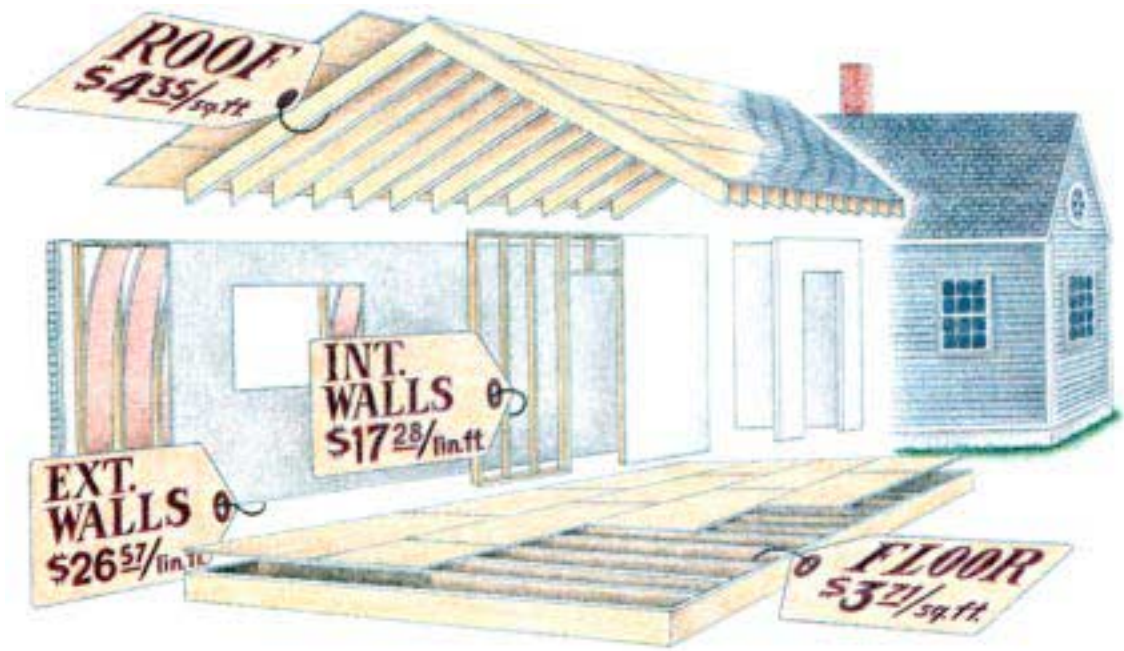
BY SAL ALFANO

UNIT-PRICE ESTIMATING



ROBERT HUNTOON

PRICING BY THE SQUARE FOOT OR LINEAR FOOT SPEEDS TAKEOFF WITHOUT SACRIFICING ACCURACY

Estimating makes or breaks a builder. A reputation for good craftsmanship may get you in the door, but your price gets you the job. The hours spent estimating are especially dear to small companies where the owner does a little bit of everything. After working all day on the site and meeting with clients in the late afternoon, many small builders spend the evening working up prices. But after all this hard work, even a good estimator lands only about 25% of the jobs he prices; time spent estimating the others is wasted. That's why every builder dreams of finding a faster way to estimate costs without compromising accuracy.

Everybody has their own way of estimating, but most systems fall into one of three categories: stick-by-stick, square foot, or unit pricing. Stick-by-stick estimating yields the most accurate price because every piece of lumber and every sheet of plywood in the building is counted individually. This method also gives you a complete bill

Item Price Lists

	FRAMING LUMBER					
	Spruce		Fir		Treated	
Size	each	$/lf	each	$/lf	each	$/lf
2x3 8	1.43	.18	10.00	1.25	–	–
2x4 8	3.40	.19	13.20	1.65	4.28	.54
10	4.38	.44	16.50	1.65	5.36	.54
2	5.26	.44	19.80	1.65	6.42	.54
14	6.15	.44	23.10	1.65	7.49	.54
16	7.01	.44	26.40	1.65	8.55	.54

	PLYWOOD					
Type	1/4	3/8	1/2	5/8	3/4	other
2-4-1	–	–	–	–	–	35.20
AA	–	–	–	–	37.58	–
AC	15.54	18.79	22.97	27.61	31.78	–
CDX	–	12.32	15.23	18.82	22.85	–
Lauan	16.90	–	–	–	–	–
MDO	–	–	43.38	–	57.48	–
TG	–	–	–	13.78	23.07	–

Figure 1. *A price list for framing lumber (left) should include all standard sizes and several species. Plywood (right) can be listed according to grade, species, and thickness.*

of materials at the estimating stage, so you're ahead of the game when you sign the job. But stick-by-stick estimating is slow and tedious. While you may be able to justify the effort on negotiated projects, it's risky for competitive bids because so much time is wasted if you don't get the job.

Square-foot pricing is much faster, but it's also less accurate. This method uses square feet of floor area to arrive at a price for the whole job. At $65 per square foot, for example, the cost of a 1,600-square-foot ranch house would be $104,000. The drawback of square-foot pricing is that it doesn't account for unusual detailing or factors like oddly shaped structures. A long, narrow two-story building will not cost the same to build as a square one-story building of the same total square footage. Square-foot prices are useful when you need to give a ballpark figure to an owner, but I wouldn't want to sign a contract based on this kind of estimate.

Between these two extremes is unit-price estimating, which is both fast enough and accurate enough for most projects. It takes some time to develop a good unit-price estimating system, but in the long run, it's worth the effort.

What Is Unit Pricing?

Unit-price estimating combines elements from stick-by-stick estimating and square-foot estimating. Unit-price estimating accounts for all of the individual items that go into constructing a building, but instead of being counted one by one, components are grouped together into *assemblies* so you can take off quantities for the whole group at the same time.

Most builders already use unit pricing for parts of their estimates. If you figure the cost of roofing by the square, for example, you're using a unit price. A price of, say, $100 per square for roofing includes the cost of the roofing, underlayment, flashing, caulk, nails, and labor. The takeoff unit is a square — 100 square feet of roof area. If the roof requires 14 squares of roofing, the total price would be $1,400 (14 squares x $100 per square).

Most price books, such as those published by R.S. Means, Craftsman, and Hometech, contain unit prices. They break the job down into component parts, like exterior walls, floor systems, and roofing, and give a price for each component based on a common unit of measure, such as square feet or linear feet. Price books usually show you the cost of the material and labor separately, as well as an installed cost.

One problem with price books, however, is that they assume ideal conditions and typical construction. The price book may assume, for example, that the subfloor is 5/8-inch tongue and groove, glued and hand-nailed. But you may need to estimate the cost of 3/4-inch subflooring, glued and air-nailed. In this case, your material costs will be higher than those in the book, and your labor costs will be lower. The regional multipliers most price books provide to allow for geographic differences won't adjust for these kinds of variations. What you need is a unit price book based on material costs in your area and on the productivity rate of your own crews.

Item Prices

A unit-price estimating system requires you to keep track of prices for individual items as well as for items grouped into assemblies.

Make a list. Since material prices change several times a year, you need to keep track of individual items, like two-by stock, plywood, and siding. Most price books use the format established by the Construction Specifications Institute (CSI). This system divides a structure into 16 major divisions, such as rough carpentry, thermal and moisture protection, and doors and windows. Whether you use the CSI format as is, modify it to suit the kind of work you do, or devise your own system, you need to establish a list of materials and prices that is well organized, easy to change, and allows you to find what you need quickly.

Before I began using electronic estimating software, which stores item prices in a database, I kept lists of prices in a three-ring binder (Figure 1). I organized the list into sections that roughly followed the logical order of

Using Unit Prices

The more assemblies you have, the faster you will be able to complete an estimate. But assemblies work best when you can easily remember what's included and what's not. Otherwise, you may accidentally omit the cost of some materials from your estimate, or count some costs twice. For example, because the number of corners in a building varies, it is easier and less confusing to exclude from a wall assembly the studs needed to provide corner nailers. You may also want to omit nails from your assemblies in favor of calculating a single lump sum quantity for each type of nail you will need.

Start with assemblies for elements of construction — such as floor systems, roof systems, windows, and doors — that remain the same from job to job. To price items deliberately left out of an assembly, you will need to estimate portions of the building twice — once using the assembly, and a second time to pick up the omitted materials. Work through the sample takeoff below to see how this works.

— S.A.

Sample Takeoff

1. Choose an assembly *that matches the specs on the drawing for 2x12s @ 16" o.c. with 3/4" tongue-and-groove decking.*

2. Calculate the unit price from the total floor area to be framed. *To keep the numbers straight, calculate the two full-length sections separately from the stairwell section.*

Full-length framing:

28.5' x 24' = 684 sq. ft.

684 sq. ft. x $3.71 per sq. ft. = $2,537.64

Stairwell framing:

3.5' x 12' = 42 sq. ft.

42 sq. ft. x $3.71 per sq. ft. =	*$155.82*
Total floor area	*$2,693.46*

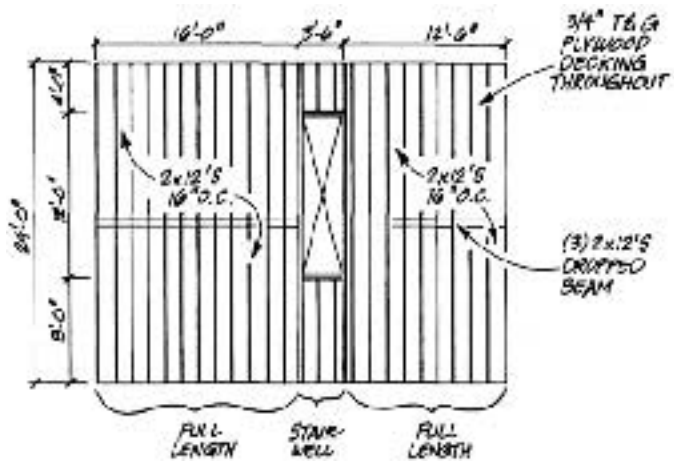
3. Add material not included in the assembly. *The doubled joists and headers at the stairwell are not covered by the assembly, and neither are any joist hangers. Calculate the cost of these items separately, omitting costs for incidental items, such as nails.*

4 joists 2x12-12' @ $19.99 ea.=	*$79.96*
2 headers 2x12-8' @ $13.33 ea.=	*26.66*
4 sgl. jst. hngrs. @ .56 ea. =	*2.24*
4 dbl. jst. hngrs. @ $1.09 ea. =	*4.36*
tax (5%)	*5.55*
labor: 1 hr. @ $20/hr. =	*20.00*
Total at stairwell	*$138.77*

4. Add the estimated totals together *to get the total price for the floor system:*

Total floor area	*$2,693.46*
Total at stairwell	*138.77*
Total Floor System	*$2,832.23*

Framing Plan



Floor Assembly x SF — **2x12 @ 16" o.c., 3/4" TG**

Description	Type	Quantity	Unit	Price Per Unit	Total Price
Joists	*2x12-12'*	*10*	*ea*	*$19.99*	*$199.90*
Rim joists	*2x12-12'*	*2*	*ea*	*19.99*	*39.98*
Glue	*PL400*	*2*	*qt*	*4.45*	*8.90*
Decking	*3/4" TG*	*4.5*	*ea*	*23.07*	*103.82*
Nails, decking	*8d Paslode*	*.1*	*bx*	*35.75*	*3.58*
Subtotal					*356.18*
tax (5%)					*17.81*
Total Materials					*373.99*
Labor *(crew of 2)*					
	Framing	*2.5*	*hr*		
	Decking	*1.5*	*hr*		
Total Labor		*4.0*	*hr*	*$40.00*	*$160.00*
Total Price for 144 sq. ft. of floor					*$533.99*
Price per square foot ($533.99 ÷ 144 sf)					*$3.71*

construction. Once or twice a year, I called my local suppliers to update the prices. At other times, I used my monthly material invoices to update pricing. When I didn't have time to update my price book regularly, I called suppliers to check current prices before I made the final calculations for each estimate.

Assemblies. Once you have an itemized list of materials, you can begin to group them together into assemblies. Start with six or seven assemblies for phases of construction that you know well. Your initial list of assemblies might include the following:

- Floor system
- Roof system
- Exterior walls
- Interior partitions
- Windows

Next you need to choose the *takeoff unit* you will use to estimate the work of each assembly. The determining factor in choosing a takeoff unit is whether or not the portion of the building described by the assembly varies in one or two dimensions. A takeoff unit of linear feet, for example, is convenient for an exterior wall assembly if most of the exterior walls you build are the same height — say, 8 feet tall. In this case, the only variable is the wall's length, so you need only to determine how long the wall is to find the price (Figure 2). Some projects, on the other hand, will have walls that vary in two dimensions — length and height — and are better suited to a takeoff unit of square feet. Another option is to create separate assemblies for each wall height, using linear feet as the takeoff unit for all of them.

Calculating Prices

One easy way to determine the price per unit for an assembly is to work up a stick-by-stick price for a typical section of work and divide the total cost by the number of takeoff units. Using the example of an exterior wall assembly, you could estimate the cost of a 10-foot length of wall, then divide by 10 to get the price per linear foot (Figure 3).

Having a complete list of materials and labor for each assembly helps to avoid omissions and overlap in your assemblies. And when prices change,

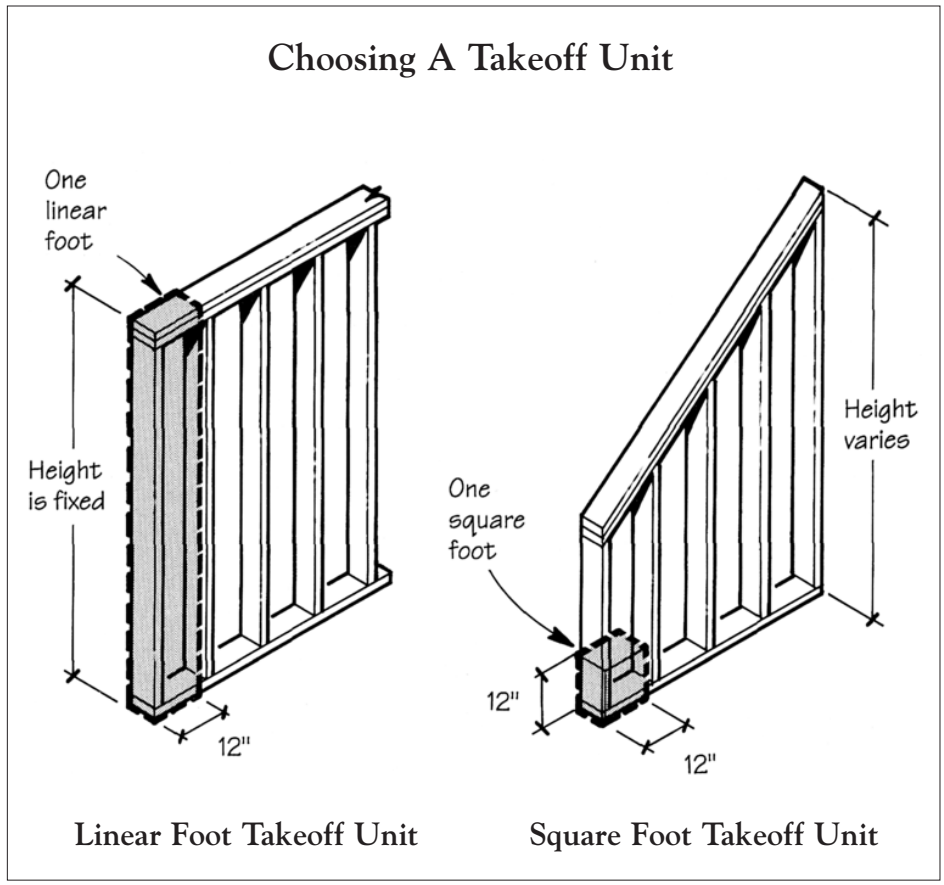


Figure 2. *Assembly takeoff units correspond to three-dimensional building components. Assuming all exterior walls are built out of 2x6s, the takeoff unit can be linear feet (left) for walls of the same height, and square feet (right) for walls of different heights.*

Sample Wall Assembly

Exterior Wall Assembly — **2x6 @ 24" o.c.**

Description	Type	Quantity	Unit	Price Per Unit	Total Price
Plates	*2x6-10'*	*3*	*ea*	*$6.09*	*$18.27*
Studs	*2x6-8'*	*6*	*ea*	*3.92*	*23.52*
Sheathing	*1/2" CDX*	*2.5*	*ea*	*19.23*	*48.08*
Housewrap	*Tyvek*	*90*	*sf*	*.09*	*8.10*
Insulation	*R-19 FG*	*80*	*sf*	*.25*	*20.00*
Vapor barrier	*Tu-Tuff*	*90*	*sf*	*.06*	*5.40*
Drywall	*1/2"*	*80*	*sf*	*.55*	*44.00*
Subtotal					*167.37*
Tax (5%)					*8.37*
Total Materials					*175.74*
Labor *(crew of 2)*					
	Framing	*1.00*	*hr*		
	Sheathing	*.50*	*hr*		
	Housewrap	*.25*	*hr*		
	Insul/VB	*.50*	*hr*		
	Drywall	*sub*			
Total Labor		*2.25*	*hr*	*$40.00*	*$90.00*
Total Price for 10-foot length of wall					*$265.74*
Price per linear foot ($265.74 ÷ 10 sf)					*$26.57*

Figure 3. *To find the unit price of an exterior wall assembly, first do a stick-by-stick estimate for a typical section of work, then divide the total cost by the number of takeoff units. If the wall in this example had a takeoff unit of square feet (instead of linear feet, as shown), the unit price would be $3.32 per square foot ($265.74 ÷ 80 square feet).*

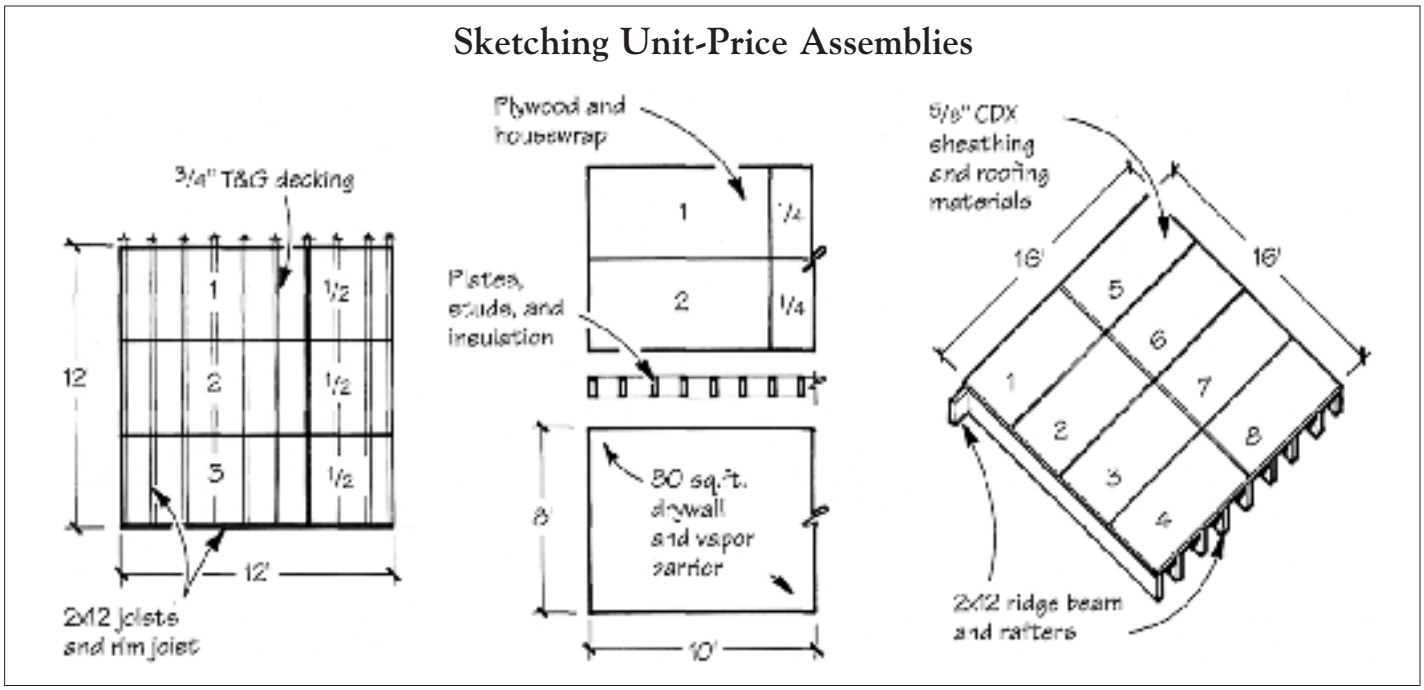


Figure 4. *When building a unit-price assembly, use a schematic drawing to prevent omissions and to help calculate quantities. Shown here (left to right) are sketches for a floor system, exterior wall, and roof system.*

an itemized list makes it easy to adjust individual line items to recalculate the assembly unit price. Using a drawing (Figure 4) while developing an assembly price will also help you to visualize material quantities.

Pricing Labor

Unit prices are most useful when they include labor prices. By tracking labor according to the assemblies you want to price, you can develop an historical record of labor costs. Then you can use an average from all jobs to establish a labor price using takeoff units from each assembly.

In the case of an exterior wall assembly, for example, you will need to track the time it takes to install all of the materials included in the assembly. But instead of using a 10-foot section of wall, as you did for material prices, use an average of the total labor for *all* exterior wall assemblies on several jobs. This will help to level labor costs and reduce the effect of specific conditions that might skew the labor costs on a particular job.

To break out labor costs, you have to keep track of what your crews are doing and how long it takes them to do it. I used a timesheet that listed all the phases of construction I wanted to track. When my field crew filled out their timesheets each day, they recorded the hours they worked as well as the number code of the type of work they were doing. At the end of each phase of a job, I used this breakdown to calculate labor prices for my assemblies.

For example, if a crew of three spends 8 hours framing 120 linear feet of exterior wall, the total cost of the labor divided by 120 is the unit price for labor per linear foot. Follow the same procedure for each item in the assembly — sheathing, housewrap, insulation, and vapor barrier — and add them together to get the unit labor price for the whole assembly.

Refining Unit Prices

Developing a unit price history improves accuracy and helps dilute the compromises you have to make when creating assemblies. For example, two skilled carpenters working together may frame the exterior walls of a building faster than one skilled carpenter working with a helper. But the labor cost for the skilled crew may still be higher because they work for higher wages. Taking an average over several jobs tends to level out these differences.

You can also refine your unit pricing system to account for different crews or special job conditions by building a set of alternate assemblies. An exterior wall framed on 16-inch centers, for example, uses more studs than one framed on 24-inch centers. Depending on how accurate you want your pricing to be, you can develop three exterior wall assemblies — one for 16-inch centers, one for 24-inch centers, and one that assumes one stud per foot.

Subassemblies. You can also incorporate subassemblies into your system. In the exterior wall example, the price for drywall is a subassembly. The line item price of 55¢ per square foot includes the drywall, tape, screws, and joint compound, as well as the labor to install the boards and finish the joints. If you use subcontractors for this kind of work, they can usually supply you with unit prices that you can plug into your assemblies.

Exclusions. It's also important to keep track of what is *not* included in your assemblies. An exterior wall assembly with studs on 16-inch or 24-inch centers won't cover the cost of three-stud corners. I recommend leaving corner studs out of your assembly and figuring them separately because the number of corners you need to frame will vary from estimate to estimate.

Odd angles, high ceilings, extra flashing, layered trim, and a host of other details will all affect your final price. In general, it's best to leave nonstandard items out of your assemblies and figure their cost separately. ■

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