

Estimating for Furnituremakers IS THE PRICE RIGHT?

TEXT AND PHOTOS
BY RICHARD JONES

How much timber is needed to make a solid oak and sycamore veneered paneled corner cabinet? How long will the joinery take? What about doing those laminated rails?

What time should be allowed to construct and install a zebrano and maple built-in unit out of mostly veneered board materials? How long will it take to deliver and install it in a 17th floor apartment?

In both examples how do I go about calculating the time required for finish preparation and finishing?

In this article I describe an estimating method that's given me remarkably accurate job times for many years. I hope others will be able to use the information as a basis for their estimating method or to perhaps refine their existing pricing system.

THE IMPORTANCE OF ACCURATE ESTIMATING

While woodworking may be for many a leisure activity, or even a romantic one, making a business of it can be hard and stressful. In the rush to gain and put to use our skills and abilities as a designer and maker, it's easy to forget that going into business is just that—a business. Businesses need cash flow like lungs need oxygen, and require profit much like the body needs food. Some furnituremakers act as if they're afraid of cash flow and profit, perhaps intimidated by the low cost expectations of potential clients.

One key to success is accurate job estimating, because consistently undercharging leads only to financial disaster. There are numerous approaches for estimating your charges. One method commonly espoused is to take materials costs, multiply by a figure, and add the two together. Multipliers ranging from 3x to 20x the cost of materials are quite common. While uncomplicated and sometimes useful for a



“quick and dirty” estimate, it’s a blunt instrument. A traditional hand-dovetailed drawer of solid wood takes much longer to produce than a plywood drawer box glued and nailed together. A single materials multiplication calculation makes little allowance for such big differences.

Businesses must take into account their true overhead, fixed costs, labor costs (over and above wages), required profit, and so on before deciding at what level to set mark-ups and labor charges. These costs will come to a specific figure for the year’s trading. This yearly cost can be divided by 52 to establish the costs per week, or figured for the working hours per year: 40 hours x 52 = 2,080, assuming only a 40 hour week is worked. However you calculate this number, you need to arrive at a realistic number of billable hours in your work year and an hourly rate based on your costs.

Estimating custom work is not easy, even for experienced furnituremakers; for the beginner it’s daunting. Without experience it’s hard to know how long all the different processes and jobs take and what a fair rate per hour is. Without initial guidance it takes years to accumulate the experience and raw data needed to do the job.

The method of estimating presented here is primarily for furnituremakers who do specialized work incorporating a high percentage of traditional hand crafting skills. The procedure has its roots in a three-page estimating guide I was given as a furniture student in the early 1980s. Over the last twenty or so years I’ve kept accurate work records, which I’ve analyzed periodically. I’ve refined my rates based upon the results of my analysis. Changes in work practices brought about by advances in tool technology, improved ability, or new skills have been incorporated into my method as required.

Times I suggest for a process or item should be modified according to your ability and experience—you might find you do jobs quicker or slower. The equipment available in your shop, and your mix of hand and machine methods must also be factored into your calculations. Long runs on the shaper with a power feeder are priced differently to short runs using less efficient methods, and you must take this into account if you don’t own a shaper and power feeder. Techniques not detailed here should be added to your own list, along with a time allowance allocated according to your records.

Units

A unit can be any process, piece, linear or area measurement, etc. The method presented in this article relies on setting a time allowance for each unit (job, item or process), followed by discounting for multiples of that unit: a 5% charge reduction for each repetition of a unit up to a maximum discount of 30%.

All forms of length or area are units: board feet of lumber, linear feet of molding, square footage of panels, etc.

All types of joints are a unit. Multiples of the same joint—8 mortise and tenons produced for a four-legged table—are calculated as eight units before a reduction is given for multiples.

Multiples of the same or similar items are units: for example, 6 drawers, dissimilar in size, but all of the same construction.

Sets of furniture are units—a set of 8 chairs, a pair of cabinets the same, or matching end tables. These are marked down after

they have already been subjected to discounted prices accrued during the manufacturing process.

In explanation of the above, if you price a single chair and simply multiply by the number of chairs in a set this doesn’t take into account economies of manufacture achievable

through the production of batches. Shaping 32 identical chair legs on a shaper using a pattern, jig, or fixture requires making only one pattern and one set-up procedure. The proportion of time required to make jigs, set up the router or the shaper diminishes as

the number of units produced increase.

For example, if the time estimated to make a chair is 50 hours, then a 4-chair set gets a discount of 20% ($4 \times 5\%$). Therefore, 50 hours minus 20% = 40 hours. 4 chairs x 40 hours = 160 billable hours. An 8-chair set would be calculated at the maximum discount of 30%: 8×35 hours = 280 hours.



Timber Buying

Waste allowance varies from species to species, and the form in which the timber is sold is also a factor. Waney-edged boards are always more wasteful than square-edged stock, and there are always defects in timber that can’t be used. It’s also necessary to cut pieces about 4” longer than required to allow for planer snipe and other machining faults at the beginning and end of each board.

I usually calculate the volume of timber required for a job as follows.

Estimate the roughsawn board requirement that will yield the finished dimensions. For example, ten pieces at a finished size of $3/4" \times 1-$

$3/4" \times 31-1/2"$ will come out of ten pieces of rough timber $4/4 \times 2" \times 36" = 1/2$ BF (board foot). Using this method you allow an additional waste factor even though you’ve calculated using roughsawn board sizes. Waney edged English oak has an additional waste factor of about 100%, so price for 1 BF. As examples of typical

additional waste factors, use 50% for walnut, cherry 30%, and poplar 20%.

A second method people use is to calculate exact finished sizes with a percentage added for waste, but it can be seen that the waste factor allowance must be higher—in my experience about double the factors suggested in the first method.



Materials Charges

ALL MATERIALS SHOULD BE charged at cost plus a mark-up of at least 25%. This mark-up applies to solid timber; plywood, MDF, veneers, plastic laminates, nails, screws, polish, thinners, dyes, stains, glue, etc. The 25% mark-up suggested is a minimum. A 100% mark-up over cost is not uncommon.

Glue, screws, nails, sandpaper, etc., that are not bought as a direct expenses for a specific job have to be treated as indirect costs. Allow for them as follows. Work out the cost of direct expenses: wood, board materials, polish, hardware, pulls, plastic laminates, etc. Charge indirect expenses at 10% of direct expenses as in the example below. If tax has to be added after this calculation don't forget to do so.

Materials mark-up example:

Direct materials (wood, hardware, polish, etc.): \$500 + 25% (\$125) = \$625.00

Indirect materials (glue, fasteners, sandpaper): 10% of direct materials = \$62.50

TOTAL: \$687.50

The materials mark-up allows an element for wastage, the cost of storage at your premises, maintenance of machinery, tooling costs, and to compensate time spent negotiating with suppliers, etc. It also covers costs incurred in selecting timber at the sawmill or yard and its collection using a business vehicle.

The 25% mark-up suggested may not be sufficient to cover overhead. Only a careful analysis of your costs and expenses within your business model will determine what this figure should be, but in the first instance a 25% mark-up should at least ensure that goods aren't resold at a loss.

Millwork

This is the squaring and truing of solid timber on all four sides using typical hand-fed woodworking equipment such as saws, jointers, and thickness planers, and the cutting of sheet goods to ready them for other operations, e.g., final edge preparation before gluing up solid wood into a wider panel, or framing parts ready for cutting to final length, joints marked and cut, etc.

There are seldom discounts applied to initial machining operations except in special circumstances, e.g., cutting up timber and sheet goods for a big run of kitchen cabinets or similar projects require machines set up for long runs. Power feeders also speed the job along. More material processed per hour can lead to a price reduction.



Solid Timber: Charge 1 hour per 15 BF.

Sheet Goods: Charge 20 minutes per sheet for all sheet goods whether they be 4' x 8' or 5' x 5'.

These basic machining charges are good for high quality and/or intricate work where delicate veneers and edges on board materials must not be damaged, and solid timber requirements are persnickety. This allows you to get the material out of storage, pick

through it, select what is most suitable, make calculations, and do primary dimensioning (truing, squaring, and thicknessing solid wood). Additionally, you have to move the stuff around the workshop, change blades or cutters in saws, jointers and planers, and finally tidy up.

Joinery

Generally speaking, estimate every joint in a carcass, frame or structure at 2 hours per joint. (Variations to this blanket two-hour charge are detailed below.) This includes all forms of mortise and tenon, halving joint, rail dovetail, dowel joint, sliding dovetail, biscuit joint, dado, etc. It also includes all edge-to-edge joints in solid timber, whether they are tongued and grooved, doweled, biscuited, or rubbed joints.

The two-hour allowance is enough to lay out the joint (or joint sample), cut it, test the fit, make adjustments to the machinery settings and processes if machine-cut, and provides time for the final assembly with glue and clamps. Also built in are allowance for such often forgotten necessities as sharpening tools, tidying up, and getting tools out of their cabinets and putting them away afterwards. This single rate allows for the fact that some joints take longer than this and some take less. In an average cabinet, frame or structure a mixture of joinery is used so two hours per joint is a safe median time that covers most eventualities.

For every repetition of the same or similar joint, give a discount of 5% up to a maximum of 30%. For example, four mortise and tenons in a frame attracts a 20% discount; thus, $4 \times 2 \text{ hours} = 8 \text{ hours}$ minus 20% = 6.5 hours to the nearest half hour. 10 mortise and tenons in a door frame gets the maximum 30% discount, i.e., $10 \times 2 \text{ hours} = 20 \text{ hours}$ minus 30% = 14 hours.



Hand carcass-dovetailing should be estimated at 2 hours per foot, rounded up to the nearest foot. The minimum charge is 2 hours. Thus, a 6"-long dovetail = 2 hours. A 17" length = 4 hours prior to calculating a multiples discount as follows: $2 \times 1 \text{ foot} \times 2 \text{ hours/foot} = 4 \text{ hours}$, minus 10% ($2 \times 5\%$) = 0.4 hours, giving 3.5 hours to the nearest half hour.

Similarly, estimate hand-cut secret miter dovetailing or secret lap dovetailing at 2.5 hours per foot, or part length, with a minimum charge of 2.5 hours. The same calculations should be made for discounting multiples as above.

Certain very demanding joints may require even higher rates. I also find that increasing the length of a joint compounds the difficulty of execution and assembly.

Machine carcass dovetailing. Charge 2.5 hours to machine dovetails in all four corners of a single large carcass using a router and jig. Charge each additional carcass at 1 hour each with no other discounts. A large carcass is one that is greater than 14" deep.

Dovetail guides vary in their complexity and ease of set-up, and in their ability to produce dovetails of different patterns. Some users have a router dedicated to the job and therefore always ready to go with the correct guide bush and router bit set at the necessary depth, so the set up time is minimal. The times suggested are a good place to start to avoid under pricing.

Moldings

Traditionally, molding was accomplished with hand-held planes, so it was worthwhile calculating this process in detail for short runs of a couple feet. In modern work most plain moldings are produced with hand-held or inverted routers. Larger shops usually have a shaper as well. In estimating for molding, a large set-up time is required to run even a short length. However, once a machine is set it will quickly run long lengths of the required profile. Another important element of doing this job is the time spent moving material around and cleaning up at the end of the job.

Some moldings, particularly those done with routers that require multiple set-ups using different bit profiles, need to be priced



as a series of distinct profiles.

Price molding in three separate stages for either the router or shaper:

- set-up time
- running the molding
- preparing the molding for finish (removing the cutter marks).

Some work, such as architectural moldings, typically omits this last process.

The following suggested times have the discount element worked

into them with the exception of given examples.

Molding with a hand held or table-mounted router: Fit router bit and set router. Remove bit and tidy up at the end of the run—0.5 hours. Run up to first 6' of molding—1 hour. The minimum charge is 1 hour. For each additional linear foot worked with a hand held router, charge at 40'/hour. For each additional linear foot with a router table, charge at 45'/hour.

Shaping: Standard set-up charge to fit the knives to the molding head and install it on the machine, run test cuts, and fine-tune the fence, guards, etc., and clean up at the end of the job—1 hour.

Hand feeding. Charge 0.5 hours for each 30' run. The minimum charge is therefore 1.5 hours (including set up time).

Power feeding. Charge 0.5 hours per 150' run. The minimum charge is 1.5 hours (including set-up time).

Charge 2 hours per pair of cutters to grind and sharpen for custom profiles.

Cutter manufacturers offer a bespoke or custom grinding service for unusual profiles. This is usually a direct cost to the job and should be marked up 25% and billed to the client.

Additional Molding Notes

Wide plain moldings are sometimes built up of small moldings glued together to achieve the width. Each molding is priced individually. Add to this the cost incurred in gluing the parts together: Price the assembly part of the job at 2 hours per joint, subject to the 5% reductions as outlined above.

Curved and compound curved molding, e.g., arched doors, cabinet and chair legs. This type of work varies greatly in its complexity. It usually requires patterns, jigs or fixtures with special safety hold-downs. These additional elements must be accounted for as well as all the normal charges for doing the molding. Perhaps all that is required is a template taking 1 hour to make prior to setting up the router with a pattern-cutting bit and running the molding. Once these patterns are made they are re-usable. Most business

store frequently used patterns therefore the full cost of making these jigs should only be charged to customers commissioning a one-off job.

Cutters ground for a specific profile are usually kept in storage for future use and modification. This is a means by which savings can sometimes be achieved.

Carved Moldings. Estimate the molding portion of carved work as plain molding. For the hand carving charge 2 hours for each 1 foot length of material up to 2" wide. For each additional 2" width add 1 hour.

For example to carve a 12" long x 3-1/2" wide molding, the basic calculation is 2 hours for the length, plus 1 hour for the additional width = 3 hours. If the piece to be carved is 24" x 3-1/2", the basic time allowance is 6 hours. Then, discount carving in 5% increments up to the maximum 30%, meaning that the charge would be 5-1/2 hours to the nearest half hour.

Drawers

For hand-dovetailed drawers, estimate at 8 hours per drawer for a single premium-quality traditional drawer. This means making the drawer complete starting with random lengths of squared timber. Apart from cutting the timber to length and pre-fitting, the dovetails must be marked and executed. The charge includes time for making and installing a solid wood bottom. This is fitted to slips molded and joined to the drawer

sides. The drawer is finally installed by trimming with a hand plane to fit the opening. Attaching pulls is extra and depends upon the pull. Carving or turning and installing wooden pulls takes longer than screwing on store-bought hardware. Lesser quality drawers don't take so long to make and should be priced accordingly.

Fitting cockbeads to drawers are estimated at 0.5 hour/foot, plus 0.5 hours per scarf joint or corner miter.

Producing separate moldings

for later planting on to drawer fronts are estimated as for moldings, plus 0.5 hours per joint and 0.5 hours each for installing each foot of length as with cockbeads.

All the drawermaking operations described are discounted in 5% increments up to 30%. A nest of 5 hand-cut graduated drawers in a cabinet can be calculated: 5 x 8 (hours) minus 25% = 30 hours.

To set up and cut one machine-dovetailed (or finger-jointed) drawer box, charge 1.5 hours, after which charge 1 hour per drawer.



Turning

Estimate at 1 hour/foot for diameters up to 2". The minimum charge is 1 hour.

For reeds, flutes and other moldings on turnings, estimate as for moldings taking the circumference at the greatest diameter as the width of the molding.

Add 1 hour/foot for each additional 2" of diameter. Discount turning in the usual 5% increments. A pair of turned dining chair front legs at something less than 24" long is charged at 2 hours each (= 4 hours) less 20% = 3 hours. For a set of twelve chairs, multiply the 3 hours per set by 12 = 36 hours, and apply the 30% multiples discount = 25 hours.



Making and Hanging Doors

Estimate at 4 hours per door for hanging and fitting, including notching out and attaching brass butt hinges and locks. Fitting handles or pulls is extra and should be charged in the same way as drawer pulls as described above.

Making the doors—for example, frame and raised panel doors—are estimated using charges as outlined in other sections for joinery,

moldings, etc.

Estimate glazed doors with wooden tracery at 2 hours per glass pane in addition to door frame joinery.

For doors constructed using matched cutters on a shaper or router table, such as for kitchens cabinets, the following estimates apply:

- Set up cutters and machine first set of door parts, i.e., one with four corner joints—1.5 hours. Time

allowed covers the set-up time, test-fitting, and then running the stiles and rails.

- Gluing and assembling the door with its separately-priced panel or glazing follows.

- Increase the charge accordingly if there are additional rails, mullions or muntins.

- Charge 1 hour for each additional door with no reductions for multiples.



Veneering

Estimate at 1.5 hours per square foot, discounting at 5% per additional foot. The tasks include preparing the ground, arranging the veneer pattern, and hand preparing with knives and veneer saws. The edges must be taped with veneer tape, glue applied, and the veneer pressed. Lastly, there is trimming overhanging edges, removing tape and tidying up after the job. Planing, scraping and sanding in readiness for finishing are a separate charge.



Crossbanding and inlaid lines are charged at 0.5 hours per linear foot and use the 5% per foot unit discount calculation. Charge 0.5 hours per joint (miter or scarf).

Veneer work for very large projects such as conference tables, large custom built cabinetry, wall paneling, etc., are often best subcontracted to panel product and veneering specialists. With their specialized equipment, skills and concentration in a niche market they beat the small workshop on price every time. While subcontracting veneer work often means making compromises in the design work and adjustments have to be made in the workshop schedule, savings to the client are usually substantial.

Leather and baize tops should be estimated as for veneering.

Bending Wood: Steam Bending and Laminates

For laminated structures, every square foot is charged at 8 hours. Apply the 5% discount to each additional square foot up to the 30% maximum, e.g., 5 sq. ft. equals 40 hours less 25% = 30 hours, and 10 sq. ft. = 56 hours, which includes the maximum 30% discount.

The times suggested don't make adjustments for such factors as the complexity of the mold or form that must be made, nor for the method of bending—cold bag press, heated bag press, cauls, cold clamping, male only or male/female molds, etc. No allowance is made for the number of laminates required to create the necessary thickness. The figures also don't account for time needed to prepare

the bending material—this might be the simple cutting of bending ply into strips, rectangles or squares compared to producing band-sawn veneers in the workshop. The suggested 8 hours/square foot rate is a fairly safe allowance that should prevent serious under-bidding. The job entails producing the bending form or jig, which sometimes requires modification, or even a completely new form made to compensate for unexpectedly large springback. Preparing the laminates, spreading glue, applying clamping pressure, and tidying up after the job follows this.

For steam-bending wood, use the same numbers and discounts as laminate bending:



8 hours per square foot.

A 5% reduction should be given for each matching shape up to a maximum of 30%; for example, 4 drawer fronts of the same radius but of different widths need just one bending form.

Miscellaneous Work

Carcase Backs: Framed backs using full mortise and tenons should be estimated using numbers and discounts described in other sections.

For installation of backs charge 2 hours. The time includes an allowance to work the necessary grooves or rabbets in the carcass sides and top.

Adjustable shelves: Estimate at 1 hour per shelf for fitting and fixing on shelf standard, pins, etc.

Tops: Attaching tops to carcasses and table frames usually takes 1 hour per top using mechanical fasteners. Where the top rails have to be mortised to accommodate fasteners, estimate at 2 hours.

If tops are attached with wooden buttons or traditionally

formed pocket screws, allow 3.5 hours to cover forming the pockets or for button fabrication and installation into the channels which must be worked.

Be a little flexible with these figures to account for the size of the top, your work methods, and the number of plates, buttons, pockets, etc., to be made and installed.

Legs: Cabriole legs take 4 hours per leg, complete with wings. Estimate cabriole legs with carved feet such as claw and ball at 8 hours per leg complete with wings. Charge knee carvings, e.g. acanthus leaf or shell at 4 hours and price carved scrolls at 1 hour each. All work on cabriole legs is subject to the 5% reductions up to the maximum 30% discount.

Estimate molded legs the same as moldings as previously detailed, e.g. 1 hour/foot or part length. For example, turned fluted or reeded legs are priced as turning plus molding.

Corner Blocks: Estimate four corner blocks fully jointed into chair frames at 4 hours per chair frame.

Corner blocks simply mitered and glued into the corner estimate at 1 hour per chair. If you add two or more screws to the blocks charge 1.75 hours per chair.

Knuckle Joints: Estimate at 2 hours per joint up to a foot of length. Knuckle joints rarely exceed 8" long.



Preparation for Polishing and Polishing

The preparation needs of premium-quality craftwork will normally include planing, scraping and hand sanding, which is often augmented by some power sanding. Commercial-quality work relies a great deal on power sanding (wide-belt sanders, drum sanders, stroke sanders, spindle sanders, horizontal belt sanders and handheld random orbital sanders) and limits the use of traditional hand tools.

The quality of finish and the work required

will vary according to circumstances. High quality furniture demands meticulous preparation on show wood and veneers, less work on such items as drawer sides and backs, and little or no work on hidden structural parts. It is quite common to see architectural or commercial woodwork finished or painted straight off the machine. On the other hand, there are circumstances where the client will demand better preparation and finishing for these items and

is willing to pay for it.

Preparation using mostly hand methods (hand planes, scrapers, etc.)—charge 0.5 hours per square foot.

Preparing surfaces using mostly power sanding or oscillating thickness sanders, etc., charge at 15 ft per hour.

Scraping and sanding moldings up to 2" wide, charge 1 hour for 6 linear feet; i.e., 10 minutes per foot. No discounts for finish preparation are applicable.

Dyeing, Staining, Grain Filling

Matching dyes and stains can be troublesome. Dyeing and staining should be charged at 15 square feet per hour. This allows for mixing dyes or stains, raising the grain and sanding back if using water-based products, applying the coloring agent by spray gun, cloth or brush, wiping off, and cleaning up afterwards.

Grain filling is charged at 1 hour per 5 square feet (12 minutes per foot.)



Finishing

Good quality finishing—whether a sprayed-on lacquer, a brushed-on finish, wiped-on varnishes, or traditional French polishing—are all fussy jobs requiring more time and skill than most people new to the business of furnituremaking realize. Perhaps the easiest and lowest-tech finishes to apply are the oil finishes, but just because they are relatively easy to apply doesn't mean that they can be done properly if enough time isn't set aside.

The small workshop does not have production line facilities to speed finishing processes along, especially on large jobs. Weather conditions can throw the schedule out of kilter. Things are constantly moved around to make space to finish the next batch. With large finishing jobs, all other work usually grinds to a halt because of it. It's not unusual to find that the preparation for and actual finishing work consumes 20%-30% of the entire time for a project.

Times given here apply to spraying lacquers and shellac. Adjustments should



be made for all other techniques: brush-on and wipe-on finishes, French polishing, etc. For spraying, use an area of 10 square feet as the basis for calculating and charge 0.5 hours per coat. Three coats sprayed on 10 square feet takes 1.5 hours. I've never given discounts for finishing and found these figures to be reliable.

I've not listed other finishing techniques that are often employed. Glazing between coats has been omitted, and so too have specialized techniques such as dealing with blotching in woods

prone to it (e.g., cherry and maple). Applying thin barrier coats between dyeing, staining, and grain filling have no suggested charges, nor have dyeing using spray techniques or staining using gel stains, etc. These and other processes need to be understood and practiced before they can be priced successfully. Skilled finishers develop the necessary knowledge and expertise for accurate estimating. The times suggested for the most common techniques should save you from seriously underpricing your work.

Delivery

Finally, it shouldn't be forgotten that a new piece of furniture doesn't get out of your workshop and into the client's house all on its own. It has to be delivered, and if it's a built-in piece it has to be installed. Add to this the number of man hours required to pack, wrap and load the piece and work out a price.

For example, if the delivery address is within 25 miles of your place of business and requires two people for half a day, charge 8 hours at your rate per hour plus a mileage charge for your vehicle. Using a mileage rate similar to those used by truck rental companies is a good baseline for this charge. If you must rent a truck to get all the items delivered in one journey, then you should pass on the vehicle rental (including your mark-up), hourly labor rates and mileage charge to the client.

Installation of built-in furniture can take anything from a day or two up to a week or more. This time should be charged at your normal workshop rates—your workshop overhead and other business costs still have to be paid for.

Richard Jones designs and builds fine custom furniture. He is now back in England, where he teaches furniture at Leeds College of Art and Design.

This article was excerpted from teaching material prepared for students. A detailed chart which accompanied that material is available from the author for a small fee. Anyone interested can contact *Woodwork*, either by letter or by email, and your request will be forwarded.