Picnic Table Design 101

Objectives:

To design a picnic table with the following attributes:

- *1. Uses standard dimensional lumber sizes.*
- *2. Uses uncomplicated cutting and assembly techniques.*
- *3. Is user friendly.*
- *4. Minimizes waste.*
- *5. Doesn't require those confounded diagonal cross braces underneath.*
- *6. Can be set on edge, stably, for storage or transport.*

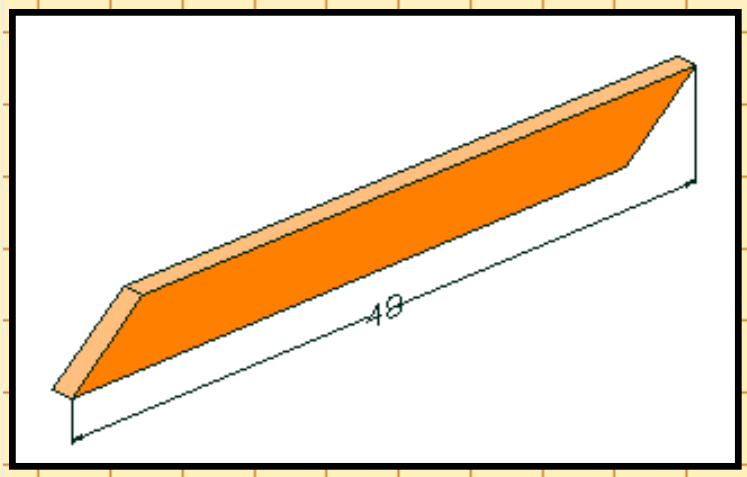
Standard dimensional lumber, to me, means 2-by-4 and 2-by-6's. Uncomplicated means, no fancy joinery or tools required beyond the basic circular saw and basic carpentry hand tools. User friendly means it is comfortable, convenient, and safe to use. Minimizes waste means I don't end up with a table and a pile of firewood. Those confounded cross braces that are usually seen installed to prevent racking just detract from the overall appearance, are difficult to design in, in effective ways, and will cause you to bang you head &/or knees (yes, you will be under the table at least once to fetch the lid from the relish jar) at least twice per season, thereby conflicting with design objective 3. The table should be able to fit in the back of a pickup truck or somewhere out of the nasty winter weather, and this is made easier if it can be free-standing on any plane.

Basics:

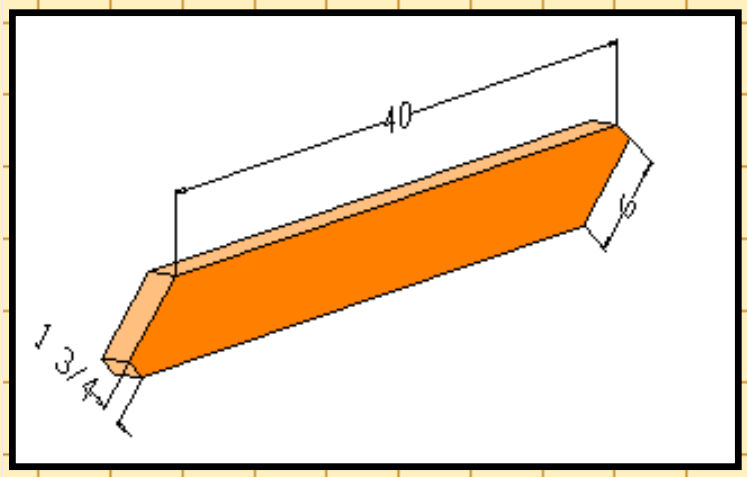
The table top and seat top heights are the two dimensions which are least open for adjustment. A standard tabletop height is about 30", and the height of the seat top should be about 16"-18". Since we are going to use simple cutting techniques, it should only require cuts at 90 degree or 45 degree angles. You just can't get more basic than that. All of the design issues will fall out of these basic principles.

Design & Cut:

The most complex part of the design will be the legs, so we start with them. The legs are cut in pairs, from two 8' lengths of 2X6 lumber. First, cut the 8' boards into four 4' boards. Now, mitre cut each end at 45 degrees so the ends are are parallel. This should result in four boards that each look like this:

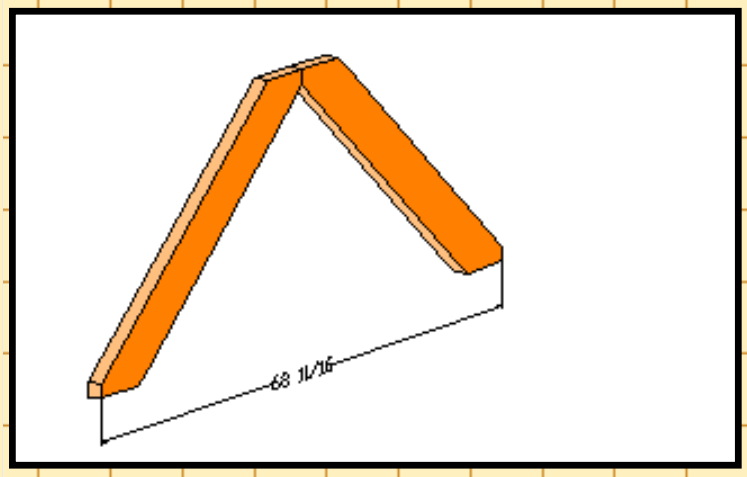


The next step requires the most difficult measurement and cutting in the entire project. Using a combination square, measure back 1-3/4" along the mitre cut, from the pointy end of the board. Mark a line perpendicular to the mitre cut, which should end at the edge of the board, 1-3/4" across. Mark and cut these points off on all eight ends of the four legs. This completes cutting of the legs. You should have four legs that look like this:



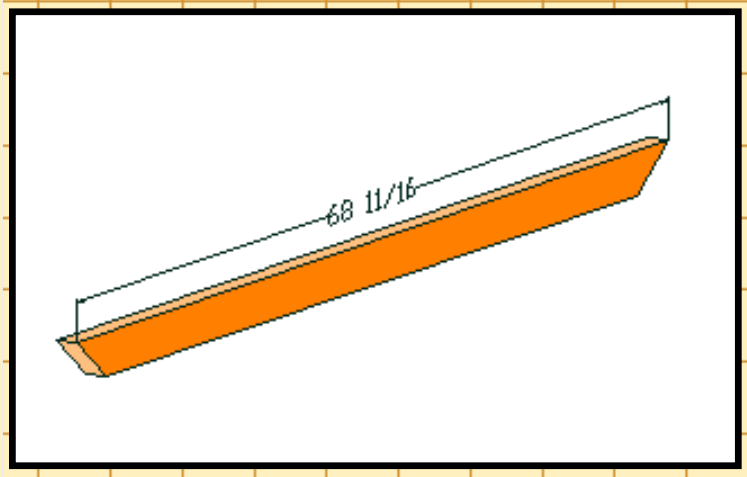
The legs will be aligned with the two parallel mitre cuts facing the underside of the tabletop, and the ground. Under the table top, the two 1-3/4" high end faces will butt together. The other 1-3/4" faces represent the outermost extremities of the table. When the legs are aligned in this fashion, the distance between the outer ends of the opposing legs is found to be 68-11/16". This is the dimension we will use for the beam that supports the seats. This way, the outer edge of the seat will be plumb with the outer end of the legs, and the whole thing can

be propped up on it's side without it falling over.



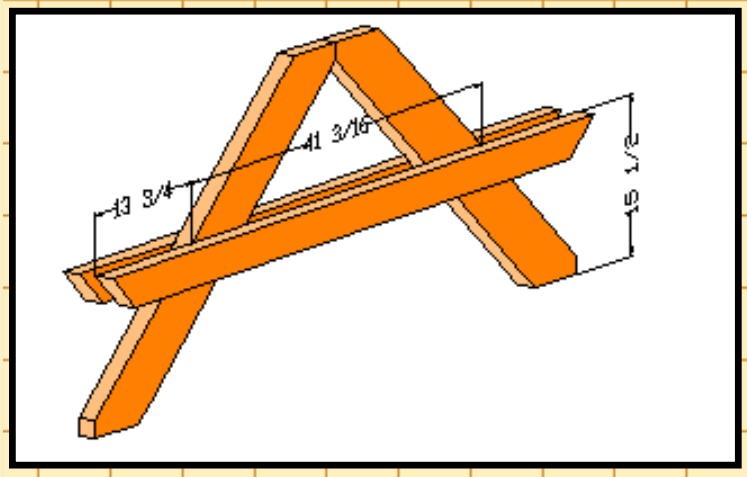
This is how the legs are arranged; one pair like this at each end.

So, cut four 2X4 beams to this length, and then mitre cut the ends of the beams so the ends angle inward and downward on all eight ends, like this:



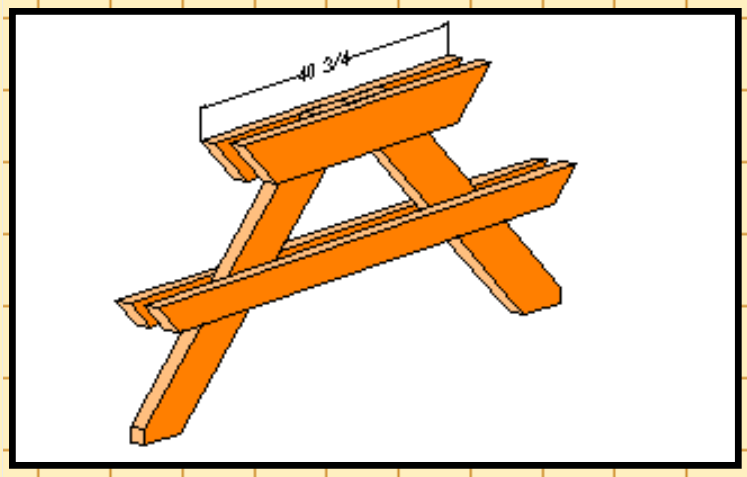
Seat beams: Cut 4 of these from 2 X 4 lumber.

The seat beams will be used in pairs, one at each end, sandwiching the leg assemblies, like this. They will be attached at an elevation suitable for a final seat top height of 17". This means the top of the beam is at the 15-1/2" elevation. The final leg/beam assembly looks like this:



Legs + seat beams assembled.

The above drawing shows that the table top will be roughly 41" wide, and the seat tops 13" wide. Lets use the information we have to design the table top. The top will be supported by pairs of beams sandwiching the legs, just like the seat beams. If we construct the table top out of 2X6 planking, we can use 7 2X6's, set on 3/8" spacing, to yield a 40-3/4" wide top. So, using 2X6 lumber, cut four table top beams to 40-3/4", and mitre the ends, like we did for the seat beams. When the top beams are attached, the leg assemblies will look like this:



Legs + seat beams + top beams assembled.

The only parts left to cut now are the table top and seat planks. The table is planked with 7 equal lengths of 2X6 lumber, and the seat tops are one 2X6 and a pair of 2X4's each. The length of the top and seat planks is pretty much whatever you want, but for this width of top, a typical top would work out in the 6-1/2' to 7' length. The leg assemblies will be situated anywhere from 10" to 16" inboard, depending on the overall length of the table. It may be possible for a small person to sit at the section outboard of the leg assembly on a large table.

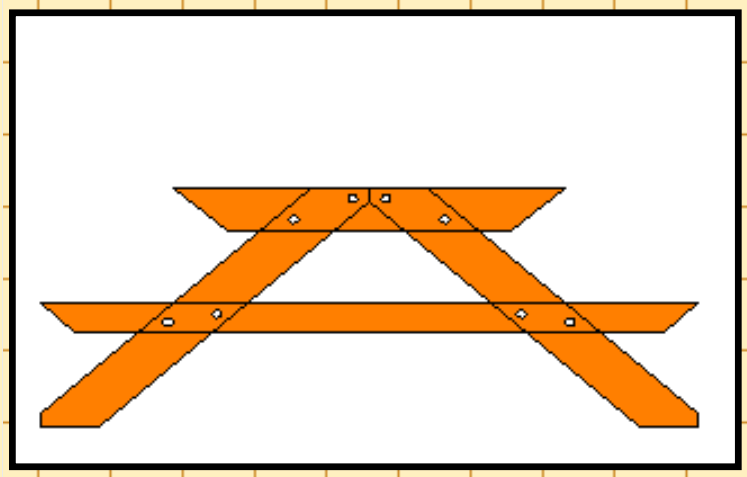
The top is planked with the planking spaced evenly across the top beams. The seat is planked with the 2X6 plank flanked by two 2X4's. The spacing on the seat planks may be set to cover the entire space from the outer end of the seat beams to the edge of the leg, or the spacing may be set to match the spacing on the table top. In the latter case, the outer plank should be aligned with the end of the seat beam.

The top and seat planks may be cut to length now, or may be installed and trimmed after assembly. The latter method will ensure a nice straight alignment of the ends of all planks.

Assembly:

So far, all we've done is cut the wood to size, and look at how it all fits together. Now the actual assembly begins. Again, we begin with the legs. Lay a top beam and a seat beam flat on the floor or a large workbench. Lay a pair of

legs on top of the beams, and then lay another pair of beams on top of the leg pieces. Use a framing square to ensure that the legs are exactly perpendicular at the corner where they meet. Measure the height of the seat beams from the bottom of the legs, using a straightedge laid across the bottoms of the legs. Wiggle everything into position, and drill 1/4" holes through both the beam & leg pieces at two locations where each pair of pieces connect to each other. On one side (the inboard surface) of one of the pairs of beams, use a 7/8" spade bit to counterbore about 3/8" deep. Use 1/4" X 4-1/2" carriage bolts with a flat washer and lock washer under each nut to fasten the leg assembly together. Take care to get everything aligned correctly, or the result will be a table that rocks on three legs.

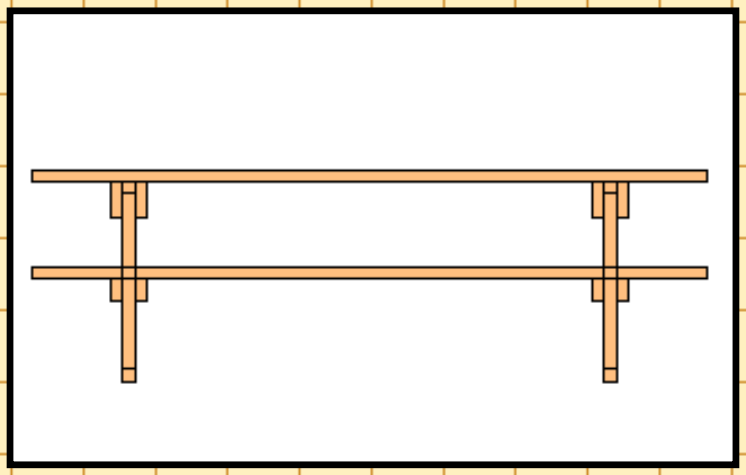


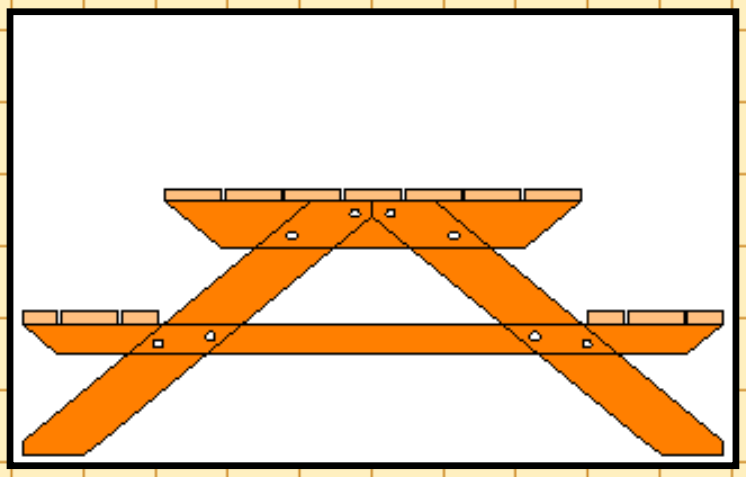
Leg Assembly showing bolt locations.

Repeat the procedure for the other leg assembly.

Finally, screw the top and seat planking into place on top of the top beams and seat beams. Use 2-1/2" #8 flat head wood screws, and predrill and counterbore the holes. Use two screws to fasten at each intersection of planks and beams. Use a ruler to mark off the locations of the screws, since the screw heads are going to be visible on the table top. If done neatly, and if rust proof screws are used, the screw heads do not detract excessively from the overall appearance. If the top and seat planks have been pre-cut, align the planking for equal overhang at each end. Otherwise, allow for enough overhang to trim each end equally, and trim all overhangs to the same length.

A couple of views of the planking...





The picnic table assembly is now complete, needing only a few coats of varnish, paint, stain, or whatever your choice of finish.

The finished table, viewed from above (1024 X 768, 17KB GIF)

The finished table, viewed from below (1024 X 768, 17KB GIF)

Notes:

This design meets the basic design objectives.

One of the important structural differences between this design and most others is the lack of the diagonal bracing typically used to provide strength against racking. This design removes the need for the diagonal bracing, by having beams that are effectively 4-1/2 inches wide under each seat and top plank. With two screws into the beam through each plank, there is plenty of strength against racking.

The table top beams must be 2X6's, in order to get bolts far enough outboard

to provide support to the outer edges of the table top.

It may be desirable to use treated lumber for the legs, or to apply some rot-proofing to the end-grain bottoms of the legs, especially if the table is to be used on a lawn or dirt surface.

The table may be stood on end or on it's side, and will remain standing. This makes it easier to store it away in a shed or elsewhere during winter months.

I hope you enjoy making and using your table as much as I have enjoyed using the one I built in 1992. It is a slightly less refined version of this one, and is still working well, although it is due for some refinishing work after a few years of exposure to the weather.

Modifying the Design:

The fundamental basis for the design of this table evolved out of the use of 45 degree mitre cuts. This factor, combined with the desire to have the outboard edge of the seat top and legs align on the same vertical plane gave us the width of the overall table and thus, the width of the table top. If the table dimensions are unsuitable as is, then the design can be modified in the following ways.

Adjust the angle of the legs. Putting the legs on steeper slopes will narrow the overall width of the table. When doing this, you will reach a limit where the legs can no longer extend to the outer edge of the seat top. This will result in a table which cannot be stood on edge, but more importantly may become unstable when the seating load becomes unbalanced. If the seats are fully occupied on one side, the table may be capable of tipping. You must use some judgement about how far inboard to allow the table legs to go. Support for the table top against tilting from side to side comes from the outboard bolts attaching the legs to the top beams. When the angle of the legs gets steeper, the bolts move inboard, and reduce the strength of the top against tipping. Use your judgement as to how far you can move the supporting bolts without excessively compromising the strength of the table top support.

Adjust the inboard/outboard position of the table legs. This adjustment may go hand in hand with any adjustments made to the slope of the legs, and the same precautions apply.

Modify the length of the table and/or the position of the legs from the end of the table. There is considerable latitude for adjustment here, and your common sense and aesthetic senses dictate this factor. You may wish to consider how many people will be expected to use the table, and how much room to allow for each person. It may be desireable to allow enough space for a small person to

sit at the end, on the outboard side of the leg assembly. Beware of the possibility of tipping when configured in this way. Also, beware of the possibility of sagging in the relatively long unsupported length of seat and top planks.
Most designs should allow for a seat height of 16"-18", and the outer edge of the table top should align no further outboard than the inner edge of the seat top. A seat width of 10" is probably the minimum width you should allow. The width of the seat will be determined by the width and spacing of the planking. A table top height of 30"-32" is optimal.

Materials:

This table shows the approximate cost in Canadian dollars (vicinity of Greater Vancouver, BC) for all materials to fabricate the table. Your actual cost will vary, depending on the type and quality of wood used. There is no finishing material costed out here, as this aspect will vary considerably, but do allow for some finishing cost.

Use good quality kiln dried lumber, especially for the top planking. Twisting, bending and cupping of the top planking causes a very uneven top surface which is a real hinderance to enjoyable use.

Qty.	Description	Approx. $
8	2X4 X 8' lumber, hem/fir/spruce	$30.00
13	2X6 X 8' lumber, hem/fir/spruce	$60.00
16	1/4" X 4-1/2" galvanized carriage bolt with lockwasher, flat washer, and nut	$5.00
104	2-1/2" #8 flat head wood screw	$5.00

Note for non-North American builders. The standard dimensional lumber used in this project is the 2X4 (two-by-four) and 2X6. This is a nominal 2 inches by 4 inches or 6 inches. I say nominal, because the industry standard today is that a 2X4 is really 1-1/2 inches by 3-1/2 inches, and a 2X6 is 1-1/2 inches by 5-1/2 inches. A number of explanations for this apparent discrepancy exist, which you can explore on your own.

UPDATE: After 9 years of living out in the wet coast dampness, the original prototype has had a leg break off, just below the seat beam. The use of pressure treated wood in this area would solve this problem. This would also solve the problem of rot penetrating the endgrain at the bottom of the legs.

This design was created on a scrap of paper, and later transcribed into AutoCAD 12, where the last refinements were made. The GIF images seen here were created using Acad, and then doctored with a popular bitmap image viewer/editor. If you are able to use the Acad drawing, I can make it available, although it is not in anything like an engineering/architectural drawing format (it was done mainly to produce the images for this web page).

Now available here : PTABLE3D.DWG

Testimonials:

For a really good look at one builder's project, check out http://www.bigsnit.com/picnic. This site is a very impressive example of both the finished project, and the construction process. Thanks, Grumpy!
And here's one that has been scaled down to kid size. Dimensions for this version kindly contributed by Anton & Missy Webber .
And yet another example of fine workmanship here, and here. Thanks to Reid

Evans for his good looking pic's.
A sample from Lance Peterson with his nicely finished rendition, in ' faux redwood'.
Thanks to gerlof van de Hoeve for these three pics [1], [2], [3], of his table and a small version of the table. Gerlof is from the Netherlands, and is ithe first known builder from outside of North America.
GMoney the dog poses with this and this photo of a table built by Chris Deacon. Chris earns bonus points for using lumber recycled from a home renovation to build his table.
Charlie Webb sends us these [1], [2], [3] pictures of a gorgeous table built with redwood. Too nice to put outdoors, in fact.
David Vandewal sends us a link to some pictures of his handiwork: http://pweb.jps.net/~dmv/house/pt/
Dennis Caisse has done a fine job on his table, with yet another example of the umbrella holder through-hole system. Thanks to the 2002 Team Canada Olympic Hockey Team for getting the Maple Leaf flying, upon Dennis' losing wager with his Canadian friends.
The proud owner of a table built by Paul Hill poses in a couple of shots [1], [2], of Paul's fine workmanship, showing a nice finishing job, and a very nice overall project. Looks like Paul has made a slightly shorter version, to fit a more confined space.
The energetic posers in this pic from Fran D show plenty about the sturdiness of his well built table. Note the 1-1/2 inch spacers under the seat planks, to raise the height of the seats to a level more comfortable to Fran and his kin.
Found in the web server logs is this page by a school in Vermont who made a group project out of constructing a batch of tables.
And speaking of tables built in batches, how about this crop of 12 tables built by Al K and his helpers as a church project. Can't even fit the whole batch in the picture! Al reports using a jig to speed up alignment of the the leg assemblies.

Certainly one of the most beautiful settings for a table, on the Kona Coast of the Big Island of Hawaii. Jonathan Sechrist's table is a working table [1], [2], used on his coffee farm, Makahiki Farms (www.makahikifarms.com).

A real masterpiece, this table [1], [2], [3], [4], [5] by Sandy is made from solid maple hardwood, and was intended from the outset as an indooor furniture piece. Note the curved ends on the table top and seats, as well as the screw heads covered with hardwood plugs. Very fine work.
The first lady builder to report her success, Julianne from Louisiana sends us a sample of her handiwork.
A table with a very refined look, with a finish of mahogany stain and polyurethane by Kent Kester is seen in in a park-like setting in this photo
Alex van der Meer of Utrecht, The Netherlands, sends us an example of resourcefulness that will be tough to beat. He says: I've made a table out of waste materials found in a dumpster at a construction site, the dutch way! Hats

off to Alex for using the plans as the basis for a table, and adapting them to suit the resources at hand.
Harold Seaborn sends us a couple of pictures [1], [2], of his new outdoor furniture, and what a spectacular outdoors it is. Harold is still planning the finishing of the table, which he built using pressure treated wood for the legs and structural components, and spruce for the human contact parts. Good plan, Harold.

Your e-mail comments are invited. Click me, Rod Nussbaumer, to send your correspondence. Feel free to use this design in whatever way you like; consider it public domain. If you build one of these tables and have any scanned pictures of it, I'd love to put your pictures or links to your site here.
NOTE: This page was originally published on the now defunct rodpc.triumf.ca Any links and bookmarks to that site should be updated to point to this permanent home site.

Some links to other picnic table and related project plans

My latest effort in outdoor funiture design is now online at Building a Patio Bench. Check it out if you might like to go with a multimedia style bench in wood and concrete.

To Rod's home page
---rod.

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