Craftsman

34th Edition
James A. Thomson

2026 NATIONAL PLUMBING & HVAC ESTIMATOR

Manhour, labor, and material costs for residential, commerical, and industrial plumbing, heating, ventilating & air conditioning

$118.25

2026 NATIONAL PLUMBING & HVAC ESTIMATOR

Edited by James A. Thomson

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The National Estimator Cloud

This manual is also available as a Web app, *National Estimator Cloud,* that makes it easy to compile and print estimates, bids and invoices for nearly any type of construction project.

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Contents

How to Use This Book

This 2026 National Plumbing & HVAC Estimator is a guide to estimating labor and material costs for plumbing, heating, ventilating and air conditioning systems in residential, commercial and industrial buildings.

This manual is also available by subscription on the Web as part of *National Estimator Cloud*. For only a few dollars a month, you get all ten of Craftsman's 2026 construction cost estimating guides. Each has about 400 pages of current labor and material costs for construction – all neatly organized and indexed. Use these costs to build estimates, bids and invoices for nearly any type of project.

National Estimator Cloud:

- Prints estimates, bids and invoices as Word, Excel or PDF documents.
- Supports progress billing. National Estimator remembers what work has been billed and what hasn't.
- Runs as a secure app on the Web so you can write estimates anywhere you have a Web connection.
- Exports invoices to QuickBooks, either desktop or online.
- Bids and invoices can show as much or as little detail as you want.
- Material costs are updated regularly as prices change.
- Costs only a few dollars a month. Cancel any time you want.

Costs in This Manual will apply within a few percent on a wide variety of projects. Using the information given on the pages that follow will explain how to use these costs and suggest procedures to follow when compiling estimates. Reading the remainder of this section will help you produce more reliable estimates for plumbing and HVAC work.

Manhour Estimates in This Book will be accurate for some jobs and inaccurate for others. No manhour estimate fits all jobs because every construction project is unique. Expect installation times to vary widely from job to job, from crew to crew, and even for the same crew from day to day.

There's no way to eliminate all errors when making manhour estimates. But you can minimize the risk of a major error by:

1. Understanding what's included in the manhour estimates in this book, and
2. Adjusting the manhour estimates in this book for unusual job conditions.

The Craft@Hrs Column. Manhour estimates in this book are listed in the column headed *Craft@Hrs*. For example, on page 19 you'll see an estimate for installing a 6 gallon hot water heater. In the *Craft@Hrs* column opposite 6 gallon you'll see:

P1@.500

To the left of the @ symbol you see an abbreviation for the recommended work crew.

Page 7 shows the wage rates and craft codes used in this book.

To the right of the @ symbol you see a number. The number is the estimated manhours (not crew hours) required to install each unit of material listed. In the case of a 6 gallon hot water heater, P1@.500 means that .500 manhours are required to install 1 hot water heater.

Costs in the Labor $ Column are based on manhour estimates in the *Craft@Hrs* column. Multiply the manhour estimate by the assumed hourly labor cost to find the installation cost in the *Labor $* column. For example, .500 manhours times $44.45 (the average wage for crew P1) is $22.225 (rounded to the nearest dime, $22.23).

Manhour Estimates include all productive labor normally associated with installing the materials described. These estimates assume normal conditions: experienced craftsmen working on reasonably well planned and managed new construction with fair to good productivity. Labor estimates also assume that materials are standard grade, appropriate tools are on hand, work done by other crafts is adequate, layout and installation are relatively uncomplicated, and working conditions don't slow progress.

All manhour estimates include tasks such as:

- Unloading and storing construction materials, tools and equipment on site.
- Working no more than two floors above or below ground level.

- Working no more than 10 feet above an uncluttered floor.
- Normal time lost due to work breaks.
- Moving tools and equipment from a storage area or truck not more than 200 feet from the work area.
- Returning tools and equipment to the storage area or truck at the end of the day.
- Planning and discussing the work to be performed.
- Normal handling, measuring, cutting and fitting.
- Regular cleanup of construction debris.
- Infrequent correction or repairs required because of faulty installation.

If the work you're estimating won't be done under these conditions, you need to apply a correction factor to adjust the manhour estimates in this book to fit your job.

Applying Correction Factors. Analyze your job carefully to determine whether a labor correction factor is needed. Failure to consider job conditions is probably the most common reason for inaccurate estimates.

Use one or more of the recommended correction factors in Table 1 to adjust for unusual job conditions. To make the adjustment, multiply the manhour estimate by the appropriate conversion factor. On some jobs, several correction factors may be needed. A correction factor less than 1.00 means that favorable working conditions will reduce the manhours required.

Condition	Correction Factor
Work in large open areas, no partitions	.85
Prefabrication under ideal conditions, bench work	.90
Large quantities of repetitive work	.90
Very capable tradesmen	.95
Work 300' from storage area	1.03
Work 400' from storage area	1.05
Work 500' from storage area	1.07
Work on 3rd through 5th floors	1.05
Work on 6th through 9th floors	1.10
Work on 10th through 13th floors	1.15
Work on 14th through 17th floors	1.20
Work on 18th through 21st floors	1.25
Work over 21 floors	1.35
Work in cramped shafts	1.30
Work in commercial kitchens	1.10
Work above a sloped floor	1.25
Work in attic space	1.50
Work in crawl space	1.20
Work in a congested equipment room	1.20
Work 15' above floor level	1.10
Work 20' above floor level	1.20
Work 25' above floor level	1.30
Work 30' above floor level	1.40
Work 35' to 40' above floor level	1.50

Table 1 Recommended Correction Factors

Supervision Expense to the installing contractor is not included in the labor cost. The cost of supervision and non-productive labor varies widely from job to job. Calculate the cost of supervision and non-productive labor and add this to the estimate.

Hourly Labor Costs also vary from job to job. This book assumes an average manhour labor cost of $51.49 for plumbers and $49.64 for sheet metal workers. If these hourly labor costs are not accurate for your jobs, adjust the labor costs up or down by an appropriate percentage. Instructions on the next page explain how to make these adjustments. If you're using National Estimator Cloud, it's easy to set your own wage rates.

Hourly labor costs in this book include the basic wage, fringe benefits, the employer's contribution to welfare, pension, vacation and apprentice funds, and all tax and insurance charges based on wages. Table 2 at the top of the next page shows how hourly labor costs in this book were calculated. It's important that you understand what's included in the figures in each of the six columns in Table 2. Here's an explanation:

Column 1, the base wage per hour, is the craftsman's hourly wage. These figures are representative of what many contractors are paying plumbers, sheet metal workers and helpers in 2026.

Column 2, taxable fringe benefits, includes vacation pay, sick leave and other taxable benefits. These fringe benefits average about 6.37% of the base wage for many plumbing and HVAC contractors. This benefit is in addition to the base wage.

Column 3, insurance and employer-paid taxes in percent, shows the insurance and tax rate for the craft workers. The cost of insurance in this column includes workers' compensation and contractor's casualty and liability coverage. Insurance rates vary

Column Number	1	2	3	4	5	6
Craft	Base wage per hour	Taxable fringe benefits (at 6.37% of base wage)	Insurance and employer taxes (%)	Insurance and employer taxes ($)	Non-taxable fringe benefits (at 5.63% of base wage)	Total hourly cost used in this book
Laborer	25.94	1.65	30.27%	8.35	1.46	37.40
Plumber	37.64	2.40	23.29%	9.33	2.12	51.49
Sheet Metal Worker	35.94	2.29	24.57%	9.39	2.02	49.64
Operating Engineer	37.21	2.37	23.79%	9.42	2.09	51.09
Sprinkler Fitter	36.99	2.36	23.88%	9.40	2.08	50.83
Electrician	36.52	2.33	19.14%	7.44	2.06	48.35
Cement Mason	32.20	2.05	22.18%	7.60	1.81	43.66

Craft Code	Crew Composition	Average Hourly Cost per Manhour
ER	4 building plumbers, 2 building laborers, 1 operating engineer	47.41
SN	4 building sheet metal workers, 2 building laborers, 1 operating engineer	46.35
P1	1 building plumber and 1 building laborer	44.45
ST	1 sprinkler fitter	50.83
SK	4 sprinkler fitters, 2 building laborers, 1 operating engineer	47.03
SL	1 sprinkler fitter and 1 laborer	44.12
S2	1 building sheet metal worker, 1 building laborer	43.52
BE	1 electrician	48.35
CF	1 cement mason	43.66
SW	1 sheet metal worker	49.64

Table 2 Labor Costs Used in This Book

widely from state to state and depend on a contractor's loss experience. Note that taxes and insurance increase the hourly labor cost by approximately 30%. There is no legal way to avoid these costs.

Column 4, insurance and employer taxes in dollars, shows the hourly cost of taxes and insurance. Insurance and taxes are paid on the costs in both columns 1 and 2.

Column 5, non-taxable fringe benefits, includes employer paid non-taxable benefits such as medical coverage and tax-deferred pension and profit sharing plans. These fringe benefits average 5.63% of the base wage for many plumbing and HVAC contractors. The employer pays no taxes or insurance on these benefits.

Column 6, the total hourly cost in dollars, is the sum of columns 1, 2, 4, and 5. The labor costs in Column 6 were used to compute costs in the Labor $ column of this book.

Adjusting Costs in the Labor $ Column. The hourly labor costs used in this book may apply within a few percent on many of your jobs. But wage rates may be much higher or lower in some areas. If the hourly costs shown in Column 6 of Table 2 are not accurate for your work, adjust labor costs to fit your jobs.

For example, suppose your hourly labor costs are as follows:

Plumber	$29.00
Laborer	$19.00
Total hourly crew cost	$48.00

Your average cost per manhour would be $24.00 ($48.00 per crew hour divided by 2 because this is a crew of two).

A labor cost of $24.00 is about 54% of the $44.45 labor cost used for crew P1. Multiply costs in the Labor $ column by .539 to find your estimated cost.

Adjusting the labor costs in this book will make your estimates much more accurate. Making adjustments to labor costs is both quick and easy if you use National Estimator Cloud.

Equipment Cost will vary according to need and application. It is typically $33.20 per day for a 2-ton chain hoist.

Material Costs in this manual are intended to reflect what medium- to low-volume contractors will be paying in 2026 after applying normal discounts. These costs include charges for delivery to within 25 to 30 miles of the supplier.

Overhead and Profit for the installing contractor are not included in the costs in this manual unless specifically identified in the text. Markup can vary widely with local economic conditions, competition and the installing contractor's operating expenses. Add the markup that's appropriate for your company, the job and the competitive environment.

How Accurate Are These Figures? As accurate as possible considering that the editors don't know your material suppliers, haven't seen the plans or specifications, don't know what building code applies or where the job is, had to project material costs at least six months into the future, and had no record of how much work the crew that will be assigned to the job can handle.

You wouldn't bid a job under those conditions. And I don't claim that all plumbing and HVAC work is done at these prices.

Estimating Is an Art, not a science. There is no one price that applies on all jobs. On many jobs the range between high and low bid will be 10% or more. There's room for legitimate disagreement on what the correct costs are, even when complete plans and specifications are available, the date and site are established, and labor and material costs are identical for all bidders.

No estimate fits all jobs. Good estimates are custom made for a particular project and a single contractor through judgment, analysis and experience. This book is not intended as a substitute for judgment, analysis and sound estimating practice. It's an aid in developing an informed opinion of cost, not an answer book.

Additional Costs to Consider

Here's a checklist of additional costs to consider before submitting any bid.

1. Sales taxes
2. Mobilization costs
3. Payment and performance bond costs
4. Permits and fees
5. Storage container rental costs
6. Utility costs
7. Tool costs
8. Callback costs during warranty period
9. Demobilization costs

Exclusions and Clarifications

Neither the job specifications nor the contract may identify exactly what work should be included in the plumbing and HVAC bid. Obviously, you have to identify what work is included in the job.

The most efficient way to define the scope of the work is to prepare a list of tasks not normally performed by your company and attach that list to each bid submitted. Here's a good list of work that should be excluded from your bid.

Your Bid Should Exclude

Final cleaning of plumbing fixtures
Backings for plumbing fixtures
Toilet room accessories
Electrical work, including motor starters
Electrical wiring and conduit over 100 volts
Temporary utilities
Painting, priming and surface preparation
Structural cutting, patching or repairing
Fire protection and landscape sprinklers
Equipment supports
Surveying and layout of control lines
Removal or stockpiling of excess soil
Concrete work, including forming and rebar
Setting of equipment furnished by others
Equipment, unless shown, and personnel hoisting
Wall and floor blockouts
Pitch pockets
The costs of performance or payment bonds
Site utilities
Asbestos removal or disposal
Contaminated soil removal or disposal
Major increases in copper material prices
Fire dampers not shown on the plans

Your Bid Should Include

Trash sweep-up only. Others haul it away
Site utilities from building to property line only
Piping to 5 feet outside the building only
Plumbing & HVAC permits for your work only

Beware of Price Changes

There's no way to be sure what prices will be in three to six months. All labor, equipment, material and subcontract prices in a bid should be based on costs anticipated when the project is expected to be built, not when the estimate is compiled. That presents a problem. Except for the installation of underground utilities, most plumbing and HVAC work is done six months to a year after the bid is submitted. When possible, get price protection in writing from your suppliers and subcontractors. If your suppliers and subs won't guarantee prices, include an escalation allowance in your bid to cover anticipated price increases.

Material Pricing Conditions

All equipment and material prices quoted by your vendors will be conditional. They usually don't include sales tax and are subject to specific payment and shipping terms. Every estimator should understand the meaning of common shipping terms. They define who pays the freight and who has responsibility for processing freight-damage claims. Here's a summary of important conditions you should understand.

F.O.B. Factory (Free On Board at the Factory): Title passes to the buyer when the goods are delivered by the seller to the freight carrier. The buyer pays the freight and is responsible for freight-damage claims.

F.O.B. Factory F.F.A. (Free On Board at the Factory, Full Freight Allowed): The title passes to the buyer when the goods are delivered by the seller to the freight carrier. The seller pays the freight charges, but the buyer is responsible for freight-damage claims.

F.O.B. (city of destination) (Free On Board to your city): The title passes to the buyer when the goods are delivered by the seller to the freight terminal in the city, or nearest city, of destination. The seller pays the freight and is responsible for freight-damage claims to the terminal. The buyer pays the freight charge and is responsible for freight-damage claims from the terminal to the final destination.

F.O.B. Job Site (Free On Board at job site, or contractor's shop): The title passes to the buyer when the goods are delivered to the job site (or shop). The seller pays the freight and is responsible for freight-damage claims.

F.A.S. Port [of a specific city] (Free Alongside Ship at the nearest port): The title passes to the buyer when goods are delivered to the ship dock or port terminal. The seller pays the freight and is responsible for freight-damage claims to the ship dock or port terminal only. The buyer pays the freight and is responsible for freight-damage claims from the ship dock or port terminal to the designated delivery point.

Obviously, it's to your advantage to instruct all vendors to quote costs F.O.B. the job site or your shop.

Reducing Costs

Most construction specifications allow the use of alternative equipment and materials. It's the estimator's responsibility to select the most cost-effective products. Research and compare your costs before making any decisions. Avoid selecting any material or equipment simply because that's what you've always done.

Don't recommend plastic products such as ABS, PVC, or polypropylene pipe or corrugated flexible ducts until you've checked local code requirements. Most building codes prohibit use of these materials inside public buildings such as schools, care centers and hospitals.

It's wise to select 100% factory-packaged equipment. Beware of equipment labeled "Some assembly required." Field labor costs for mounting loose coils, motors and similar equipment are very high.

Value Engineering

Let's suppose you've submitted a combined plumbing and HVAC bid for $233,000. Your cutthroat competitor put in a bid at $4,000 less, $229,000. Obviously there's no way you're going to get the job. Right?

Not so fast! Maybe value engineering can help you win that contract — while fattening your profit margin.

Suppose the proposal you submitted had two parts. Part I is the bid for $233,000, based entirely on job plans and specs, just the way they were written. But appended to your proposal is Part II, a list of suggestions for saving money without sacrificing any of the capacity or quality designed into the system. Here's an example of what might be in Part II:

1. Deduct for providing pipe hanger spacings per UPC in lieu of specified spacings: $1,750.00
2. Deduct for reducing heating hot water pipe sizes by using 40 degrees F Delta T in lieu of specified 20 degrees F Delta T: $4,600.00
3. Deduct for providing pressure/temperature taps at air handling units, pumps and chillers in lieu of specified thermometers and pressure gauges: $875.00

4. Deduct for eliminating water treatment in closed piping systems: $1,800.00

5. Deduct for piping chilled and heating hot water pumps in parallel in lieu of providing 100% standby pumps: $2,900.00

Total deductions: $11,925.00

Adopting these suggestions would make you low bidder by nearly $8,000. A saving like that will be tempting to most owners, especially if the owner understands that your suggestions result in a system that is every bit as good and maybe better than the system as originally designed.

You're not offering to undercut the competition. Far from it. You're using knowledge and experience to create better value for the owner. That's called value engineering and it's likely to win the respect of nearly all cost-conscious owners.

Notice that reducing costs is only part of what value engineering is all about. You don't cut costs at the expense of system quality, integrity, capacity or performance.

Don't waste your time, and your client's, by offering to substitute cheaper or lower-quality fixtures or equipment. Any cutthroat contractor with a price list can do that. Recommend the use of inferior materials and you'll be associated with the inferior goods you promote. Some owners consider even the suggestion to be insulting.

The recommendations you make (like most of those in the example) will require design changes. You can expect to be examined (or even challenged) on these points. Be ready to explain and defend each of your suggestions. Convince the client (or the design engineer) that your ideas are based on sound engineering principles and you're well on the way to winning the owner's confidence and the contract.

Now, let's go back to the list and see how we might justify the five value engineering recommendations.

1. **Pipe Hanger Spacing.** The pipe hanger spacings recommended in the Uniform Plumbing Code (UPC) are calculated by experienced, professional structural engineers. The safety factors used in these calculations are very conservative. They've been widely used for many years and have proved to be more than adequate. There's no need for more hangers than the UPC requires.

2. **Changing HHW Delta T.** In hydronic heating systems, heat measured in Btus is pumped to terminal units. The proposed change of the Delta T, from 20 degrees F to 40 degrees F, has no effect whatsoever on how many Btus the system delivers. You're not changing anything but the volume of water being pumped. At lower volume levels, the size of the pump, the pipe and the pipe insulation can all be reduced. Not one of these changes will affect the system's ability to transmit heat. Furthermore, operating costs will also drop, since less pump horsepower will be needed to run the smaller pump.

3. **Thermometers/Pressure Gauges.** Thermometers and pressure gauges installed on or near vibrating machinery have a very short life expectancy. Gauges quickly lose accuracy under harsh conditions. Readings will become less and less reliable. That's potentially dangerous. You can avoid this problem by using insertion-type pressure/temperature taps instead. Store these sensitive gauges in a desk drawer or a tool crib when not in use. Safely stored, they're protected from damage. They'll give accurate readings longer and won't need to be replaced as often. And they're simple to use. Just insert a gauge in one of the conveniently located taps. Make the reading, then remove the gauge and put it away.

4. **Water Treatment.** ITT Bell & Gossett has done studies on corrosion in closed hydronic systems that have a make-up water rate of no more than 5% per year. These studies show that corrosion virtually stops when entrained air is either removed or depleted. No water treatment is needed in this closed system.

5. **100% Standby Pumps.** Two pumps piped and operated in parallel are more economical. Even if one pump fails, the other pump can maintain delivery at 75 to 80% of the designed flow rate. That's usually adequate for emergency operation.

These cost-saving ideas are small, but could tip the balance in your favor. I hope they demonstrate the potential that value engineering has when bidding jobs. Any time you're compiling an estimate, keep an eye out for ways to save money or reduce the owner's cost. Jot a note to yourself about each potential saving you identify. Before submitting the bid, make a list of your alternate suggestions. Maybe best of all, markup on your value engineering suggestions can be higher than your normal markup. If value engineering can cut costs by $10,000, maybe as much as $4,000 of that should end up in your pocket!

Value Engineering: Surplus Materials

Value engineering doesn't begin and end with job plans and specs. Value engineering means getting the most value at the least cost, no matter whether it's value to the owner or value to the contractor. Smart mechanical contractors learn to build extra value into their jobs by controlling shrinkage of materials. Nearly every significant plumbing and HVAC job ends with at least some surplus material on hand. Material left over when the job is done tends to be discarded as waste or hauled off the job in the back of a truck that doesn't have your company name on the door. And why not? It's surplus — not needed. The owner didn't need it. So now it's up for grabs.

Not quite. Let's consider who actually owns that surplus material. When your company has been paid, every piece of material your crew installed belongs to the building owner. But what about those fittings, hangers and valves delivered to the job site but never actually used? Almost certainly, those materials were included in your bid. So aren't they the property of the owner? Not in my opinion. The owner contracted for a mechanical system and (presumably) has one. Unless it's a cost-plus job or a labor-only job, the owner didn't buy materials delivered to the job site. The owner bought a mechanical system and has one — completely separate and apart from any surplus materials. In my mind, the property owner has no more claim to left-over materials than the same owner would have claim to labor hours not expended or equipment not used on the same job.

Unless there's some provision in your contract to the contrary, surplus material belongs to the installing contractor. But your right to that material and the chance of actually getting it back to your shop are two very different propositions. I see recovery of surplus material as a training issue. As a matter of company policy, make it clear to your crews that surplus material belongs to your company. The supervisor on every job should be accountable for recovery of excess material. Every significant job will have at least some surplus. Accounting for that surplus should be part of your routine close-out procedure. Fortunately, it's not difficult. I'll explain.

Control of surplus materials begins with a good checklist, or form. I recommend the Materials, Equipment and Tool form, "MET" for short. A blank MET form appears following this section. Your MET should show both what's delivered to the job site (material, equipment and tools) and surplus "drops" returned to your shop at project close-out. A MET ensures that the estimator, the shop inventory manager and your field supervisor are on the same page. Your MET establishes accountability. Nothing falls through the cracks. Job input equals job output plus returns. Everything delivered to the job and not expended should be returned to your shop.

Here's how it works:

1. Based on the estimate that won you the job, the items needed are purchased for the job and staged for delivery to the job site.
2. As materials, equipment and tools are delivered to the job site, your supervisor completes the first three columns of the MET form: Description, Quantity and Date.
3. As work is completed, the same supervisor completes the four columns under Returned to Inventory: Quantity Returned, Date, Status Code and Value. The status code will be either "RS" (Returned and Salvaged) or "RN" (Returned New).
4. Back at your shop, both RS and RN materials should be restored to inventory.
5. If your company has an inventory manager, have that manager assign the return value to each item returned. If you're using QuickBooks Pro, the "Adjust Inventory" feature can handle this task quite easily. Add two new categories under "Inventory Stock on Hand by Vendor." The first new category is Returned Salvage. The second is Returned New. Be sure the value of RS materials includes the cost of any reconditioning done to restore salvaged materials (such as pumps and boilers) to serviceable condition.
6. Comparing MET deployed to the job site with MET returned to inventory yields MET actually used on the job. That's a very important number to every plumbing and HVAC estimator. Be sure actual usage gets entered on the Project Summary form.
7. When the take-off on your next estimate is complete, compare that materials list with a summary of RS and RN materials on hand from prior jobs.
8. Evaluate which returned materials can be redeployed on the new job.
9. It's a management decision to either (1) charge the new job for the cost of RS and RN materials already on hand, or (2) consider materials on hand as "free" and a competitive advantage in winning the new bid. Either way, RN and RS materials are an asset to your company.

Plumbing and HVAC materials are expensive. Every mechanical contractor has an interest in MET tracking. Everyone in your company should be aware of the need for good materials management. Used correctly, the MET form in this book can help engineer more value into your jobs.

Maximizing the Value of Old Estimates

There should be two profits in every job. The first is money in the bank — a return on time and expenses. The second is what you learn from the job — primarily by comparing the estimate you made with what turns out to be your actual cost. On some jobs, the value of lessons learned may outweigh net revenue.

Every plumbing and HVAC contractor has marginal jobs. That's normal. What *shouldn't* be normal is repeating mistakes. The best way to avoid trouble in your future is to keep track of your past. Keeping old estimates available for reference can help prevent errors on new estimates.

As your file of completed estimates grows, organization becomes more important. You need an easy way to find similar projects with the same components and comparable scope of work. If your estimating file is in QuickBooks Pro, searching by keyword may be enough. Otherwise, I recommend creating a short summary for each completed job, and an index that references all summaries available for comparison. You'll find a blank Project Summary form at the end of this section. To make reference easier, create an index by type of job and equipment used. You may choose to use an alphabetical index based on client name or project ID.

How to complete the Project Summary form is obvious. The many ways to use this form may not be so obvious, so here are a few pointers.

1. Use your index of Project Summary forms to find completed jobs most similar to the job you're bidding. Believe it or not, Project Summary forms with the widest margin of error will be most useful. Ask yourself: Who worked on those projects? Who was the field superintendent? Who were the vendors? Did the errors result from poor estimating or the poor performance of vendors, supervisors or crews? The most common estimating errors occur when (a) inspecting the job site, (b) examining the plans or (c) reading the specifications. What did you miss and why? Look for pitfalls to avoid in the job now being estimated. Identify the biggest two or three mistakes made when bidding that job. Make a notation about each on the Project Summary form.
2. Now look at your bid for the current job. Which mistakes made on a prior job might you expect on this job? Concentrate on the big three oversights to avoid: Inspecting the job site; examining the plans; and reading the specifications.
3. Unless there's a major error in take-off, your estimate of material costs should be within about 5 percent of the actual costs of materials. However, it's common for labor cost estimates to vary 20 percent or more from actual labor costs. This is precisely where data from old jobs comes in handy. If your Project Summary files show that some project types are consistent money-losers, either shift your company's focus to another class of work, factor more contingency into your bids, or find some way to wring inefficiencies out of the labor component. Poor staging, delivery and retrieval procedures drag down labor productivity on any job.
4. Use your file of Project Summary forms to spot any common thread that runs through either money-making jobs or money-losing jobs. For example, if the names of certain subcontractors or vendors are prominent on low-margin jobs, maybe there's a relationship between your profit margin and choice of subs and suppliers. Even the best and most reliable vendors can become complacent if not challenged occasionally.
5. Project Summary forms should note changes and extras identified after the contract was signed — both for which your company was paid and changes done without additional compensation. Projects with changes and extras that exceed about 4 percent of the contract price deserve special scrutiny. Jobs with changes beyond about 4 percent aren't good for business, at least in my opinion. Nearly all changes have a negative impact on your job schedule and require a disproportionate investment of management resources. Too many changes can antagonize the owner and design staff, even if they were responsible for the altered plans. You may know of a mechanical contractor with a reputation for capitalizing on change orders. But I've rarely seen a job plagued with changes that turned into a money-maker for anyone — except the attorneys. Your file of Project Summary forms will show job types that carry change order risk. Before finalizing and submitting any bid, consider whether the job will get mired in disputes over changes and extras. If similar jobs have ended on the courthouse steps, factor that risk into your estimate.

Utility of a Project Summary forms file is limited only by your ingenuity. The important point is to keep and organize the source of your second profit available on every job. What you learn can be more valuable than what you earn.

The Estimating Procedure

Every plumbing and HVAC estimator works under deadline pressure. You'll seldom have the luxury of spending as much time as you would like on an estimate. Estimators who aren't organized waste valuable time and tend to make careless errors. Try to be well-organized and consistent in your approach to estimating. For most projects, I recommend that you follow the procedures listed below and in the order listed:

1. Get a second set of project drawings and specifications for use by your suppliers and subcontractors. Remember that your subs and suppliers need access to the plans and specs and time to prepare their quotes.

2. Study the plans and specs carefully. Highlight important items. Make a list of specific tasks that require labor unit correction factors. The estimate is never complete until you're totally familiar with the project and the applicable construction codes.

3. Get the general contractor or owner to identify the proposed construction schedule and subcontractor lay-down (storage) area. Work schedule and site conditions always affect your costs.

4. Contact all potential suppliers and subcontractors as early as possible. Set a time when each can come to your office to make their take-offs from the spare set of contract documents.

When this important preliminary work is done, or in progress, it's time to begin your detailed take-off.

Guidelines for Good Estimating

You can compile estimates on a legal pad, a printed estimating form or on a computer. Regardless of the method, these guidelines will apply:

List Each Cost Separately on your take-off sheet. Don't combine system estimates, even if the materials are the same type. A combined system estimate may have to be completely redone if materials for one system are changed at a later date. Use the Estimate Detail Sheet on page 16 if you don't already have a good material take-off form.

Use Engineer's Identification Numbers when listing equipment. The word pump without any other description is ambiguous when there are several pumps included in the project.

Don't Forget Labor Adjustment factors if your labor costs are significantly higher or lower than the costs used in this book. See instructions on page 7 for adjusting labor costs.

Use Colored Pencils or highlighters to mark the items you've taken off and listed. Use a different color for each piping or ducting system.

Log Telephone Quotes and other important phone conversations on a telephone quote form. See the sample on page 18.

Project Estimated Costs for labor, material and equipment to the time when the work is expected to be done, not when the job is being estimated.

The only good estimate is a complete estimate. You've probably heard this saying, "He who makes the most mistakes is likely to be low bidder, and live to regret it."

Preparing the Proposal

It's both common courtesy and good business practice to deliver an unpriced copy of your bid or proposal letter to the general contractor three or four days before the bid deadline date. This gives the contractor time to study your proposal and obtain alternate pricing for items you may have excluded. To avoid misunderstandings, make sure your proposals include, as a minimum, the following elements:

1. The complete name and address of the proposed project.
2. Specification title and issue date.
3. A complete listing of drawings and their issue or revision date.
4. A complete list of addenda and their dates of issue.
5. A list of specification section numbers covered by your proposal.
6. A list of exclusions, clarifications and assumptions.

Your final bid can be phoned in or sent by fax, but it should reach the general contractor or owner no more than five or ten minutes before the bid deadline. Prices submitted too early may have to be revised because of last-minute price changes by subcontractors or suppliers.

MET Worksheet

Material, Equipment and Tool Delivery and Surplus Return Record

Project ID _____ Job Location _____

Supervisor _____ Start Date _____

Description of Material, Equipment or Tool Delivered or Returned	Delivered to Job Site		Returned to Inventory			
	Quantity Delivered	Date Delivered	Quantity Returned	Date Returned	Status Code RN or RS	Value at Return

PROJECT SUMMARY

Project ID _____ Job Location _____

Short description _____ _____

Supervisor _____ _____

Index ID _____ Start Date _____

Estimator _____ Client _____

Major vendors _____ Subcontractors _____

_____ _____

Sources of cost deviation _____ _____

_____ _____

_____ _____

Related Projects by ID Number _____ _____

Thumbnail Summary	Labor	Material	Equipment	Subcontract	Deployed RN/RS	Total
Actual cost						
Estimate Over/(Under)						
Full Summary						
Bid amount						
Estimated cost						
Projected profit						
Cost overrun						
Bid profit						
Change orders						
Cost of changes						
Total profit						
Total profit with RN/RS						
Redeployment						

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Estimate Detail Sheet

Data carried forward from Take-Off Quantity Survey Sheet(s)

Company/Department _____ Estimator _____ Date _____

Project _____ Checked by _____ Date _____

Address _____ Notes: _____

Job description _____ Estimate # _____

CSI Division/Account _____ Estimate due _____

Item Description	Quantity	Unit	Crew @ MH/Unit	Manhours Ext.	Materials Unit $	Materials Ext. $	Labor Unit $	Labor Ext. $	Equipment Unit $	Equipment Ext. $	Subcontract Unit $	Subcontract Ext. $	Total $
Totals This Sheet			**Manhours**		**Material $**		**Labor $**		**Equipment $**		**Subcontract $**		**Total $**

Carry totals forward to Estimate Summary Sheet Estimate #_____ Estimate Detail Sheet _____ of _____

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Quotation Sheet

Job: _____

Supplier: _____

Salesperson: _____ **Phone No:** _____

Per Plans/Specs: _____ **Freight:** _____ **Terms:** _____

Description	Delivery Time	Price

By: _____

Record of Telephone Conversation

Date: _____ **Time:** _____ **Project:** _____

Telecon with: _____

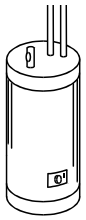
Company: _____ **Phone No:** _____

Subject: _____

Details of Conversation: _____

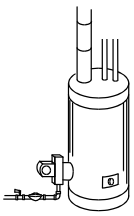
By: _____

Description	Craft@Hrs	Unit	Material $	Labor $	Equipment $	Total $
Electric domestic hot water heater (residential). Set in place only (floor models). Make additional allowances for pipe and electrical connections. (See below)						
6 gallon						
1.5 KW/110V	P1@.500	Ea	495.00	22.20	—	517.20
10 gallon						
1.5 KW/110V	P1@.500	Ea	554.00	22.20	—	576.20
15 gallon						
1.5 KW/110V	P1@.750	Ea	582.00	33.30	—	615.30
20 gallon						
1.5 KW/110V	P1@.750	Ea	547.00	33.30	—	580.30
30 gallon						
1.5 KW/110V	P1@1.00	Ea	561.00	44.50	—	605.50
40 gallon						
1.5 KW/110V	P1@1.20	Ea	587.00	53.30	—	640.30
50 gallon						
3 KW/110V	P1@1.30	Ea	634.00	57.80	—	691.80
12 gallon						
3 KW/220V	P1@.500	Ea	488.00	22.20	—	510.20
20 gallon						
3 KW/220V	P1@.750	Ea	534.00	33.30	—	567.30
30 gallon						
3 KW/220V	P1@1.00	Ea	609.00	44.50	—	653.50
40 gallon						
3 KW/220V	P1@1.20	Ea	663.00	53.30	—	716.30
50 gallon						
3 KW/220V	P1@1.30	Ea	710.00	57.80	—	767.80

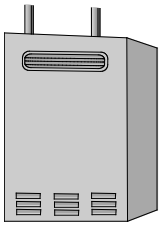


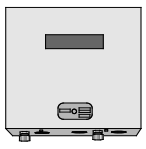
Electric domestic hot water heater (commercial), 208/240 volt. Set in place only. Make additional allowances for pipe and electrical connections. (See below)						
96 gallon, 12 kw	P1@1.50	Ea	2,750.00	66.70	—	2,816.70
96 gallon, 18 kw	P1@1.50	Ea	3,730.00	66.70	—	3,796.70
96 gallon, 36 kw	P1@1.50	Ea	3,860.00	66.70	—	3,926.70
120 gallon, 18 kw	P1@2.00	Ea	3,960.00	88.90	—	4,048.90
120 gallon, 36 kw	P1@2.00	Ea	4,080.00	88.90	—	4,168.90
120 gallon, 54 kw	P1@2.00	Ea	4,830.00	88.90	—	4,918.90
120 gallon, 63 kw	P1@2.00	Ea	5,210.00	88.90	—	5,298.90

Gas-fired domestic hot water heater (residential). Set in place only, Make additional allowances for pipe and combustion venting connections. (See below)						
30 gallon	P1@1.00	Ea	565.00	44.50	—	609.50
40 gallon	P1@1.00	Ea	913.00	44.50	—	957.50
50 gallon	P1@1.50	Ea	1,040.00	66.70	—	1,106.70



Description	Craft@Hrs	Unit	Material $	Labor $	Equipment $	Total $
Gas-fired domestic hot water heater (commercial), standard efficiency. Set in place only, Make additional allowances for pipe and combustion venting connections. (See below)						
50 gal./ 95 gph	P1@2.00	Ea	2,740.00	88.90	—	2,828.90
67 gal./106 gph	P1@2.00	Ea	3,250.00	88.90	—	3,338.90
76 gal./175 gph	P1@2.00	Ea	4,340.00	88.90	—	4,428.90
91 gal./291 gph	P1@2.00	Ea	5,240.00	88.90	—	5,328.90
Gas-fired domestic hot water heater (commercial), energy miser. Set in place only, Make additional allowances for pipe and combustion venting connections. (See below)						
50 gal./ 95 gph	P1@2.00	Ea	6,760.00	88.90	—	6,848.90
67 gal./106 gph	P1@2.00	Ea	7,060.00	88.90	—	7,148.90
76 gal./175 gph	P1@2.00	Ea	8,750.00	88.90	—	8,838.90
91 gal./291 gph	P1@2.00	Ea	10,400.00	88.90	—	10,488.90
Tankless natural gas water heaters. Ambient pressure. DOE and UL rated. For residential, multi-dwelling and light commercial potable water applications. Add the cost of piping, tempering valve, circulating pump, controls, and electrical connection, post-installation inspection by both the fire marshal and the mechanical inspector to validate federal, state and local energy tax credits or energy tax credit offsets. For larger arrays (laundries, institutional facilities, food processing plants), develop an estimate based on the required capacity and multiply these costs by the number of heaters required. Rated in Btus and gallons per minute capacity. (1 Mbh = 1,000 Btus)						
19.5-140 Mbh, .75-5.8 Gpm	P1@16.0	Ea	1,950.00	711.00	—	2,661.00
11-199 Mbh, .5-7 Gpm	P1@20.0	Ea	2,310.00	889.00	—	3,199.00
25-235 Mbh, .75-9.6 Gpm	P1@20.0	Ea	3,000.00	889.00	—	3,889.00
Tankless electric point-of-use water heaters. Ambient pressure, DOE and UL rated. For residential, multi-dwelling and light commercial potable water applications. Cost does not include piping, tempering valve, circulating pump, controls, storage tank, electrical connection. Add the cost of post-installation inspection by the mechanical inspector to validate federal, state and local energy tax credits or energy tax credit offsets. In rated gallons per minute capacity.						
5.5 Kw/40 Amp, .75-2 Gpm	P1@4.00	Ea	492.00	178.00	—	670.00
9.5 Kw/50 Amp, .75-2.5 Gpm	P1@4.25	Ea	582.00	189.00	—	771.00
19 Kw/100 Amp, 1-3.5 Gpm	P1@4.50	Ea	969.00	200.00	—	1,169.00
28 Kw/120 Amp, 1.5-5 Gpm	P1@4.75	Ea	1,770.00	211.00	—	1,981.00





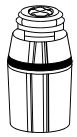
Description	Craft@Hrs	Unit	Material $	Labor $	Equipment $	Total $
Domestic hot water heater connection assembly. Includes supply, return, recirculation and relief piping and fittings (copper), relief and isolation valves. Make additional allowances for gas and venting connections where applicable.						
¾" residential	P1@1.75	Ea	342.00	77.80	—	419.80
¾" commercial	P1@2.25	Ea	459.00	100.00	—	559.00
1" commercial	P1@2.75	Ea	804.00	122.00	—	926.00
1¼" commercial	P1@3.50	Ea	985.00	156.00	—	1,141.00
1½" commercial	P1@3.75	Ea	1,020.00	167.00	—	1,187.00
2" commercial	P1@4.50	Ea	1,090.00	200.00	—	1,290.00
2½" commercial	P1@5.75	Ea	2,270.00	256.00	—	2,526.00
3" commercial	P1@6.50	Ea	3,480.00	289.00	—	3,769.00
Domestic water heater combustion vent connection. Make additional allowances for piping distances greater than 25'.						
2" B-vent	P1@.090	LF	7.18	4.00	—	11.18
3" B-vent	P1@.100	LF	8.88	4.45	—	13.33
4" B-vent	P1@.110	LF	11.80	4.89	—	16.69
6" B-vent	P1@.130	LF	14.40	5.78	—	20.18
Tankless heater vent kit	P1@2.50	Ea	681.00	111.00	—	792.00
Power vent kit	P1@2.00	Ea	1,670.00	88.90	—	1,758.90

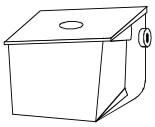
Description	Craft@Hrs	Unit	Material $	Labor $	Equipment $	Total $
Water softener, time clock controller. Including brine tank, brine well and pick-up tube. Labor includes setting in place, connecting the unit to an existing domestic water distribution system, start up and testing.						
20,000 grain water softener, TCC	P1@4.50	Ea	634.00	200.00	—	834.00
30,000 grain water softener, TCC	P1@4.50	Ea	676.00	200.00	—	876.00
45,000 grain water softener, TCC	P1@4.50	Ea	752.00	200.00	—	952.00
50,000 grain water softener, TCC	P1@4.75	Ea	848.00	211.00	—	1,059.00
60,000 grain water softener, TCC	P1@4.75	Ea	1,000.00	211.00	—	1,211.00
75,000 grain water softener, TCC	P1@5.00	Ea	1,080.00	222.00	—	1,302.00
90,000 grain water softener, TCC	P1@5.50	Ea	1,460.00	244.00	—	1,704.00
120,000 grain water softener, TCC	P1@5.75	Ea	1,570.00	256.00	—	1,826.00
Water softener, mechanically-metered controller. Including brine tank, brine well and pick up tube. Labor includes setting in place, connecting the unit to an existing domestic water distribution system, start up and testing.						
20,000 grain water softener, MMC	P1@4.50	Ea	824.00	200.00	—	1,024.00
30,000 grain water softener, MMC	P1@4.50	Ea	860.00	200.00	—	1,060.00
45,000 grain water softener, MMC	P1@4.50	Ea	936.00	200.00	—	1,136.00
50,000 grain water softener, MMC	P1@4.75	Ea	1,030.00	211.00	—	1,241.00
60,000 grain water softener, MMC	P1@4.75	Ea	1,200.00	211.00	—	1,411.00
75,000 grain water softener, MMC	P1@5.00	Ea	1,290.00	222.00	—	1,512.00
90,000 grain water softener, MMC	P1@5.50	Ea	1,650.00	244.00	—	1,894.00
120,000 grain water softener, MMC	P1@5.75	Ea	1,760.00	256.00	—	2,016.00

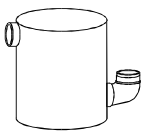
Description	Craft@Hrs	Unit	Material $	Labor $	Equipment $	Total $
Water softener, electronically-metered controller. Including brine tank, brine well and pick up tube. Labor includes setting in place, connecting the unit to an existing domestic water distribution system, start up and testing.						
20,000 grain water softener, EMC	P1@4.50	Ea	874.00	200.00	—	1,074.00
30,000 grain water softener, EMC	P1@4.50	Ea	900.00	200.00	—	1,100.00
45,000 grain water softener, EMC	P1@4.50	Ea	987.00	200.00	—	1,187.00
50,000 grain water softener, EMC	P1@4.75	Ea	1,080.00	211.00	—	1,291.00
60,000 grain water softener, EMC	P1@4.75	Ea	1,270.00	211.00	—	1,481.00
75,000 grain water softener, EMC	P1@5.00	Ea	1,330.00	222.00	—	1,552.00
90,000 grain water softener, EMC	P1@5.50	Ea	1,700.00	244.00	—	1,944.00
120,000 grain water softener, EMC	P1@5.75	Ea	1,810.00	256.00	—	2,066.00
Water softener accessories						
By-pass valve	P1@.400	Ea	85.50	17.80	—	103.30
Manifold adapter kit	P1@.200	Ea	23.10	8.89	—	31.99
Turbulator	P1@.400	Ea	42.20	17.80	—	60.00
Iron filter, electronically-metered controller. Manganese green sand filter. Labor includes setting in place, connecting the unit to an existing domestic water distribution system, start-up and testing.						
42,000 iron filter (1.5 cf media), 5 gpm	P1@4.00	Ea	826.00	178.00	—	1,004.00
65,000 iron filter (2.0 cf media), 6 gpm	P1@4.50	Ea	978.00	200.00	—	1,178.00
84,000 iron filter (2.5 cf media), 8 gpm	P1@4.75	Ea	1,040.00	211.00	—	1,251.00
Replacement green sand media	P1@1.20	CF	49.80	53.30	—	103.10
Iron filter accessories						
By-pass valve	P1@.400	Ea	85.80	17.80	—	103.60
Air vent	P1@.200	Ea	68.10	8.89	—	76.99
Air controller	P1@.400	Ea	76.90	17.80	—	94.70

Description	Craft@Hrs	Unit	Material $	Labor $	Equipment $	Total $
Combination iron filter/water softener. Zeolite resins soften water and remove iron and manganese. Controller automatically controls PH level. Labor includes setting in place, connecting the unit to an existing domestic water distribution system, start-up and testing.						
40,000 iron filter, 1.3 cf media	P1@4.00	Ea	1,600.00	178.00	—	1,778.00
60,000 iron filter, 1.7 cf media	P1@4.50	Ea	1,730.00	200.00	—	1,930.00
80,000 iron filter, 2.5 cf media	P1@4.75	Ea	2,510.00	211.00	—	2,721.00
Hot water softener, time clock controller. Brass valve construction. Designed for 150 F. maximum operating temperature. Includes brine tank, brine well and pick-up tube. Labor includes setting in place, connecting the unit to an existing domestic water distribution system, start-up and testing.						
20,000 grain hot water softener	P1@4.50	Ea	2,000.00	200.00	—	2,200.00
30,000 grain hot water softener	P1@4.50	Ea	2,130.00	200.00	—	2,330.00
40,000 grain hot water softener	P1@4.50	Ea	2,230.00	200.00	—	2,430.00
60,000 grain hot water softener	P1@4.75	Ea	2,630.00	211.00	—	2,841.00
Pressure tank, fiberglass wound. Labor includes setting in place, connecting the tank to a domestic water distribution system and testing.						
Fiberglass pressure tank, 20 gallon	P1@2.00	Ea	325.00	88.90	—	413.90
Fiberglass pressure tank, 30 gallon	P1@2.00	Ea	366.00	88.90	—	454.90
Fiberglass pressure tank, 80 gallon	P1@2.75	Ea	593.00	122.00	—	715.00
Fiberglass pressure tank, 120 gallon	P1@3.50	Ea	782.00	156.00	—	938.00
Brass tank tee assembly, ¾"	P1@3.50	Ea	50.40	156.00	—	206.40
Brass tank tee assembly, 1"	P1@3.50	Ea	93.90	156.00	—	249.90
Brass tank tee assembly, 1¼"	P1@3.50	Ea	164.00	156.00	—	320.00

Description	Craft@Hrs	Unit	Material $	Labor $	Equipment $	Total $
Ultra-violet water disinfection unit. Stainless steel reactor, audible and visible alarm, lamp end-of-life indicator and 7-day override. Gpm rating at 30,000 mj/m2 output. Labor includes setting in place, connecting to the water system and testing.						
UV system, 1 gpm, ¼" in/out	P1@3.00	Ea	276.00	133.00	—	409.00
UV system, 6 gpm, ½" in/out	P1@3.00	Ea	537.00	133.00	—	670.00
UV system, 8 gpm, ¾" in/out	P1@4.00	Ea	621.00	178.00	—	799.00
UV system, 12 gpm, ¾" in/out	P1@4.00	Ea	796.00	178.00	—	974.00
UV replacement lamp, 20W, 1 gpm	P1@.750	Ea	61.80	33.30	—	95.10
UV replacement lamp, 32W, 6 gpm	P1@.750	Ea	70.10	33.30	—	103.40
UV replacement lamp, 39W, 8-12 gpm	P1@.750	Ea	89.70	33.30	—	123.00
UV replacement ballast, 420 Mv/110V	P1@1.00	Ea	270.00	44.50	—	314.50
Kitchen equipment booster heater						
1,000 watt	P1@4.00	Ea	876.00	178.00	—	1,054.00
Dishwasher						
Built-in	P1@5.00	Ea	949.00	222.00	—	1,171.00
Garbage disposal						
½ HP	P1@2.00	Ea	197.00	88.90	—	285.90
¾ HP	P1@2.00	Ea	329.00	88.90	—	417.90
Grease and oil interceptor						
4 GPM	P1@4.00	Ea	395.00	178.00	—	573.00
10 GPM	P1@5.00	Ea	643.00	222.00	—	865.00
15 GPM	P1@7.00	Ea	959.00	311.00	—	1,270.00
20 GPM	P1@8.00	Ea	1,160.00	356.00	—	1,516.00
Hair and lint interceptor						
1½"	P1@.650	Ea	225.00	28.90	—	253.90
2"	P1@.750	Ea	320.00	33.30	—	353.30
All bronze ¾" to 1½" in-line NPT pump						
1/12 HP	P1@1.50	Ea	843.00	66.70	—	909.70
1/6 HP	P1@1.50	Ea	1,260.00	66.70	—	1,326.70
1/4 HP	P1@1.50	Ea	1,470.00	66.70	—	1,536.70







Description	Craft@Hrs	Unit	Material $	Labor $	Equipment $	Total $
Kitchen appliance gas trim						
½"	P1@1.15	Ea	48.60	51.10	—	99.70
¾"	P1@1.30	Ea	88.80	57.80	—	146.60
1"	P1@1.60	Ea	103.00	71.10	—	174.10
1¼"	P1@2.10	Ea	170.00	93.30	—	263.30
1½"	P1@2.50	Ea	215.00	111.00	—	326.00
2"	P1@3.00	Ea	287.00	133.00	—	420.00
Hot and cold water supply						
½"	P1@1.10	Ea	58.90	48.90	—	107.80
¾"	P1@1.55	Ea	83.60	68.90	—	152.50
1"	P1@1.90	Ea	114.00	84.50	—	198.50
1¼"	P1@2.50	Ea	160.00	111.00	—	271.00
1½"	P1@3.00	Ea	200.00	133.00	—	333.00
Continuous waste						
2-part	P1@.250	Ea	71.60	11.10	—	82.70
3-part	P1@.350	Ea	122.00	15.60	—	137.60
4-part	P1@.450	Ea	156.00	20.00	—	176.00
Indirect waste						
½"	P1@1.05	Ea	18.70	46.70	—	65.40
¾"	P1@1.50	Ea	31.70	66.70	—	98.40
1"	P1@1.90	Ea	50.90	84.50	—	135.40
1¼"	P1@2.15	Ea	75.10	95.60	—	170.70
1½"	P1@2.60	Ea	98.90	116.00	—	214.90
2"	P1@3.00	Ea	151.00	133.00	—	284.00
Kitchen fixture waste tailpiece						
1½"	P1@.100	Ea	17.90	4.45	—	22.35
Kitchen fixture trap with solder bushing						
1½"	P1@.250	Ea	60.40	11.10	—	71.50
2"	P1@.300	Ea	83.70	13.30	—	97.00

Description	Craft@Hrs	Unit	Material $	Labor $	Equipment $	Total $

Water closet, floor-mounted, flush tank, white vitreous china, lined tank. Complete with trim. Make additional allowances for rough-in. Based on American Standard Cadet series. ADA means American Disabilities Act compliant. (Wheelchair accessible)

Round bowl	P1@2.10	Ea	312.00	93.30	—	405.30
Elongated bowl	P1@2.10	Ea	377.00	93.30	—	470.30
ADA, 18" high	P1@2.10	Ea	513.00	93.30	—	606.30

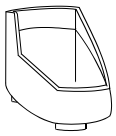
Water closet, floor-mounted, flush valve, white vitreous china. Complete with trim. Make additional allowances for rough-in. Based on American Standard. ADA means American Disabilities Act compliant. (Wheelchair accessible)

Elongated bowl	P1@2.60	Ea	488.00	116.00	—	604.00
Elongated bowl, ADA 18" high	P1@2.60	Ea	581.00	116.00	—	697.00
Elongated bowl with a bedpan cleanser	P1@4.10	Ea	843.00	182.00	—	1,025.00
Elongated bowl, ADA 18" high with a bedpan cleanser	P1@4.10	Ea	913.00	182.00	—	1,095.00

Water closet, wall-hung, flush valve, white vitreous china. Complete with fixture carrier and all trim. Make additional allowances for rough-in. Based on American Standard Afwall series.

Elongated bowl	P1@3.55	Ea	773.00	158.00	—	931.00
Elongated bowl with electronic flush valve	P1@3.80	Ea	1,380.00	169.00	—	1,549.00
Elongated bowl with bedpan cleanser	P1@5.05	Ea	1,120.00	224.00	—	1,344.00
Electronic flush valve, add	P1@.600	Ea	611.00	26.70	—	637.70

Urinal, wall-hung, flush valve, white vitreous china. Complete with trim. Make additional allowances for rough-in.



Siphon-jet type	P1@3.15	Ea	773.00	140.00	—	913.00
Wash-out type	P1@3.10	Ea	631.00	138.00	—	769.00
Wash-down type	P1@3.00	Ea	446.00	133.00	—	579.00
Urinal carrier, add	P1@.600	Ea	135.00	26.70	—	161.70
Electronic flush valve, add	P1@.600	Ea	494.00	26.70	—	520.70

Urinal, stall-type, flush valve, white vitreous china. Complete with trim. Make additional allowances for rough-in.

Stall urinal	P1@5.00	Ea	1,470.00	222.00	—	1,692.00

Description	Craft@Hrs	Unit	Material $	Labor $	Equipment $	Total $

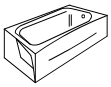
Lavatory, wall-hung, white vitreous china. Complete with trim and fixture carrier. Make additional allowances for rough-in. ADA means American Disabilities Act compliant. (Wheelchair accessible)

Wall-hung lav	P1@2.70	Ea	598.00	120.00	—	718.00
Wall-hung, ADA	P1@2.70	Ea	871.00	120.00	—	991.00
Fixture carrier	P1@.500	Ea	134.00	22.20	—	156.20

Countertop lavatory, white. Complete with trim. Make additional allowances for rough-in.

Vitreous china	P1@2.00	Ea	435.00	88.90	—	523.90
Enameled steel	P1@2.00	Ea	360.00	88.90	—	448.90
Acrylic	P1@2.00	Ea	262.00	88.90	—	350.90

Bathtub, white, 60" x 32". Complete with trim, including shower head. Make additional allowances for rough-in.



Enameled steel	P1@2.50	Ea	611.00	111.00	—	722.00
Cast iron	P1@3.50	Ea	1,200.00	156.00	—	1,356.00
Fiberglass	P1@2.50	Ea	622.00	111.00	—	733.00
Acrylic	P1@2.50	Ea	665.00	111.00	—	776.00

Tub and shower combination, fiberglass, white. Complete with trim. Make additional allowances for rough-in.

One-piece	P1@4.50	Ea	1,400.00	200.00	—	1,600.00
Two-piece (reno)	P1@5.50	Ea	1,790.00	244.00	—	2,034.00
Four-piece (reno)	P1@6.25	Ea	1,900.00	278.00	—	2,178.00

Shower stall, white, 36" x 36". Complete with trim. Make additional allowances for rough-in.

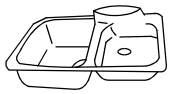
Fiberglass one-piece	P1@3.50	Ea	886.00	156.00	—	1,042.00
Fiberglass three-piece	P1@4.25	Ea	1,140.00	189.00	—	1,329.00
Acrylic one-piece	P1@3.50	Ea	1,330.00	156.00	—	1,486.00
Acrylic three-piece	P1@4.25	Ea	1,750.00	189.00	—	1,939.00

Shower basin, 36" x 36". Complete with trim (faucet, shower head and strainer). Make additional allowances for rough-in.

Fiberglass	P1@2.50	Ea	570.00	111.00	—	681.00
Acrylic	P1@2.50	Ea	613.00	111.00	—	724.00
Molded stone	P1@2.65	Ea	593.00	118.00	—	711.00

Description	Craft@Hrs	Unit	Material $	Labor $	Equipment $	Total $

Kitchen sink, double compartment. Complete with trim. Make additional allowances for rough-in.



Stainless steel	P1@2.15	Ea	448.00	95.60	—	543.60
Cast iron	P1@2.50	Ea	1,400.00	111.00	—	1,511.00
Acrylic	P1@2.15	Ea	530.00	95.60	—	625.60

Kitchen sink, single compartment. Complete with trim. Make additional allowances for rough-in.

Stainless steel	P1@2.00	Ea	378.00	88.90	—	466.90
Cast iron	P1@2.10	Ea	873.00	93.30	—	966.30
Acrylic	P1@2.00	Ea	394.00	88.90	—	482.90

Bar sink. Complete with trim. Make additional allowances for rough-in.

Stainless steel	P1@2.00	Ea	321.00	88.90	—	409.90
Acrylic	P1@2.00	Ea	216.00	88.90	—	304.90

Exam room sink. Complete with trim. Make additional allowances for rough-in.

Stainless steel	P1@2.10	Ea	491.00	93.30	—	584.30
Acrylic	P1@2.10	Ea	419.00	93.30	—	512.30

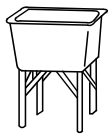
Laboratory sink. Complete with trim. Make additional allowances for rough-in.

Stainless steel	P1@2.25	Ea	562.00	100.00	—	662.00
Acrylic	P1@2.25	Ea	491.00	100.00	—	591.00

Laundry sink, double compartment. Complete with trim. Make additional allowances for rough-in.

Cast iron	P1@3.50	Ea	626.00	156.00	—	782.00
Acrylic	P1@2.25	Ea	275.00	100.00	—	375.00

Laundry sink, single compartment. Complete with trim. Make additional allowances for rough-in.



Cast iron	P1@2.75	Ea	1,080.00	122.00	—	1,202.00
Acrylic	P1@2.00	Ea	190.00	88.90	—	278.90

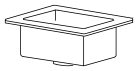
Mop sink, floor-mounted, 36" x 24". Complete with trim. Make additional allowances for rough-in.

Molded stone	P1@2.65	Ea	800.00	118.00	—	918.00
Terrazzo	P1@2.65	Ea	953.00	118.00	—	1,071.00
Acrylic	P1@2.35	Ea	617.00	104.00	—	721.00

Description	Craft@Hrs	Unit	Material $	Labor $	Equipment $	Total $

Slop sink, enameled cast iron with P-trap, standard. Complete with trim. Make additional allowances for rough-in.

Slop sink with P-trap, std.	P1@3.50	Ea	1,520.00	156.00	—	1,676.00

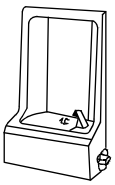


Floor sink, recessed, enameled steel, white. Add 40% to material prices for acid-resisting finish. Complete with strainer. Make additional allowances for rough-in.

9" x 9"	P1@1.00	Ea	112.00	44.50	—	156.50
12" x 12"	P1@1.00	Ea	131.00	44.50	—	175.50
15" x 15"	P1@1.15	Ea	143.00	51.10	—	194.10
18" x 18"	P1@1.25	Ea	164.00	55.60	—	219.60
24" x 24"	P1@1.50	Ea	215.00	66.70	—	281.70

Drinking fountain, refrigerated, stainless steel. Complete with trim. Make additional allowances for rough-in. ADA means American Disabilities Act compliant. (Wheelchair accessible)

Free-standing	P1@2.00	Ea	1,800.00	88.90	—	1,888.90
Semi-recessed	P1@2.50	Ea	2,410.00	111.00	—	2,521.00
Fully-recessed	P1@2.50	Ea	4,160.00	111.00	—	4,271.00
Wall-hung	P1@2.00	Ea	1,690.00	88.90	—	1,778.90
Wall-hung, ADA	P1@2.50	Ea	4,160.00	111.00	—	4,271.00



Drinking fountain, non-refrigerated. Complete with trim. Make additional allowances for rough-in. ADA means American Disabilities Act compliant. (Wheelchair accessible) S.S. means stainless steel.

Recessed, china	P1@2.50	Ea	1,430.00	111.00	—	1,541.00
Wall-hung, china	P1@2.00	Ea	813.00	88.90	—	901.90
Recessed, S.S.	P1@2.50	Ea	1,600.00	111.00	—	1,711.00
Wall-hung, S.S.	P1@2.00	Ea	850.00	88.90	—	938.90
ADA, S.S.	P1@2.50	Ea	1,450.00	111.00	—	1,561.00

Commercial plumbing fixture rough-in. Includes type L copper supply pipe and DWV copper (to 2½") or cast iron (MJ) DWV (over 2½") drain and vent piping. Make additional allowances for plumbing fixtures and trim. Use these costs for preliminary estimates.

Description	Craft@Hrs	Unit	Material $	Labor $	Equipment $	Total $
Water closet, wall-hung, flush valve, with carrier	P1@2.25	Ea	1,080.00	100.00	—	1,180.00
Water closet, wall-hung, flush valve, no carrier	P1@1.95	Ea	993.00	86.70	—	1,079.70
Water closet, floor-mounted, flush valve	P1@2.75	Ea	877.00	122.00	—	999.00
Water closet, floor-mounted, tank type	P1@2.25	Ea	672.00	100.00	—	772.00
Bidet	P1@2.00	Ea	468.00	88.90	—	556.90
Urinal, wall-hung, flush valve, with carrier	P1@3.10	Ea	1,180.00	138.00	—	1,318.00
Urinal, wall-hung, flush valve, without carrier	P1@2.35	Ea	672.00	104.00	—	776.00
Lavatory, wall-hung, with carrier	P1@2.40	Ea	974.00	107.00	—	1,081.00
Lavatory	P1@1.90	Ea	468.00	84.50	—	552.50
Sink	P1@1.90	Ea	504.00	84.50	—	588.50
Bath tub	P1@2.35	Ea	720.00	104.00	—	824.00
Shower	P1@2.60	Ea	844.00	116.00	—	960.00
Mop sink	P1@2.40	Ea	599.00	107.00	—	706.00
Slop sink	P1@2.60	Ea	428.00	116.00	—	544.00
Laundry tub	P1@1.95	Ea	509.00	86.70	—	595.70
Wash fountain	P1@2.10	Ea	548.00	93.30	—	641.30
Lab sink, glass drainage	P1@3.80	Ea	2,160.00	169.00	—	2,329.00
Lab sink, acid resistant plastic drainage	P1@2.65	Ea	344.00	118.00	—	462.00
Drinking fountain	P1@2.20	Ea	373.00	97.80	—	470.80
Emergency eyewash and shower	P1@1.75	Ea	141.00	77.80	—	218.80
Washing machine	P1@2.25	Ea	547.00	100.00	—	647.00

Description	Craft@Hrs	Unit	Material $	Labor $	Equipment $	Total $
Commercial plumbing fixture group rough-in. Includes Type L copper supply pipe and DWV copper (to 2½") or cast iron (MJ) DWV (over 2½") drain and vent piping. Make additional allowances for plumbing fixtures and trim. Use these costs for preliminary estimates.						
3-piece washroom group	P1@5.50	Ea	1,290.00	244.00	—	1,534.00
3-piece washroom group back to back	P1@9.75	Ea	2,390.00	433.00	—	2,823.00
Kitchen sink, back to back	P1@2.15	Ea	695.00	95.60	—	790.60
Battery of water closets, floor-mounted, tank type, per water closet	P1@1.75	Ea	541.00	77.80	—	618.80
Battery of water closets, floor-mounted, flush valve, per water closet	P1@2.20	Ea	707.00	97.80	—	804.80
Battery of water closets, wall-hung, flush valve, with carrier, per water closet	P1@1.80	Ea	930.00	80.00	—	1,010.00
Battery of water closets, wall-hung, flush valve, without carrier, per water closet	P1@1.50	Ea	272.00	66.70	—	338.70
Battery of urinals, wall-hung, flush valve with carrier, per urinal	P1@2.45	Ea	1,120.00	109.00	—	1,229.00
Battery of urinals, wall-hung, flush valve without carrier, per urinal	P1@1.90	Ea	576.00	84.50	—	660.50
Battery of lavatory basins, wall-hung, with carrier, per lavatory	P1@2.00	Ea	870.00	88.90	—	958.90
Battery of lavatory basins, without carrier, per lavatory	P1@1.50	Ea	393.00	66.70	—	459.70
Residential plumbing fixture rough-in. Includes polyethylene (PE) supply pipe and ABS DWV drain and vent piping. Make additional allowances for plumbing fixtures and trim. Use these costs for preliminary estimates.						
Water closet, floor-mounted, tank type	P1@2.00	Ea	143.00	88.90	—	231.90
Bidet	P1@1.85	Ea	107.00	82.20	—	189.20
Lavatory	P1@1.75	Ea	107.00	77.80	—	184.80
Counter sink	P1@1.75	Ea	118.00	77.80	—	195.80
Bathtub	P1@2.10	Ea	107.00	93.30	—	200.30
Shower	P1@2.45	Ea	157.00	109.00	—	266.00
Laundry tub	P1@1.75	Ea	97.90	77.80	—	175.70
Washing machine	P1@2.00	Ea	121.00	88.90	—	209.90

Index

C

D

E

F

G

H

I

J

K

L

M

N

O

P

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T

U

V

W - X - Y - Z

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