

# Pipe Organ Windchest Construction

*An amateur's attempt to avoid "reinventing  
the wheel" each time a windchest is built.*

November 14, 1998

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## Electro-pneumatic chest construction

### Measurements

- Assumption: toe board is 1" poplar; rack board is 0.5" plywood; bottom board is 1" poplar; Reisner #25 magnets
- Ensure end of rack board and toe board have enough length at the end to accommodate the hole diameter in the rack board with room for the end rack board support piece.
- Ensure rack board is wide enough to accommodate wide hole with adequate wall thickness.

### Toe board

1. Cut rack board, toe board, and bottom board
2. Clamp rack board and toe board together
3. Drill pilot holes for toes and standoff dowels
4. Separate boards
5. Drill standoff holes in rack board and toe board to diameter (not thru holes in toe board)
6. Drill toe holes in toe board to diameter (forstner if possible). Backup bottom while drilling to prevent splitting.
7. Chamfer toe holes on top
8. Drill fillable windholes from edge to valve center (if stepped, largest first)
9. Cut plugs
10. Plug edge holes
11. Drill valve pouch hole into edge hole
12. Sand all boards

### Side board assembly

1. Assemble sides, glue
2. Plane gasket surfaces flat
3. Glue cork gasket material to surfaces

### Screw holes

1. Clamp toe board to side assembly
2. Mark, drill, and countersink for #12 flat head screws, avoid holes in end standoff screw areas
3. Clamp bottom board to side assembly
4. Mark, drill, and countersink for #10 flat head screws

### Valve pouch block and rail

1. Size valve pouch blocks to accommodate pouch diameter and valve pouch rail
2. Forstner drill the pouch depression
3. Forstner drill the spring depression

### Exhaust block

1. Use ¾" - 1" poplar
2. Cut 2-1/2" x 2-1/2" pieces
3. Mark center and four screw holes
4. Drill 5/16" exhaust hole at center of one edge, thru entire block
5. Drill #42 pilot hole on center
6. From outside, countersink screw holes, widen holes for clearance
7. From inside, drill ½" forstner hole, set depth stop to just past 5/16" exhaust hole

#### Primary board ( 3/4" valve diameter)

1. Mark side hole locations on primary board
2. Layout center of valves. Refer to drawing.
3. Drill #42 pilot hole through center of each valve location
4. Drill fillable windholes from edge to valve center (if stepped, largest first)
5. Cut plugs
6. From inside, drill 1/2" forstner holes 3/8" deep
7. From outside, drill 1-1/8" forstner holes, set depth stop to leave inside wall thickness
8. Plug edge holes

#### Magnet location

1. On outside of primary board, determine location of edge of exhaust block
2. Trace Reisner magnet location 1/4" away. Refer to drawing.
3. Mark magnet hole and rectangle
4. Drill out with 3/8" drill and router

#### Primary pouch blocks

1. Drill wind hole in end, (if stepped largest first)
2. Cut plugs
3. Drill pouch depression with ? diameter forstner
4. Drill spring depression with ? diameter forstner
5. Plug edge holes
6. Drill into side of wind hole

#### Primary pouch block spacer rail

1. Determine distance from inside of primary board to primary pouch block
2. Subtract thickness of cork gasket on both surfaces
3. Fabricate spacer rail
4. Glue cork gasket to surfaces

#### Primary pouch assembly

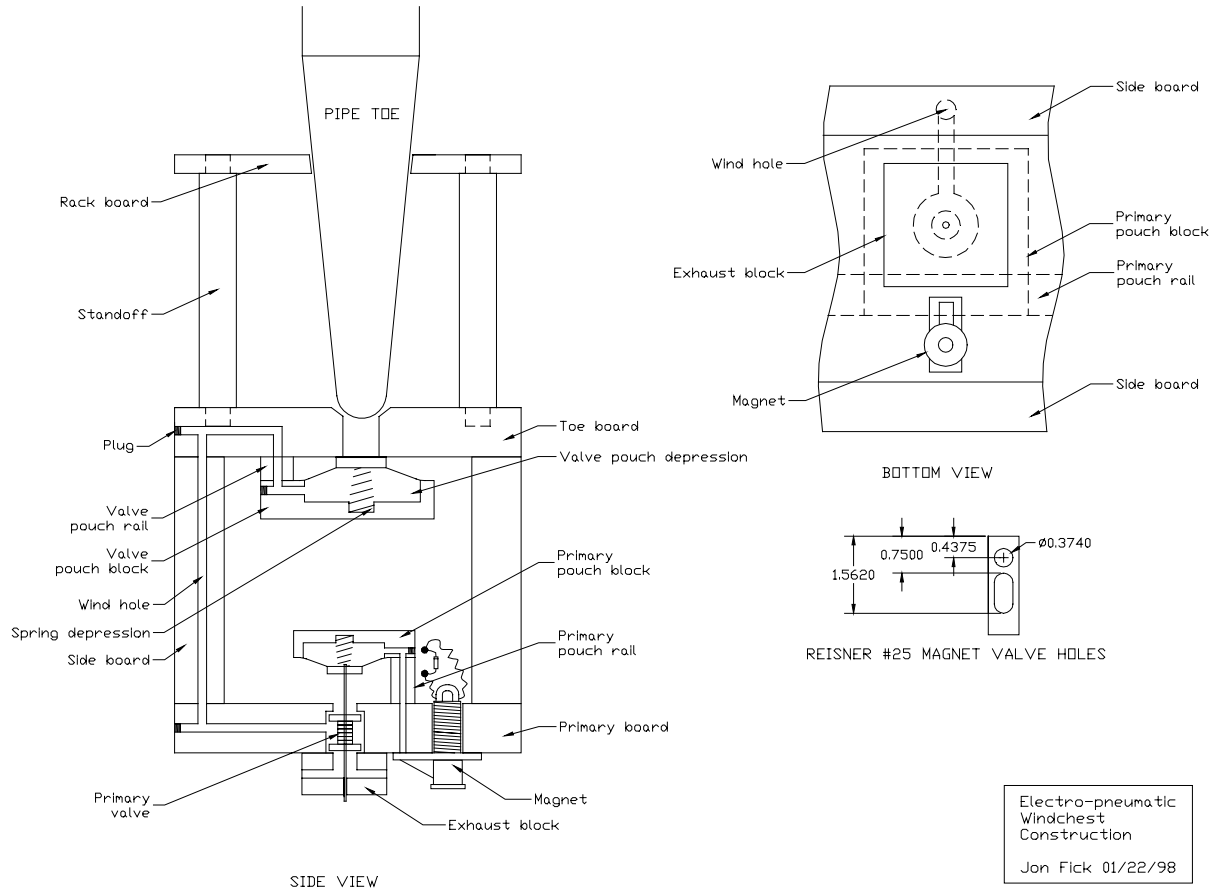
1. Screw primary valve shaft into pouch leather
2. Screw inner leather nut on shaft to correct location
3. Install pouch spring
4. Glue pouch to block

#### Install primary pouch assembly and exhaust block

1. Install primary pouch rail on inside of primary board
2. Extend magnet holes through rail
3. Insert valve shaft into inner hole of primary board
4. Screw pouch blocks into place on rail
5. Insert inner valve, felt washers, and outer valve on shaft. Refer to drawing.
6. Install outer leather nut on shaft
7. Install exhaust block
8. Install magnet
9. Wire magnets (with diodes)

## Assembly

1. Install toe and bottom boards
2. Install rack board on standoffs
3. Fabricate end pieces to support rack board, attach
4. For each pipe, coarse drill the rack board, rout/rasp the final diameter



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## **Direct-electric chest construction**

### Measurements

- Assumption: toe board is 1" poplar; rack board is 0.5" plywood; bottom board is 0.5 inch plywood; Reisner direct-electric magnets
- Ensure end of rack board and toe board have enough length at the end to accommodate the hole diameter in the rack board with room for the end rack board support piece.
- Ensure rack board is wide enough to accommodate wide hole with adequate wall thickness.

### Toe board

1. Cut rack board, toe board, and bottom board
2. Clamp rack board and toe board together
3. Drill pilot holes for toes and standoff dowels
4. Separate boards
5. Drill standoff holes in rack board and toe board to diameter (not thru holes in toe board)
6. Drill toe holes in toe board to diameter (forstner if possible). Backup bottom while drilling to prevent splitting.
7. Chamfer toe holes on top
8. Drill fillable windholes from edge to valve center (if stepped, largest first)
9. Cut plugs
10. Plug edge holes
11. Drill valve pouch hole into edge hole
12. Sand all boards

### Side board assembly

1. Assemble sides, glue
2. Plane gasket surfaces flat
3. Glue cork gasket material to surfaces

### Screw holes

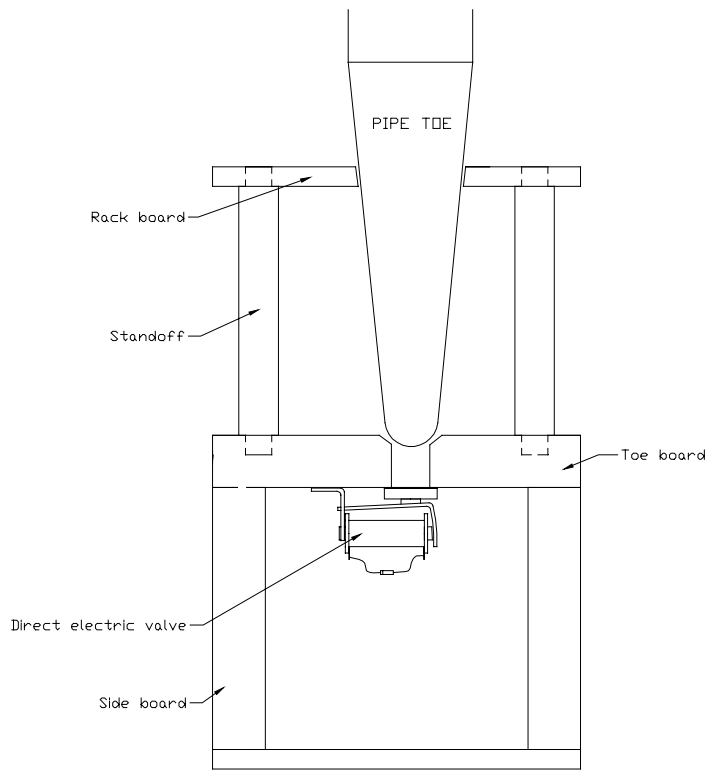
1. Clamp toe board to side assembly
2. Mark, drill, and countersink for #12 flat head screws, avoid holes in end standoff screw areas
3. Clamp bottom board to side assembly
4. Mark, drill, and countersink for #10 flat head screws

### Magnets

1. Install magnets
2. Wire magnets (with diodes)

### Assembly

1. Install toe and bottom boards
2. Install rack board on standoffs
3. Fabricate end pieces to support rack board, attach
4. For each pipe, coarse drill the rack board, rout/rasp the final diameter



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## **Reference**

### Clearance holes

- for #8 & #10 screw, use #18 drill
- for #12 screw, use #3 drill

### Drill sizes

- #42 is 0.093"
- #18 is
- #3 is

### Valve opening distance

- For a round valve to be fully open it must be drawn away a distance of  $d/4$ , where  $d$  is the diameter of the hole. This allows the cross-sectional area to be unimpeded.

### Factoring cross-sectional area

- To change the area of a circular cross section by factor  $x$ , multiply the diameter by the square root of  $x$ . For example, double the area of a 3 inch hole is a 4.2 inch hole.

### Primary magnets

- Generally required for toe holes greater than  $\frac{1}{2}$  inch.