount of work will be required to make the cutouts user-friendly.

Building a second level

First and most important of all, before building a second level, discuss your ideas with your builder, or if self-building, your local building control as regulations vary from country to country.

Looking on a panel maze from above can look a bit messy because of the lack of finish on the tops of the panels. As a general rule, overlooking a barrel maze is OK. If you wish to build a second level that has a smaller footprint than the ground floor, we suggest that the visible open tops of the panel maze are lined with strips of lath (thin strips of timber), about 3" x 1/2". These can be painted black or grey (or decorated with fluorescent paint) and tacked into place at 3" – 6" intervals.

Where there is to be a balcony, the **vertical posts** should be obtained in lengths to total the ground floor height, plus the ceiling/floor thickness, plus a safe height for the edge of the balcony (usually at least 3 feet, 0.9m), ie so that a single post does the whole job. Additionally, these posts should be anchored at ceiling level, with steel angle plates, to the ply ceiling of the ground floor maze.

For the rest of the maze the posts can be cut slightly shorter than the panels so that 4" x 2" timbers can be slotted and laid over the panelwork, resting on the posts

If headroom is not an issue then the cross-supports can then be fitted in between the 'top of panel' timbers, at 16" (400mm) centres, using joint hangers. The ceiling/upper floor should be of good quality 3/4" (19mm) ply.

Where headroom is an issue, it may be acceptable to dispense with the cross-supports, which will intrude into the passageways of the maze. Lay ply directly on the top of the lower maze, cut 4" (100mm) wide strips of ply which are then screwed and glued at 16" centres on the top of the ply, then complete a sandwich construction with a second sheet of ply screwed and glued on top of the strips. The screws should go through the ceiling ply up into the strips and down through the top sheets into the strips also, using 2" screws so that all three layers are screwed.

Access to a second level should be via ramps, not stairs. These should be gently sloped and it is usually better (if not required) that the ramp is broken up with a landing halfway. If you have a straight run with no landing then place panelling at the bottom of the ramp. If not carpeted, ramps should be painted with non-slip paint (not grit). Do not fit battens as toe-grips – these may cause trips.

Each upper level should have two ramps. The width of the ramp should be at least the width of a panel ie greater than 4' (1.2m).

Barrel Maze

Do not start building your barrel maze until all the spray painting is completed. Using a jigsaw or sabre saw cut a large enough hole in the bottom of a barrel to clear the post base. In the top of this (lower) barrel and in the top and bottom of the upper barrel cut a hole just large enough to clear a post.

Probably the best way to fit a pair of barrels is to lay them on their side, slide a post through and then lift the end of the post into the post base. Have a crate handy that can be slid under the barrels as the post is lifted upright. This will hold the barrels off the ground so that you can tighten the bolts. These must be tightened as, unlike the maze posts, there is not much attached weight to hold the posts down. To hold the barrels down, fasten a short piece of batten, or a steel bracket to the post over the top barrel.

Strut the posts as for the panel maze, making sure that you have struts that connect to the panel maze so that the whole structure is as rigid as possible.

Decorating Tips

Maze panelwork can be easily and quickly decorated in an industrial panel style. Cut two or three sizes of hardboard (fibreboard), say 4' x 1', 2' x 2', 3' x 2'. Screw a crude handle along the centre of each panel. Laying the simple stencil on the panel, spray along two edges with black spray paint. Then use a different size panel, and repeat, building up a pattern of overlaid 'steel plates'. To make the 'rivets' that hold the plates, cut a circle of foam about 1" in diameter (or the head of a shoe polish applicator) and dab round the inside edges of the 'sheets' with black paint. Finish off with a wine bottle cork dipped in white paint. To see this effect go to the arena page of our Website at <http://www.laserverture.com/arenas.htm> .

Fluorescent paints are a must in lasertag arenas. Depending on the skill you have available they can be used to good effect in creating murals and 'external scenes' though dummy portholes. You can also have signs screenprinted with fluorescent paint to add mood. Signs like 'Level One', 'Reactor Area' help players orientate themselves and 'learn' the arena.

Another quick and easy method of decoration is to create 1) cable trays and junction boxes, 2) girders. These are made from hardboard or thin MDF and glued in place using gap-filling adhesives such as 'No Nails'. A staple in each corner will hold the décor in place while the glue sets. Cable trays are around 2' x 6", girders 2' x 9". Paint one side and the edges of the material matt white and then have the patterns silk-screened on. We can supply FOC artworks for silk-screen printing the patterns. Cable trays can also be seen on the web-page above.

For the drum maze it is of course good to have self-adhesive 'hazard warning' labels printed, but you can do quite a bit simply by flicking paint onto the drums, creating a 'dripping toxic waste' effect.

Use of a red spray fluorescent paint can be used to create wavy 'alien slime' streaks in darker areas of the arena.

Make sure you have a number of arrowed 'Emergency Exit' signs.