THE ACADEMY OF ELECTRICAL CONTRACTING

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Computers in the '90s and the
Electrical Contractor

May 1990

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In the mid sixties the electronic calculator was the start of computer technology playing a major role in the electrical construction trade. In the electrical construction business it gave the contractor the ability to accumulate and calculate estimates faster and with fewer errors. In fact, any business that did a lot of hand calculation in their everyday business was greatly influenced. As new computer technology was developed, it continued to be incorporated slowly into the electrical construction industry.

In the mid seventies some of the companies, in a centralized computer room, began to implement computer card systems, where all the company's information was coded and key-punched onto computer cards and then the information was entered into the computer. This gave the electrical contractor the ability to run reports on how projects were progressing. It also gave them the ability to automate their accounting systems and everyday business practices. In the late seventies you began to see some companies implement multi-user on-line computer systems, where one computer operated several terminals and processed several tasks at the same time. This gave owners and managers faster and more up-to-date information about their business and the projects they were working on.

Then in the early to mid eighties the development of the personal computer made it possible for any business, electrical construction included, to computerize their business. Thousands upon thousands of programs have been written since the first personal computer was manufactured. New computer technology is being developed and implemented every day. The electrical industry, along with all businesses in the world have a lot to look forward to in computerization in the 90's.

Today, computers are playing a major role in the electrical construction industry. What role will the computer play in the future as far as construction industries are concerned, or better yet, how will the computer change the construction industry? There are two ways that I would like to look at this question. First, what are some of the current technologies that will play a part in how computers will affect our business? Then second, give an example of what it might be like putting an electrical bid package together five or ten years from now.

Today there is a lot of research and development going on in the computer industry. Smaller, but faster and more powerful computers are being developed almost daily. PC's (personal computers) have gone from a 16 bit, 286 processor to the newest 32 bit, 486 processor. The newest processor is at least three times faster than the old

unit. Some feel that this system is fast enough and powerful enough to be utilized as a multi-user system (there are some manufacturers doing this now). Computer workstations have seen the same type of performance improvements. Computer CAE (computer-aided engineering) and CAD (computer-aided drafting or design) systems that fit on top of your desk and are capable of doing millions of instructions per second. Parallel processors are being researched and developed to increase the throughput (processing speed) of a computer. New fault tolerance systems, better than the UPS systems that we have been installing, are being developed that will enable you to have a system that is guaranteed not to go down, and if a part of the system does fail it can be repaired while the rest of the system is up and running. They are even working on a system that will tell you when a part is beginning to fail so you can schedule a service call (at your convenience) before the part goes bad. This will tell them what part he will be required to service.

Networks are one of the popular areas today and will continue to be for some time. New functions and ease of use are being developed and implemented all the time. As networks continue to mature, look for companies with networks to let you log in to their system via the network to send and receive information (ex., catalog information, pricing, requests for cuts and drawings). Some day you may join a regular network system for a fee, which will allow you to log in to the network to receive or just read information (Electronic Library). As network development continues, the boundaries between different manufacturer's computers will be reduced enabling systems from different manufacturers to interact with each other over networks. Look for electronic mail to be used between companies not just inter-company. Even today, facsimile copies are becoming part of the computer world. You can buy options for your personal computer that will let it send a facsimile direct from your wordprocessor to a facsimile machine. Look for facsimiles to be sent from computer to computer, then the receiving computer will produce the hard copy. This will cut telephone costs and enable you to produce as many hard copies as you need. Remember, times are changing and Western Union Telegraph had teletype machines all over the world and today they are obsolete compared to a few years ago.

Voice processing industry (voice messaging, automatic call distribution, voice recognition, etc.) became a big business in the late 80's and it is estimated to increase 3 to 4 times by the mid 90's. By the year 2000 it would not surprise me that you will be talking to your computer to

give it instructions, which will be small enough that you may carry it in your shirt pocket.

New optical scanners, capable of converting an original drawing into electronic form, are being developed that can scan an "E" size drawing (36" x 42") in less time than it takes to unpack the drawings and load them in the scanner. This can significantly improve and reduce drafting time on any electrical drawing or electrical project.

Computers are and will continue to be smaller, faster and more powerful in the future, which means that the software applications that can be accomplished will be only limited to the amount of money and time you wish to invest in your system. But you can only imagine what the future will bring, so I would like to use an example of submitting an electrical bid package together in the mid 90's.

You walk into your office on Monday morning around 8:00 a.m. and you are greeted by your head estimator, who tells you "I received an electronic mail message from XYZ architect and engineering company. "They wanted to know if we would be interested in submitting an electrical bid proposal on a high-rise building complex that goes Thursday at noon. "The architect's firm, a friend of mine, guessed that the electrical package is budgeted to be between 25 and 30 million dollars. "The project duration time is estimated to be completed in about two plus years." You tell your chief estimator "OK." He sends a mail message to XYZ telling them that your company would like to bid the electrical portion of the project, please send the plans and specifications.

Tuesday morning at 9:00 a.m., by special courier, you receive a complete set of drawings and specifications, both a hard copy and a copy on electronic media. You take the electronic media copy and give it to your engineering department and have them start to load this information into their department's computer system. At the same time, you have them take the hard copy drawings and scan them into another computer system. Next, you take the specifications to document processing department and ask them to do the same with the specifications you received. By 2:00 p.m. all the information is loaded into your computers, your estimating department receives a mail message and they begin the process of developing an electrical estimate for the construction project.

First they have the computer compare the electronically loaded drawings to the scanned drawings. As the computer compares the drawings, it prints out a list of differences so they can be reviewed. If any action has to be taken, it is entered after the comparison. After the comparison program is finished, the computer asks which drawings are to be included in the estimate. This information is manually entered and the computer program begins to break the drawings down by components. In about two and a half hours you have a complete list of components needed to develop an estimate (the program is intelligent enough to read drawing notes, schedules and leaders on the scanned drawings. The type of CAD system used to create the original drawings will determine how much detail is included with electronic media). It is about 5:00 p.m., so overnight this information is transferred via the computer network to your electrical estimating system.

While this process was being completed, another computer process was comparing the scanned specifications to the electronic media version and a standard specification that you keep on the computer. This process not only prints a listing of differences but notifies the operator so they can input what action is to be taken. After completing this comparison, the computer builds a project specification file that is transferred to the computer electrical estimating system.

The next morning you have a complete list of components and a project specification in a work file that the estimating system can read and compile. At this time the estimating system reads the two files and begins to build the estimate detail file. This process is the most time-consuming because the estimating system takes each component and compares it to your standard components data base. When it finds a match, it labels and prices each component. After all components have been processed (note, if the detailed component is not found it is added to a quote file to be processed later), the program uses your prebuilt assembly file components and the estimated component file to make sure no parts are missing. If there are, it will notify you that these components are being added to the estimate work file. All items that are to be quoted are printed out so the purchasing department can endeavor to get material and equipment pricing from some company, whose name we might not even recognize today.

This pricing is somewhat different from that in the past. The purchasing department logs in via a modem onto a nationwide network of vendors and/or distributors. A special program on the network reads the information from your file and compares it to available manufacturers, vendors, and/or distributors who may be able or who are quoting the project. Within two hours purchasing receives, by electronic mail and/or facsimiles, quotes from all the vendors (now we are dreaming) who are approved by the specifications on file. This information is loaded into the estimating system's work file.

The estimating system then processes all the information previously loaded one more time to make sure all information needed is available. It is now about 3:30 p.m. Wednesday afternoon and by 5:30 p.m. the estimating system will have a complete itemized bill of materials with material prices and labor hours or labor prices. The estimating department informs you that they are ready for you to summarize and build the final bid proposal package.

During the past two days as the computer was processing the estimate, the estimating department has manually been checking the drawings and specifications to see if there are any areas that may confuse the computer. Af-

ter reviewing the computer printouts with the estimating department, you are ready to put the bid package together. This is done by verbally answering the questions that the estimating summary program that you developed ask you. After you have answered all the questions, the program compiles a complete bid summary for you to review. This process can be run as many times as required by you or your associates.

It is now 9:45 a.m. Thursday and you are satisfied with your bid. You give your bid package to your secretary and she enters the information in the electronic facsimile file. She instructs the computer to fax the bid package at 11:45 a.m. to the proper destination.

All the information is retained on line, in your computer, until the project is awarded. If you are low bidder the estimating system will process all the information once again. In this process the program will compare the bill materials to your inventory file and will produce a listing of items that need to be ordered. It will also build a CPM chart and a manpower man chart. It will send your purchasing department a confirming list of items that need to be ordered and when the estimated required schedule date of usage will be. It will build a job comparison file to track estimated to actual material cost and labor hour cost. The list of what can be done once the information is in the computer seems endless.

A tremendous amount of computer technology and software has to be developed to process an estimate as de-scribed above, but if the technology and software continue over the next ten years as they have over the last ten years, it will be possible. There are all types of new technology being researched today (voice-activated PC, PC that will read handwriting, optical computers, object-oriented programming, and electronic imaging are just a few) that will have a great impact on all of our lives and our business not just the world of electrical construction as we know it today.

It is now 1990 and I have just discovered that our company has invested over two million dollars in five generations of computer hardware and software. In the past twenty years I have spent all my spare time working with our people in developing over 2000 programs for our business. As a result, my golf game is rotten and I never had enough time for my customers. And believe it or not, I just discovered that you can purchase a complete computer electrical estimating and software system package for only $169.95, and if you are willing to invest an additional $49.95 you can have included all the labor units you will ever need for every electrical item for any electrical proposal.

Now is the time to realize what you want to do. Have fun, stay healthy, enjoy yourself, it's later than you think. And remember, your grandchildren even though they are under 13 years old know more about computers than we will ever know.