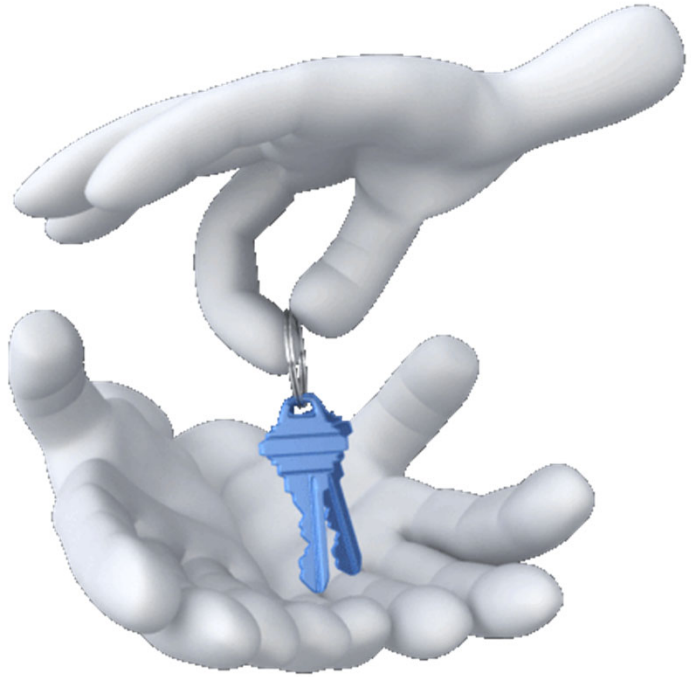
Labor Overruns Are Costly

Understanding Labor is KEY Estimating Accuracy



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Labor Overruns Are Caused By:

1. Not enough labor hours in the estimate
2. Failure to apply Installation Labor Factors
3. Failure to calculate Project Labor Factors
4. Poor project management
5. Poor labor productivity

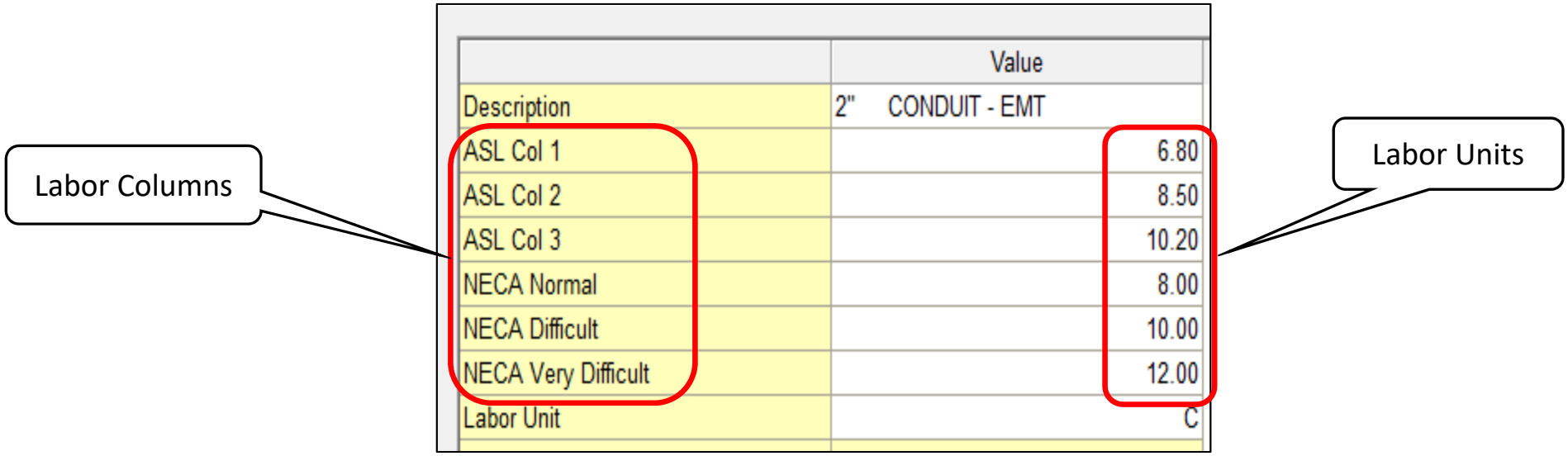
Webinar Objective

Accurately estimating LABOR HOURS and how to FOCUS where it matters.

Learning Objectives

1. Understanding Labor Units and Columns
2. Installation Labor Factors
3. Project Labor Factors
4. Focus on What Matters

1. Understanding Labor Units and Columns



	Value
Description	2" CONDUIT - EMT
ASL Col 1	6.80
ASL Col 2	8.50
ASL Col 3	10.20
NECA Normal	8.00
NECA Difficult	10.00
NECA Very Difficult	12.00
Labor Unit	C

Note: Screenshot is Trimble ACCUBID Classic Software

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Understanding Labor Columns

Labor columns are determined by:

- Project Size
- Building Height
- Project Duration
- Project Location

NECA Manual of Labor Units

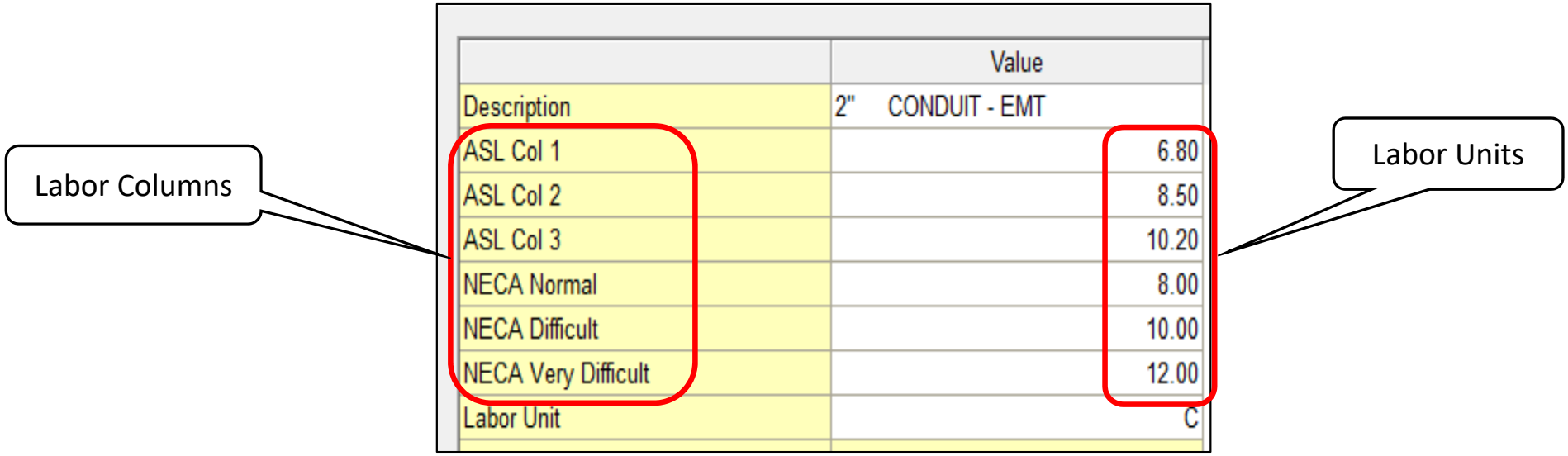
First published in 1923, this manual is an experienced-based reference for electrical estimating.

NECA
NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION

NECA Labor Columns

- Column 1 – Normal – Residential, Commercial
- Column 2 – Difficult – Institution
- Column 3 – Very Difficult – Industrial

Understanding Labor Units & Columns



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Labor Unit	C

Note: Screenshot is Trimble ACCUBID Classic Software

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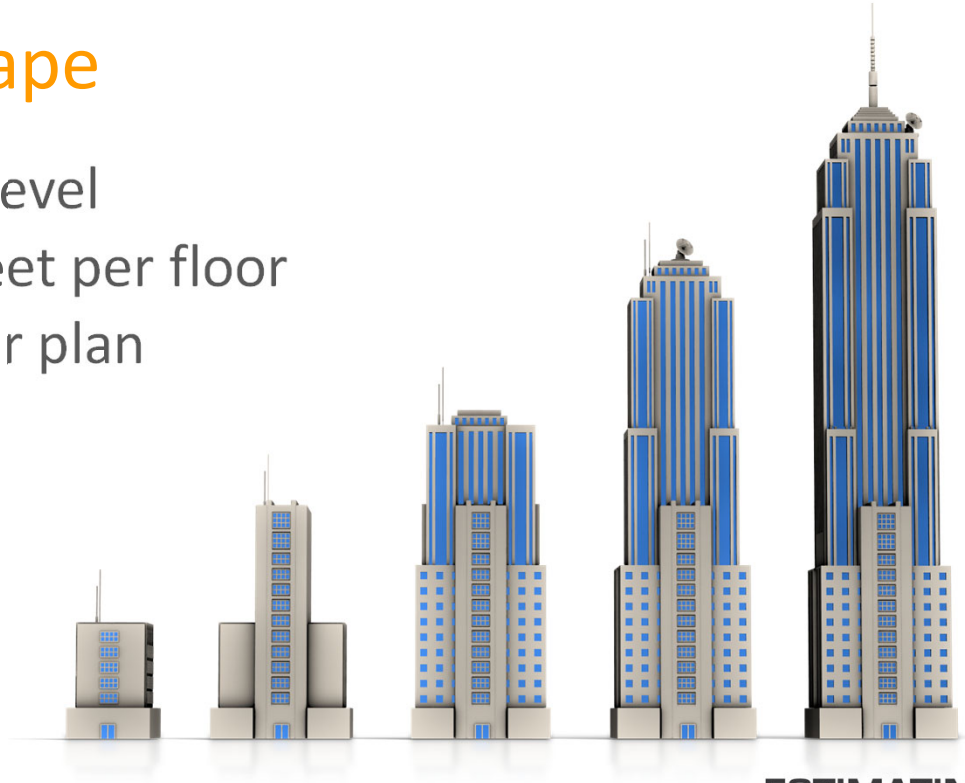
NECA 1 Labor Column Description

Building Size & Shape

- Up to 3 floors above street level
- 20,000 to 100,000 square feet per floor
- A rectangular or square floor plan



Building Location

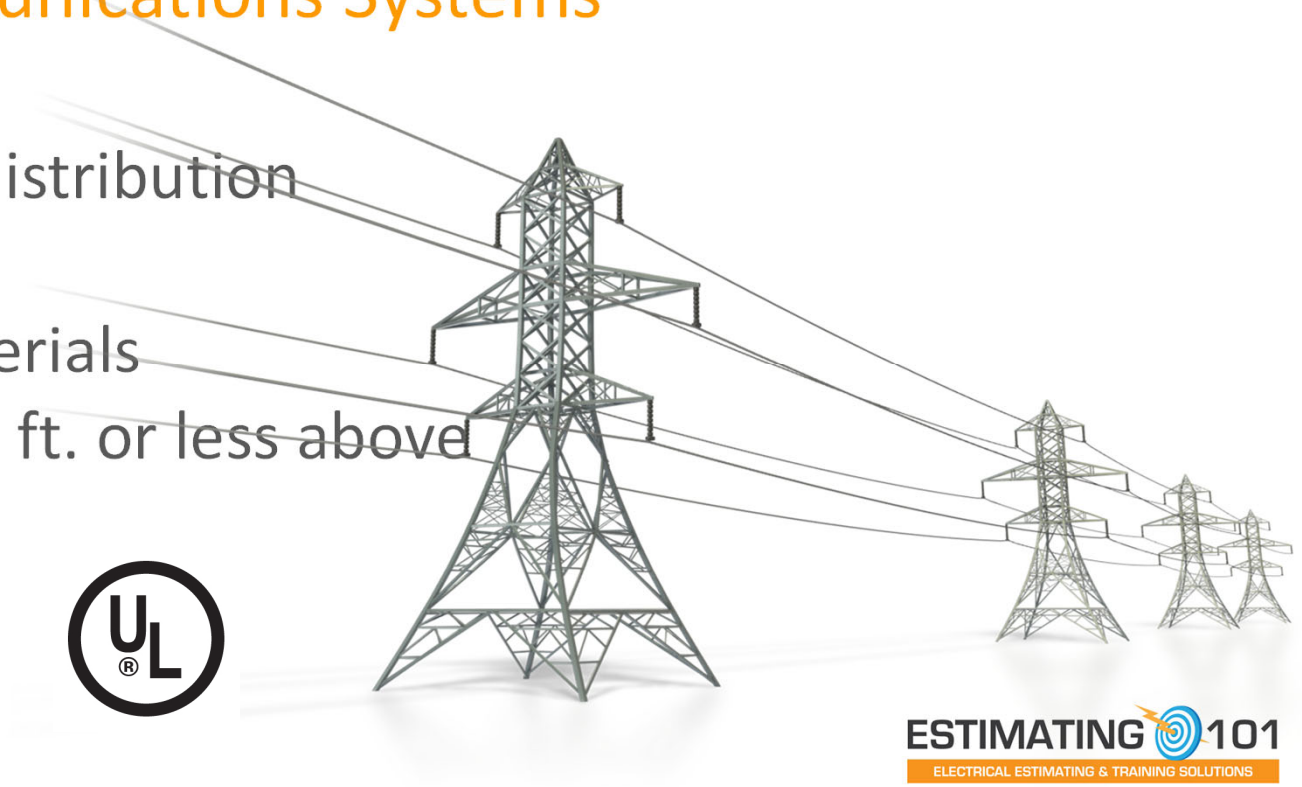
- In or near a metropolitan area
- Outside of a controlled access area
- A single building or facility

Construction & Work Schedule

- 8 hours per workday
- 40-hour work week
- All work on one daytime shift
- No overtime

Electrical & Communications Systems

- Up to 600-volt power distribution
- Local utility company
- Standard UL listed materials
- All systems installed 16 ft. or less above a solid floor



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Typical Site Conditions

- Good engineering and design
- Complete drawings and specifications
- Realistic schedule
- Electrical material furnished by electrical contractor

Typical Site Conditions

- Sufficient supply of qualified electricians
- All new materials
- No interruptions, delays or jurisdictional disputes
- No harsh weather – above 35 degrees F and less than 88 degrees and 50% RH

Which Labor Column To Use?

When project is not characterized as noted by project description, then an appropriate labor column based on project conditions must be selected.

Definition of the Standard Labor Unit

A UNIT of TIME for the installation of material.

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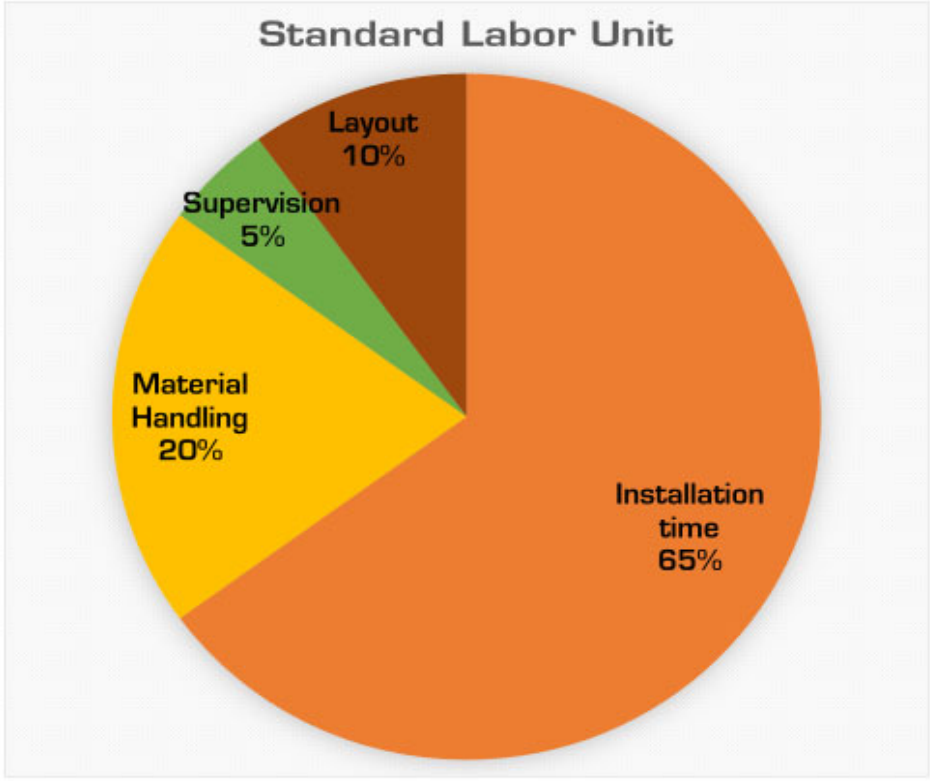
What is Included In a Standard Labor Unit?

- 65% Installation Time
- 35% Non-productive Time


Standard Labor Unit
Layout
10%
Supervision
5%
Material
Handling
20%
Installation
time
65%

Standard Labor Unit Breakdown

Standard Labor Unit – 1 Hour Breakdown		
Labor Task	**Percentage**	**Minutes**
Material Handling	20%	12
Supervision – interacting	5%	3
Layout	10%	6
Installation Time	65%	39
TOTAL	**100%**	**60**

Standard Labor Unit Facts

1. Based on the work being done by a skilled, qualified journeyman electrician.
2. Adjustments might need to be considered in the Bid Summary for less skilled electricians.

Labor Units for Special Items

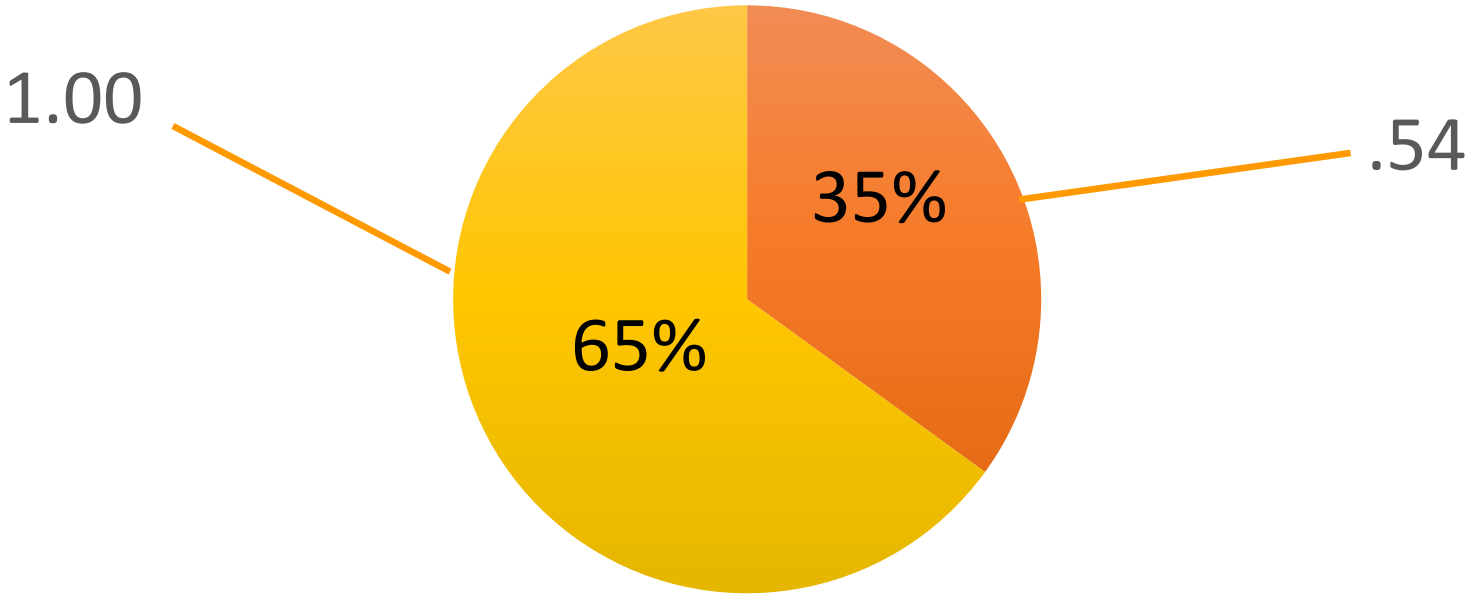
An estimator needs to understand the composition of a labor unit. A standard labor unit is 65% installation time and 35% for layout, material handling, clean up, and supervision.

Labor Units for Special Items

For example – If something would take 1 hour to install, a labor unit of 1.54 is required.

Labor Unit – 1.54 x 65% = 1.00 installation time.

1.54 Labor Unit x 65% = 1.00 installation time.



2. Installation Labor Factors

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Definition of an Installation Labor Factor

Are labor unit adjustments based on the DIFFICULTY or EASE of installation.

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Installation conditions that INCREASE the labor unit:

1. Metal stud
2. Masonry
3. Vertical runs
4. Exposed above normal heights

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Installation conditions that DECREASE the labor unit:

1. Slab
2. Trench – Single Runs
3. Trench – Multiple Runs
4. Parallel runs

Metal Stud Wall – Increase of 25% is required to the labor unit

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Masonry Walls Labor Unit – Increase – 100%

Slab Conduits = Reduction in Labor

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Single Trench Runs =
Reduction

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Multiple Trench Runs =
More Reduction

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Lift Work = Increased Labor

2" EMT Conduit Labor Unit		
Exposed Height	% Increase	Labor Unit
10 Feet	0%	8.00
15 Feet	10%	8.80
20 Feet	20%	9.60
25 Feet	30%	10.00
30 Feet	40%	11.20
40 Feet	50%	12.00

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Installation Labor Factors Review

1. Installation Labor Factors are the application of adjustments based on the difficulty or ease of installation.
2. This adjustment may increase or decrease the labor unit.
3. Factoring labor is handled in the takeoff.

3. Project Labor Factors

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Project Labor Factor Definition

Project Labor factors are PROJECT CONDITIONS that affect labor productivity negatively.

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Project Labor Factor Facts

1. Are labor hours added to the direct labor hours total.
2. Percentages vary in various markets and geographic location.
3. Labor factor percentage adjustments are cumulative.
4. Labor factors are addressed in the bid summarization.

10 Critical Project Labor Factors

1. Access to Work Area
2. Building Construction
3. Crew Size
4. Job Location
5. Multistory Impact
6. Occupied Facility
7. Overtime Impact
8. Stacking of Trades
9. Staging Location
10. Weather Conditions

A Five-page Free Download of the 24 most important Project Labor Factors is available on Estimating 101 website under the Tips & Articles Menu.

Use this Link:

https://www.electricalestimating101.com/free-downloads/

The Estimator's Responsibility

The ESTIMATOR must bring to the attention of the Chief Estimator any of these project labor factors that will be applicable to the project that is being bid.

Overtime Loss Productivity

Standard LABOR UNITS are based on normal work week.

Effects of Overtime

- Decreased labor productivity
- Safety awareness lessened
- Decreased energy levels
- Worker's Morale decline
- Increased Absenteeism

SCHEDULE		WEEKS															
Shift	**Hrs**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
5 days x 10 hrs.	**50**	3%	4%	6%	11%	12%	17%	20%	23%	25%	28%	29%	31%	32%	32%	33%	34%
6 days x 9 hrs.	**54**	4%	6%	10%	13%	16%	19%	22%	25%	28%	30%	32%	33%	34%	35%	36%	37%
6 days x 10 hrs.	**60**	5%	8%	13%	17%	21%	25%	29%	32%	34%	36%	38%	39%	40%	41%	42%	42%
7 days x 8 hrs.	**56**	10%	14%	18%	23%	27%	30%	32%	35%	37%	38%	40%	41%	42%	43%	43%	44%
5 days x 12 hrs.	**60**	10%	15%	20%	25%	30%	35%	39%	42%	44%	46%	47%	45%	50%	51%	52%	53%
7 days x 9 hrs.	**63**	13%	18%	23%	28%	33%	38%	42%	45%	47%	48%	50%	51%	52%	53%	54%	55%
7 days x 10 hrs.	**70**	15%	20%	25%	30%	35%	40%	43%	47%	48%	50%	53%	54%	55%	55%	56%	55%
6 days x 12 hrs.	**72**	21%	25%	30%	35%	40%	44%	47%	50%	52%	53%	55%	56%	57%	58%	58%	59%
7 days x 12 hrs.	**84**	25%	30%	35%	40%	45%	50%	53%	56%	58%	60%	61%	62%	63%	63%	64%	65%

SCHEDULE		WEEKS															
Shift	**Hrs.**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
5 days x 10 hrs.	**50**	3%	4%	4%	6%	7%	9%	10%	11%	12%	14%	15%	17%	18%	19%	20%	21%
6 days x 9 hrs.	**54**	4%	5%	7%	8%	10%	11%	13%	14%	16%	17%	19%	20%	21%	22%	23%	24%
6 days x 10 hrs.	**60**	5%	7%	9%	11%	13%	15%	17%	19%	21%	22%	24%	25%	26%	27%	28%	29%
7 days x 8 hrs.	**56**	10%	12%	14%	16%	18%	20%	22%	24%	25%	27%	28%	29%	30%	31%	32%	33%
5 days x 12 hrs.	**60**	10%	13%	15%	18%	20%	23%	25%	27%	29%	30%	32%	33%	34%	36%	37%	38%
7 days x 9 hrs.	**63**	13%	16%	18%	20%	23%	25%	27%	30%	32%	34%	35%	36%	37%	38%	39%	40%
7 days x 10 hrs.	**70**	15%	18%	20%	22%	25%	27%	29%	32%	34%	35%	37%	38%	39%	40%	41%	43%
6 days x 12 hrs.	**72**	21%	23%	25%	27%	30%	32%	34%	36%	38%	40%	41%	42%	43%	44%	45%	46%
7 days x 12 hrs.	**84**	25%	28%	30%	33%	35%	38%	40%	42%	44%	45%	46%	48%	49%	50%	51%	51%

Overtime Financial Impact for 10 Weeks
6 – 10-Hour Days

Work Week Hours	60
Number of Workers	10
Weekly Hours	600
10 Weeks	6000
Lost Productivity 22%	1320
Hourly Blended Labor Rate	$75.00
Financial Impact	**$99,000.00**

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Extreme Cold Temperatures

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Extreme Hot Temperatures

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Stacking of Trades

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Multi-story Buildings

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Shift Work

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Site Access

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Occupied Facility

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Occupied Facility

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Project Labor Factor Definition

Labor factors are PROJECT CONDITIONS that affect labor productivity negatively.

4. Focus On What Matters

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Definition of *FOCUS*

1: a center of activity, attraction, or attention

2: a point of concentration

FOCUS in Estimating requires concentration on the following:

- Types of Projects
- Systems
- Labor Categories
- Material Categories
- Items with Largest Costs

Focus on What Matters

Percentages by Projects Types

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COMMERCIAL WORK

60% - 80%
Branch wiring

RETAIL SPACE

80% - 90%
Branch Wiring

WATER TREATMENT

85%

- Site Power
- Distribution
- Feeders
- Generation

GAS & OIL

50% - 60%

- Tray
- Tray Cable

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Branch Wiring by Project Types

- **Commercial 60% - 80%**
- **Water Treatment 5% - 8%**
- **Industrial Plants 10% - 15%**

Focus on What Matters

Percentages by Labor Categories

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Focus on What Matters

Grouped by Labor

	LABOR SORT	Brkdn Fct %	Material($)	Mat...	Labor Hrs	Lab(%)
1	100 || Conduit - Fittings - Boxes - Coring		20,389.07	33.84	1,678.43	54.21
2	108 || Cutting / Patching / Painting		1.80	0.00	0.36	0.01
3	120 || Cable Tray & Firestopping		100.00	0.17	89.12	2.88
4	125 || Poles - Excavation - Civil Work		1,559.09	2.59	5.00	0.16
5	200 || Wire Pulling		34,284.52	56.90	601.26	19.42
6	300 || Distribution Installation & Termination		131.20	0.22	118.55	3.83
7	320 || Grounding		1,934.08	3.21	50.68	1.64
8	350 || Motors & Equipment Termination		83.25	0.14	29.35	0.95
9	400 || Fixtures				252.85	8.17
10	450 || Branch Terminations		140.50	0.23	23.28	0.75
11	500 || Devices		1,482.73	2.46	227.43	7.35
12	600 || Control Devices		152.86	0.25	19.65	0.63

Note: Screenshot is Trimble ACCUBID Classic Software

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Three Largest Labor Categories

54.21% - Conduit – Fittings – Boxes
19.42% - Wire Pulling
8.17% - Fixtures

Total combined labor percentage - 81.80%.

Consider Conduit-Fittings-Boxes Category

	LABOR SORT	Brkdn Fct %	Material($)	Mat(%)	Labor Hrs	Lab(%)
1	100 || Conduit - Fittings - Boxes - Coring		20,389.07	33.84	1,678.43	54.21
2	108 || Cutting / Patching / Painting		1.80	0.00	0.36	0.01
3	120 || Cable Tray & Firestopping		100.00	0.17	89.12	2.88
4	125 || Poles - Excavation - Civil Work		1,559.09	2.59	5.00	0.16
5	200 || Wire Pulling		34,284.52	56.90	601.26	19.42
6	300 || Distribution Installation & Termination		131.20	0.22	118.55	3.83
7	320 || Grounding		1,934.08	3.21	50.68	1.64
8	350 || Motors & Equipment Termination		83.25	0.14	29.35	0.95
9	400 || Fixtures				252.85	8.17
10	450 || Branch Terminations		140.50	0.23	23.28	0.75
11	500 || Devices		1,482.73	2.46	227.43	7.35
12	600 || Control Devices		152.86	0.25	19.65	0.63

Conduit work is 54% of the total Direct Labor Hours

Note: Screenshot is Trimble ACCUBID Classic Software

Consider Conduit-Fittings-Boxes Category

	Description	Quantity	DB Labor	Labor	Unit	Lab Adj %	Total Hours
1	3/4" CONDUIT - EMT	5,075	3.52	4.84	C		245.70
2	1" CONDUIT - EMT	590	4.48	8.28	C		48.83
3	3" CONDUIT - EMT	4	10.40	10.40	C		0.42
4	4" CONDUIT - EMT	8	14.80	29.60	C		2.37
5	3/4" CONDUIT - EMT - RED FIRE ALARM	301	3.52	3.52	C		10.60
6	3/4" CONN SS DC - EMT	504	10.00	14.13	C		71.20
7	1" CONN SS DC - EMT	47	12.00	21.70	C		10.20
8	2" CONN SS DC - EMT	5	18.00	18.00	C		0.90
9	3" CONN SS DC - EMT	4	28.00	28.00	C		1.12
10	3/4" COUPLING SS DC - EMT	714			C		
11	1" COUPLING SS DC - EMT	122			C		
12	3" COUPLING SS DC - EMT	1			C		
13	ARL EMT100 1" NM BUSHING	43		2.60	C		1.12
14	ARL EMT400 4" NM BUSHING	8	10.80	10.80	C		0.86
15	3/4" CONDUIT - RMC - GALV	376	4.95	3.47	C		13.03
16	1" CONDUIT - RMC - GALV	216	5.70	3.58	C		7.73
17	1 1/4" CONDUIT - RMC - GALV	10	6.60	6.60	C		0.66
18	1 1/2" CONDUIT - RMC - GALV	8	8.80	6.16	C		0.49
19	2" CONDUIT - RMC - GALV	338	10.80	17.56	C		59.36

Labor Adjustment % Column available with the Consolidated View

Note: Screenshot is Trimble ACCUBID Classic Software

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Consider Conduit-Fittings-Boxes Category

	Description	Quantity	DB Labor	Labor	Uni	Lab Adj %	Total Hours
1	3/4" CONDUIT - EMT	5,075	3.52	4.84	C	25.000	307.12
2	1" CONDUIT - EMT	590	4.48	8.28	C	25.000	61.94
3	3" CONDUIT - EMT	4	10.40	10.40	C	25.000	0.52
4	4" CONDUIT - EMT	8	14.80	29.60	C	25.000	2.96
5	3/4" CONDUIT - EMT - RED FIRE ALARM	301	3.52	3.52	C	25.000	13.24
6	3/4" CONN SS DC - EMT	504	10.00	14.13	C	25.000	89.00
7	1" CONN SS DC - EMT	47	12.00	21.70	C	25.000	12.75
8	2" CONN SS DC - EMT	5	18.00	18.00	C	25.000	1.13
9	3" CONN SS DC - EMT	4	28.00	28.00	C	25.000	1.40
10	3/4" COUPLING SS DC - EMT	714			C	25.000	
11	1" COUPLING SS DC - EMT	122			C	25.000	
12	3" COUPLING SS DC - EMT	1			C	25.000	
13	ARL EMT100 1" NM BUSHING	43		2.60	C	25.000	1.40
14	ARL EMT400 4" NM BUSHING	8	10.80	10.80	C	25.000	1.08
15	3/4" CONDUIT - RMC - GALV	376	4.95	3.47	C	25.000	16.29
16	1" CONDUIT - RMC - GALV	216	5.70	3.58	C	25.000	9.66
17	1 1/4" CONDUIT - RMC - GALV	10	6.60	6.60	C	25.000	0.83
18	1 1/2" CONDUIT - RMC - GALV	8	8.80	6.16	C	25.000	0.62
19	2" CONDUIT - RMC - GALV	338	10.80	17.56	C	25.000	74.20

Add desired % adjustment for any Labor Category

Note: Screenshot is Trimble ACCUBID Classic Software

Focus on What Matters

Percentages by Systems

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Grouped by Systems

	System	Brkdn Fct %	Material($)	Mat(%)	Labor Hrs	Lab(%)
1	|| SITE POWER		9,756.32	16.19	88.02	2.84
2	|| SITE LIGHTING		15,532.58	25.78	495.19	15.99
3	|| LIGHTING		5,844.16	9.70	806.89	26.06
4	|| DISTRIBUTION		629.27	1.04	145.66	4.70
5	|| FEEDERS		8,955.07	14.86	102.41	3.31
6	|| BRANCH WIRING		6,569.07	10.90	417.23	13.48
7	|| EQUIPMENT CONNECTIONS		2,632.26	4.37	136.94	4.42
8	|| FIRE ALARM		1,646.69	2.73	164.22	5.30
9	|| RADIO CONDUITS		1,193.35	1.98	111.53	3.60
10	|| CABLE TRAY		476.51	0.79	122.21	3.95
11	|| DATA		1,447.69	2.40	290.53	9.38
12	|| SECURITY		2,248.32	3.73	152.33	4.92
13	|| SOUND		187.50	0.31	7.40	0.24
14	|| GROUNDING		2,788.35	4.63	36.64	1.18
15	|| ENTRY GATE ISLAND		351.96	0.58	18.75	0.61

Note: Screenshot is Trimble ACCUBID Classic Software

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Four Largest Systems Percentages by Labor

15.99% - Site Lighting
26.06% - Lighting
13.48% - Branch Wiring
9.38% - Data

Total combined labor percentage – 64.91%.

Focus on What Matters

Percentages by Material Categories

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Focus on What Matters

Grouped by Material Totals

	MATERIAL SORT	Brkdn Fct %	Material($)	Mat(%)	Labor Hrs	Lab(%)
1	1000 || Conduit & Fittings		14,039.84	23.30	1,007.21	32.53
2	2000 || Wire & Cable		36,688.78	60.89	754.87	24.38
3	4000 || Wire & Cable Accessories		1,537.26	2.55	146.37	4.73
4	5000 || Boxes & Cabinets		1,912.75	3.17	200.31	6.47
5	6000 || Ducts & Trays				81.12	2.62
6	7000 || Wiring & System Devices		1,482.73	2.46	231.63	7.48
7	8000 || Fasteners & Hangers		2,250.09	3.73	267.26	8.63
8	9000 || Controls		152.86	0.25	3.45	0.11
9	10000 || Distribution		131.20	0.22	118.55	3.83
10	11000 || Motor & Equipment Terminations				13.63	0.44
11	12000 || Grounding		387.20	0.64	4.00	0.13
12	13000 || Fixtures				252.85	8.17
13	15000 || Poles & Trenching		1,559.09	2.59	5.00	0.16
14	15500 || Concrete Coring		15.00	0.02	1.00	0.03
15	15600 || Interior Wall Pentrations		0.50	0.00	0.35	0.01
16	15700 || Cutting / Patching / Painting		101.80	0.17	8.36	0.27

Note: Screenshot is Trimble ACCUBID Classic Software

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Two Largest Material Categories

23.30% - Conduit – Fittings
60.89% - Wire & Cable

Total Material - 84.19%

Focus on What Matters

Items With The Largest Totals

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Focus on What Matters

Top 23 Items in Total Costs

Consolidated View sorted using the SORT DESCENDING option.

	Description	Quantity	Total Material
171	#350 XHHW BLACK	1,576	12,291.19
166	# 4 XHHW BLACK	5,860	6,118.25
162	#12 XHHW BLACK	25,131	4,704.02
137	1" CONDUIT - PVC80	6,240	2,630.16
169	#1/0 XHHW BLACK	885	2,461.94
41	3/4" CONDUIT - EMT	5,075	1,822.94
180	#12/2C CABLE MC - STL ARMOR	5,003	1,744.70
163	#10 XHHW BLACK	6,077	1,704.90
138	2" CONDUIT - PVC80	1,800	1,547.28
167	# 2 XHHW BLACK	920	1,481.97
311	QZT PG2436DA24 BOX W/BASE 24IN	1	1,266.47
179	22/4 CABLE SHLD - PLENUM	5,000	1,250.00
59	2" CONDUIT - RMC - GALV	338	1,032.56
292	DATA J-HOOK	375	937.50
165	# 6 XHHW BLACK	1,095	818.71
170	#2/0 XHHW BLACK	220	764.84
314	FLOOR BOX	3	750.00
110	1" CONDUIT - RMC - GALV PVC CTD	112	648.39
177	16/2 FA SHIELDED CABLE - FPLP	2,500	625.00
61	4" CONDUIT - RMC - GALV	64	579.05
112	1" ELBOW 90 DEG - RMC - GALV PVC CTD	28	553.56
288	CAT 5E JACK	156	546.00
178	18/4 CABLE - PLENUM	2,000	500.00

Note: Screenshot is Trimble ACCUBID Classic Software

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Results of Material Total SORT DESCENDING option

- **317 items total material cost of $60,259.00.**
- **Top 23 items total $46,780 - 78% total material costs.**
- **Top 23 items = 7% of the total items.**
- **93% of the items = 22% of the total material costs.**

Wrapping It Up

1. Select the appropriate labor column/units
2. Apply installation labor factors
3. Calculate project labor factors – percentages & duration
4. Focus on what matters
   - Project Type
   - Labor Cost Code Percentages
   - Material Categories
   - Systems with Largest Labor Percentages
   - Materials with the Largest Totals

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Estimating Webinar Summary

You Now Have the KEY to Preventing Labor Overruns

UNDERSTANDING LABOR!

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Thank You!

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PanelScan – Digitizing the panel takeoff process via ABB empower

Process Automation

Machine Accuracy

- Upload panel schedule document for scan (no need to edit or pre-process)
- Algorithm will learn based on user validations

Human Validation

- Review identified panels
- Validate and accept panels into quote
- Use global modifications to bulk update

Bulk Processing

- Create as many quotes or lines as needed
- PanelScan works in the background
- Finalize full quote when needed

General Availability [GA] Launch

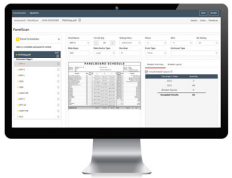
7.2019
GA in empower

- PanelScan activated for all distributors using empower-Quote
- Continuous improvement via machine learning and feedback loops
- 90%+ accuracy per document

1Q 2020
Continuous improvement and feature rollout

- Processed so far:
  - 6,000+ documents
  - 71,000+ pages
  - 85,000+ panelboards
- Ongoing investment and development; feedback is key!
- **PanelScan launch video**

Committed to Success



PanelScan Enhancements

- ✓ Continuous work to increase the supported panel schedule formats
- ✓ Panel directory card output
- Interactive PDF … allow user to train system for data extraction
- Comparison/revision tool
- Identifying additional information such as breaker accessories, etc
- Global modifications / panel defaults as part of PanelScan