

THE ACADEMY OF ELECTRICAL CONTRACTING

**Paper Presented by
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THE HOW, WHY AND FUTURE OF ESTIMATING

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Should I Estimate This Project?

The first step in estimating is deciding whether to estimate a project. Many important factors are a part of this decision. Each of the following could make the difference in whether to estimate the project and how it will affect your company.

- Does the size of this project meet the guidelines and limitations of my Company?
- Is a sufficient work force available to complete the project within the allotted time?
- Does our Company have the expertise to complete this project within the project's scope?
- If engineering is needed, do we have the engineering capability needed?
- If bonding is needed, how will this project affect our company's bonding limits, and is that level of bonding available to our company?
- Do we have the proper tools and equipment to complete this project, and if not, what additional resources will be needed, and can I include those costs in the estimate and still be competitive?
- Does our company have the estimating capability to complete this estimate within the time allotted?
- Will this project adversely affect our company's cash flow and/or credit? Does the payment schedule fit our company's finances?
- Which and how many of our competitors will be bidding this project, and what is the cost of our estimate versus the likely hood of obtaining the project?
- Is this the best use of our estimating resources? Is there another project better suited for our Company?
- If we estimate this project, and are successful, will this project fit into our company's long-range plan?
- Are the owner and/or general contractor financially capable of paying for this project?
- If the quotation is to a general contractor, what is their history of payment, job completion, job progress, cooperation with sub-contractors, safety record, clean up, and punch list?
- If the quotation is to the owner or owner's representative, what is their history of payment, job completion, job progress, cooperation with contractors, safety record, clean-up, and punch list?

Plans and Specifications

- Are the plans and specifications readily available? Can we obtain at least one copy for our

use, or do we need to do our takeoff in the General Contractor or Owner's office?

- Is there a plan deposit, and is it refundable? If the deposit is not refundable, is the project still worth estimating, or are there other projects that would suit us better?
- May we mark the plans, and if not should we make copies for our own use?
- Are the plans and specifications in a paper or digital format? If they are in a digital format, do we have the capability to either print them or read the digital format?

NOTE: I believe that in the near future most plans and specifications will be in a digital format. The days of picking up paper plans will have ended, and drawings will be sent over the Internet or on a CD. This transition will happen almost overnight, similar to how the FAX took over the industry. Users of a CAD Estimating program will have the advantage of being on the leading edge of the industry.

- Check the plans in, noting the number of copies of both the plans and specifications, the bid due date, plan deposit amount, any addenda's including the addenda number and date, and the contacts (architect, engineer, owner, general contractor, etc.). This should be done on a sheet or chart that is available to all involved.
- Distribute the plans and specifications to the estimators involved, keeping a list of who has which plans and specifications, etc.
- When paper plans are picked up, make sure that their rolled with the printing out. Then they will lay flat on your desk when laid out.

The Specifications, Division 1-15

Read the specifications very thoroughly adding the following information to your estimate. If costs are to be included in the estimate, but are not known yet, make note of those items, and check them off as the prices are added to the estimate. **Appendix A** is a check off form that I used while checking the specifications.

Note the following for your estimate:

- Date and time the proposal is due.
- Are a Bid Bond and/or a Proposal Bond required? If so, start the process and be sure that bonding costs are properly setup in your Bid Summary.
- Was there a non-refundable plan charge? If so, add that cost to your Bid Summary.

- Are “As built” drawings required? If so, add their cost to your Bid Summary

Note: As built drawings may be more expensive than seems on the surface. Keep careful records of your company’s costs for as built drawings based on a project’s size and type.

- Note all of the additive and deductive alternates for this project. Separate the Alternates in your estimate. Be sure to note clearly whether the alternate is an additive or deductive alternate. A typical list of the Base Bid and Alternates would be as follows:

Base Bid
 Alt. E-1 Add
 Alt. E-2 Add
 Alt. E-3 Deduct
 Alt. E-4 Add

Do not forget to include all deductive Alternates as a part of your Base Bid.

- Check the General Conditions for any requirements that may affect your portion of the work. Look for requirements that could affect the **completion time, job conditions, cleanup, relationships with the owner, engineer, other contractors, “Approval drawing” approvals, additional insurance, hold harmless clauses**, and any areas where responsibility is shifted from the owner, architect, engineer, or general contractor to you.
- You may need additional insurance for the project. If you do, obtain the cost from your insurance carrier and add those costs to your Bid Summary.
- Check the payment terms. How will they affect cash flow? Will we need additional money? Add the estimated cost of money to your Bid Summary.
- Check for any penalty clauses that may affect the estimate or the completion of the job. Is the work force available to complete the job within the requirements? Will overtime be required? Be sure to include those cost in the Bid Summary either as an additional labor amount or as a Direct Job Expense.
- Is shift work or overtime required, do to owner occupancy, etc? If so, include those cost in the Bid Summary.
- Check the Mechanical and Plumbing Sections (Division 15) for work required under your division, including any requirements or schedules that will affect the estimate.
- Do you know the other trades that will be working on this project, and what is your relationship

with them? Will there be additional costs because of their involvement?

- Check the other Divisions for work required under your division, including any requirements or schedules that will affect the estimate.
- Is a sample copy of the contract included or referred to as part of these specifications? Read the contract very carefully. Is it a standard contract (AIA, AGC, etc.)? If it is a standard contract, check with an attorney, trade association, other contractors, etc. Are the contracts terms and conditions acceptable? If the contract is not a standard contract, having it reviewed by your attorney would be wise. If the contract needs revision, can it be revised without additional cost to your company?

The Specifications, Division 16

At this time Division 16 of the specifications is where most of the electrical specifications are. This format may be added to or modified in the future. Further information is available at www.csinet.org and www.ibs-16.org. The following is based on the 1995 MasterFormat of Division 16.

It is very important that you read and fully understand all of the Specifications, including Division 16. The specifications normally supercede the plans.

The beginning of this section will talk about installation standards, codes, permit fees, submittals, warranty and guarantee, cutting and patching, alterations and demolition, temporary utilities, “As built” drawings and manuals, etc.

Section 16050 covers Basic Electrical Materials and Methods. Note the conduit systems allowed. What type of wire and devices? Are there any special installation standards required? Note anything special or out of the ordinary.

Other Sections cover specifics such as High Voltage Distribution, Service and Distribution, Lighting, Special Systems, Communications, Electric Resistance Heating, Controls, Testing, etc.

Mark the specification pages and the items needed for future reference. You may need to send copies of particular parts of the specification to various suppliers. If copies are used, errors in the translation are less likely.

Preparing the takeoff for job management

Most contractors divide the job into sections for project management at the time of the estimate, and other contractors redo the takeoff for project management after they have been awarded the job. Either way, most jobs will need to be broken down in areas for project

management (job costing) purposes. Most computerized estimating systems have ways of dividing the takeoff into sections or labels for these purposes. The following tips may help in that breakdown.

An Idea? A NECA Contractor I knew had his estimators estimate the job, then if they were successful, brought in the supervision (foreman, etc.) and had him estimate the job. Then the supervisor and the estimator would check the differences and compromise on the final figures. This way the supervisor has accepted the final compromise as a number that can be accomplished and has a thorough understanding of the job.

Divide the job into logical sections for project management purposes. Try not to make the divisions so small that it is difficult to obtain the information from the field or too time consuming to process in the office.

Within each division, breakout the different labor areas or cost codes, such as branch conduit, branch wire, feeder conduit, feeder wire, devices, etc. that are a part of the estimate.

Examples of divisions or label break down could be:

- Additive or deductive alternates.
- Change Orders.
- Sections of a slab if there is extensive under floor or slab work.
- Areas of a project or building that can be easily separated for project management purposes.
- Systems or new types of construction may be separated for future estimate analysis.
- An area of the job that you think may be deleted or modified because of cost cutting or other reasons.

Divisions or labels may also be used for the release of materials. This will help cash flow, cut down on theft, and reduce breakage due to moving the material a number of times.

Company estimating procedures

A company practice of forming an estimating procedure will help in the output of good estimates. The same colors of pencils, order of takeoff, etc. will help a company control the estimating process. If an estimator leaves the estimate for a period of time, his estimating procedures should allow him to start exactly where he left off. If an estimator cannot complete the estimate for any reason, another estimator should be able to pick up where he left off. This can only be accomplished by using good, standardized estimating procedures.

The plans

Check the table of contents for the drawings; **be sure that they are complete.** If they are not complete

either obtain the missing drawings or be positive you don't need them.

Now that you have thoroughly checked the specifications. Compare the plans to the specifications. It is a good practice to mark any areas affected by alternates with a colored pencil so they won't be missed. (Mark the drawings so there is no mistake that they have been marked). Create the labels for the alternates either as labels, etc in a computerized estimating system or using separate sheets in a manual system, as shown below. Keep in mind that the deductive alternates need to be included in the base bid.

Base Bid

Alt. E-1 Add

Alt. E-2 Add

Alt. E-3 Deduct

Alt. E-4 Add

Circle the drawing scale, i.e. 1/4" = 1', on all the drawings and circle the scale of any insets on the same page. A good practice is to write the scale on that part of the drawing in large numbers with a brightly colored pencil.

Check the scale on all the drawings and insets against a known measurement, like a door opening, a 2x4 lay-in, etc.

Takeoff – The counting and measuring of items and assemblies

The takeoff order can be important. The following takeoff order has worked well.

- Quoted items. (Lighting fixtures, panels & switchgear, systems, specials, etc.)
- Feeders.
- Devices.
- Systems wiring.
- Branch wiring.

Manual takeoff is usually done on special takeoff forms, lined paper, or directly onto the pricing sheets. The pricing sheets may consist of either items or assemblies (groups of items). They usually have a name, quantity, price, unit, price extension, labor, unit, and labor extension columns.

Takeoff using computerized estimating systems varies between software companies. One of the advantages of computerized estimating in the ability to build and use assemblies. Assemblies are treated differently between computer estimating systems. Look at the systems keeping in mind the ability to easily build assemblies within a job.

As the items or assemblies (outlets, panels, etc.) and lengths are taken off, mark them with bright colored pencils. Any notes, or existing items, etc. should

also be marked as they are noted or taken care of. When the takeoff is complete, every item, note or length that pertains to our work should be brightly marked.

CAD Takeoff

The difference between a CAD Estimating program and the counting/measuring method used with printed drawings, is that the CAD Estimating program counts and measures the drawing for you. Outlets are not missed and lengths are measured with the accuracy of the CAD system they were drawn with. Any modifications to the drawings may be easily determined by using the CAD Estimating Software. More and more contractors are obtaining their drawings in a digital format. Someday soon plans and specifications will be available in only a digital format, on CD, over the internet, or whatever the future may bring.

CAD takeoff may also be used after the estimating stage to assure the delivery of the proper materials to the job and for Job Management. A portion of a project can be blocked out and taken off using a CAD Estimating program allowing for an accurate material list and labor for job costing.

Pricing/extending the estimate

After the takeoff is complete, that part of the estimate needs to be priced for material dollars and labor hours.

Manual Systems

- On a manual system the takeoff is transferred to numbered and labeled pricing sheets including an item or assembly description and quantity.
- The items or byproducts that make up the assemblies are listed including their quantities.
- The items or byproducts that make up the assemblies are priced and each item/byproduct is extended, and all are totaled to give a total assembly material price.
- Labor is added to that assembly either as a total of the labor for the items/byproducts, or as an assembly labor unit.
- Each pricing sheet is totaled by at least two people. If an adding machine using a paper tape is used, the totals shown on the paper tape should be checked against the digital readout.
- The pricing sheet label, page number, and totals should be added to an extension sheet labeled for that area of the estimate (Base Bid, Alternates, etc.) and totaled again by at least two people.

- The extension sheet totals (material dollars and labor hours) should then be transferred to the bid summary pages.

Computerized Systems

- Some computerized estimating systems allow the estimate to be extended by the various divisions or labels used during takeoff. Other systems may require a different job for each division.
- Run a zero price and labor report and a quotes report to see if any prices are missing and a list of the quoted items.
- Pricing is usually just a case of picking a pricing formula and extending. Extending by various pricing formulas is usually very easy using computerized systems.
- Vary the pricing formulas or adjust the prices until you are comfortable with the extended prices for the job.
- When you are comfortable with the pricing, send the material dollars and labor hours for each division to the bid summary.

The Bid Summary

Manual Systems

- The bid summary may use a paper form or a program such as Excel.
- The bid summary should contain at least the following elements:
 - The material dollars from the extension.
 - The productive labor hours from the extension.
 - The cost of labor based on the productive labor hours and the classes of labor including burden to be used.
 - Any non-productive labor cost in addition to the productive labor.
 - The quoted items needing pricing with the quoted prices. A bill of material should be checked for all quotations.
 - The cost for any work to be subcontracted to others.
 - Any direct job expenses such as telephone, temporary power, additional insurance, trailer, plan charges, permit fees, etc.
 - Any equipment rental charges.
 - A charge for the equipment that you furnish i.e.: trenchers, lifts, etc.
 - Was demolition included in your takeoff or does it need to be added here?
 - Any security problems (prisons, schools, mental institutions, etc.) requiring additional costs.

- Any special safety considerations requiring testing or special equipment.
- Any special site conditions that will increase costs. Is material delivery going to be difficult?
- Don't forget to include any of the special costs noted as you reviewed the plans and specifications such as the cost of money, etc.
- Add any taxes required.
- Add the cost of overhead. Overhead may be added as a dollar amount, a percent of the job either broken down between the costs or as a total percentage, or as a dollar per hour figure based on the job hours.
- **Don't forget to add profit.** Profit is not a dirty word, it is the dollars that let you continue and expand your business.
- Add any bonding costs.

You are now ready to summarize and review your bid.

Computerized Systems

- The digital bid summary will use the same steps listed under the manual bid summary except the bid summary is integrated with the extension and will follow the changes made in extending.
- Computerized estimating systems have built in features to help with labor distribution, labor costs, quotes, expenses, taxes, overhead, profit, bonding, etc.
- Computerized estimating systems have the ability to allow changes with automatic bid updating.

Checking the estimate

Square foot costs and hours per square foot are good measures to use in checking the estimate. Some computerized estimating systems have the square foot costing built into their bid summaries. Build a library of square foot costs based on a certain type and density of jobs.

Ratios are a good check of the estimate. Some of the computerized estimating systems either give ratios or show them as visual graphs. The following are a few quick checks:

- Material to labor to quotes ratio for a job type and density.
- The labor mix of journeyman to apprentice to foreman.
- The ratio of fixtures to switch gear.

Quality estimates

Try to look at taking the time to make quality estimates rather than just pushing a quantity of estimates

out the door.

Look at your rate of success ratio. Is it one in five or one in twenty five?

Always try to consider your competition. Have you tried using your gross cost in his bid to find out what he's using for overhead and profit? Are you then tracking his overhead and profit so you have an average to consider on your quotations?

Do you complete the takeoff far enough ahead so that time can be devoted to the bid summary and your final price?

Exporting data to other programs

Some of the computerized estimating systems allow exporting the estimating data to other programs or files. This helps with job costing, purchasing, accounting, etc.

Other computerized estimating features

Some of the computerized estimating systems have integrated Scheduling, Proposal Forms, Change Order tracking, etc. available.

Please direct any comments or questions to:

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Richard E. Manrod worked in the industry as an electrician for four years, and then served a four year apprenticeship. In 1964, he founded the business that became Manrod Electric Inc., which he operated for 35 years. The company has been a NECA member since 1968. Manrod developed his own computerized estimating system and taught computerized electrical contracting at the University of Wisconsin. As a member of NECA, Manrod has participated in many NECA classes including ESP, Sales, and the "Win Win" negotiations seminar held at Cornell University. He served on the Northern Illinois Chapter's negotiating committee for over 20 years, served as Chapter President for 10 years, and Chapter Governor for 2 years. He has been instructing on McCormick Systems windows products since March of 1999.

Appendix A: Specification Form

Project: _____

Date: _____

Project Location: _____

Est. #: _____

Proj. # _____

Com. # _____

Name

Address

Phone

Architect _____

Engineer _____

Owner _____

Bid To: Architect Engineer General Contractor

Bid Due: ____ : ____ AM PM _____ , 20 ____

Bid due GC _____

Bid Deposit _____% Certified Check

Bid Bond Amount _____ Performance Bond _____%

Sales Tax _____%

Temporary Power by: General Contractor Electrical Contractor Owner Other _____

Cost of Power by: General Contractor Electrical Contractor Owner Other _____

Temporary Outlets: Type _____ Spacing _____

Type _____ Spacing _____

Completion Time _____

Liquidated Damages _____

Method of Payment _____ Retention _____%

Addenda – Number & Dates

Electrical Drawings on Page Number:

Electrical work on Architectural Drawings:

Electrical work on Mechanical Drawings:

Electrical work in other sections of the specifications:

Electrical Alternates:

Service Overhead Underground
____ / ____ Volts, ____ Phase, ____ Wire, ____ Amps

Pad Mounted Transformer - Pad by: E.C. G.C. _____
Trench by: E.C. _____

Excess Facilities Charges – Paid By: E.C. G.C. _____
Amount \$ _____

Main Distribution Panel: Load Center Fused Sw. Breakers
Branch Panels: Load Centers Fused Sw. Breakers

Fuses: Main Distribution Panel Type: _____ Branch Panel Type: _____

MOB - Motor Outlet Box Motor wiring by E.C. Disconnect Switch by E.C. Starters by E.C. Controls by E.C.

FBO – Furnished by others Wiring by E.C. HD Safety Switch GD Safety Switch Fuse Type _____

Concealed Raceways

Exposed Raceways – Type: Conduit Wiremold _____

Raceway Min. Size _____ Switchlegs _____ Branch Feeders _____

NEC _____

EMT Feeders _____ Feeders EMT Branch IMC Branch RMC Branch MC Cable Branch NMC Branch
 Exterior _____ Underground _____ Concrete _____

EMT Feeder Fittings: D/S D/C S/S S/C EMT Branch Fittings: D/S D/C S/S S/C

Trench: Minimum _____ inches deep Hangers: Minimum _____ inches on center

Minimum wire size _____ Number of wires in conduit: NEC _____

Wire Type: Feeder _____ Branch _____ Mechanical Room _____ Underground _____ _____

Telephone Raceway – Min. Size _____ Stub Above Ceiling System by E.C. System by others Separate Quote

Computer Raceway – Min. Size _____ Stub Above Ceiling System by E.C. System by others Separate Quote

Video Raceway – Min. Size _____ Stub Above Ceiling System by E.C. System by others Separate Quote

Fire Alarm Voice Security Access UPS Generator Lightning _____

Device Plates: Ivory Brown White Grey Black Red Stainless Brass _____

Device Type: Ivory Brown White Grey Black Red Stainless Brass _____

Receptacles: Duplex _____ Single _____ GFI _____ WP _____

Hospital _____ IG _____ TVS _____ _____

Power _____ Power _____

Power _____ Power _____

Switches: Ivory Brown White Grey Black Red Stainless Brass _____

Switches: SP _____ DP _____ 3W _____ 4W _____

Keyed _____ Pilot _____

_____ _____

Lamps: Inc. _____ HID _____ Fluorescent _____ _____