

# Electrical Construction Estimating



**NORTH STATE  
ELECTRIC**

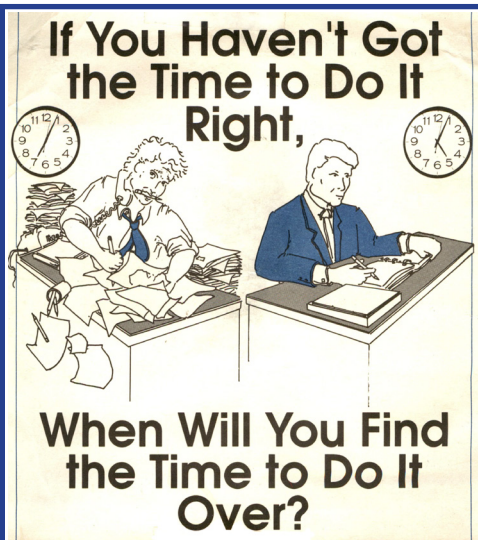
## **Introduction to Electrical Construction Estimating**

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Estimating activities will use the North State Electric estimating procedures.

### **Estimating and the Estimator**

- Estimating is the science and the art by which a person or organization determines in advance of the actual construction what the final total cost will be.
- Contrary to the opinion of many people outside this industry, there is very little guessing and a great amount of hard work and detail in estimating.
- Should any estimate be too low, the contractor's costs will exceed what he is paid. The results of that situation are obvious. Should any estimate be too high, the contractor will not receive the work and a competitor will probably get the contract.
- Whether the estimator is a trainee, a full-fledged senior, or a supervisor, every estimate must be as correct as possible.
- Single biggest problem of estimating? **TIME**

**To be successful, every estimator must learn time management and practice it!**



### **Estimators**

- Function with a minimum of supervision
- Frequently work under pressure
- Make decisions constantly
- Must be dedicated to their profession
- Establish Cost
- Prepare a Structured Take Off
- Strive for Accuracy
- Must Be Consistent
- Are organized
- Are uber awesome people

### **Estimating**

Successful estimating requires:

- ✓ organization
- ✓ self-discipline
- ✓ and time management

Estimators begin with the written documents (plans and specifications) furnished to them. They prepare quantity take offs from the construction plans and may or may not prepare the final estimate for bidding.

## Why Become an Estimator?

1. Estimating offers a challenge which is new and different every day.
2. It is an art which does not have standard formulas.
3. Estimating is a science which, when followed, produces reliability, and
4. It is a profession which is always in demand.

## Steps for Estimating and Bidding Electrical Work

1. Choose the Right Work to Bid
2. Review the Specifications
3. Review the Drawings
- 4. Perform a Quantity Takeoff**
5. Request Supplier Quotes
6. Create your Estimate
7. Add Overhead and Profit
8. Build your Proposal
9. Double Check Takeoff Quantities & Estimate
10. Submit Bid
11. Review the Results

### 1. Choose the Right Work to Bid

- Determine whether that job should or should not be bid.
- Gather all pertinent and related documents:
  - \* Bidding and contract documents
  - \* Standard blank forms
- Pertinent information relating to the project such as:
  - \* Project location
  - \* Owner
  - \* General contractors
  - \* Subcontractors
  - \* Time schedule
  - \* Completion date

### 2. Review the Specifications

- Read the Specs
- Understand the EC's responsibilities

## Construction Specifications Institute (CSI)

With the assistance of the American Institute of Architects, the National Electrical Contractors Association, and others, has developed and published a standard sequence for arranging information in construction specifications. This publication, the Uniform Construction Index (UCI), lists every component that is normally installed in any building construction, and lists the sequence, by number, in which each item should appear in the specification.

### CSI

Division One - General Requirements	Division Nine - Finishes
Division Two - Site Work	Division Ten - Specialties
Division Three - Concrete	Division Eleven - Equipment
Division Four - Masonry	Division Twelve - Furnishings
Division Five - Metals	Division Thirteen - Special Construction
Division Six - Carpentry	Division Fourteen - Conveying Systems
Division Seven - Thermal & Moisture Protection	Division Fifteen - Mechanical
Division Eight - Doors, Windows & Glazing	Division Sixteen - Electrical

## MasterFormat 2018 Edition Divisions

50 Divisions as defined by the Construction Specifications Institute (CSI)'s

### PROCUREMENT AND CONTRACTING REQUIREMENTS GROUP:

Division 00 — Procurement and Contracting Requirements

### SPECIFICATIONS GROUP

#### *General Requirements Subgroup*

Division 01 — General Requirements

#### *Facility Construction Subgroup*

Division 02 — Site Construction

Division 03 — Concrete

Division 04 — Masonry

Division 05 — Metals

Division 06 — Wood, Plastics, and Composites

Division 07 — Thermal and Moisture Protection

Division 08 — Openings

Division 09 — Finishes

Division 10 — Specialties

Division 11 — Equipment

Division 12 — Furnishings

Division 13 — Special Construction

Division 14 — Conveying Equipment

Division 15 — RESERVED FOR FUTURE EXPANSION

Division 16 — RESERVED FOR FUTURE EXPANSION

Division 17 — RESERVED FOR FUTURE EXPANSION

Division 18 — RESERVED FOR FUTURE EXPANSION

Division 19 — RESERVED FOR FUTURE EXPANSION

#### *Facility Services Subgroup:*

Division 20 — Mechanical Support

Division 21 — Fire Suppression

Division 22 — Plumbing

Division 23 — Heating Ventilating and Air Conditioning

Division 24 — RESERVED FOR FUTURE EXPANSION

Division 25 — Integrated Automation

Division 26 — Electrical

Division 27 — Communications

Division 28 — Electronic Safety and Security

Division 29 — RESERVED FOR FUTURE EXPANSION

#### *Site and Infrastructure Subgroup:*

Division 30 — RESERVED FOR FUTURE EXPANSION

Division 31 — Earthwork

Division 32 — Exterior Improvements

Division 33 — Utilities

Division 34 — Transportation

Division 35 — Waterways and Marine Construction

Division 36 — RESERVED FOR FUTURE EXPANSION

Division 37 — RESERVED FOR FUTURE EXPANSION

Division 38 — RESERVED FOR FUTURE EXPANSION

Division 39 — RESERVED FOR FUTURE EXPANSION

#### *Process Equipment Subgroup:*

Division 40 — Process Interconnections

Division 41 — Material Processing and Handling Equipment

Division 42 — Process Heating, Cooling, and Drying Equipment

Division 43 — Process Gas and Liquid Handling, Purification and Storage Equipment

Division 44 — Pollution Control Equipment

Division 45 — Industry-Specific Manufacturing Equipment

Division 46 — Water and Wastewater Equipment

Division 47 — RESERVED FOR FUTURE EXPANSION

Division 48 — Electrical Power Generation

Division 49 — RESERVED FOR FUTURE EXPANSION

### 3. Review the Drawings

#### Typical Installation Drawings

Site Plans Building Layouts Foundation Details Structural Details	Mechanical Systems Electrical Systems Plumbing Systems Life Safety (Fire Alarm, Egress Routes, etc.)
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#### Examine the drawings

- Look over the drawings at a high level to get an idea of the full scope of work.
- Take Notes. Watch for any discrepancies between the drawings and specifications and write this down.
- Record questions and draw a line through it when answered.
- Pay attention to drawing scale on EACH drawing.
- Read all notes and descriptions.
- Record drawing numbers and dates of latest change on the drawing.

#### Electrical Systems (Typical)

Lighting

Switchgear

Floor Duct

Devices

Receptacles

Switches

Thermostats

Feeders

Branch Power

Branch Lighting

Fire Alarm

Motor and Equipment Connections (Including Mechanical Equipment)

Grounding

Special Systems

Telephone

Data

Audio Visual

Security

Other

#### Drawing Sizes

American National Standards Institute (ANSI)

Size Designation	Sheet Width (Vertical)	Sheet Length (Horizontal)	Minimum Margins
A	8-1/2"	11"	0.25"
B	11"	17"	0.38"
C	17"	22"	0.50"
D	22"	34"	0.75"
E	28"	40"	0.75"
F	34"	44"	1.00"

Most Common - approximately 30" x 42"

#### 4. Quantity Takeoff

The process of counting and measuring items depicted in the electrical drawings such as: light fixtures, receptacles, conduit runs, panels and switchgear.

#### Take Off

1. Visualizing
2. Count & Measure
3. Listing

#### Estimating Tools

Proper tools are needed to accurately count and measure the electrical symbols shown on the electrical drawings. The estimator must also keep track of what has been taken off and indicate that on the plans. This is typically done by highlighting or coloring the symbols counted or measured as they are recorded on a take off sheet.

#### Estimating Toolkit

##### Item

- Plastic Storage Box - ArtBin 1040
- Colored Pencil Brown
- Colored Pencil Pink
- Colored Pencil Green
- Scalemaster Pro
- Tally Counter
- Helix Clear Shatter Proof 6" Ruler
- Texas Instruments® TI-503SV
- Sharpie Highlighters Yellow
- Sharpie Highlighters Blue
- Sharpie Highlighters Green
- Sharpie Highlighters Purple
- Sharpie Highlighters Pink
- Sharpie Highlighters Orange
- Pentel® Super Hi-Polymer® Leads, 0.7 mm, Medium, HB
- Pentel® Sharp™ Mechanical Pencil, 0.7mm, #2 Lead, Blue Barrel
- BIC® 4-Color™ Retractable Ballpoint Pen, Medium Point
- Pentel® Hi-Polymer Erasers, White
- Office Depot® Brand Manual Pencil Sharpeners
- Post-it® Notes Super Sticky Notes, 3" x 3"



#### Estimating Forms

1. Take Off Color Codes
2. Estimate Set-up Package
3. Take Off Sheet
4. Feeder Take Off Sheet
5. Motor Branch Take Off Sheet
6. Pricing Sheet

## Quantity Takeoff Process

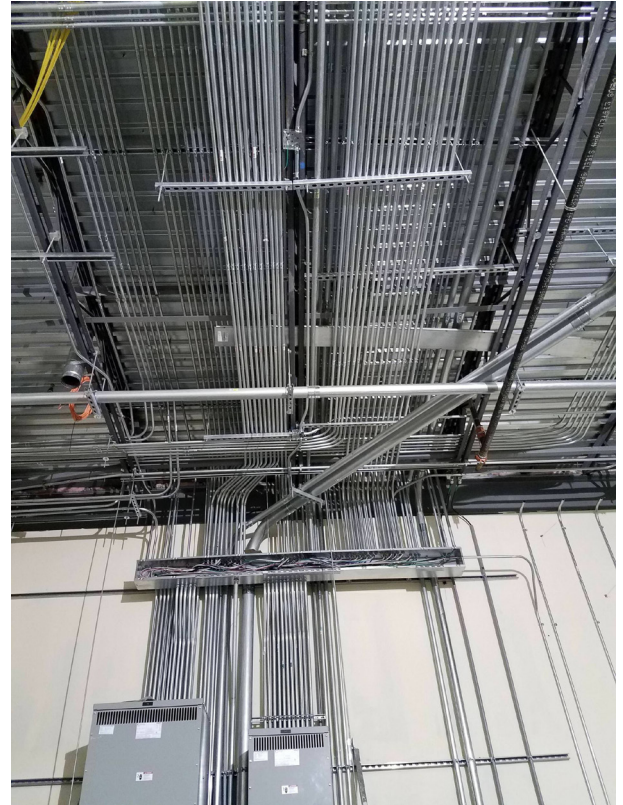
Study the drawings to understand the scope of work and how the items you are counting, or measuring are installed. For example, conduit in a slab versus conduit in the wall or fastened to a steel beam are installed differently.



Conduit Installed in a Slab

Conduit in a slab can often use the shortest run from point A to point B and runs under the slab do not have to be installed parallel or orthogonal to the building walls or framing.

Conduit runs in a slab are “stubbed-Up” to the device, panel, box, or location it is being connected to. The requirement for the stub-ups is given in the specifications. PVC conduits often must be stubbed-up with rigid elbows.



Conduit Installed Along Wall and Ceiling



PVC Conduit Stubbed-Up with GRS Elbows



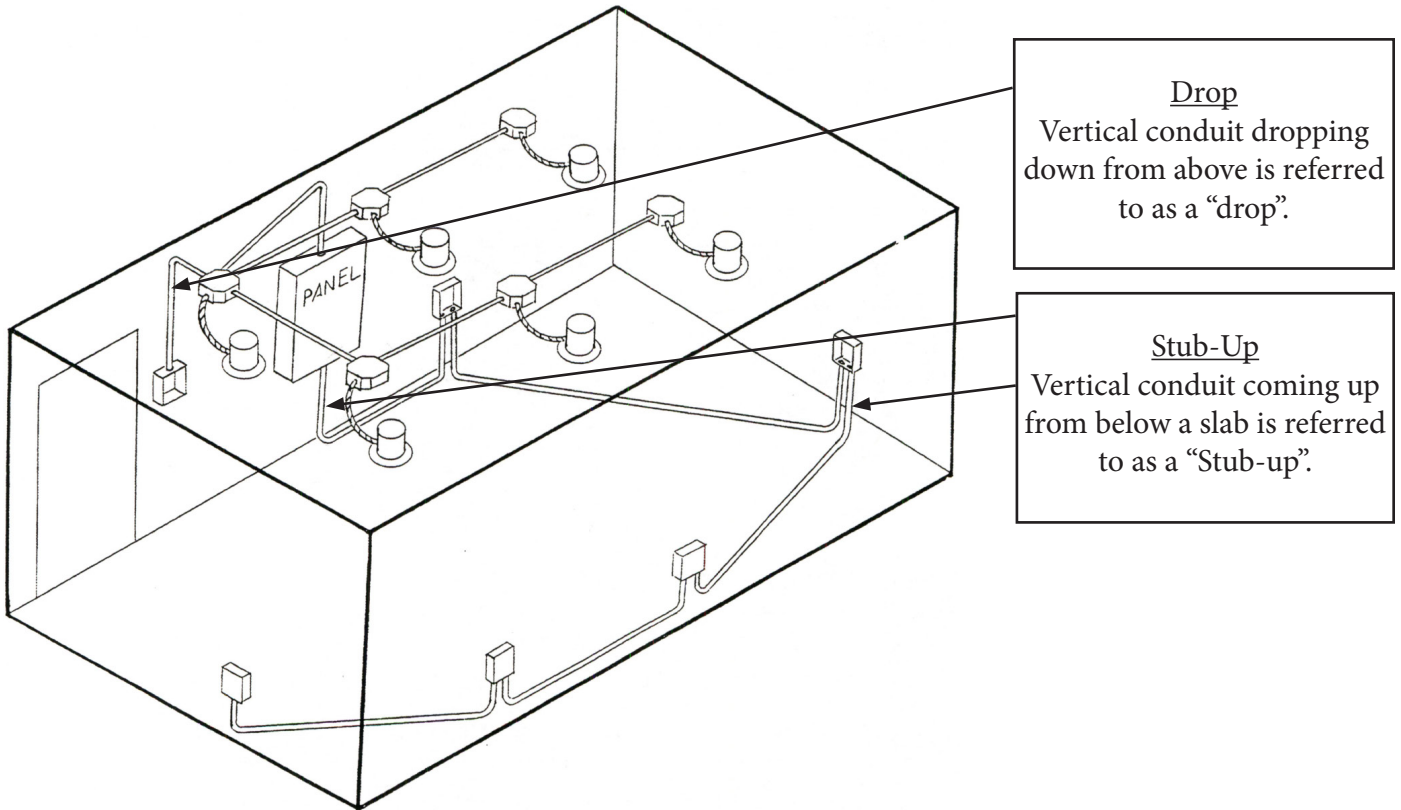
PVC 90's? Aren't you concerned about your jet line/rope cutting through them when you pull the wires? We always use rigid 90's underground.

Typical Specification

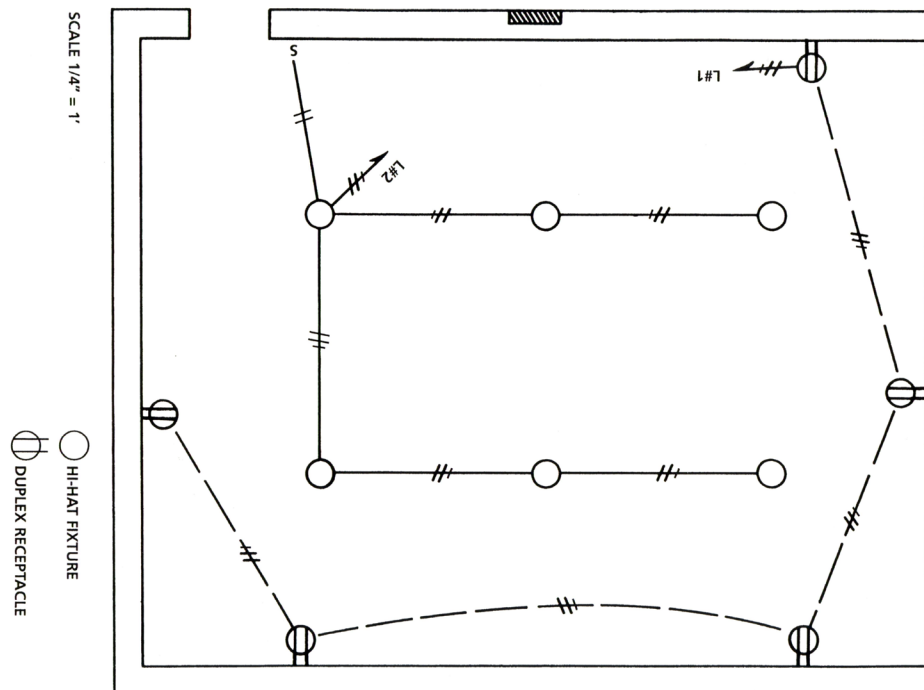
3.03 Workmanship:

- A. All work shall be executed in code compliance, when completed. All exposed conduit, line, boxes, and fittings shall be installed parallel or perpendicular with principal structural members of the buildings in

The isometric drawing below (not to scale) illustrates the horizontal and vertical installation of conduit intalled in a ceiling (Lighting Branch) and in a slab (Power Branch).



Plan View




### Take Off Forms

1. Used to Organize the Quantity Take Off
2. ALWAYS prepare them neatly. Expect someone else (your BOSS) to look at them and to use them.
3. Typically, each system is taken off on one or more columnar takeoff sheet.

### Take Off Sheet

Totals of each item to be installed are organized and recorded in a takeoff sheet.

### Example: Take Off Sheet for Light Fixtures (Atlantic Food Company)



**NORTH STATE  
ELECTRIC**

**TAKE OFF SHEET**

JOB Waste Management Hauling Facility

ESTIMATED BY LAG

06 FIXTURES  
SYS 08 Devices - Lighting

SHEET \_\_\_\_ OF \_\_\_\_

DATE \_\_\_\_\_

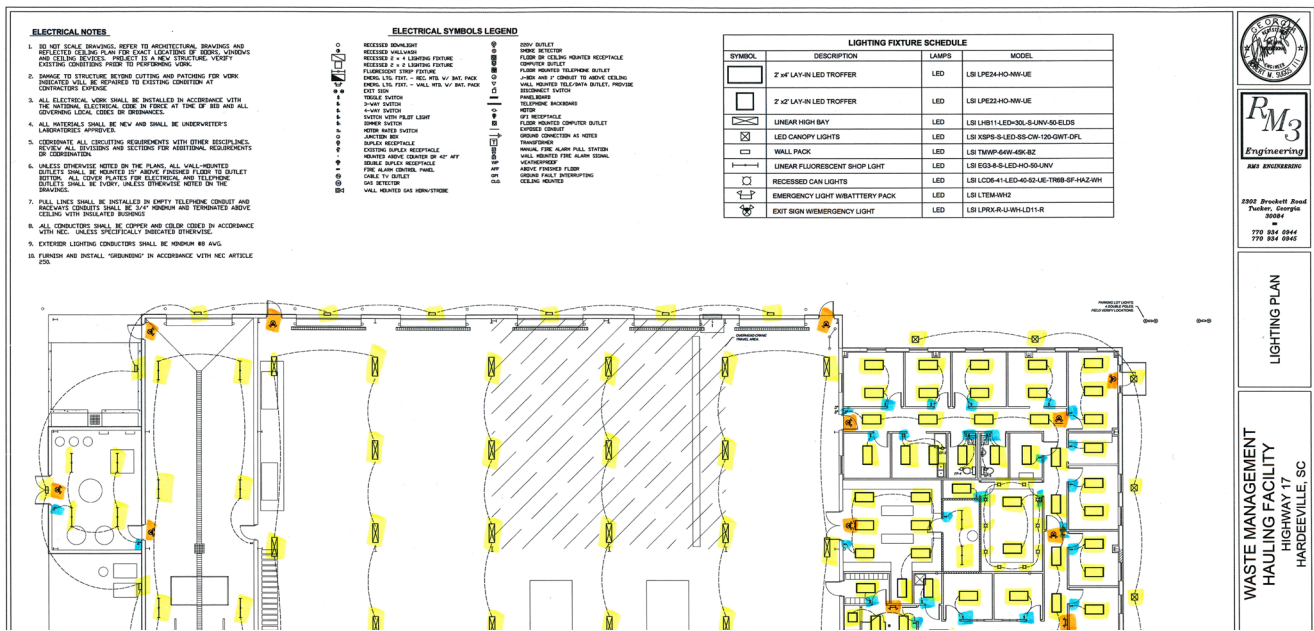
  

SYMBOL											\$	\$	\$	\$	\$	\$
DESCRIPTION	2x4 LED LAY-IN	2x2 LED LAY-IN	11" LED Linear High Bay Chain	LED Canopy	LED WALL PACK	8 FT LED LINEAR SHOP LIGHT	6" LED DOWN LIGHT REC	LED EM LIGHT W/BATT	LED EXIT W/EM		20A SP SW	20A SP 2G	20A 3-WAY SW	20A 3-WAY SW 2G	20A SP SW DIM 2G	
EI LIGHTING PLAN	64	2	26	9	16	14	10	4	13		23	3	6	2	1	

Before counting or measuring items the first step is to prepare a take-off sheet for the system to be counted such as, light fixtures, or measured, such as Branch Lighting. Then, using the corresponding drawing for the system to be counted or measured, count or measure all items for each drawing where they are shown to be installed and record on the take-off sheet. Continue until all those items for each drawing where they are shown are counted before moving to the next item. If you find something you missed earlier, immediately count it and adjust your previously noted quantity. Most companies have a Take Off Color Code for marking the items counted on the plans.

For example, color all light fixtures with a yellow highlighter and emergency fixtures with an orange highlighter. Lighting devices (switches, etc.) color with a blue highlighter.

### Example: Colored Lighting Fixture Plan





### **Process for Counting Fixtures**

The basic process for the counting Fixtures is to choose the Fixture type to be counted. Using the yellow highlighter, color the fixture symbol on the plan and “click” the hand tally (clicker). Continue coloring and clicking until all fixtures of that type have been counted. Record the number in the corresponding location on the takeoff sheet. Repeat for another type of fixture.

The Quantity Take Off is just one step in the process for creating an estimate and ultimately a bid price.

The following components of preparing an electrical construction estimate and bid will be covered throughout the semester. You can also refer to the article “How to Estimate Electrical Work” for more information.

4. Request Supplier Quotes (RFQ)
5. Create your Estimate
6. Add Overhead and Profit
7. Build your Proposal
8. Double Check Takeoff Quantities & Estimate
9. Submit Bid
10. Review the Results