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Introduction

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Welcome to BG's Better Bio-mass Brick Builder Book. This device will let you create one form of an alternative energy fuel for use in a small wood stove or fireplace or anywhere wood or coal is burned (some wood burning stove manufacturers don't like paper to burn in their stoves). The raw material for the fuel can be totally free. I use junk mail, cardboard and sometimes saw dust. Go to YOUTUBE for a free video to see how it works.

There are a few units out there that look very similar to mine but I made some improvements and additions. This publication will show you how to build the device you see in the video. Nothing will be left out and there are no upsells, nothing else to buy from me. Just some in-expensive parts from your local Big Box stores or lumber yards.

Burning paper may be hazardous. There are inks and other chemicals in the paper that may give off toxic vapors or fumes. Do your own research and decide for yourself. Due to the pressures developed when using the device, it can be dangerous to use. These plans call for schedule 40 PVC pipe to be used. According to one pressure table I found, a 4" dia (used here) PVC pipe has an approximate burst pressure of 710 PSI with no holes drilled in it. In a calculation I describe below an average user can create about 377 psi on the surface of the plunger. (The pipe used here has water drain holes so it is probably weaker), so it is probably possible to develop pipe burst pressure with this machine if pushed near its limits so be careful (I have not done much testing in this area). One solution is to use heavier (thicker) pipe. The biscuits can easily be made by the average user so just use a little caution by not over stressing the machine.

This document assumes you know how to use power tools, especially for manipulating wood. If you don't know how to use tools please don't try any of this and / or get someone who is knowledgeable in this area to help you out.

I am providing this information as is, for your information, with no guarantees or promises of any kind expressed or implied except that the plans are as accurate as possible to duplicate the machine presented in the YOUTUBE video. Proceed at your own risk. By purchasing, using, reading this information / document, you are accepting full responsibility for any outcome, damages, loss, injury to yourself or others. You agree to indemnify and hold me harmless and defend me from any action against me due to your purchase and / or use of this material and / or any *losses, liabilities, and claims* arising out of or relating to this transaction. You are responsible to determine if this is for you or not.

General

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When drilling the bolt holes, in general, you should use a drill press or some other method to get a straight hole. The front legs should be accurately aligned and clamped together so that the holes can be drilled simultaneously. Same applies to the back legs and any of the other dual parts that need bolt holes. There are inexpensive devices you can get for an ordinary drill to allow it to act as a simple drill press. Cutting all the pieces straight and to accurate length is important. The whole building and usage experience will be greatly enhanced if accurate lengths, cuts and holes are made in all cases.

The basic design of the device is very similar to others on Youtube. I have made what I consider improvements and additions to the one I built. You have those improvements and changes here. I describe here what I built and what you see in the Youtube video.

One other point of interest. You probably noticed that there is crud all over the device I show in the pictures. I was going to use a picture perfect, cleaned up unit to show you but I decided (besides being easier) to show you I actually use the press that I am advertising.

Please read through this whole instruction book at least twice before doing anything including buying any of the materials. It is always a good idea to have a good overall understanding of any project before proceeding with it.

……I did some calculations and came up with the following numbers. Pulling down at the end of the main lever with 40lbs will press with about 700 lbs on the low pressure end of this machine. 40 lbs on the lever will produce about 1900 lbs on the high pressure end. Pulling the lever with 50lbs will produce 875 lbs and 2375 lbs. respectively. At 2375 lbs the circular plunger presses on the material with about 377 lbs / square inch (psi). This is more than enough to make the biscuits. According to one information source the schedule 40 pipe used in this construction can take up to approximately 710 psi before it bursts. Don't try pushing the machine to it's limits.

If you find something wrong with the plans and have any other questions and / or comments please e-mail me at: freefuel@bgtaylor.com

Go get the Materials.

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I'm going to tell you what I used for the unit you see in the youtube video. You could use less expensive and somewhat different material but I'm going to stick to what I did. I used 2, 8ft pressure treated 2x4's, 1 pressure treated 2x6 (less than 6ft), and a small scrap piece of pressure treated 1x4. And some silicon caulk. Make sure you get straight pieces of wood! I find that when I shop at the big box stores I usually have to look at 3 or 4 pieces before I find one that is straight and that's on a good day!

There will be some leftovers but not much. I also used pressure treated lumber because the lower boards are always wet when using it. You can decide. Regular non-pressure treated lumber is, of course, less expensive.

According to Lowes the wood I used is pressure treated, not used for ground contact, safe around people and pets, Southern Yellow Pine. You may want to substitute harder wood (especially for the high pressure points) but that would be more expense and so far I have found that not to be necessary. This specific type of wood may not be available where you are, especially outside the USA and this continent.

Hardware used for this project:
QTY= 4, -- 5.5" Hex Bolts, 3/8"
QTY= 2, -- 6.5" Hex Bolts, 3/8"

(You may have noticed I didn't use Hex Bolts. However, Hex bolts won't twist when trying to tighten them because you can use two wrenches to do the work)

QTY= 20, -- 3/8" Flat Washers

QTY = "as needed", -- 4", 3" and 2" Exterior screws that can be used with pressure treated wood. I used Grip Rite brand "High Performance Exterior Screws", with the star type drive head. These are much better than the normal Philips or flat blade screw heads. The screw bit comes with the screws.

You will need a longer than normal 1/8" drill bit to be sure the holes are long enough for the 4" screws or you can use 2.5" screws with a normal length drill bit. You will need a few more of them.

Cut the Wood.

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See the drawings and images sections below for all dimensions and visual info. Numbers in (..) on the DRW's are mm (millimeters). Cut the 2 rear legs out of the first 2x4. Remember that the thickness of the saw blade makes a difference. The leftover piece of this 2x4 is not quite enough for the 2 front legs (because of the saw blade) so take these out of the next 2x4. Continue until all the pieces are cut. This may take a little time but be patient. Just do one at a time until you have them all. When cutting the "H" and "D" boards use one piece of a 2x4 which is 30" long. Cut it down the center (the long way) so you have two 30" long pieces. Use one piece for "D" and the other piece can be cut up for the 2 "H" boards. The 1.75" dimension won't be exact but it doesn't matter in this case and you can save material and time.

Cut a 6 inch piece of the schedule 40 pipe. You will be drilling holes in it in the next section. I just used a saber saw to cut the two round pieces "J" and "K" out of a piece of 2x6 pressure treated lumber. It was pretty rough and I needed to use a file. "K" has to fit snug in one end of the plastic cylinder without being too tight. "J" should be a bit more loose than "K" because it will be doing the compressing as the apparatus pushes down on it. You may have to make some minor adjustments after you try it for the first time. These 2 items should also be coated with oil or a waterproof finish to help prevent expansion by water absorption.

Cut the plunger extender (board "I"). The length of this is somewhat critical so that you get full use of the compression area of the apparatus. Watch the YouTube video for better details. Next cut the FOOT "P". This is important for overall stability of the machine in the upright position as you are pressing the biscuits. Once you see how it works you can always make your own improvements. This is how I did it.

Cut the 2 "L" pieces. I have to admit this was the hardest part for me since I don't have the correct tools to do it. It was a real hack job but necessary to allow extraction of the pressed biscuit from the cylinder. Watch the video for more details. Slide5 shows "L" with non-symmetrical ends. Try to make them like DRW-6.

The last two pieces to cut are "N" and "O". "N" stops water from running out the end of the press as well as establishes the boundary for the high pressure end of the press. "O" helps with the placement

of the removable extractor piece (one of the "L" pieces). It also establishes the boundary for the low pressure end of the press.

Drill the Holes.

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Mark the center of the 2 holes on one of the "A" boards only. Line up and clamp the two "A" boards together tightly with 2 c-clamps. You may have to fuss with this a little in order to lay the two boards together flat and perpendicular (90 deg) to the drill bit, under the drill press or drill mechanism. Line up the drill at the center of the holes and drill through both boards. These holes must line up exactly when assembling and this is the only way to do it with basic tools. It works very well. I used a 3/8" wood bit.

Continue on with the "B" boards, and "H" boards with the same method. You may only need one c-clamp to work with the "H" boards. There are two "F" boards as well. These require pilot holes for the wood screws although you could use bolts here as well. There is only one "G, C, D and E" board that require 3/8" bolt holes.

Holes in the schedule 40 Chamber (part "M") are 1/8" alternating and are separated by ½" These are necessary to let the water out while compressing without letting too much material out at the same time. To make accurate placement I took a ruler and marked off ½" increments on a standard piece of paper then cut a ¾ to ½ inch strip with the marks on it and wrapped it around and taped it to the cylinder. This allowed very consistent (but not perfect) hole spacing's. I used a drill press to drill the holes. The holes must go all the way around and within ½" of the bottom and 1" of the top. See SLIDE THREE. You will note I have a few more holes than necessary at the bottom.

Mark the holes for 2 "F" pieces See Drawings. DO NOT drill these here.

Take the time to set up each piece carefully to drill the holes. You will thank yourself and not cuss me out later when it comes time to put everything together.

Assemble the Parts.

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Assuming you have all the holes drilled, it is time to put the whole thing together. Refer to SLIDE FOUR (sorry it's sideways). This best shows the parts relationships. NOTE: You will probably need to tap the bolts through the holes with a small hammer. If it takes more than a few light taps then the hole, or the bolt is not straight, or the wrong size. There should also be no wobble either after the bolt is inserted.

Start with the 2 "A" boards and 1 "G" board and 5.5" bolt washer and nut. Set "G" board on a FLAT surface with the holes in the downward direction as in SLIDE FOUR. Stand the 2 "A" boards up as shown with the hole closets to one end toward the bottom. Line the holes in the 2 "A" boards up with the hole in the "G" board and slide the 5.5" hex bolt through. There will be a space (about an inch) between the flat surface and the end of the "G" board that is connected to the "A" boards. The picture is not very clear because of the spacer board under the, and supporting the 2 "A" boards. More about the spacer board later. Otherwise I think the picture is clear enough.

Next, do the same thing with the 2 "B" boards and the other end of the "G" board. In SLIDE ONE please note the position of the upper hole in the 2 "B" boards. Also, direction of the lower bolts does not matter. Tighten the 2 bolts enough to hold the structure together. You may have to temporarily loosen them a little later.

Take the "C" board and the "D" board and connect to the upper holes of the "A" boards as shown in SLIDE ONE & FOUR. Note that the hole 3 inches from the end of the "C" board connects to the "A" boards. Also, what you can't see in the pictures are the extra washers used between "C" and the "A" board on either side. See SLIDE FIVE. Make sure the non-slot end of the "D" board is used on this end with the slot facing IN on the other end of the board. Use one 6.5" Hex bolt for this. Let the other end of the "C" board rest on the "G" board at the "B" boards side of the structure.

Now get the "E" board and connect it to the other end of the "D" board and the 2 "B" boards using the other 6.5" Hex Bolt. Note where the holes are in the "E" board and how they are positioned next to the other boards (Slide one). Use 2 extra washers as shown in SLIDE FIVE. Let the "A" side of the "E" board rest on the "C" board.

Now it is time to complete the assembly of the press portion of the device. Get the 2 "H" boards and assemble / connect them to the loose end ("B" side) of the "C" board. The other side of the "C" board should already be connected to the "A" boards and "D" board. Assemble the other ends of the "H" boards to the lower hole in the "E" board. You will of course have to lift up the "C" board to do this. The bolt head of this assembly must be on the side of the picture you can't see in order for the bolt to slide past the slot in board "D" when the press is in motion. Lift up the "E" board all the way up until it is straight up and down then bring it back down again. Make sure that board "D" slot does not interfere with the upper bolt head in the "H" and "E" assembly.

Next you need to install the 2 "F" boards These will complete the lower beam section. These are installed with outdoor deck type screws. I used 4 inch screws so that they went through all three boards. Position the 2 "F" boards on either side of the "G" board. Line up carefully and clamp in place with two C-clamps, one on either side. Clamp tightly. You must drill pilot holes in order to put the screws in. 1/8" holes will work well. Once you get one screw in on both ends you can take the C-clamps off and put in the rest of the screws. Don't try to pre-drill these holes in the drill section above and DON'T remove the clamps until the first 2 screws are in as described above. These must be drilled after the C-clamps are tight. Drill all the way through the three boards. Alternate putting the screws in from either side (one "F" board or the other).

When installing any parts that require wood screws in this assembly you must clamp the wood pieces together first then drill the pilot holes through the pieces involved then drive the screw through with a screw gun or there is a good chance you will split the wood and / or misalign the pieces. I always drill a countersink hole as well for the screw head to be flush or below the surface. This makes the whole assembly the strongest it can be with the least amount of stress. I drill 1/8" holes for the screws.

Once all the parts are installed, except "L", "N", and "O", "P" and "F's" and "G" are screwed tight then tighten up all the bolts snug but not excessive. It is important that the parts are cut correctly because the 2 "F" boards have to fit exactly between the "A" and "B" boards to help square up the machine.

Install the "P" board (foot). Make sure the already assembled machine is on a flat hard surface. Then place board "P" as shown in SLIDE ONE on the back / outside of the lowest portion of the "B" legs with the angle cutout of the "P" board down so it is resting on the two ends of the cut out. These are like two separate feet. This may be harder to clamp in place than other pieces of wood but you have to make sure to drill pilot holes first before inserting screws. Exact placement of screws is not important in this case but you should use at least 2. Also, 4" screws may be overkill so you may want to use 3" screws here. When finished with the "foot" the whole machine should be able to sit upright without wobbling or falling over.

Install one "L" board, against the two "B" boards while centered on top of the 2 "F" and one "G" boards (see SLIDE 4). Use 2" screws. Exact placement of screws is not important but the more centered and symmetrical, the better. What is important is that the heads are below the surface of the "L" board. The other "L" board remains loose and is placed against the "O" board facing the other "L" board during operation. See the youtube video for operating details.

Install the "N" board against the inside of the "A" boards resting on top of and centered on the "G" and "F" boards. Two 2 or 3" screws will hold this in place. This stops the water from running off the end of the machine and forces the water into the tray below. This also establishes the far placement on the maximum force end of the machine.

Install the "O" board. Carefully clamp the "O" board in place (See Drawing DRW-8 & 10). You can either pre drill the two pilot holes for board "O" on a drill press then clamp the board in place and finish drilling the pilot holes into the "F" boards or clamp it first and then drill the holes. There is not much room so drill the holes carefully.

Miscellaneous but important parts are:

The water collection tray is placed under the whole device to catch the streams of water as the biscuit is pressed. There is a lot of water. I used the cover from one of those plastic storage bins, placed upside down under the device. It just perfectly fit between the lower "A" and "B" boards under the "G" and "F" boards with the use of a spacer under the legs. This was sheer luck. The container is a Hefty brand, Hi-Rise Pro, 40 quart, 24.14" x 16.81" x 7.8" (remember, all you really need is the lid) from Lowes.

I drilled a hole in one corner of the tray lid (see SLIDE FOUR) and mounted a 5/8" quick connector for stiff (but still flexible) plastic tubing (quick connect has threads for mounting). This tube runs down to a bucket which collects the water which can be used over and over again. You can put different spacers under the legs ("A" and "B") boards to accommodate different height water collection trays. Notice that I have one 2x4 thickness board under each set of legs. Actually the Foot "P" is resting on the spacer near the "B" legs.

Operation

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I was going to give a complex detailed operating procedure here but decided it would be much better to watch the video on YouTube. I narrate the procedure as well. In this case a video is definitely worth a thousand words.

Slides

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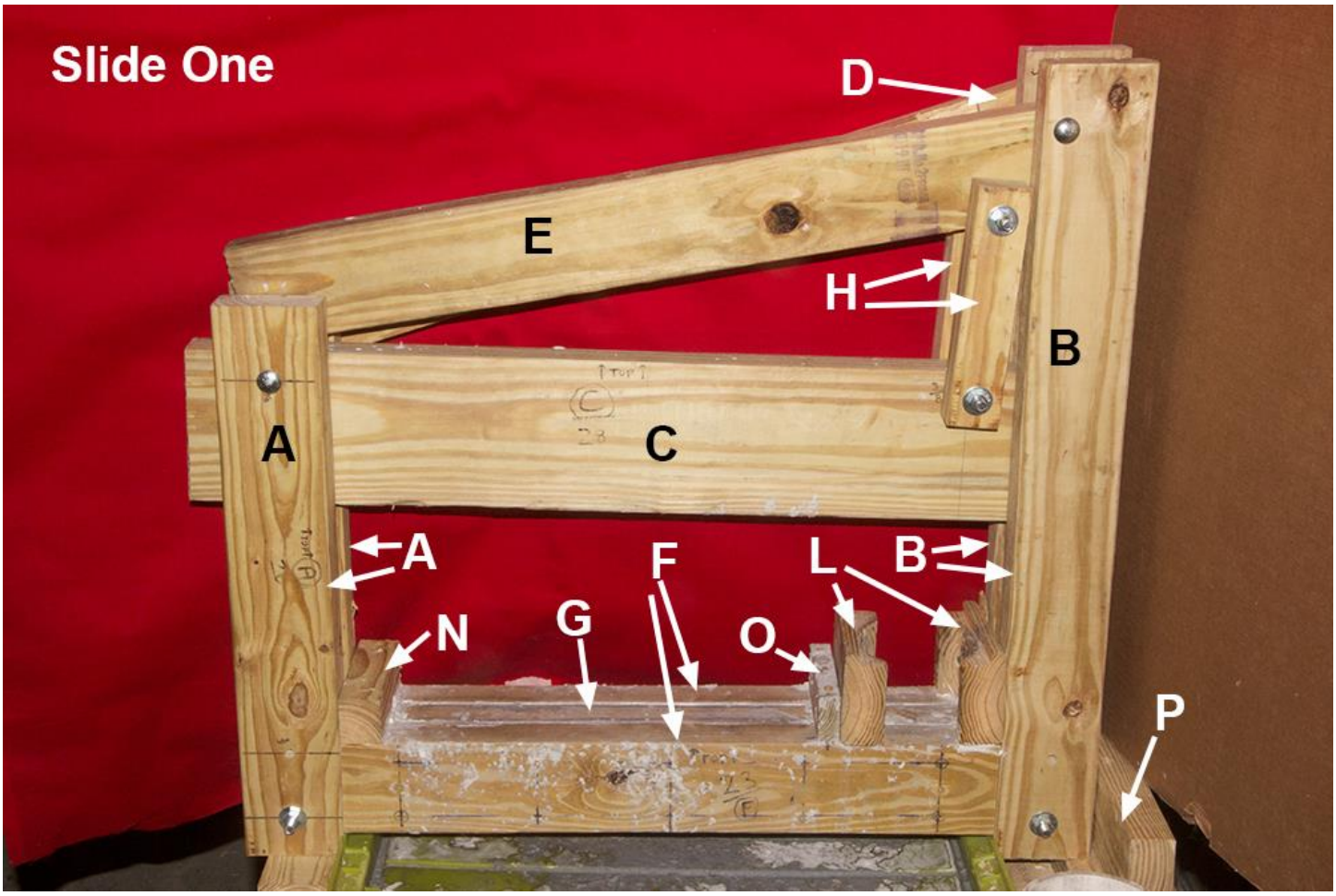

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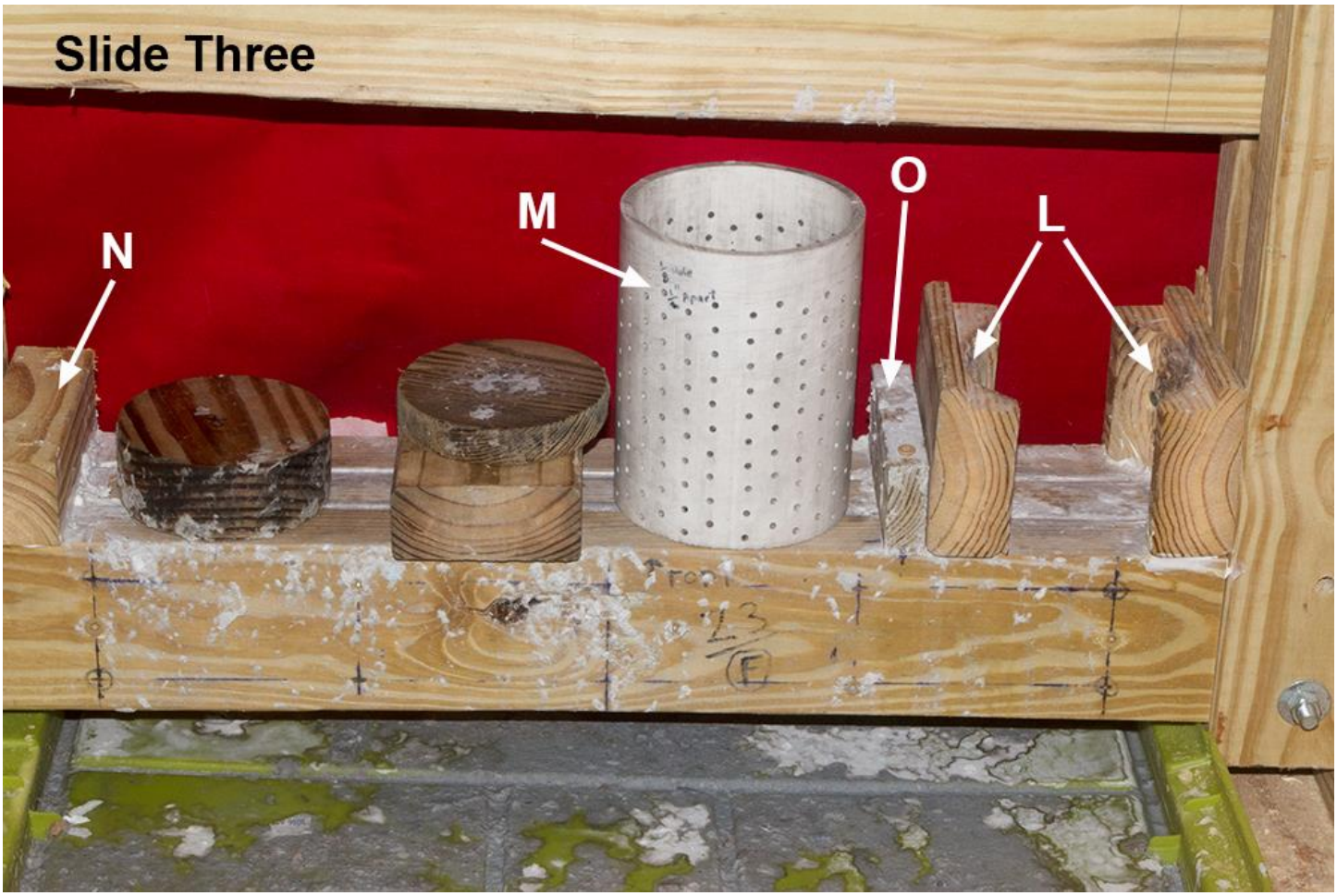

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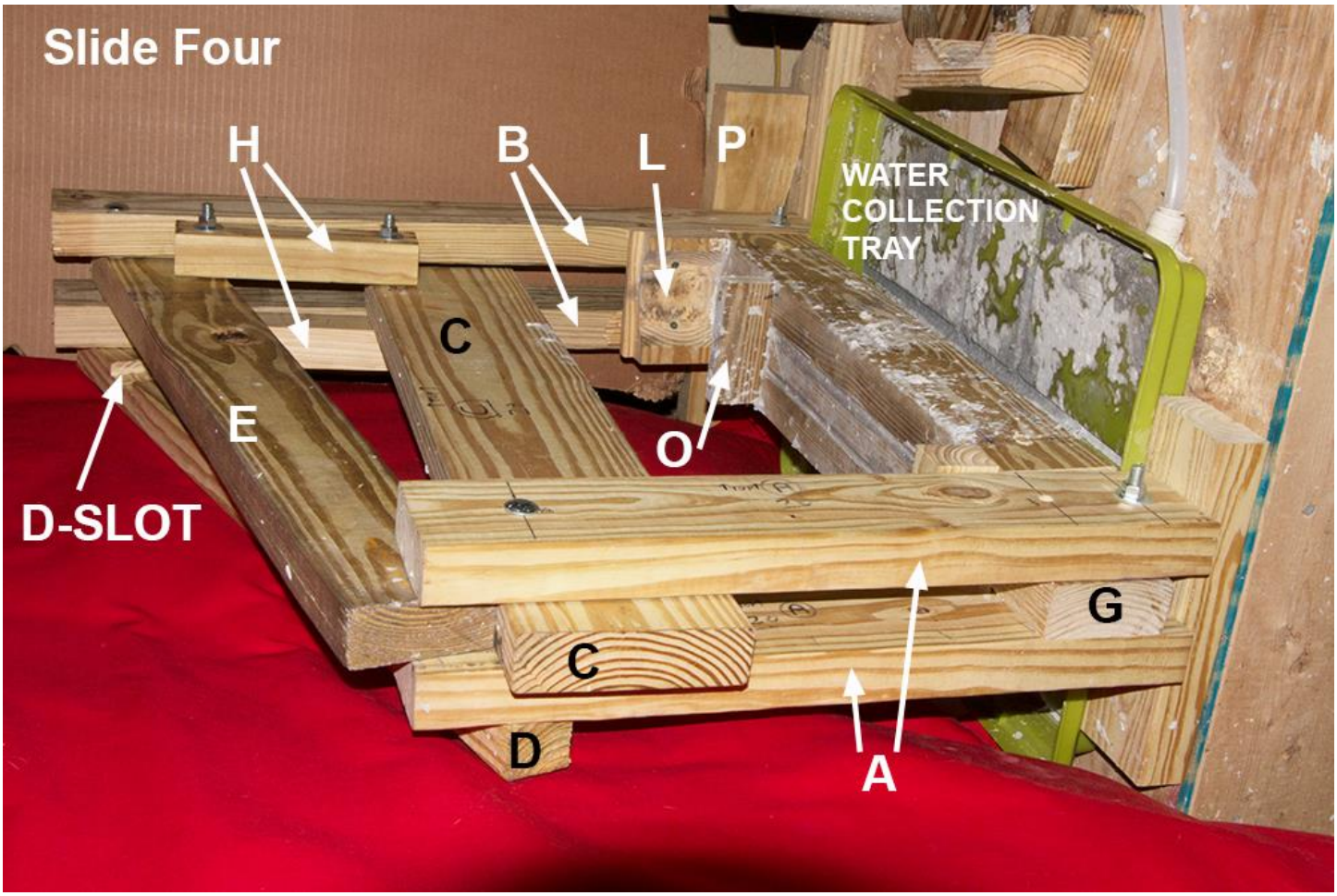

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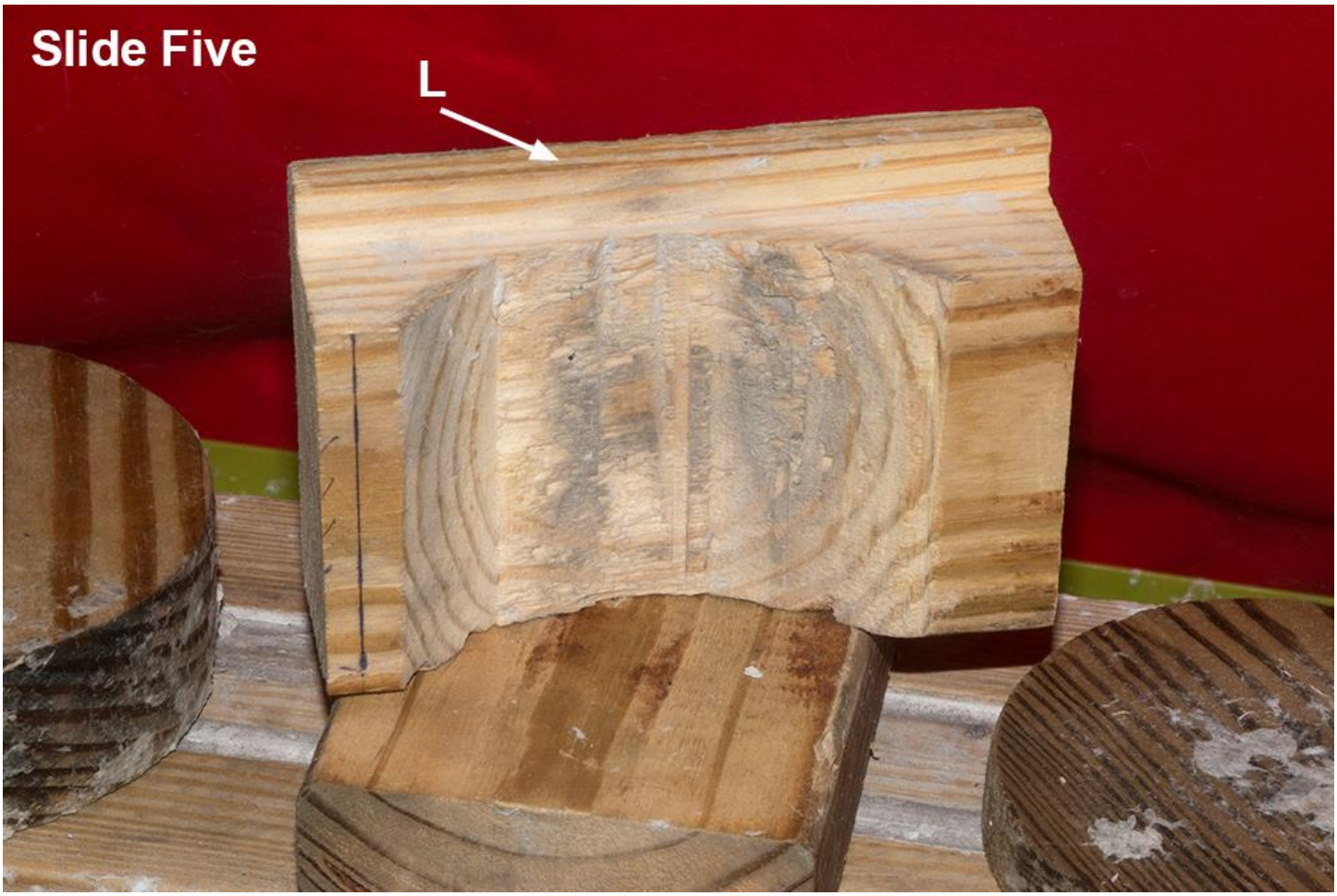

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Drawings

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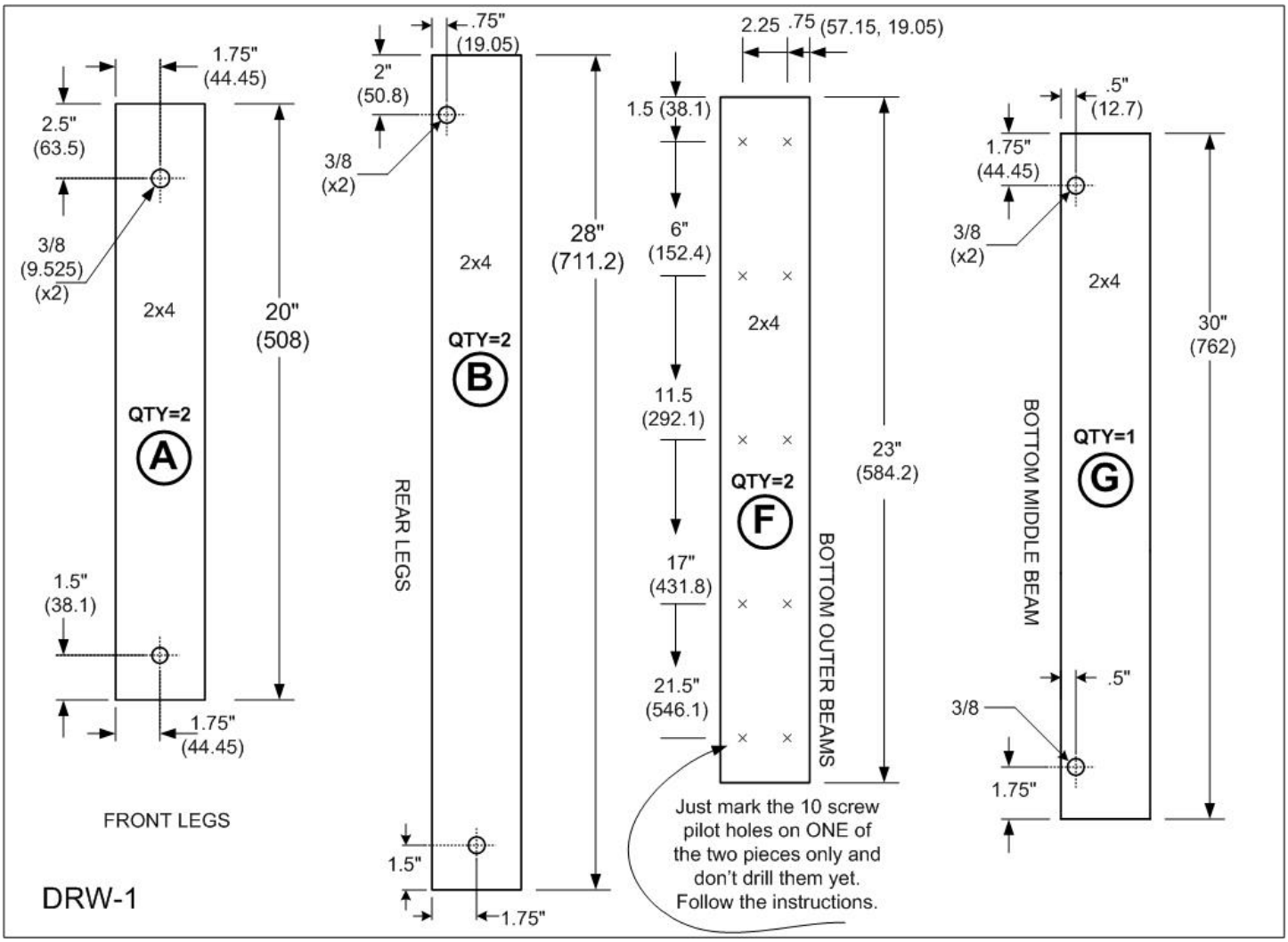

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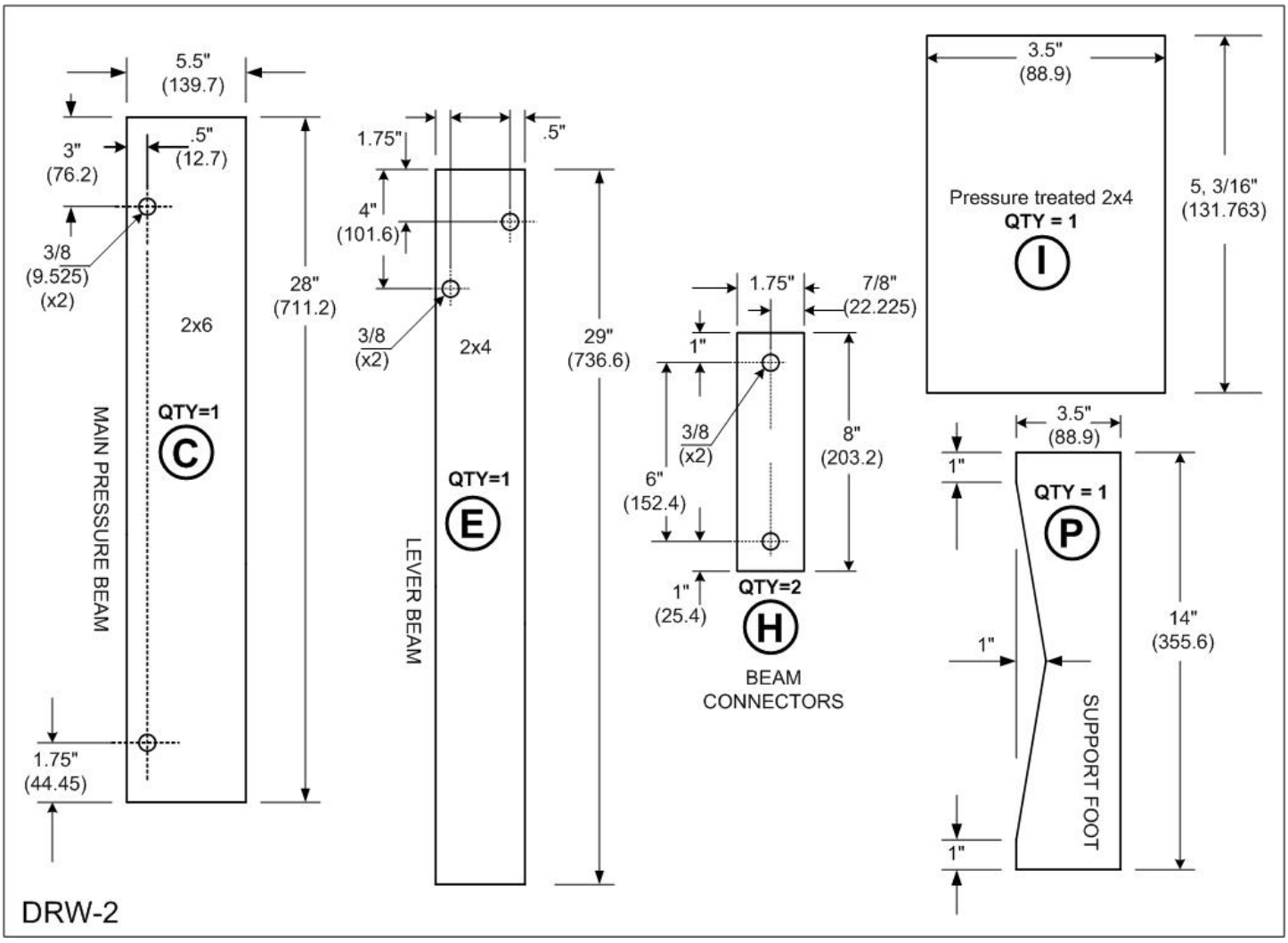

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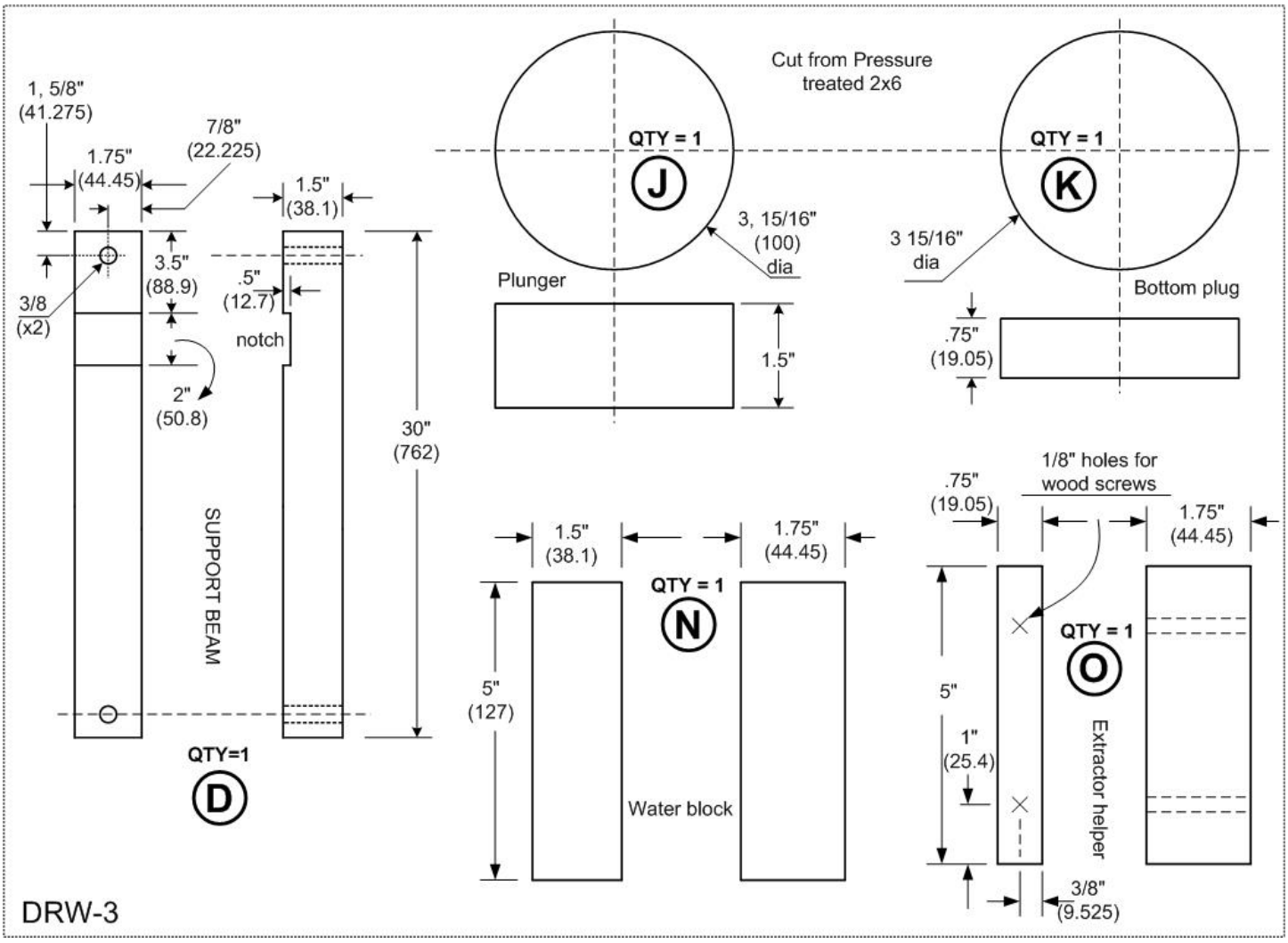

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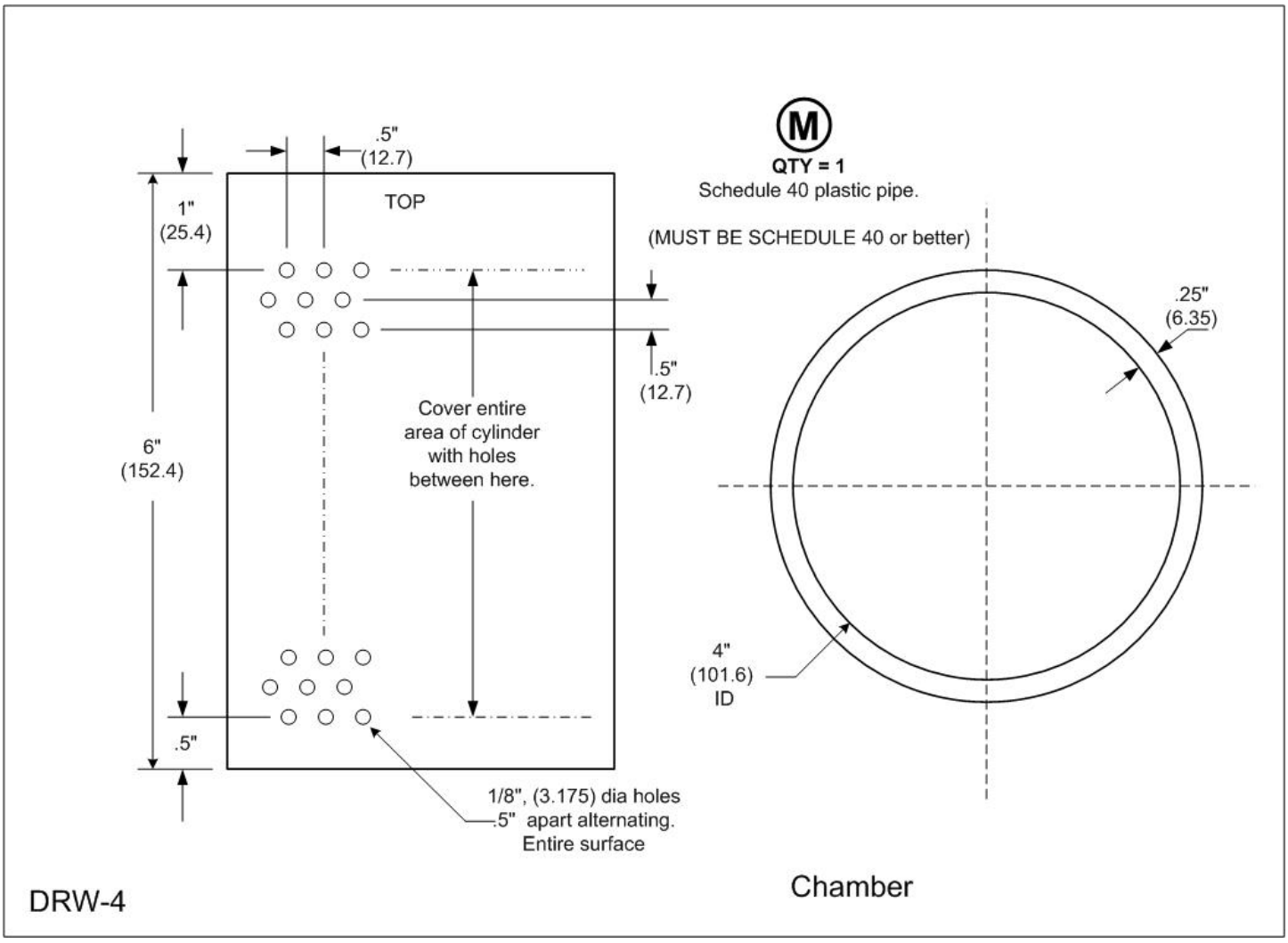

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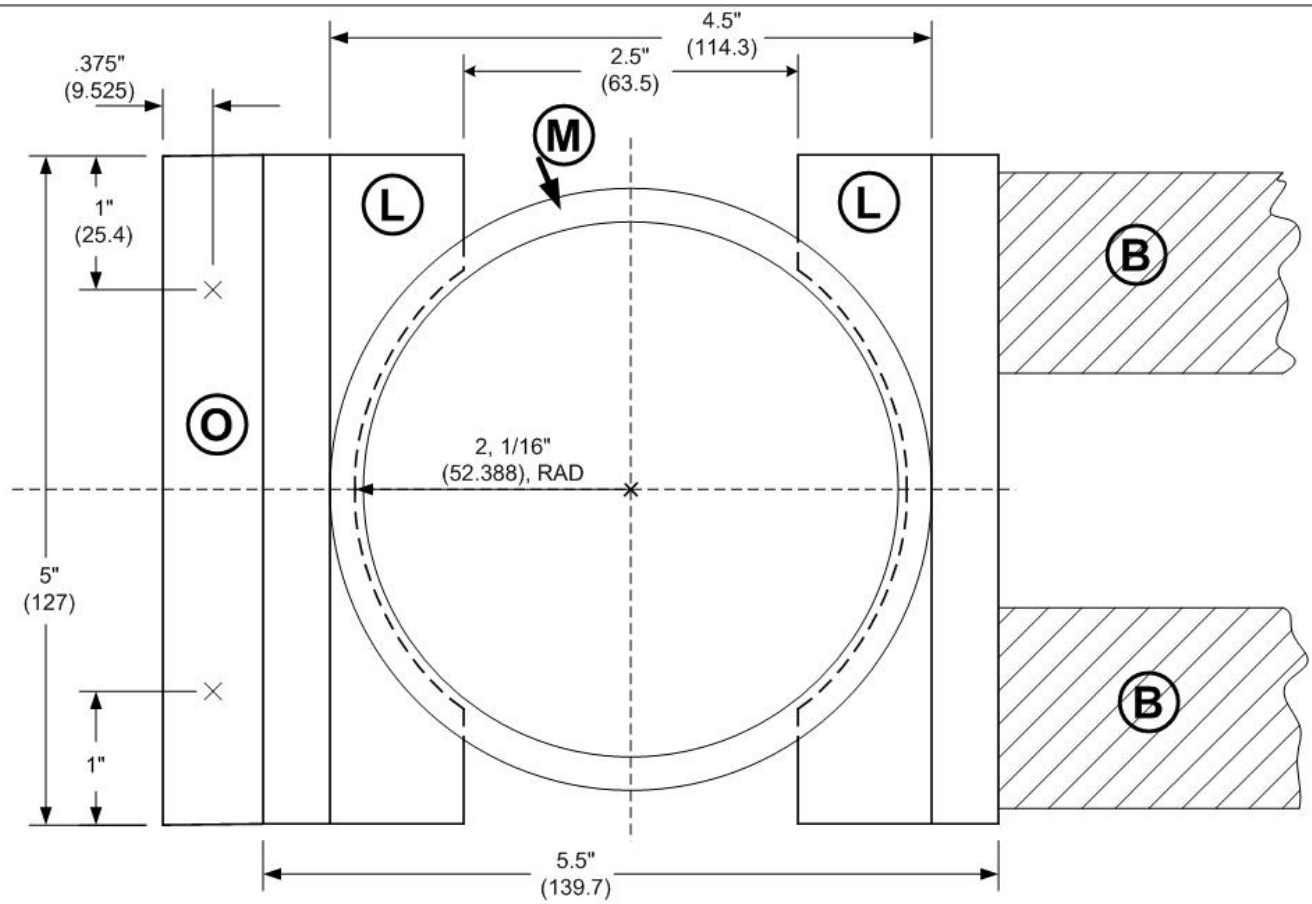

Plastic CHAMBER (cylinder) "M" on top of "L" shown with the "L" and "O" boards, with one "L" board up against the "B" boards. See SLIDE ONE & FOUR. This view is looking down from top with "L", & "O" sitting on top of the "G" and "F" boards which are not shown.

DRW-5

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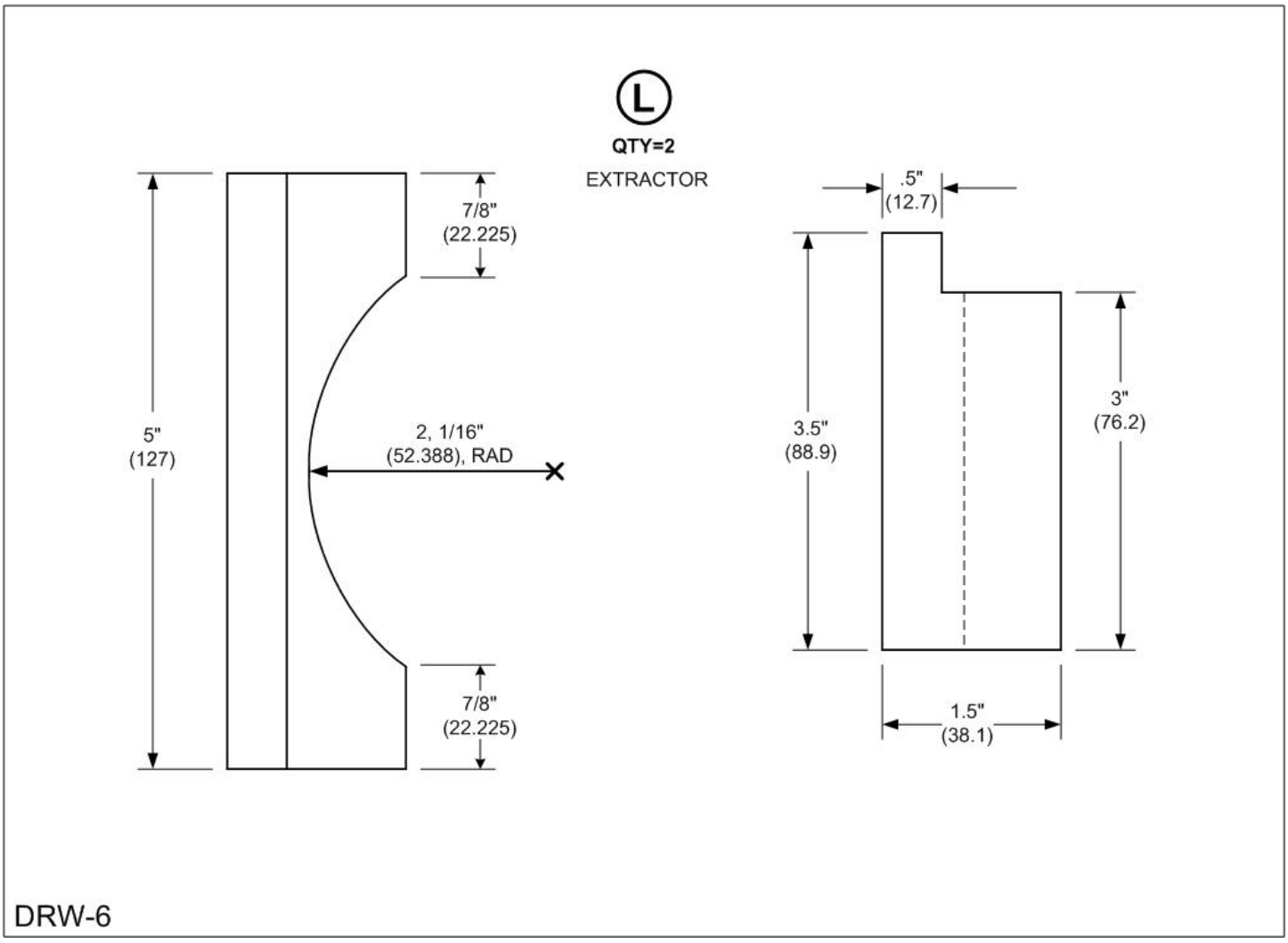

DRW-6

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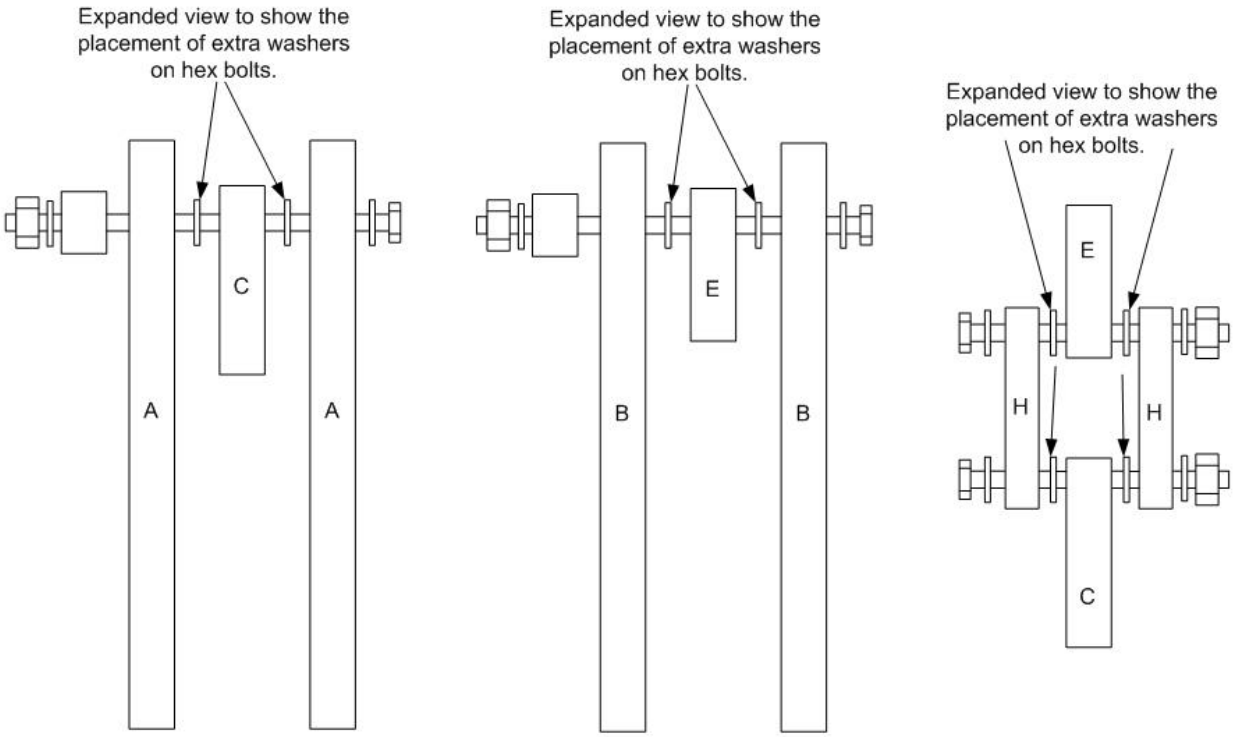

DRW- 7

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Making the slop (Raw biscuit material to be pressed)

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Using junk mail, egg cartons, cardboard, magazines sawdust, old newspapers etc, create the raw material for making the biscuits. Fill one of those 5 gallon plastic buckets with the paper goods within a few inches from the top of the bucket. Fill the bucket with water so it covers the material in the bucket (or just add more water later). It would be a good idea to leave a few inches between the water and top of the bucket.

Using a drill with chopper attachment (see youtube video and Slide Six) chop up the paper in the water. This can be a bit messy until you get some experience and it is a bit dangerous, so be careful. The blade was made from a 4" square electrical box cover. I simply cut away some of the box cover material and bent the pointed ends over with a hammer. To give you some idea how dangerous this is, I was chopping full drill speed when the drill was almost jerked out of my hand. Turns out that one of those blades caught the side of the bucket and twisted and snapped the bolt apart that held the blade to the extended drive shaft. Besides fixing the blade connection I had to repair the hole in the bucket. To help stop this from happening again I place the spindle shaft on the edge of the bucket at an angle (see video) and this helps give some stability while the blade spins. I believe a better way to do this is to use many, much finer teeth from a normal dremel tool blade or something similar. I haven't tried that yet. Also, it helps to let the paper soak in the water for a while before trying to chop it up. Some types of paper (with water proofing additives etc) won't work well. You will figure it out as you go.

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