The following is a transcript of the closed circuit video broadcast by the AMSNA on Construction Cost Estimating and presented by the Los Angeles Chapter of the American Society of Professional Estimators.

For a copy of the estimating CD featured, containing 82 software items, send your mailing address and $20 to :

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CONSTRUCTION COST ESTIMATING

The vital need for a good estimator

Before the first shovel of dirt is moved, before the first nail driven, a construction project can be in serious trouble if it is not bid on the basis of an accurate estimate. Years ago the estimator was often viewed as just another member of the office staff. Today the cost estimator is generally recognized as one of the key personnel, in addition to the project manager, responsible for the success or failure of a project. At the time of bid the estimator knows more about the project than anyone in the construction company. He or she is relied upon to furnish reliable costs.

If the estimator bids a project too high the time and expense of bidding the project are lost. If the estimator provides an estimate which is too low the company faces the prospect of losing far more money. There are many cases where a faulty estimate has resulted in the ruin of a company.

The work of the estimator is vital to the success of a construction company.

Various Types of Estimating

The words estimator and estimating in the general vernacular can convey a number of things. There are estimators who determine the cost of:

Moveable Items

Such as computers, radios, televisions, automobiles and other mobile items. Members of the National Estimating Society members are involved in such estimating. Appraisers of valuables are sometimes also referred to as estimators.

Construction Cost Estimator

Construction cost estimating, which we are concerned with here, involves the development of estimates of the cost of construction of static immobile items such as:

commercial, industrial and residential buildings, dams, roads, bridges, utilities

Cost Engineers

Large projects may have what is referred to as a Cost Engineer. A **Cost Engineer** has functions that often overlap those of a Construction Cost Estimator. A Cost Engineer may be involved in the production of a Rough Order of Magnitude (ROM) estimate or a Parametric estimate; estimate types that will be described later. Once plans and specification become available a **Construction Cost Estimator** will refine that cost with a detailed estimate. A **Scheduler** will break the detailed estimate down into a schedule of activities and their associated time and costs The Cost Engineer will track construction costs, labor, material, equipment and sub-contracts, and develop reports for the project manager that indicate whether the project is on schedule and within budge. The Cost Engineer will also process Change Requests for approval or negotiation. On smaller projects the Construction Cost Estimator may handle all estimating, scheduling and change order work.

Quantity Surveyors

In the British Commonwealth and many European countries an estimator is referred to as a Quantity Surveyor. The Quantity Surveyor is tasked with development of a list of material, labor and equipment for the completion of a project. This list is then given to contractors to bid on the project.

Classifications of Estimators

As in most professions there is a hierarchy of positions based on the degree of responsibility. These positions may go by a variety of names but generally follow this order:

Junior Estimator or Take-off Person

This is a starting position in estimating and generally involves taking off quantities from plans and making calls to suppliers for price quotations. The title and tasks may vary from company to company. A senior or chief estimator supervises this position.

Estimator

The next step up is the work of an estimator who is given more responsibility and may be responsible for smaller estimates. This position is supervised by a senior or chief estimator and is held by someone with less than 5 years estimating experience.

Senior or Project Estimator

At this level an estimator may be assigned a project for which he or she is completely responsible. A Senior or Project estimator may supervise a staff of estimators.

Chief Estimator, Manager of Estimating or Manager of Cost Control

In a large corporation there is generally a Chief Estimator or Manager of Estimating or Manager of Cost Control. Such person will have a staff of Senior or Project Estimators who he or she supervises. This is the highest position an estimator will achieve in a company. Often he or she is paid a bonus or percentage of profits in addition to wages.

Estimating Consultant

The most rewarding level of estimating, financially and professionally, is that of a consultant. Owners, construction companies and attorneys will call upon the services of an estimating consultant. A consultant generally has many years experience in estimating and most like may be a retired estimator. Some specialize in certain types of construction, value engineering studies and others offer their services as expert court witnesses in lawsuits and arbitration .

Professional Estimating Society

Estimators

The American Society of Professional Estimators
675 S Washington - Alexandria, Virginia
Mail and Admin: 2525 Perimeter Place, Suite 103 Nashville, TN 37124
Tel: 888-378-6283 615-316-9200 Fax: 615-316-9800
Website: http://www.aspenational.com
Membership is open to all classifications of estimators and certification as a professional estimator (CPE) is available.

Estimator Equipment

As in any profession an estimator has to have certain essential equipment with which to perform his or her job. The following list of items is typical for a general estimator. Specialty estimators may have different requirements.

Work Space

1) A quiet room with a desk
2) A large table or drafting table upon which to lay plans
3) Good lighting over the table and desk
4) A plan rack or plan box to store rolls of plans

Communications

5) Telephone
6) Computer with access to the Internet

7) Access to a fax machine
8) Access to a photocopy machine
9) Cell phone for field use

Typical Equipment

10) 10' Tape Measure
11) 100' Tape Measure
12) A good quality hand calculator
13) Architectural Scale
14) Construction Boots
15) Ear Plugs
16) Engineering Scale
17) Goggles
18) Graph Paper
19) Hand Held Compass
20) Hard Hat
21) Hi-Liters, various colors
22) Metric Scale
23) Paper, Pens, Pencils
24) Protractor
25) Thomas Guide for area of activity

Advanced Equipment

26) Digital camera or Video Camera
27) Miniature Tape Recorder
28) Scanner
29) Laser or Sonic Measuring Device

Reference Manuals

There are reference manuals that all estimators should have access to as well as a dictionary of construction terms is definitely a must have.The following books and cost manuals are recommended:

Construction Directories

Blue Book of Building & Construction http://www.thebluebook.com
Thomas Regional Industrial Buying guide

Construction Dictionaries

Means Illustrated Construction Dictionary 781-422-5000
Dictionary of Architecture and Construction (from AIA)
National Association of Women in Construction (NAWIC) Dictionary

Regulations (Optional)

Uniform Building Codes (UBC)

Cost Manuals

Design Cost Data (DCD)
http://www.dcd.com

Green Book of Equipment Rental
http://www.equipmentwatch.com
E-Mail customerservice@equipmentwatch.com
1-800-669-3282 Fax 1-800-224-3527
1735 Technology Drive, Suite 410
San Jose, CA 95110-1333

Marshall & Swift

Http://www.marshallswift.com
E-Mail csinquiry@marshallswift.com
1-800-544-2678
915 Wilshire Blvd. 8th Floor
Los Angeles, CA 90017

National Estimator by Craftsman Book
http://www.craftsman-book.com
1-800-829-8123 Fax 760-438-0398
Craftsman Book Co.
6058 Corte del Cedro
P.O.B 6500
Carlsbad, CA 92018-9974

R.S. Means Building Construction Cost Data
http://www.reedconstructiondata.com
1-800-322-6996 Fax 1-800-895-8661
Reed Construction Data Inc.
30 Technology Parkway South
Norcross, GA 30092-2912

Saylor Publications
E-Mail saylor@saylor>com
1-800-624-3352 Fax 818-718-8024
9420 Topanga Canyon Blvd., Suite 205
Chatsworth, CA 91311

Trade Services
http://www.tradeservice.com

These books are generally available from the following bookstores in the Los Angeles, California area:

Builders Books
8001 Canoga Avenue
Canoga Park, CA 91304
E-Mail :buildersbook.com
(Tel) 818-887-7828
(Fax) 818-887-7990

Building News Bookstore
10801 National Blvd.
Los Angeles, CA 90064
(Tel) : 310-202-7775
(Fax) : 714-535-8078

OPAMP Technical Book Store
1033 N. Sycamore
Los Angeles, CA 90038
(Tel) 213-464-4322
(Fax)213-464-0977

Types of Estimates

Parametric

An estimate developed in the earliest stages of the planning of a project and is based on historical costs or physical performance of the project. The purpose of a Parametric estimate is for budgetary and feasibility determinations.

Example: A community wants to build a sewage treatment plant. The designers are aware of a sewage treatment plant built several years ago in another city with a certain daily capacity measured in gallons per day. The final cost of the plant divided by the capacity in gallons gives a $4 / gallon construction cost. This cost must be escalated to today's cost to account for inflation and must be adjusted to the costs prevalent in the area of the proposed plant. Say the first sewage treatment plant was built for $7,500,000 and had a capacity of 2,000,000 gallons of raw sewage per day or a cost of $3.75 / gallon. At the proposed site local construction costs overall are about 10% higher and the desired capacity of the new plant is 3,500,000 gallons per day. The new plant, according to a parametric estimate would probably cost 3,500,000 gallons/day x $3.75/Gallon x 1.10 or $14,438,000. A Parametric estimate typically may be increased by a contingency factor of up to 30%.

Rough Order of Magnitude

In the early planning stages of a project all the information available may be only the type of construction desired and the approximate square footage of space required to fulfill the projects needs. A Rough Order of Magnitude estimate may be little more than the gross square footage of a building times a updated historic unit price per square foot of floor area. A Rough Order of Magnitude estimate will be increased by a contingency factor of up to 30%

Conceptual Estimate

Generally at the conceptual stage a little more information is available and includes a better definition of the type of construction, building heights, and other preliminary information. A rough sketch of the outline of the building or project may be included. A contingency of up to 25% is included.

Schematic Design Estimate

At the Schematic level more information is available which may include a site drawing, preliminary drawings of the building floor plan, some equipment identification, some specifications. A contingency of up to 20% should be included.

Preliminary / Design Development Estimate

When drawings and specification are at approximately the 50% complete stage a design development estimate is usually commissioned to assure that the project is not over designed or exceeding the clients budget. A contingency of up to 15% is added at this level.

Project Control or 90% Estimate

At this stage the drawings and specifications are nearly finalized and may be accompanied by soils reports, demolitions drawings, site drawings, utilities drawings and equipment call outs. Generally no more than a 10% contingency is included.

All of the above estimates are generally produced for the benefit of the owner, architect or designer. A contractor does not become involved in the production of these estimates unless the contractor is engaged in design-build.

Definitive / Bid Estimate

At bid time a contractor will be furnished with 100% complete drawings, specifications and bid documents that may detail time constraints, bonding requirements, and other information concerning the conduct of construction. The contractor's estimator will produce a detailed estimate of the cost of labor, materials, equipment and any sub-contracted work. The estimate will be backed up with detailed take-offs and references to the sources of costs.

The final cost will include the contractor's direct costs, general requirements, overhead, bonding and profit and will constitute the basis from which the bid price is derived. Generally no contingency is used in the development of this type of estimate.

Types of Construction Contracts

The type of construction contract offered dictates the final form of the estimate. There are three basic types:

Lump Sum (Fixed Price)

This is the most commonly used form and in submitting a bid only a single price is shown plus prices of any alternates. The estimate from which this fixed price is derived will include the contractor's direct costs, general requirements, overhead and profit. The plans and specification on which a Lump Sum bid is based must be complete.

Unit Price

Many public construction projects are bid as Unit Price. The owner furnishes a quantity take-off and the bidders are required to offer a unit price for each item. The contractor must maintain accurate records of the actual qualities used in order to file a claim for quantities in excess of that furnished by the owner.

Cost-Plus-Fee

This type of contract is used when a project has to be hurriedly finished, involves unknowns that are not possible to estimate at the time of bidding or are used by an owner who has a long standing relationship with the contractor. This type of contractual arrangement requires accurate records of costs. In addition to his direct costs the contractor may be compensate by ;

A fee expressed as a percentage of the total cost.

A fixed fee.

A fixed fee with either a bonus for coming in under a certain budget or schedule or a penalty for failure to do so.

A fee based on a sliding scale

Project Selection

Selection of projects to bid is a critical part of the construction business. A project that is not within the parameters set by a construction company will result in a waste of an estimator's

time and can potentially lead to the company losing money. The first step is to set the companies job selection parameters.

Project Type

A contractor's license to some extent sets limits on the type of work he, she or they are permitted to perform. Other factors are how complicated the project is. An example was a contract put out to replace a steam boiler at a local prison. The contractor with the winning bid failed to understand the conditions of working in a prison and soon discovered that on a good day productivity was considered 4 hours out of 8. He had failed to understand that there was a very lengthy process of going through the sally port and the tool check exiting or that on foggy days the contractor would not be allow into the prison. Better understanding of the nature of the project, and it's particular requirements, would have save the contractor from a great loss.

Understand the types of projects you want to bid on and insure that they are the types of projects you have experience in and can successfully complete.

Project Location

The further a project is from the main office the higher the cost of travel time and other expenses such as the possibility for the need of per diem, use of unfamiliar sub-contractors or labor force. Generally small firms prefer projects that are within 30 miles of their main office. Larger firms may range much further out depending upon the size of the project.

Project Size and Bonding Capacity

In selecting a project to bid on the estimator, or contractor, must set an upper and lower limit to the size of a project they will bid on in addition to other factors. The contracting firm must decide on a dollar amount below which it is not in their interest to bid. The upper dollar limit of projects they will bid on is generally set by their bonding capacity.

Anticipated Competition

Who else is bidding on a project can be a factor in determining whether a project is bid or not. Example: a contractor with little or no experience in construction of schools would wise to reconsider bidding on a school project when it becomes known that a contractor with a long extensive record of winning bids on schools in the bidding. The watchword is "know your competition".

Degree of Difficulty

The degree of difficulty of a project plays a major role in project selection. If a construction project involves particular difficulties that the construction company is equipped to handle then this may be a prime project to bid, if the construction company is not familiar with, or equipped to handle the work, then the best course of action is to pass.

Locating Projects

Construction Journals

Subscription to construction journals is a must for a successful construction business. These journals will give notice of projects out to bid and will list the project title, a brief description

of the project, the location, the contact number for obtaining drawings and specifications and often a list of those bidding on the project and an estimated value of the project. Some of the more prominent are :

Construction Data Corporation	http://www.cdcnews.com
Daily Construction Reporter	http://www.dcreporter.com
Dodge Reports (Green Sheets)	http://www.dodge.construction.com
Reed Construction Data	http://www.reedconstryctuindata.com

And many more in the Blue Book of Building & Construction http://www.thebluebook.com

Plan Rooms

Many plan rooms publish newsletters or have on line services advertising projects up for bid or coming up for bid. Review the Plan Rooms of North America section of the CD for contact numbers of hundreds of Plan Rooms throughout the United States and Canada.

Reputation and Word of Mouth

By far the cheapest and best source of projects to bid on is derived from a good reputation and an extensive network of contacts developed over the years that result in invitations to bid. A wise contractor establishes contact with a wide variety of companies, organizations and associations. Ads placed in construction journals are very helpful in bringing in business.

Scheduling an Estimate

Years ago it was common practice for an estimator to literally heft a set of drawings and from the weight 'guesstimate' the amount of time necessary to produce an estimate. This method was crude and in 1988 a study was conducted to determine if it were possible to devise formulas for determining the amount of time required to estimate a project. From answers obtained from questionnaires sent out to a number of members of the American Society of Professional Estimators it was determined that there were two fairly reliable methods.

Percentage of the Probable Project Cost

This method relies upon taking a percentage of the probable cost of the project as the dollar allotment for estimating. Estimating man-hours are then found by dividing the allotment by the average wage rate of the estimating staff. This method may appear to be "placing the cart before the horse" but produces generally reliable figures. A probable construction cost is derived by use of square foot cost manuals such as Design Cost Data, Marshall & Swift, National Building Cost Manual, R.S. Means Square Foot Cost Manual and others. From the main menu click on **Chart** for the percent of the probable cost that will apply to estimating according to the dollar size of the project.

Sheet Count Method

A quicker and generally more precise method involves counting the drawings that will be used in the estimate and multiplying by 2 hours per sheet. Sheets that will be used include –

Demolition drawings
Civil drawings
Site Improvement drawings
Foundation drawings
Plan View drawings
Profile drawings
Doors & Windows schedule
Finish Schedule
Plumbing drawings
HVAC drawings
Electrical drawings

To all of the above consideration must be given to extra time for : a Site visit / Job Walk, Meetings with the architect, engineer, client, estimating staff or project manager.

NOTE: the above methods of determining the amount of time required for the preparation of the estimate are applicable only to new construction of buildings and will not function for renovation work, historical renovation or tenant improvement work..

Accuracy vs Time

One of the major failings in estimating is taking on a project without sufficient time to do a proper estimate. Often an estimator working with an architect will find that a bid date has been set and the architect fails to deliver the drawings on time. Or, for whatever reason, a contractor obtains drawings at a late date and expects the estimator to pull rabbits out of a hat. It is of paramount importance that estimators fully inform architects, designers, owners, contractors and project managers that a good estimate requires time and access to the drawings and specifications by a certain date if it is expected of them to make the bid date. If there is not enough time then the estimator must insist upon over time and/or extra help.

Never allow the estimating staff to be placed in a position where it has to work long successive hours of over time. This may be financially rewarding but soon leads to weariness, burnout and errors in the estimate. Many decades ago the author worked for a major construction company and through poor planning the estimating staff had to work until 3 am two days in a row and return to work at 8 am. Fortunately we employed a math checker and found a million dollar error in the estimate; the result of estimators nearly falling asleep at their desks.

Estimate Preparatory Work

Upon receipt of a set of plans and specifications the estimator should insure that –

1) The drawings listed on the index sheet are in the set.
2) Specifications have been provided. On smaller projects the specification may be written on the drawings themselves.
1) If, particularly on government and military projects, there are forms that management will be required to fill out, these forms shall be detached and sent to the parties responsible.
2) The bid date and time are noted on the job calendar
3) He or she has prepared an estimate of the time required to develop the estimate and appraised management. If extras help is indicated it should be scheduled immediately.
4) If there is a particular format the estimate must be bid in that format is available.
5) Are there **alternate bid items** to be considered?
6) A thorough review of the drawings and specifications is conducted looking specifically for possible problem areas, particularly with the drawings or specifications, and long lead items.

Estimate Book Development

1) Obtain a three ring binder with dividers and tabs.
2) Place the specification behind tab one.
3) Quotations behind tab two
4) Take-off sheets behind tab three
5) The estimate behind tab four
6) Alternate Bid items behind tab five
7) Addendums behind tab six.
8) In the front of the binder place a sheet with the project title, project location, bid date and time and location of bid box and addresses of all architects, designers and other pertinent addresses and telephone numbers.

Quote Development

On small projects the estimator may perform the task of obtaining quotes on long lead items. On larger projects this task may be assigned to junior estimators. Develop quantities and send off quote requests first for –

1) Material that is not 'off the shelf type'.
2) Doors and Windows
3) Industrial or special equipment
4) HVAC equipment
5) Electrical equipment
6) "BigTicket" items, Items accounting for a significant portion of overall cost.

Site Visit

Good estimating practice requires the estimator, if possible, to make a visit to the construction site prior to preparing the estimate. Generally this will be done on the 'Job Walk' or if

no Job Walk is scheduled or required the estimator should arrange to visit the site. On a site visit look for problems that may not appear on the drawings. Such things as ;

1) Demolition not shown on drawings.
2) Evidence that site was once a landfill site.
3) Difficulties in accessing the site.
4) Overhead electrical wires
5) Poor soil conditions. Be wary of sites surrounded by block walls that can retain ground water and create poor load bearing soil.
6) Evidence of underground fuel storage tanks or hazardous cleanup requirements.
7) Evidence of Asbestos, Lead paint, Hydrocarbon contamination or Black Mold.
8) City ordnances that restrict times of construction or require special permits.
9) Rock conditions that may require blasting.
10) Underground and aboveground utilities.
11) Adequate lay down area for construction materials and construction trailers.
12) Crane requirements
13) Availability of electrical power and water on site.
14) Nearest rubbish dump, hazardous material dump and availability of select soil for fill.
15) If the project involves demolition or renovation of a building and the drawings furnished do not furnish elevations try this estimator technique- Carry with you 1"x 1" 5 foot or 10 foot long wood strip. Place this against a side of the building and step back a distance and take a digital photo. Print the photo and use the wood strip as you would the scale bar on a drawing. Measure the length of the wood strip as shown in the photo in inches and then divide the length of the wood strip by the length in inches to arrive at a scale. Now measure the heights of the building using the new scale.

Errors & Omissions Sheet

One of the first sheets to be filled out in the estimate binder is a sheet where the estimator, or party conducting the quantity take-off, lists any errors or omissions discovered in the drawings. An over all dimension that does not equal the sum of the smaller dimensions; items which cannot be accurately quantified due to the absence of a dimension; a detail that doesn't correspond to the referenced detail and questions that need be asked and clarified by the architect or designers.

A prudent policy is for the estimator to notify the architect or designer of the errors or omissions found in order that a correction may be made. Architects and designers are appreciative of such courtesy.

Construction Specification Institute (CSI) Master Format

Presently the Construction Specification Institute (CSI) Master Format consists of 16 divisions; from General Requirements (1.0) through Electrical(16). The American Society of

Professional Estimators (ASPE) worked with the CSI to revise the Master Format from 16 divisions to 30 or more. Presently the CSI format lumps Fire sprinkler installation, Interior plumbing, Industrial Plumbing and HVAC all under division 15. Low voltage electrical, high voltage electrical, security systems, communication systems and telephone work are all lumped under division 16. The new format divides the work into divisions that more accurately reflect the trades responsible for each task.

For the present estimates presented here will follow the old CSI Master Format. The CSI Master Format in it's present arrangement consists of:

Division 1 - General Requirements
Division 2 - Site Work
Division 3 - Concrete Work
Division 4 - Masonry
Division 5 - Metals
Division 6 - Wood & Plastics
Division 7 - Thermal & Moisture Protection
Division 8 - Doors & Windows
Division 9 - Finishes
Division 10 - Specialties
Division 11 - Equipment
Division 12 - Furnishings
Division 13 - Special Construction
Division 14 - Conveying systems
Division 15 - Mechanical
Division 16 – Electrical

Labor Types

Closed Shop - In a Closed Shop the employer will not hire non-union labor.

Open Shop - Employer will hire any qualified individual, union or non-union.

Union Shop - Employer will hire non-union labor but they must join union.

Estimating Spreadsheet

There are many estimating systems and estimating software packages available today. On the CD offered by the ASPE is a section labeled **EstSoft** that lists many estimating software packages available and the ASPE website also lists a number of estimating software packages. It is not the place of the author to recommend any one product nor would it be practical to try to offer instruction in the operation and use of any one of the many estimating software packages available on the market.

The author has developed a simple, easy to use, estimating spreadsheet for use on a computer that is included on the CD offered through the ASPE. It is found under **Estimate Template** and is Microsoft Excel based.

The estimating spreadsheet has a number of hidden sheets.

The first page, found by clicking on the tab labeled **Title** at the bottom of the screen, is used for describing the project.

The 2nd page **Summary** is hyper links to the estimate spread sheet and summarizes.

The third tab labeled **Labor** contains the labor wage rate database.

The fourth tab labeled **Material** is the material cost database.

The fifth tab labeled **Equipment** contains the equipment cost database.

The subsequent sheets are used in taking off quantities from CSI division 2 - Site Work through division 16 - Electrical. At the bottom of the estimate spreadsheet is software that calculates bonding, escalation and marks-up the direct costs up for overhead, profit and contingency.

Using the Estimating Spreadsheet

The first step involves filling in information on the **Title** sheet and recording the drawing numbers and date of the drawings of the drawings provided. This should include the specification provided and any amendments to the drawings. This information will become important if there is a dispute over which drawings and specifications were used in the preparation of the estimate.

Labor Data Base

The second step is to prepare the estimating spreadsheet by filling in information on the cost of labor. With the class CD in your computer open **EstimatingTemplate** and at the bottom of the screen click on the tab labeled **Labor**. The labor cost figures shown are for the Los Angeles area and need to be replaced with the current labor wage rates for your area.

Setting Wage Rates

All Federal, State, military and municipal projects will require the contractor to pay prevailing wage rates, either Federal or those decreed by the state, or the union where the project is located.

Prevailing Wage Rates can be downloaded from:

California Department of Labor Relations website at -

http://www.dir.ca.gov/DLSR/statistics_research.html#PWD

Federal Prevailing Wages Rates (Davis-Bacon) at the website

http://www. access.gpo.gov/davisbacon/allstates.html

On the CD offered by the ASPE are websites for other states but I have found them difficult to use and suggest that the Federal rates be used instead. The Federal rates are listed by state and within the state county by county.

Prevailing wage rate will be in two parts –

Base Wage Rate, place this dollar figure in the appropriate cell in **column E**

Fringe Benefits, include health costs, holiday pay, pensions, training, welfare costs.

Place the total of these costs in the appropriate cell in **column F**.

The total of these dollar amounts will be automatically totaled in column **G**.

Setting Burden

In addition to the base wages and fringe benefits an employer will have to pay a number of other items that collectively are referred to as "Burden". Burden does not include –

Contractors Overhead

Contractors Profit,

Bonding,

Escalation

Contingency

FICA

Percentages for the **Federal Insurance Contributions Act** are obtained from Federal Internal Revenue Circular "E", Page 15 found on website

http://www.irs.gov/elec_svs/efile-bus.html.

In cell H5 insert the sum of the FICA percentage and the Medicare percentage.

FUTA

Federal Unemployment Tax Act is found on page 27 of IRS circular "E" on the same website as above. Place figure in cell I5

SUTA

State Unemployment Tax Act is entered in cell J5. In California the rate is found on page 1 on the State of California website http://www.edd.ca.gov/taxrte9x.htm

ETT

Employment Training Tax is also found on page 1 of the California Employment Tax web-page as above and entered in cell K5.

Workman's Compensation Insurance

The formula for calculating Workman's Compensation Insurance rates for each trade is a complicated formula and is best left to ones insurance agent. The rate for each individual trade is then entered into the appropriate cell in columns **L, M & N**. Rates have risen sharply over the past few years and should be checked frequently.

Liability Insurance

The formula for calculating Liability Insurance rates for each trade is also complicated formula and is best left to ones insurance agent. The rate for each individual trade is then entered into the appropriate cell in columns **O & P**. Rate should be checked frequently.

Total burden is summarized in column **Q.**

Non-Union Wage Rates

If the contractor utilizes non-union labor from an organization that charges an all inclusive rate, such as the California Labor Pool, or prefers to charge a set rate, skip the above and type in the labor rate for each trade in the appropriate cell in column **R**.

Total Labor Straight Time

Is automatically calculated in the appropriate cell in column **R** and represents the sum of the **base wage rate** (cell **E**), **fringe benefits** (cell **F**) and all **burden items** (cell **Q**) for a particular trade.

Over Time Wage Rates

Total hourly labor cost for **time and a half work** is automatically calculated in column **T.**

Total hourly labor costs for **double time work** is automatically calculates in column **U.**.

Premium Pay

Carefully review the labor wage rate database for conditions that may require premium pay; such as remote areas, hazardous conditions, odd hours, Saturday or Sunday works, ect.

Productivity

There are many things that can reduce productivity and these can be categorized under three headings

Inefficiency caused by :

Crowded work area. Too many workers or trades in one area; (Peter Principle)

Cluttered work area. Materials and equipment stored in the way of workers

Double handling of material and equipment. Usually caused by improper storage.

Inadequate or confusing instructions to workers.

Materials not on hand or stored in remote location.

Poor lighting of work area.

Poor sequencing of work.

Support equipment missing or not enough of.

Tools not available or in sufficient quantity.

Low Morale caused by :

Absenteeism, usually through alcohol or drug use.

Adverse site conditions, high crime area.

Frequent and excessive changes and rework.

Foreman turnover or unqualified foremen.

Job site at excessive distance from home office.

Management / labor conflicts.

Poor quality employee facilities, lack of water or not enough toilet facilities.

Shortage of equipment, tools or material.

Excessive turnover of employees.

Uncertain job future.

Weather extremes. Too cold, too hot, too windy, rain.

Progress Delayed

Complex design

Learning curve

Labor strikes or slowdowns.

OSHA or ADA requirements.

Procurement delays.

Safety violations

Overtime

Productivity declines after a period of time working more than 40 hours per week. See **Labor Efficiency** table in the CD.

Calculation of Productivity

Productivity figures are available from R.S. Means and the National Construction estimator manuals. These will be expressed as the number of units a crew can be expected to install in the course of an 8 hour day or the number or hours and fractions of an hour it takes a crew to install one unit of measure.

The best source of productivity is that of your company's crew measured by visiting the job site and timing them and/or through talks with the foremen, project manager or superintendent.

Equipment Costs

Click on the tab at the bottom of the screen labeled **Equipment** and insert a description of the equipment in column **A** and in column **B** the rental rate (the rate charged by an equipment rental company or the rate your firm charges for the equipment plus any fuel or lubrication necessary) but without operator, equipment mechanic or equipment oiler labor costs.

Equipment rental costs may be found in the Green book, RS Means and National Estimator cost manuals

Material Costs

At the bottom of the Estimating Template screen click on the tab labeled **Material**. In column **A** type in the description of the material. In Colum**n B** type in the unit of measure, in column **C** the $/unit (without sale tax), in column **D** the date the price quote was obtained, column **E** the source of the quote and in column **F** the telephone number of the quote source.

Using the Estimate Spread Sheet

In column **C** insert the description of the construction task.

Column **A** insert the drawing number and detail, if any, where the item in was found in drawings.

Column **B** insert the source used for pricing the item described in column C.

Suggested Cost Codes : .

Building News	a B followed by a seven digit number
Consultant	a C followed by a Quote Book page number
Historical	an H followed by Historic Estimate No.
National Estimator	an N followed by National Estimator page no.
Quote	a Q followed by page no, from Quote Book
R.S. Means	a 10 digit number from R.S. Means cost manual

In column **D** insert the quantity of the items described in column C.
In column **E** the unit of measure. Example - Square Feet, Cubic Yards, ect.
In Column **F** insert the cost of material, per unit, without inclusion of sales tax.
In cell **G14** insert the percent sales tax levied on materials in the county where the material will be purchased . This will increase the unit cost of material to include the sales tax in column **H**
The cells in column **H** will reflect the total cost of material with sales tax for that particular material.
Column **I** insert the man-hours required to perform the task described in column C. This "productivity figure" can be obtained from RS Means Estimating manuals, or other estimating manuals or obtained from your company's historical records.
The man-hours in cells in column **J** are the product of the quantity in cell **C** and the man-hours per unit in cells **I.**
Column **K** insert the labor wage rate by highlighting the cell and typing an equal sign (=), clicking on the Labor tab at the bottom of the screen and then clicking on the labor wage rate desired in column R then press the Enter key and the $/Mhr wage rate will be automatically transferred to the Estimate Spreadsheet. Example : A Cement Finisher (Cement Mason) will appear as Labor!R14

When a task requires a crew add together all various wage rates times the number of each respective trades and divide by the total number of crewmembers.

Example : A concrete crew is composed of 2-Cement Masons , 3 Laborers, 1 Rough Carpenter (Form Setter) and 1 Rebar Installer. For the first entry do as above, click on R14; then press shift and click on the + sign and then click on the next crew member and so on until the final crew member is added then press enter. To indicate the number of crewmembers of a particular trade type * and the number of trades men. The crew would be designated as -

=(Labor!R14*2+Labor!R28*3+Labor!R12+Labor!R49)/7

The figure in cells **L** are the product of cells J & K and represent the total cost of labor for that particular task described in cell **C**.
Column **M** insert the equipment usage hours per unit of measure.

Column **N** shows the total equipment hours for each particular task described in column **C** by automatically multiplying the entries in columns **D** & **M**.

Column **O** type in an equal sign (=) then click on the Equipment tab at the bottom of the screen and click on the appropriate equipment rental rate of the equipment required and then press Enter. As an example the cost of rental or use of a 600 CFM Air Compressor would be noted as Equipment!B2.

The cells in column **P** detail the total cost of equipment rental or usage for each item. Cost of operating personnel is figured in the labor columns.

In the event that certain tasks are to be sub-contracted out insert in column **Q** the dollar rate per unit of measure.

Cells in column **R** reflect the total dollars for sub-contracted work before marked-ups are applied.

The cells in column **S** reflect the direct cost of material, labor, equipment and any sub-contract costs before contractor's mark-up is applied.

Column **T** contains a mark-up factor derived from the division of the total marked-up cost (cell highlighted in green at the bottom of the estimate sheet) by the total direct cost found in the last cell at the bottom of column **S**.

The cells in column **U** reflect the total cost, including contractors mark-up, of the task described in cell **C**.

In column **V** sub-totals for the various CSI (Construction Specification Institute) divisions are summarized.

If applicable place the SFFA (gross square footage of floor area) in the cell highlighted in yellow at the bottom of column X (cell **X711** in the example). Gross square footage floor area should be calculated using American Institute of Architects directive D101. Template for calculating is found under Gross Floor Area in the CD.

Cells in column **W** will display the dollars per SFFA that can be used as a check on the accuracy of the estimate based on prior experience.

Cells in column **X** will show the cost of each CSI division as a percentage of total cost. Again, a means of checking accuracy.

The dollar figures in column **Y** represent the totally marked up cost of each unit of measure.

Bonding Calculator

In the appropriate cells highlighted in yellow at the end of columns A & B (cells **A709-711 & B709-711** in the example) insert the bonding rates and break points provided by your bonding agent. To activate bonding insert a 1 in the highlighted box (cell **E712** in the example.

Escalation Calculator

In the first highlighted cell (**B714** in the example) insert the number of months from today's date until construction starts. In the next cell (cell **B715** in the example) insert the anticipated number of months from today until construction will be completed. The next

unhighlighted cell (**B716** in the example) will give the 'mid point of construction'. In the highlighted cell below (**B717** in the example) insert the anticipated rate of inflation expected during construction. Check the Engineering News Record for inflation rates. The next unhighlighted cell (**B718** in the example) will give the escalation factor and automatically insert it in the Mark-up Calculator (cell **B732** in the example). To turn off the escalation calculator remove the 1 from the highlighted box (cell **B719** in the example)

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Contractor's Overhead

In the highlighted cell next to Overhead (cell B**724** in the example) insert the percentage for the contractor's office overhead. Overhead refers to main office overhead; the costs charged to maintaining and operating the main office and should not to be confused with Field Overhead (General Requirements) which applies to individual projects.

Calculation of Main Office Overhead Percentage

The total dollar amount of items such as office building rent, property tax, utilities, office staff payroll, office-supplies, telephone service, ect. are divided by the anticipated amount of gross income the company will generate over the year to arrive at a minimum percentage the company must apply to all work in order to breakeven on main office overhead.

General Requirements

General requirements are sometimes referred to as 'Job Overhead' and are the expenses that are assigned to a particular project and should not be confused with Main Office Overhead. In some publications General Requirements are referred to as General Conditions. This is not the proper usage as General Conditions are found in the Specifications and refer to responsibilities of the contractor. A project's General Requirements or Job Overhead are those expenses for a project that cannot be assigned to any particular task or trade. Examples :

Electricity, Water, Cell Phones, Sanitary facilities, ect. are used throughout the project by concrete workers, framers, HVAC installers and are not identifiable with one particular CSI division or trade.

If an item of cost can be identified as to be used exclusively for one trade then its cost goes with that trade and not in General Requirements. If an item of cost is associated with more than one trade then it is part of General Requirements (Job Overhead). Example :

Scaffolding that is to be used by the masons only should be included under CSI division 4 (Masonry) in the cost estimate spread sheet. However, if the scaffolding will also be used by a stucco crew, a painting crew and perhaps a crew installing gutters and downspouts then it is a cost assigned to General Requirements. This figure is automatically entered in the Estimate Summary sheet below.

Contractor's Profit

In the highlighted cell next to Profit (**B726** in the example) insert the percentage of profit to be charged. Profit should be calculated according to how competitive the market is.

Setting a high percentage rate for profit may well result in losing a bid. Profit percentages should be reasonable and competitive.

Contingency

In the highlighted cell next to Contingency (**B730** in the example) insert the percentage of contingency to be charged, if any. It is proper to include contingency if the drawings are not complete or there a major questions still unanswered at bid time or if material or labor costs are unstable; other wise on a definitive estimate or bid estimate no contingency should be used.

Total Project Cost

The Total Project Cost will appear in the green highlighted (cell **B732** in the example) and is the sum of Direct Costs, Overhead, Profit, Bonding, Escalation and Contingency.

Estimate Summary Sheet

The estimate Summary Sheet summarizes all the cost elements. On bid day as bids come in for the various work tasks insert these bids into the appropriate cell in column **G**. General Requirements will automatically be entered.

Write in the sub contractors name in the appropriate cell in column **H.** If for a particular trade task a better bid is received erase the existing bid and insert the bid amount and new sub-contractor's name. For "no shows", or tasks to be performed by the general contractor, use the "plug number" in column G .

The project total and final bid number will appear in the green highlighted cell (**G779** in the example).

Making Entries in the Spreadsheet

There are two methods of entering data in the spreadsheet. Under concrete the two most common methods are demonstrated with construction of a simple sidewalk.

The first method simply lumps all material costs together and all labor costs together. Included with material is the formwork lumber, reinforcing, concrete and curing compound. Labor includes form-setters, rebar man, laborers and cement finishers. This method is quick but lacks the accuracy of the second method.

The second method details as separate items every step of the project. Each material is listed separately and each trade required to install that material is listed separately. Excavation, excess soil disposal, setting forms, installing base aggregate, installing reinforcing, pouring concrete, finishing concrete, curing concrete and removing and cleaning forms. This method is more time consuming but allows for a very detailed estimate.

Quantity Take-off Software

In estimating approximately 80-85% of an estimators time will be spent doing a quantity take-off. In order to help reduce the time spent in quantity take-off, as well as help eliminate mistakes and to reduce the time spent looking for information, the following items have been developed and include on the CD.

Index

General

$ / SFFA	Swift means of calculating cost of construction of single family homes or condos. Requires National Estimator Square Foot cost manual.
Areas & Volumes	193 geometric figures for which perimeter, area and volume are calculated automatically. On second sheet are trigonometry functions, conversion calculators and interest calculators.
Article	Article on how to calculate the amount of time necessary for production of an estimate. Use with Chart below.
Chart	Chart that goes with Article.
Classifications	California State Contractors Board classifications of trades.
Converter	Converts English units to Metric and Metric to English.
CSI list	The new Construction Specification Institute list.
Efficiency	Table of drop in efficiency with extended work hours.
EstSoft	List of computer estimating and take-off software providers.
Extensions	Computer address extensions and meanings.
Foreign Costs	Percentage factors for foreign costs.
Gross Floor Area	Gross Floor Area calculator according to AIA D-101.
Improvements	% increase in value of a residence for various improvements.
Labor Efficiency	Time wasted in typical day.
Plan rooms	List of the plan rooms of U.S.A. & Canada.
Prevailing Wage Rates	List of internet sites for obtaining prevailing wage rates.
Plant Names	List of English names of plants and Latin name and vice versa.
Quote Sheet	Sample Quote sheet.
Scale Correction	Useful tool for correcting scales due to paper stretch / shrinkage.
Tip letter	How owners should deal with a contractor.
Waste Factors	Various waste factors for use in estimating.
Weights	Weights of a variety of materials.

Carpentry

Glulams	Calculates the board feet of glu-lams.
JoistTO	Joist quantity calculator.
Nail Schedule	Schedule for number of nails per application.
Nails	Number of nails per pound for various types.
Simpson	Simpson-Strong-tie cost calculator.

Concrete

Anchor Bolts	Calculates the number of anchor bolts required.
Concrete Mixes	Calculates quantities of cement, sand and gravel for mixes.
Concrete	Calculates excavation, backfill, disposal, formwork and concrete for variety of configurations
Rebar	Calculates pounds of rebar for straight runs and flat slabs.
WWM	Welded Wire Mesh types and weights.

Damp-proofing & Thermal-proofing

Locks/Seams 1 & 2	Pictures of various metal roof seams.
Roofing Take-off	Roof area calculator.
Roofing Types	Sketches of various roof configurations.

Doors & Windows

Window Parts	Sketches of various window parts.
Window Types	Sketches of various window types.

Electrical

Al vs Cu	Aluminum wire compared to Copper wire.
Conduit	Calculates number of wires that can fit in various type conduits.
Formulas	Electrical formulas.
Receptacles	Sketches of various electrical receptacles and applicable voltage and amperage.

Finishes

Paint take-off	Paint take-off spreadsheet.

Stucco Mixes	Calculates amount of stucco mix, mix quantities, black paper, mesh, chicken wire and nails required per square yard of surface.

Masonry

Brick Types	Sketches of various brick types with dimensions.
Masonry CMU	Sketches of various CMU with dimensions.
Masonry Joints	Sketches of various masonry Joint styles.
Masonry Styles	Sketches of various masonry styles.
Masonry Take-off	Calculates number of units for bricks and CMUs, rebar, mortar and cell grouting plus mortar mixes.

Mechanical

Ductwork	Calculates pounds of sheet metal and area for variety of duct sizes, fittings and HVAC pressure ratings.

Metals

Aluminum	Weights & gages of various sizes of Aluminum sheet metal.
Copper	Weights & gages of various sizes of Copper sheet metal.
Gage Comparisons	Compares various gages.
Galvanized Steel	Weights & gages of various sizes of galvanized steel sheet metal.
Lead	Weights & gages of various sizes of Lead sheet metal.
Metal Decking	Calculates cubic yards of concrete for various metal decks.
Metal Take-off	Calculates tonnage, surface area & gyp board wrap for a variety of steel shapes in three orientations.
Stainless Steel	Weights & gages of various sizes of Stainless steel sheet metal.
Steel Frames	Sketches of structural steel framing members.
SteelTOM	Structural steel take-off in metric (similar to Metal Take-off).

Sitework

Cut&Fill	Cut & Fill excavation calculator.
Demo	Demolition calculator giving cubic yards and tonnage of debris from various types of demolition.

Excavation	Calculates the volumes of excavation, sand fill, backfill, excess soil disposal and shoring necessary for a variety of excavation configurations.

For questions, comments or corrections notify
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