

# EC&M<sup>®</sup>



## 2023 Electrical Salary Survey & Career Report

*EC&M's second career survey evaluates compensation trends and job satisfaction in the electrical profession. Read more on [pg. 18](#)*

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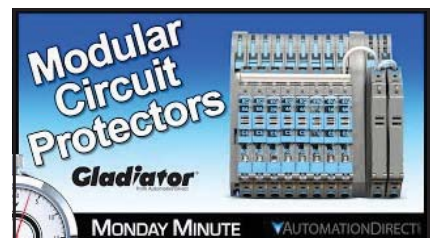
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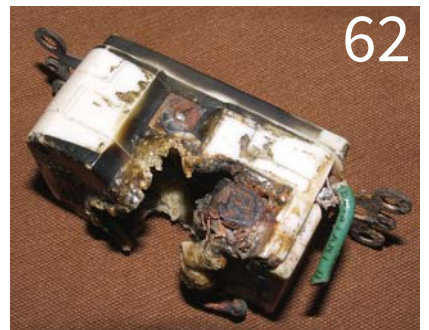
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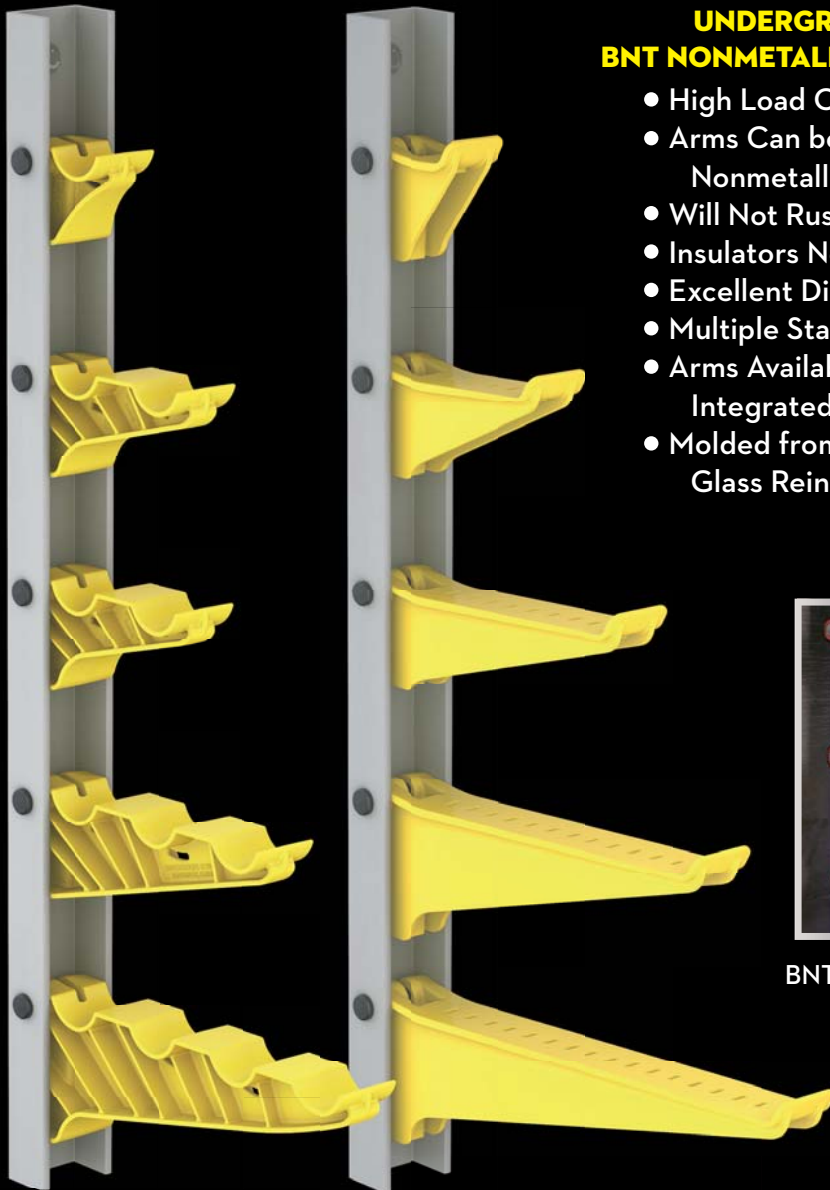
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**Video** ▶ In this episode, Electrical Safety Expert Randy Barnett covers OSHA requirements found in Part 1926, Subpart K. [ecmweb.com/21276570](http://ecmweb.com/21276570)



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### HOW EFFECTIVE ARE AFCIS AND GFCIS?

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**Safety** ▶ Electrical Consultant Mark Lamendola discusses how a combination of good safety practices and good luck may lead to reliance on the luck part. [ecmweb.com/21275097](http://ecmweb.com/21275097)

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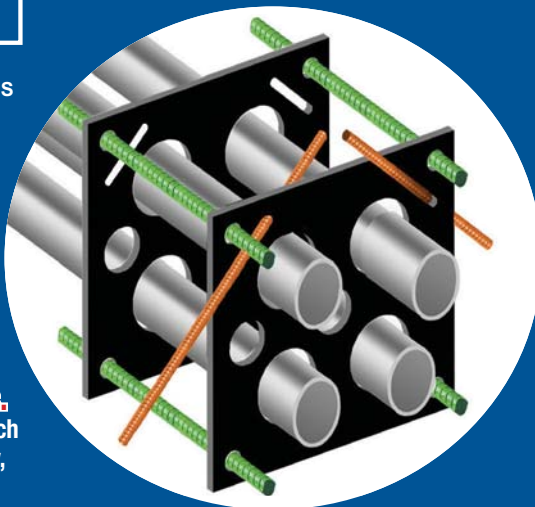
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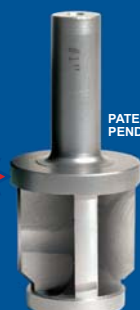
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# Evaluating Job Satisfaction in the Electrical Industry

By Ellen Parson, Editor-in-Chief



Four years ago, *EC&M* launched its inaugural “2019 Electrical Salary & Career Report.” To track job satisfaction and career development in the electrical industry, we embarked on a second survey this year to not only establish benchmarks for historical compensation data in the electrical industry but also to take the pulse of electrical professionals on many related factors that play into career contentment. Again for the 2023 survey, we split up the sample audience into the same four demographic groups, which garnered more than 1,300 responses: electrical contractors (600); industrial facility (269), commercial/institutional/educational or CIE (221), and engineering (243).

Before we dive into how electrical professionals rate their salary, fringe benefits, and employment packages, let’s take a look at how content the typical American worker is with their career. According to “Job Satisfaction 2023” (<https://rb.gy/3zxyv7>) from The Conference Board, U.S. job satisfaction reached an all-time high in 2022. The study, which found improved satisfaction across nearly all 26 components measured, revealed that non-compensation factors, such as work-life balance, outpaced improved pay and benefits every time. Overall, 62.3% of American workers were satisfied in 2022. Up from 60.2% from 2021, this marks the highest level recorded by this think tank since it started the survey in 1987. Based on average salary data from Forbes, using the latest numbers from the Bureau of Labor Statistics, the average salary nationwide for the general population this year is \$59,428. In September 2023, about 134.17 million Americans were employed on a full-time basis (those who work 35 hours per week or more), according to Statista.

Based on this year’s *EC&M* survey findings, a few trends quickly jumped out, including: pay increases were commonplace across the board with all four demographic segments; the majority of survey respondents got a bonus in 2022 and expect to receive one in 2023; most characterized their work as satisfying; and employer support was typically deemed strong. However, when compared to 2019 survey results, work/life balance definitely emerged as a top concern for electrical professionals, exposing a potential juxtaposition that pay increases and satisfying work don’t necessarily trump job-related stressors. Another related highlight was the number of respondents who indicated they would recommend the electrical industry to a young close relative or family friend. In 2019, only 7% said they would not recommend the electrical field as a career; this year, that number jumped to 33%. What’s behind this change in perspective, especially when you consider the overwhelming majority was somewhat or extremely satisfied with their jobs, and more than 75% strongly or somewhat agreed they “love their current job”?

According to Veteran Freelance Writer Tom Zind, who also analyzed and wrote the 2019 career piece for us, maybe times have changed. “A life-altering pandemic, the Great Resignation phenomenon, higher inflation, back-breaking educational costs, and a reassessment of what’s important in life may have also intervened,” he writes in the special report. “Many workers have taken a step back, looked at their lives, and lamented paths not taken or reimagined their futures — and maybe glimpsed those of their loved ones as well — with a calculating eye.”

Turn to this month’s cover story on page 18 for more in-depth coverage and analysis on employment trends in the electrical industry.

*Ellen Parson*



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# Measuring the Cost Benefits of Prefabrication

An inside look at which prefab factors impact job-site productivity the most

By Phil Nimmo and Jim Ford, MCA, Inc.

**P**refabrication in construction is a very broad topic. As such, it covers many different areas. Regardless of how much prefab work you are doing, where you are doing it, or who is doing it, the one common fact is that everyone struggles to see how prefab saves them money — and how much money it saves them. So, here's a simple way to quickly recognize and measure the benefit of prefabrication on your projects. This is by no means a comprehensive measure of the benefits and cost savings; it is a simple look at two easily measured contributions to cost reduction from prefabrication.

A prefabrication environment can offer the benefits of climate control and greater production efficiencies combined with a cheaper labor rate for the lesser-skilled employees needed for more standardized work. With that in mind, having a few journeymen on site working on assemblies or painting boxes/face plates is not an ideal use of their skill and is not helping you benefit from prefabrication. Most of the benefits available from utilizing prefabrication on the project are first recognized during the planning phase of the job. Only if your planning processes account for where the work should be performed, when the work should be performed, and what skills are needed to perform the work can you benefit from increased installation productivity as well as a reduced composite rate.

## HOW TO PLAN FOR PREFAB

Let's begin by comparing the productivity or effective labor spent working on assemblies in a manufacturing-based

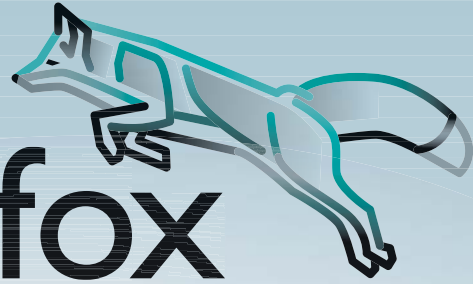


environment versus on a job site. Some of the biggest differences between the two environments are the normal job-site distractions from work going on by other trades, having to mobilize and demobilize according to the general contractor's (GC's) schedule, and locating/handling tools and materials. Studies have shown that field personnel typically have 63% (or five out of eight hours) of their time available for the final installation of material. The remaining time and effort is lost to handle, manipulate, and assemble components before installation. Meanwhile, similar studies have shown that work being performed by prefab in a manufacturing-based environment is far more effective, using as much as 75% of their time for the assigned production tasks. The reason

behind this 20% or more gain in productivity is due to the reduction of material handling and variation of site conditions on the project, essentially the ability for managers and supervisors to manage and control the work environment.

For example, project "Mission Critical" has a labor budget of 2,000 hours. Based on the field personnel with productive installation accounting for only five of the eight available hours each day, the project will have 1,250 hours of effective labor spent on the final assembly and installation of the material. The project manager set a goal to have 5% of the work go through the company's prefabrication department. Using the 5% prefabrication goal from the labor budget of 2,000 hours, the project manager is now designating 100 hours from the labor budget

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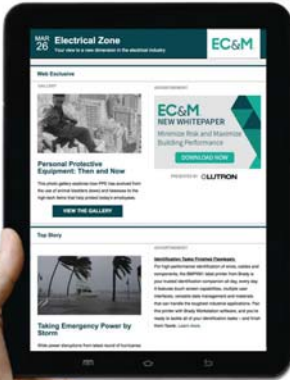


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to go to the prefabrication department. The project now has 1,900 hours left in the budget, which translates to 1,188 hours of effective installation effort. The prefabrication department has an effective labor productivity of 75%. Using the 100 hours of the labor budget, the prefabrication department has 75 hours of effective labor giving the project 1,263 hours of effective labor for assembly and installation of material. The project manager, by budgeting 5% of the labor budget on the project to the prefabrication department, increased the project's effective labor productivity by 1%. Not only did the project manager increase hours of effective labor, but this increase also came with cost savings as well. Originally, the project manager started with 1,250 hours of effective labor productivity at \$75 an hour, which carried a cost of \$93,750. Now the project has 1,263 hours of effective labor productivity. To have the same 1,263 hours of effective labor productivity, the project manager would have to carry an additional 2.4%

in labor cost, bringing the effective labor cost to \$94,688 or 1,263 hours at \$75 an hour (Table 1).

## UNDERSTANDING A PROJECT'S COMPOSITE LABOR RATE

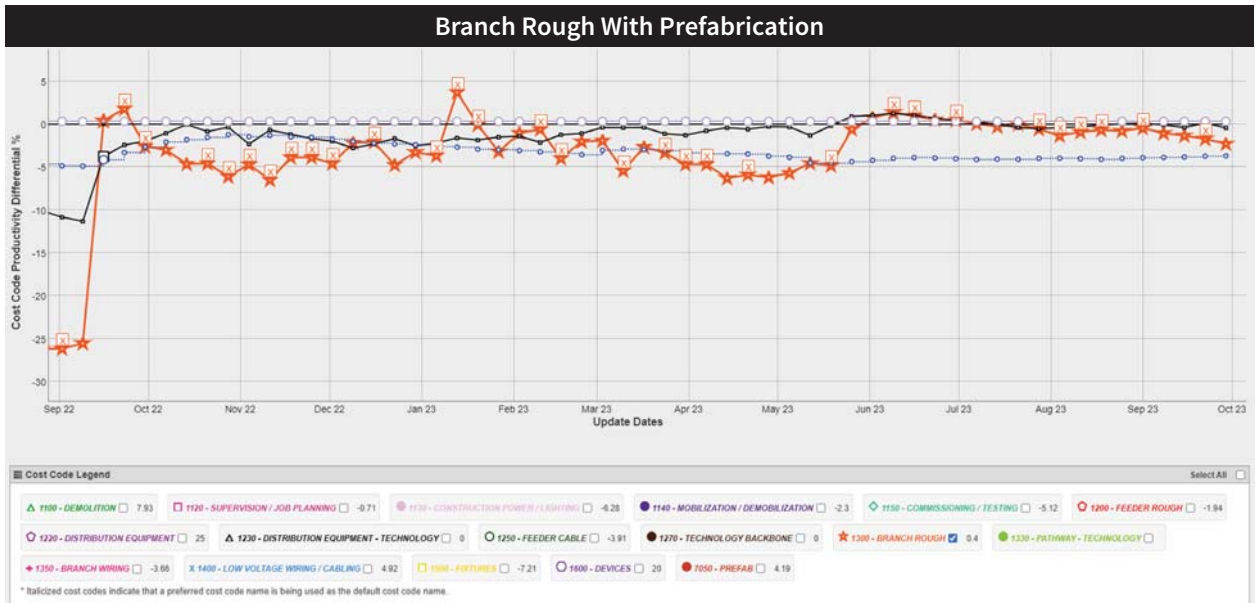
The second aspect of the cost savings metric of prefabrication to examine is its impact on the project's composite labor rate. Assume that field labor for the company carries a fully loaded rate of \$75 an hour, while the prefabrication department maintains a labor rate of \$46 an hour. From the labor budget of 2,000 hours, the Mission Critical project has an estimated labor cost of \$150,000. Using the project manager's prefabrication goal of 5% or 100 hours from the labor budget, the project now has 1,900 field hours at \$75 an hour or \$142,500 in field labor. The prefabrication department's labor budget of 100 hours at \$46 an hour costs \$4,600. The total labor budget on the project is now \$147,100 or a savings of \$2,900 from the

Labor Productivity Savings	Field	Prefab	Total
Estimated labor hours	2,000		
Labor effectiveness	63%	75%	
Effective field hours @ 2,000 hours	1,250		1,250
Estimated labor hours w/ 5% prefab	1,900	100	2,000
Effective labor hours w/ 5% prefab	1,188	75	1,263
Composite rate	\$75.00	\$46.00	\$73.55
Effective labor cost w/ 5% prefab	\$89,063	\$3,450	\$92,513
Field labor cost for 1,263 hours	\$94,688		\$94,688
<b>Total Effective Labor Cost Savings</b>			<b>\$2,175</b>

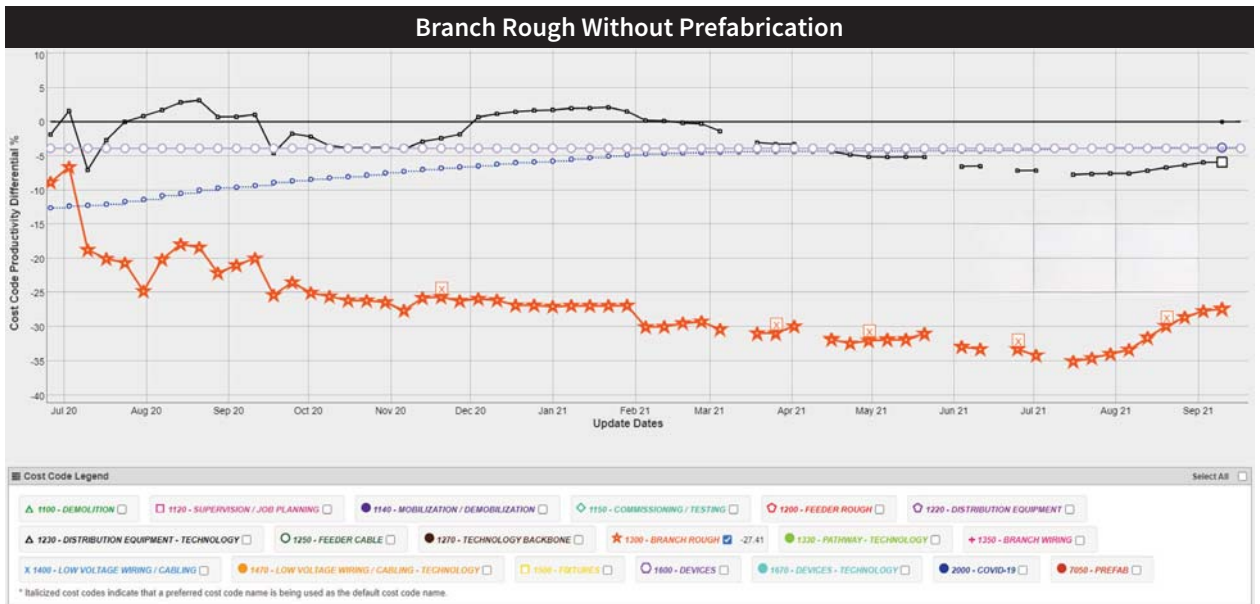
**Table 1.** Budgeting 5% of the labor budget to the prefabrication department resulted in an increased labor productivity of 1%.

Composite Rate Savings	Labor Dollars	Labor Hours
Estimated labor	\$150,000	2,000
Field composite rate	\$75.00	
Prefab composite rate	\$46.00	
Prefabrication goal of 5%		100
Remaining field hours		1,900
Field labor cost	\$142,500	
Prefab labor cost	\$4,600	
Total labor cost	\$147,100	
<b>Composite Rate Savings</b>	<b>\$2,900</b>	

**Table 2.** Reducing this project's composite labor rate helped the project manager maintain the original labor budget of 2,000 hours.



**Fig. 1.** This project identified the work that could be done off site by the prefabrication department.



**Fig. 2.** Not utilizing prefab on the branch rough work for this project resulted in lost job-site productivity.

original estimate of \$150,000. In doing so, the project manager is able to spend \$147,100 on labor and still maintain the original labor budget of 2,000 hours. This is because the composite labor rate on the project has been reduced by \$1.45 or 1.9% to \$73.55 (Table 2 on page 10).

At the end of the day, because the project manager set a goal of 5% prefabrication on project Mission Critical, he was able to achieve a total cost savings of

\$5,075 by saving \$2,175 based on the 1% increase in the effective labor productivity, and a savings of \$2,900 on the 1.9% reduction of the composite rate.

The graphics highlight the productivity gains realized by prefabrication on the same labor code – branch rough. Figure 1 is from a project that had planned ahead of time and identified the work that could be done off-site by the prefabrication department. The

second project did not utilize prefab on the branch rough work of the project; as a result, the productivity of the branch rough work negatively impacted the project (Fig. 2).

**EC&M**

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# The Three Arc Flash Mitigation Levers

Understanding how energy, time, and distance impact an arc flash event's potential risk to electrical workers

By Mose Ramieh III, CBS Field Services



These are the only levers available to reduce an arc flash event's potential injury to electrical workers.

## ENERGY

The first lever of reducing available fault current — energy — is the least useful. Facilities are commonly increasing the sizing (ampacity) of their power system equipment. Low-voltage switchboards of 4,000A to 5,000A are becoming increasingly more commonplace. This level of power is necessary for processes/manufacturing and to save cost over installing multiple smaller systems.

Outside the facility, the utility power system is designed to feed numerous systems (i.e., facilities). This translates simply into the idea that there's plenty of fault current available, and there's just not much that can be done about that (particularly at the service entrance). Arc-resistant switchgear is an attempt to mitigate these high-energy hazards. If you aren't familiar with arc-resistant switchgear, picture military-tank-like switchgear with plenums (ducts) to route the force of a blast out of the room, thereby mitigating the likelihood of a switchgear explosion injuring a qualified worker.

## TIME

The second lever is the time or duration that an overcurrent fault can persist before system protection isolates the overcurrent fault. Traditional power system protective devices are coordinated to obtain a balance between power system reliability and equipment safety (not qualified worker safety). This reliability factor allows overcurrent faults to occur and persist for a second(s) while

In the not-so-distant past, electrical workers routinely racked out breakers in the normal course of their jobs. They did this with little concern or knowledge of the hazards to which they were exposed. While all of us are more educated and knowledgeable today, many electrical workers still prefer the expediency of putting on a 40-cal suit over taking advantage of other available solutions.

Today, there are state-of-the-art remote racking and switching systems that allow a qualified electrical worker to interact with circuit breakers from a distance outside of the arc flash boundary. This is a big step in reducing

safety risks related to arc flash. Remote racking systems require a significant investment and take time to learn. This can lead to them being under-utilized in cultures that fail to understand the consequences of an arc flash and the available strategies to mitigate arc flash severity and exposure.

Three factors affect arc flash incident energy level:

- **Energy.** The available fault current at a particular system location.
- **Time.** How long it takes to clear a fault.
- **Distance.** Proximity to the fault is exponentially proportional to its intensity.



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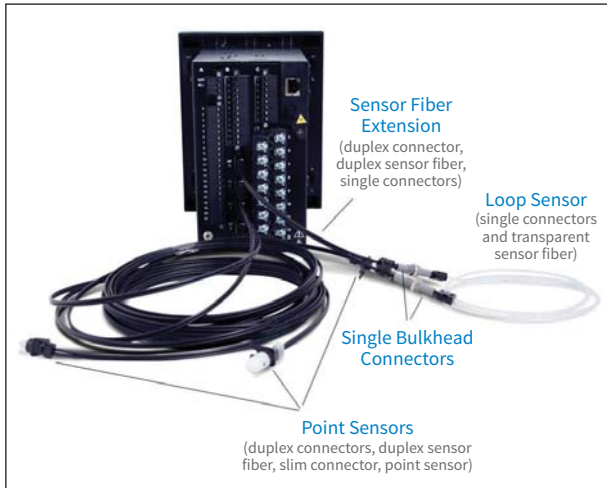
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**Fig. 1.** Typical inputs include fault current, light sensors, and/or pressure sensors.

the downstream breakers closest to the fault time out and trip. Please note that each system has its unique coordination settings that determine the time delay during a fault.

Fortunately, technology is evolving to provide improved safety for qualified electrical workers and system reliability, creating a win-win for the facility and the qualified worker.

Systems and technology categories to mitigate arc flash include:

1. Arc flash relaying
2. High-speed bus differential relaying
3. Maintenance bypass switching
4. Arc-quenching switchgear designs (not addressed in this article)

Systems that (dare I say) can largely eliminate arc flash:

1. Gas-insulated switchgear (GIS)
2. High-resistance grounding (HRG)

## ARC FLASH RELAYING

Arc flash relay technologies work to trip faster than traditional overcurrent protection by using a combination of inputs. The typical inputs are fault current and light sensors and/or pressure sensors (Fig. 1). The sensors consist of fiberoptic point sensors or clear-jacketed fiber loops. Point sensors are typically installed in switchgear compartments (breaker enclosures). Fiber loops can be routed through several sections, such as bus compartments.

## TRIP AND TRIP FASTER TESTING

These devices add a level of complexity to standard testing. Two tests are required to verify proper operation:

1. A traditional overcurrent test to prove that the relay operates per its coordinated settings (time delay).
2. The second test would be a combination of both the overcurrent and a light input.

## AN ON-THE-JOB LEARNING MOMENT

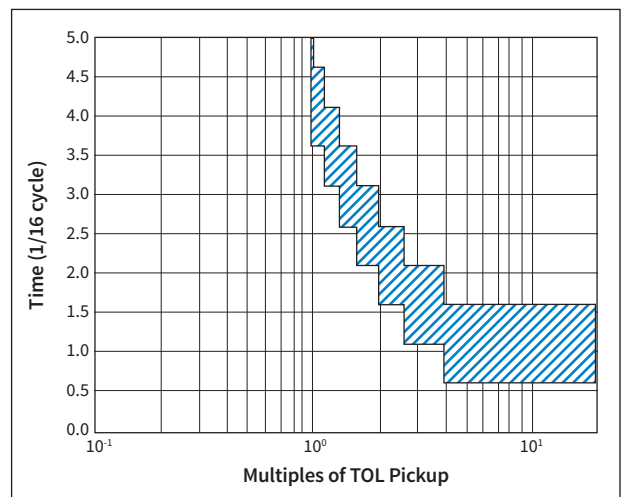
Attempting to simulate real-world fault scenarios is the best method to ensure that protective devices are operating

as designed. For an arc flash protective feature test, a relay manufacturer recommended a particular camera flash model be used. We bought the flash model and wrote “the perfect” relay test plan. This plan would initiate an overcurrent fault and initiate the camera flash at the same instant in time — just like a real arc flash event. To our disappointment (and my frustration), the system failed to pass the test. Repeated attempts and double-checks of the camera model didn’t solve our problem. Why didn’t the camera flash work? The time-over-light (TOL) setting was new to me at that time. Like time overcurrent (TOC), the greater the fault current, the faster the relay operates. In the case of light, the more intense the light, the faster the relay operates (Fig. 2). The camera flash (even though it had been recommended) was insufficiently bright enough for long enough to meet the requirements.

The solution, while not ideal, was to use a flashlight to verify this TOL operation by introducing enough light over enough time (a few seconds) to activate the light sensor TOL pick-up element. Once the light sensor element was verified picked up, the fault current was initiated to verify that the relay tripped instantaneously (no intentional delay). Once the trip operation was proven, each loop or point had to be verified for the TOL pick up. Relays monitor each sensor to ensure that the fiber is intact. A final verification of the relay is to disconnect each sensor individually to ensure that the relay detects this loss and provides a notification.

## HIGH-SPEED BUS DIFFERENTIALS

The waveform in Fig. 3 on page 15 is a fault that was captured by a power system relay. Refer to A phase in the Figure. A worker who was in the wrong cubicle (and failed to verify the absence of voltage before applying grounds) unintentionally grounded an energized 13.8kV system conductor. Technician note: ALWAYS perform a live-dead-live check of your voltage detection meter. To everyone’s amazement (and good fortune), the only thing that happened was that the facility was plunged into darkness — no explosion, no arc flash, not even



**Fig. 2.** In the case of light, the more intense the light, the faster the relay operates.



a scratch on the grounds. This fault, which was cleared by a high-speed bus differential relay, demonstrates the value of clearing faults quickly (three cycles in this case).

## MAINTENANCE BYPASS SWITCHES

Clearing faults quickly and at lower current values is the theory of operation behind maintenance bypass switches. As an example, to maintain system reliability, an instantaneous trip on a low-voltage main circuit breaker may be set to 32,000A (eight times the rating of a 4,000A breaker). This setting is great for reliability, but not for safety.

While racking a breaker in or out in a maintenance situation, the switch is used to turn on an alternate group of settings. In this alternate group of settings, the instantaneous value is changed to a lower setting. This means that instead of 32,000A, the

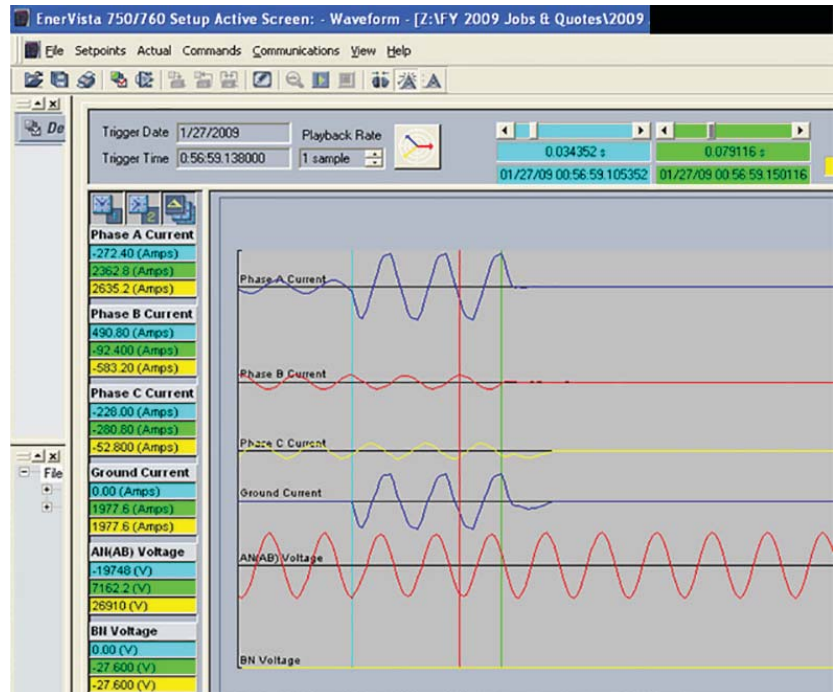


Fig. 3. A phase-to-ground fault waveform that was captured by a power system relay.

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breaker could trip instantaneously as low as 6,000A (depending on trip unit type). This reduces the amount of fault current necessary to activate the instantaneous element as well as eliminates the time delay to clear a fault, should one occur.

Testing these systems is straightforward. Test the breaker at its normal settings. Place the switch in maintenance mode. Verify the settings group changes. Verify that the breaker operates at the lower current setting. An important final note for power system reliability: Always remember to return the maintenance bypass switch to its normal position (**Photo**).

Two brief thoughts on GIS and HRG to eliminate arc-flash hazards:

1. **GIS gear in a nutshell.** No exposed energized parts; no arc flash hazards.

2. **HRG.** Most (but by no means all) arc flash events begin as a phase to ground fault. By installing a resistor in the ground circuit, HRG systems eliminate arc flash in these situations by limiting the fault current to as little as 5A. Systems provide alarming of a ground fault and many methods and



Leaving the maintenance bypass switch enabled reduces power system reliability.

components that allow for the identification of the faulted circuit.

## DISTANCE

Reference Annex F of the NFPA 70E.

1. **Eliminate the hazard.** For example, use GIS.

2. **Reduce risk by design.** Use HRG systems, arc flash relaying, and maintenance bypass switches.

3. **Apply safeguards.** Use remote racking and switching to put distance between people and hazards.

4. **Implement administrative controls.** For example, the use of a maintenance bypass switch is most reliably used when added as a specific step in a maintenance procedure to enable the maintenance bypass switch and place in normal when maintenance is complete.

5. **Use PPE.** The last line of defense, not the first line.

It may be difficult to alter your system by installing arc flash relaying or HRG systems. These take money and outage time to reduce the hazards of arc flash and still may not reduce the hazard to an acceptable level.

In contrast to other systems, the use of remote racking and switching is easier to implement. Depending on the manufacturer, no outages or gear modifications are required, and the training can be done on the job. By

modifying how these common system tasks are accomplished, qualified workers can now remove themselves from the arc-flash boundary and still perform their jobs. For example, opening or closing or racking breakers in or out can be performed outside of the arc flash boundary or even from another room.

## CONCLUSION

While modern technology and protective gear play crucial roles in mitigating arc flash incidents, it is equally important for individuals in an organization to be committed to their implementation. In most facilities utilizing multiple strategies will provide layers of protection as described in Annex F of NFPA 70E for their legacy power systems. As the opportunity presents itself, new power system installations and equipment upgrades can incorporate several of the strategies in the equipment design. By understanding and embracing these three key levers for arc flash mitigation, you will enhance workplace safety and can build a culture that prioritizes employee well-being and operational excellence. **EC&M**

*Mose Ramieh III is vice president, business development at CBS Field Services and has been in the electrical testing industry for 26 years.*



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# 2023 Electrical Salary Survey and Career Report

*EC&M's* second industry compensation survey reveals pay increases and satisfying work don't necessarily alleviate job-related stress for electrical professionals.

By Tom Zind, Freelance Writer

Pay hikes are solid, bonuses are commonplace, the work is satisfying, and employer support is strong. Yet work/life balance seems out of kilter, it's harder to keep up with the cost of living these days, the economy is a nagging concern, and staffing issues are worrisome.

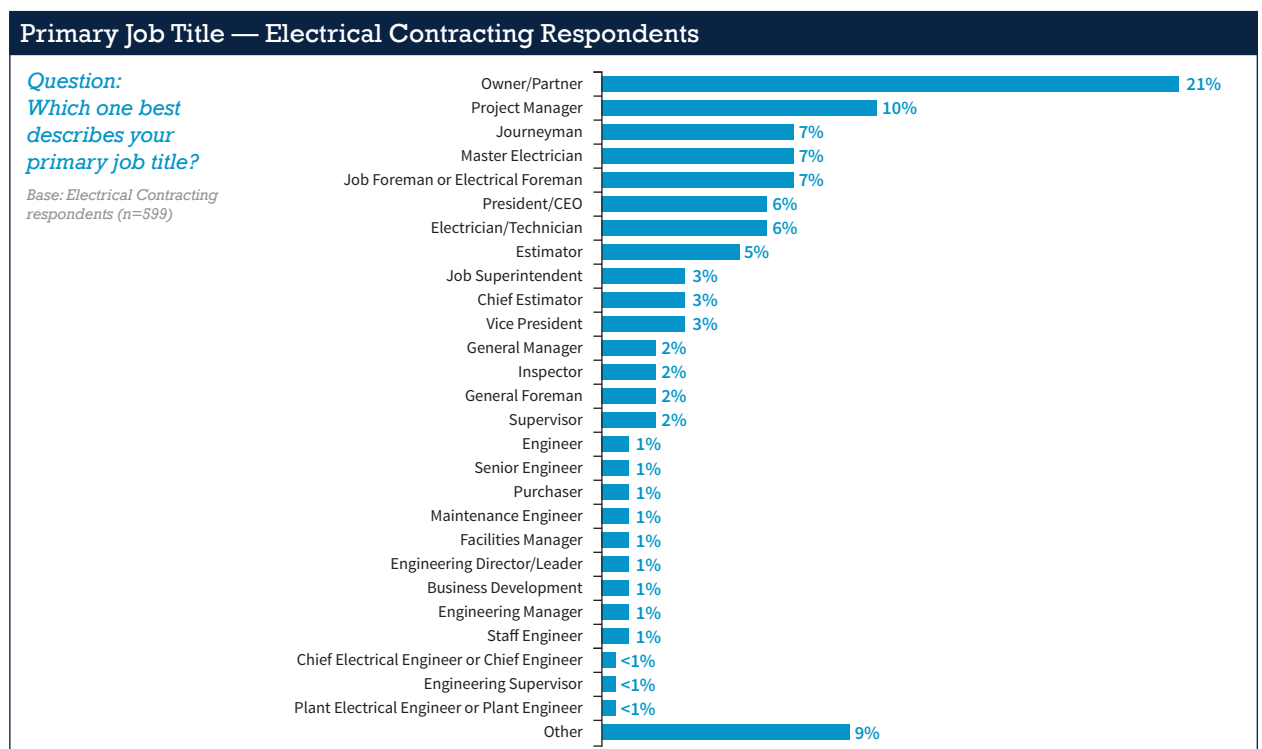
That's a quick summation of the findings of *EC&M's* 2023 Electrical Salary Survey and Career Report. But then there's this nugget: One-third of

electrical professionals who work in roles like electrician, engineer, company owner, C-suite executive, and manager (Fig. 1 through Fig. 4 on page 20) indicated they would not be inclined (many without reservation) to recommend that a child or young close relative pursue a career in the electrical field (Fig. 5 on page 20).

Shocking? Perhaps, given the pay, status, and relative security that comes with many job roles in this sector — and more so since *EC&M's* inaugural survey

on compensation and career satisfaction in 2019 found only about 7% indicating they wouldn't recommend the electrical field. So what happened?

Maybe times have changed. A life-altering pandemic, the Great Resignation phenomenon, higher inflation, back-breaking educational costs, and a reassessment of what's important in life may have also intervened. Many workers have taken a step back, looked at their lives, and lamented paths not taken or reimaged their futures — and maybe



**Fig. 1.** Electrical contractors returned the greatest number of surveys (almost 600), with owners/partners leading this group.

## Primary Job Title — Industrial Facility Respondents

### Question:

Which one best describes your primary job title?

Base: Industrial Facility respondents (n=270)

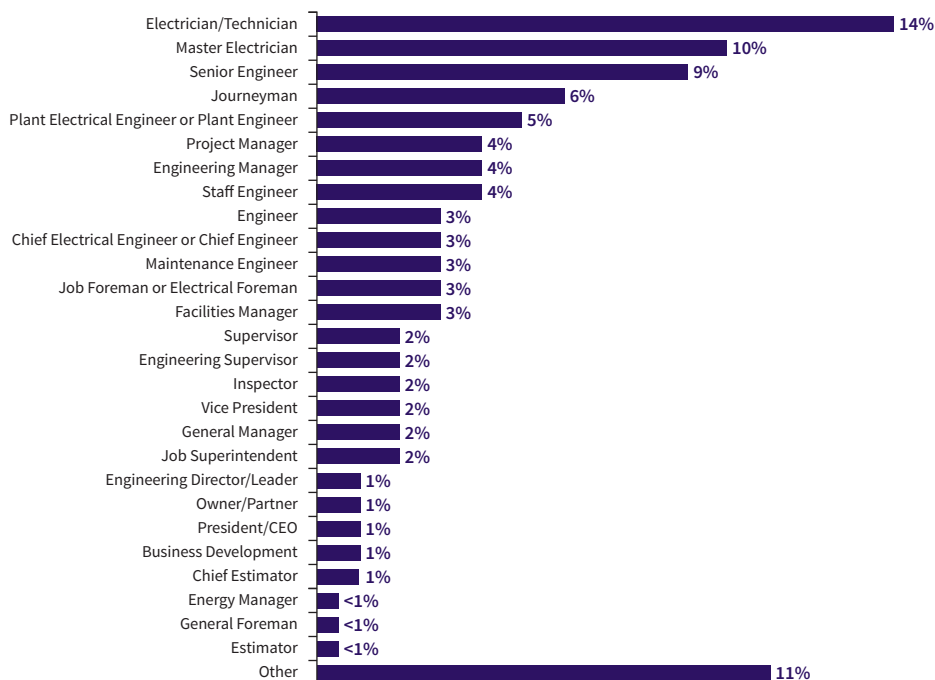


Fig. 2. Like the last survey, electricians/technicians made up the largest group of respondents from the industrial facility segment.

## Primary Job Title — Commercial, Institutional or Educational Facility Respondents

### Question:

Which one best describes your primary job title?

Base: Commercial, Institutional or Educational Facility respondents (n=221)

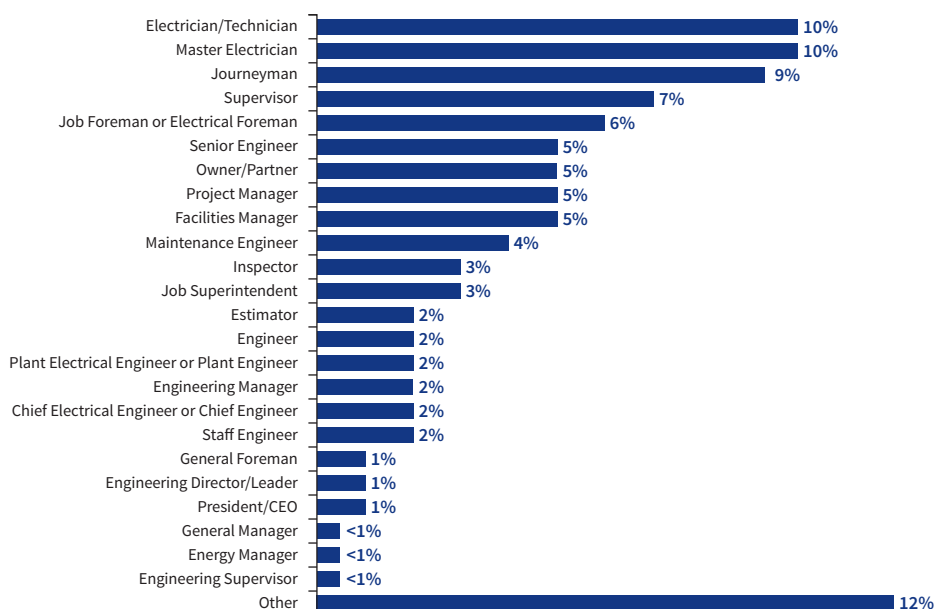


Fig. 3. As with the 2019 survey, job titles from the CIE segment were much more spread out than other respondent groups.

glimpsed those of their loved ones as well — with a calculating eye.

But a wider lens has many of the 1,333 professionals surveyed saying life in the electrical world trenches is pretty good on balance and possibly getting better — at least in the short term. Whether

it's in the realm of total compensation, overall job satisfaction, or perceptions of employer sensitivity to their work and personal life needs, a hearty majority of respondents give their lot a thumbs up. And to be clear, even when it comes to that question about recommending a

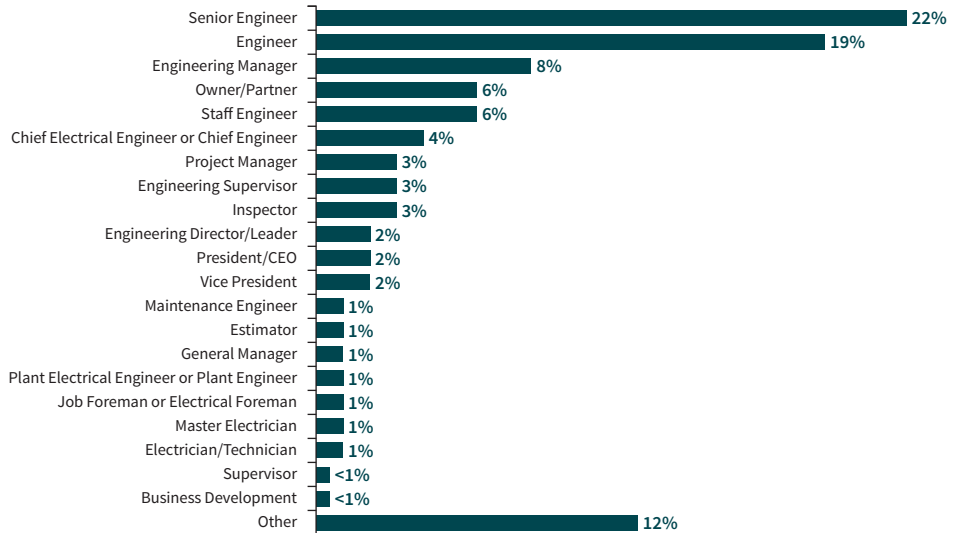
career as an electrical professional, most indicate they would.

“Sanguine,” then, might describe the mood of these professionals — and for good reason. In an economy where energy and its management are an increasingly vital and complex

### Primary Job Title — Engineering Respondents

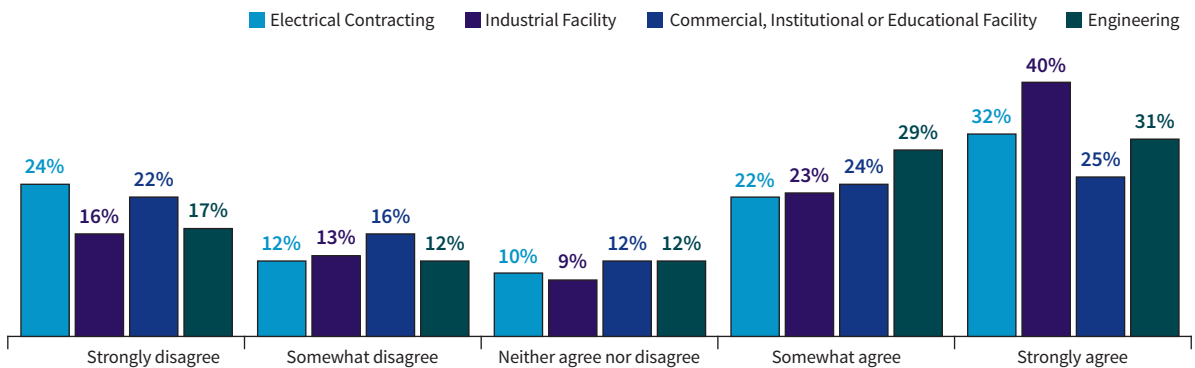
**Question:**  
Which one best describes your primary job title?

Base: Engineering respondents (n=243)



**Fig. 4.** Again, senior engineer (22%) and engineer (19%) led responses from the engineering segment of respondents.

### Agreement: “If My Child, Niece or Nephew Asked, I’d Recommend Working in the Electrical Field.”

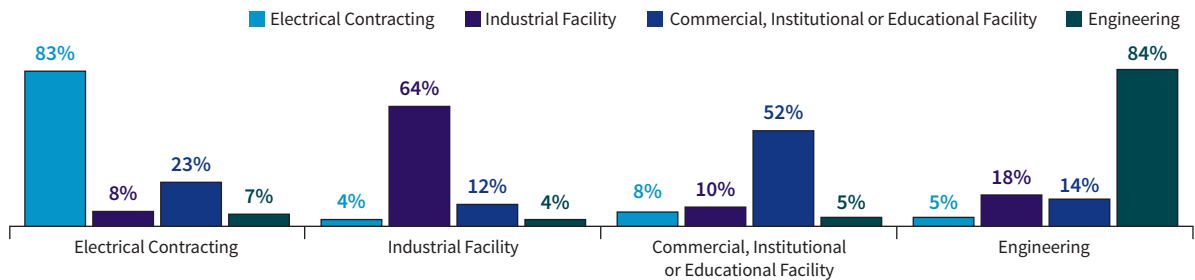


**Question:** Please indicate your level of agreement with the following statement. If my child, niece or nephew asked, I'd recommend working in the electrical field.

Base: Electrical Contracting respondents (n=598); Industrial Facility respondents (n=269); Commercial, Institutional or Educational Facility respondents (n=220); Engineering respondents (n=242).

**Fig. 5.** In the 2019 survey, 7% of respondents indicated they would not be inclined to recommend the electrical field to a young close relative or family friend. In 2023, that number jumped to an average of 33%.

### Primary Business/Institution

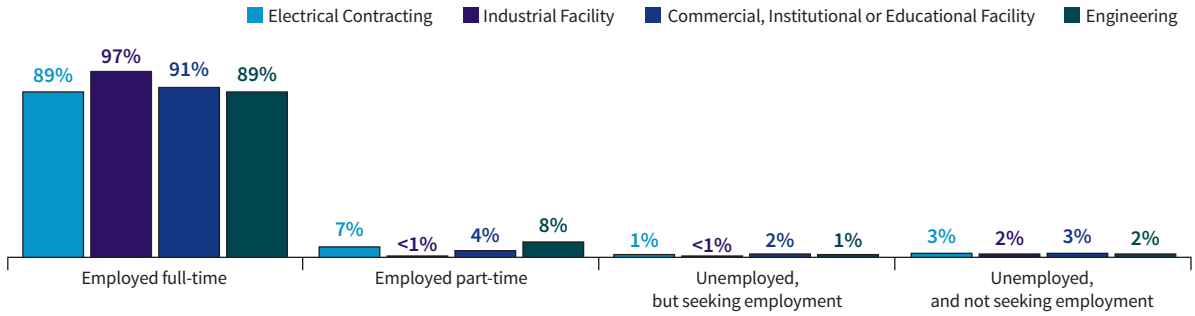


**Question:** Which of the following best describes your company's primary business/industry?

Base: Electrical Contracting respondents (n=597); Industrial Facility respondents (n=265); Commercial, Institutional or Educational Facility respondents (n=217); Engineering respondents (n=241).

**Fig. 6.** The 2023 salary survey garnered an impressive response rate among electrical professionals in four industry demographic groups.

## Employment



**Question:** Which of the following best reflects your current employment status?

Base: Electrical Contracting respondents (n=600); Industrial Facility respondents (n=269); Commercial, Institutional or Educational Facility respondents (n=221); Engineering respondents (n=243).

**Fig. 7.** As was the case in the 2019 survey, the overwhelming majority of this year's respondents were full-time employees.

centerpiece, their unique skills, knowledge, and expertise are in demand — and they like that feeling. But with their ranks thinning and the talent pipeline narrowing, they're being asked to bear more burdens — and that's taking a toll on mood. Yes, compensation has improved, but inflation is eroding its value. Looking ahead, the market for electrical professionals' services will

be strong, boosted for many by more infrastructure spending, and the rewards could be outstanding.

In the new survey, views on compensation and job satisfaction break along professional sector lines, sometimes sharply. Respondents came from four arenas employing electrical professionals, each of which has its distinctive internal dynamics that affect pay, benefits, and

working conditions, unionization and education/training being important variables: electrical contracting (600 completing survey); industrial facility (269); commercial/institutional/educational (221); and engineering (243), as shown in **Fig. 6** on page 20.

Cross-sector, almost all were employed full-time (**Fig. 7**) and had been steadily employed the prior

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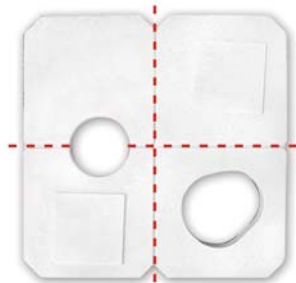
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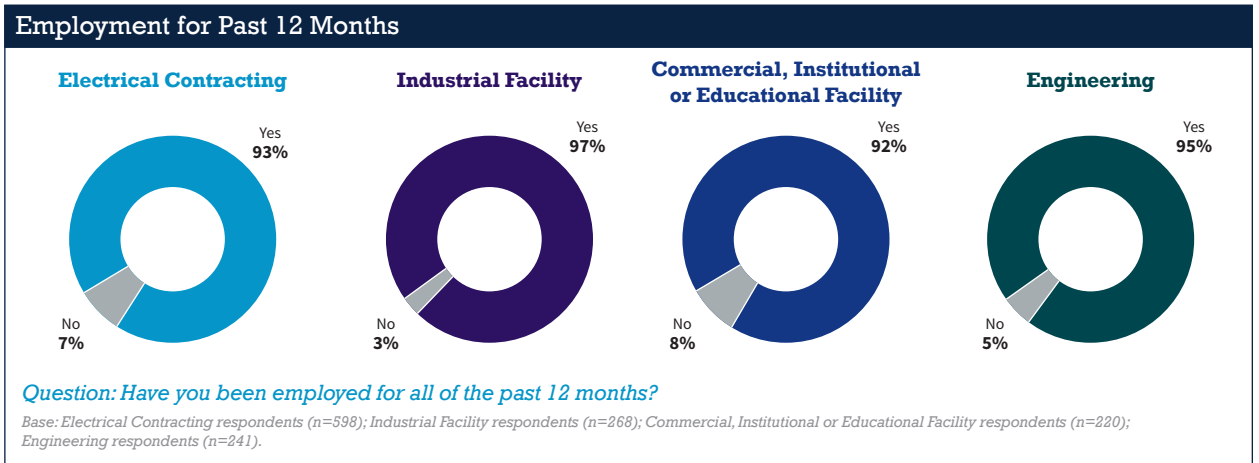
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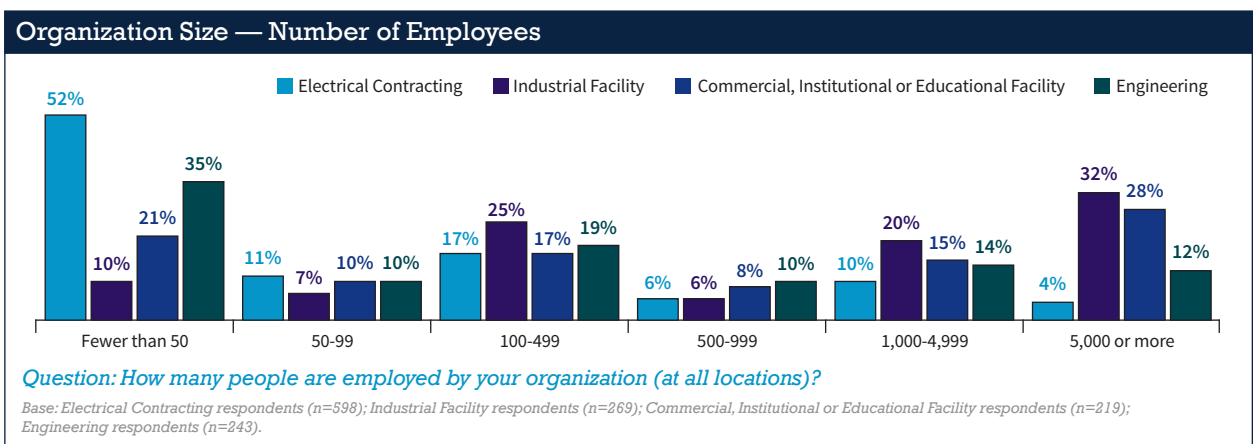
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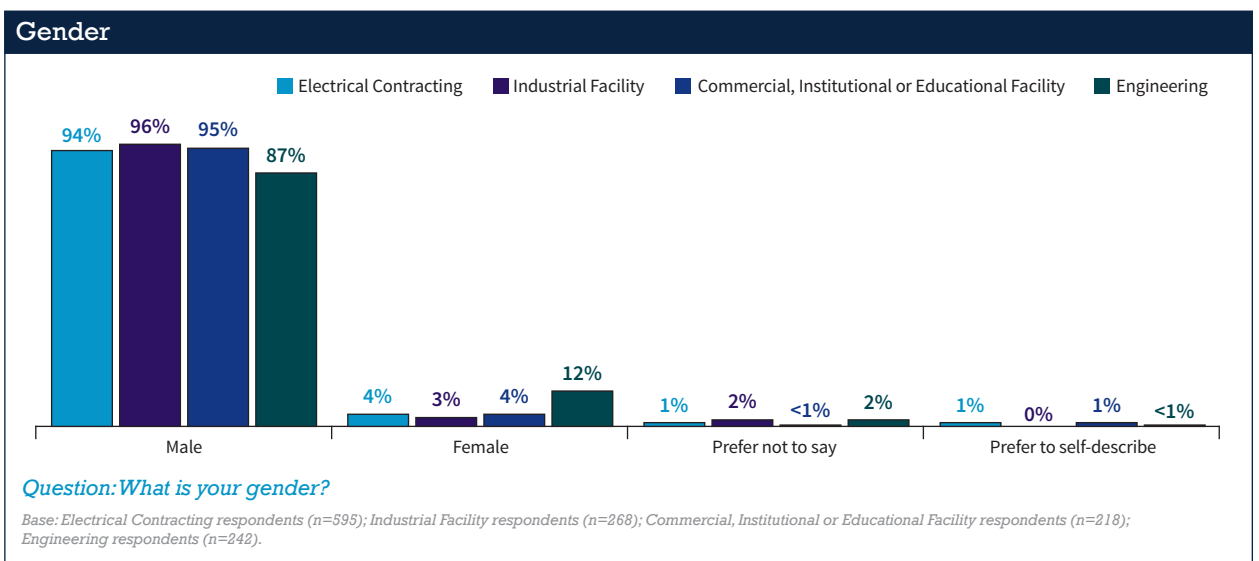
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**Fig. 8.** Similar to the full-time status question, nearly all respondents had been steadily employed the previous year.



**Fig. 9.** Organization sizes varied by type with smaller electrical contractors (fewer than 50 employees) making a strong showing.



**Fig. 10.** Compared to the last survey, an increase in representation from females was not apparent, reiterating the reality that the majority of the EC&M audience is still largely male.

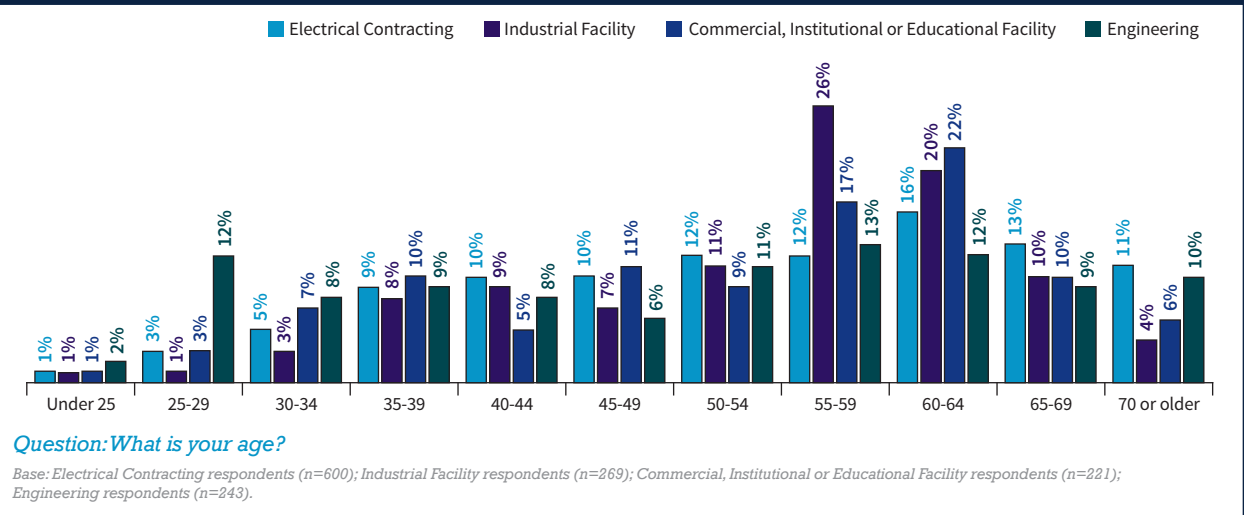
year (Fig. 8). They worked at firms of all sizes but skewed toward smaller among electrical contractors and engineering companies and larger among

those at industrial and commercial/institutional/educational (CIE) workplaces (Fig. 9). Nearly all were male (Fig. 10), and a solid majority were

clustered in the 50- and 60-plus age groups (Fig. 11 on page 23). Most have at least some post-secondary education or degree (Fig. 12 on page 24), and the



## Age



**Fig. 11.** Not surprisingly, the largest age demographic among EC&M survey respondents came from the 55- to 59-year-old and 60- to 64-year old categories.

vast majority hold some sort of professional certification (Fig. 13 on page 24).

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labor in an economy where labor participation rates have been falling, U.S. employers have been raising pay to hire and retain workers. And those that employ electrical professionals haven't been spared the angst of signing cost-of-living-adjusted (COLA) paychecks that

look a lot fatter over a year and positively rotund compared with four years ago.

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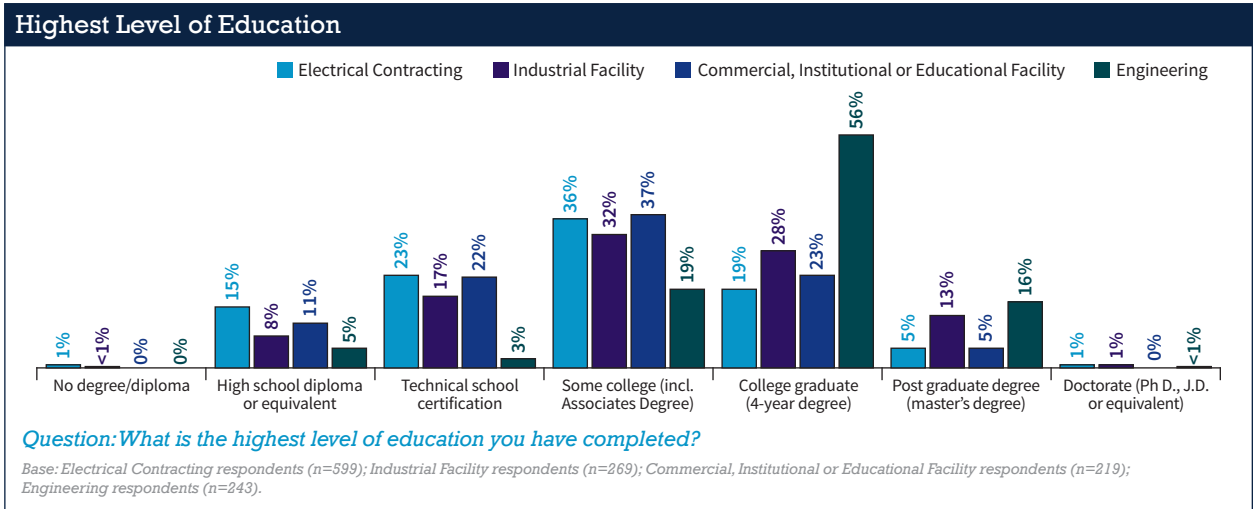


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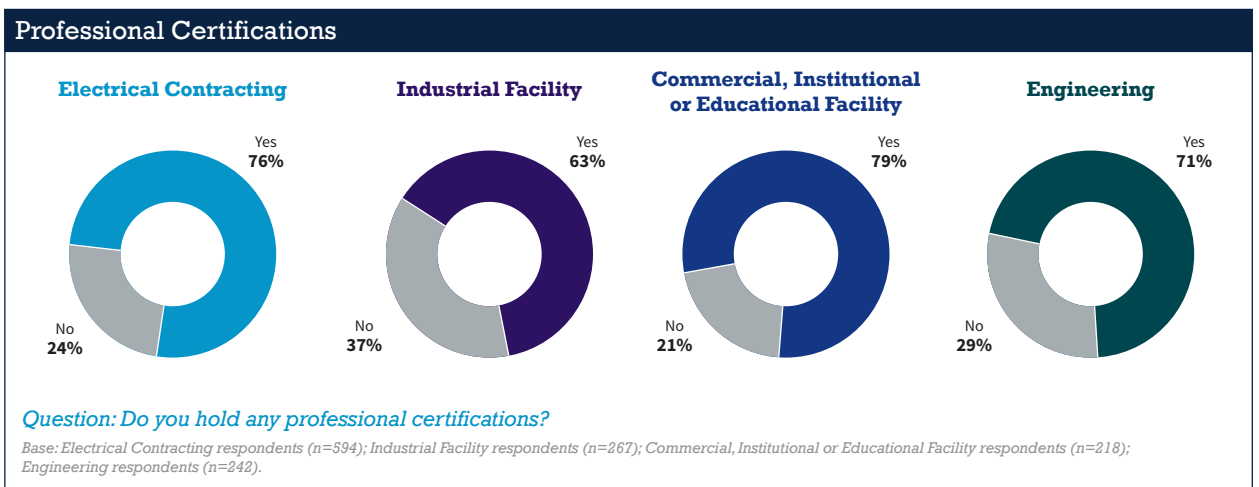


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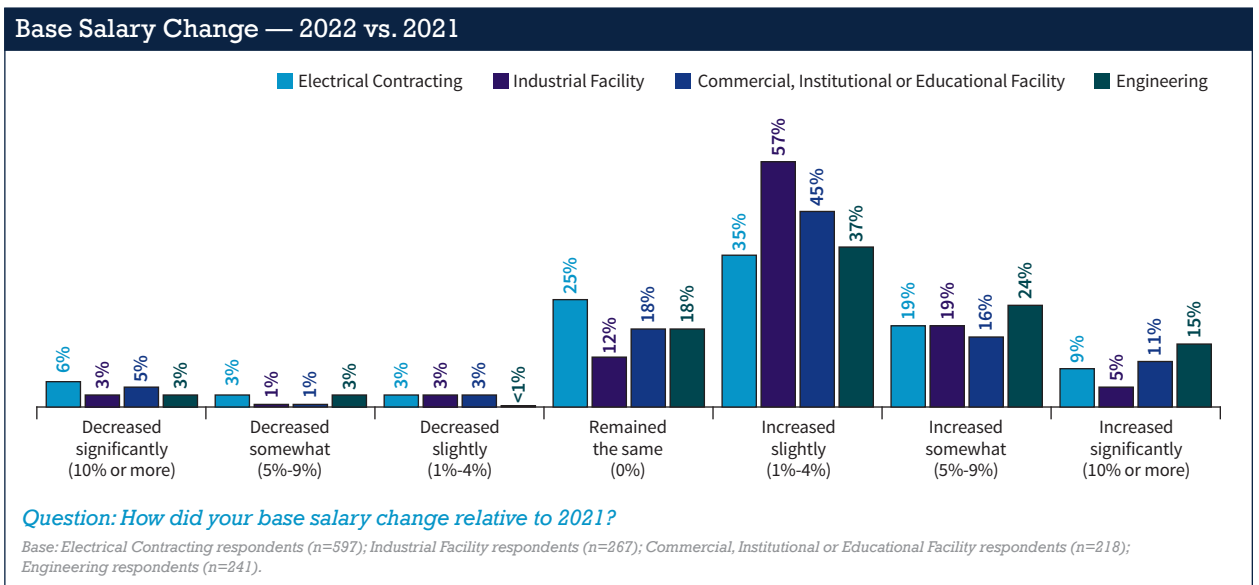




**Fig. 12.** Again with this survey, engineering respondents were the most highly educated of the sample, with approximately 73% holding a college degree or higher.



**Fig. 13.** Most respondents (ranging from 63% to 79%) from all demographic groups held at least one professional certification.



**Fig. 14.** Most respondents from all four groups indicated their base salaries went up between 1% and 4% from 2021 to 2022.

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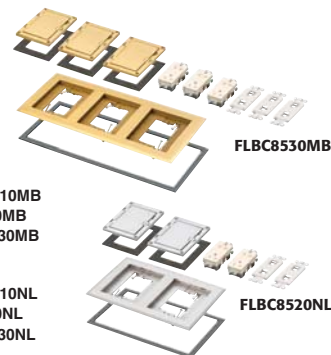


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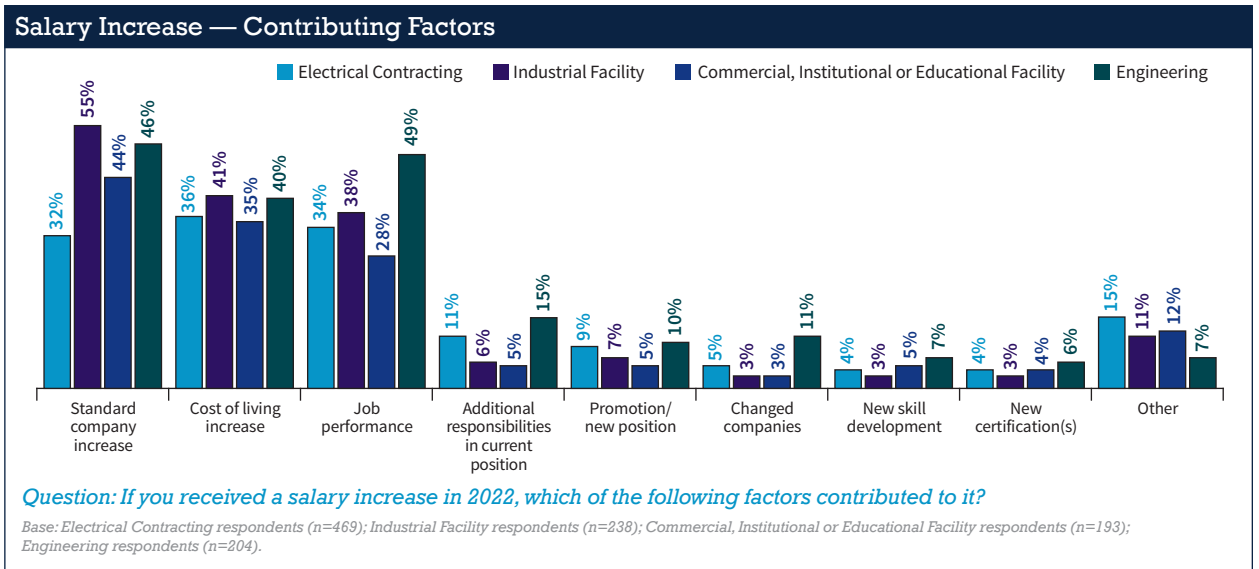


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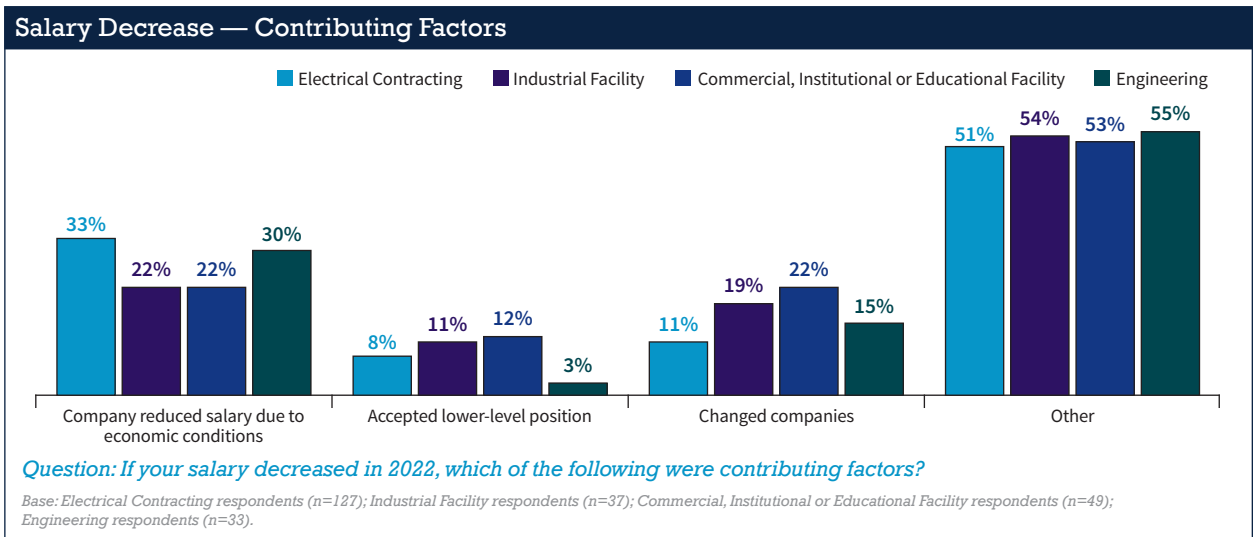
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**Fig. 15.** In all four segments of respondents, the most common drivers of increased salaries in 2022 were standard company increase, cost of living increase, and job performance.



**Fig. 16.** Although most prevalent among electrical contractor and CIE respondents, only a small share of respondents reported pay cuts.

Half were offering incentives or bonuses to secure workers, while a quarter were beefing up benefits packages.

A plurality of those polled in the EC&M survey indicated that between 2021 and 2022 their base salaries went up in the 1% to 4% range (Fig. 14 on page 24). The high end of that range is where a recent WorldatWork survey of U.S. businesses found mean and median salary increases settling in both 2023 and 2024.

More industrial professionals reported an increase (81%), while the electrical contracting cohort, consisting of a quarter each identifying as owners or presidents and electricians, had the fewest reporting a hike (63%). More

engineering firms reported hikes at the top range of 10% or more (15%).

In the 2019 survey, respondents were reporting comparatively stagnant wages. Then, 32% of electrical contracting sector workers reported receiving no salary boost in 2018; this year 25% reported no change in the prior year. Discrepancies were similar in other sectors. With the percentage reporting prior-year pay cuts similar in both years — 8% on average — more pay boosts surely explain the difference.

Those reporting a pay hike — 75% of the sample — attributed the boosts to a mix of possible factors (Fig. 15). But cost of living, job performance, and standard

company policy drew by far the most mentions from a list of eight possibilities. Those three factors were the top reasons in the 2019 survey, but cost of living had far more mentions this year — all but confirming that workers have been beneficiaries of inflation-influenced pay policies employers have had to institute to stay competitive in the labor market.

On average, 38% of respondents cited cost of living as a reason for the 2018 boost; in 2019, it was mentioned by only 25%. Generally, slightly fewer this year said promotions, new skill development, or added responsibilities were pay raise factors. Top write-in reasons included new union

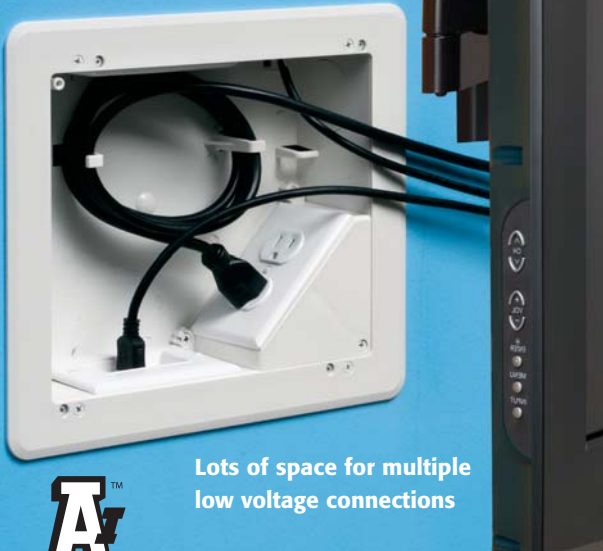


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(with wall plate, order CED135WP)

Arlington's TVBU505 TV BOX



The SCOOP™ series of reversible, non-metallic ENTRANCE HOODS, PLATES AND DEVICES protect cable while delivering good looks and installation versatility. They also reduce labor and eliminate extra connections.

Our newest **CABLE ENTRY DEVICES** come with *or without* a wall plate for efficient cable management. **HOODS** for decorator-style wall plates, single and two-gang **PLATES** install facing in or out...and save time!

- Low voltage cable protection
- Best way to run cable



CED130 entry device w slotted cover



CED1 facing OUT



CED1

CE1 facing IN



CE2 facing OUT

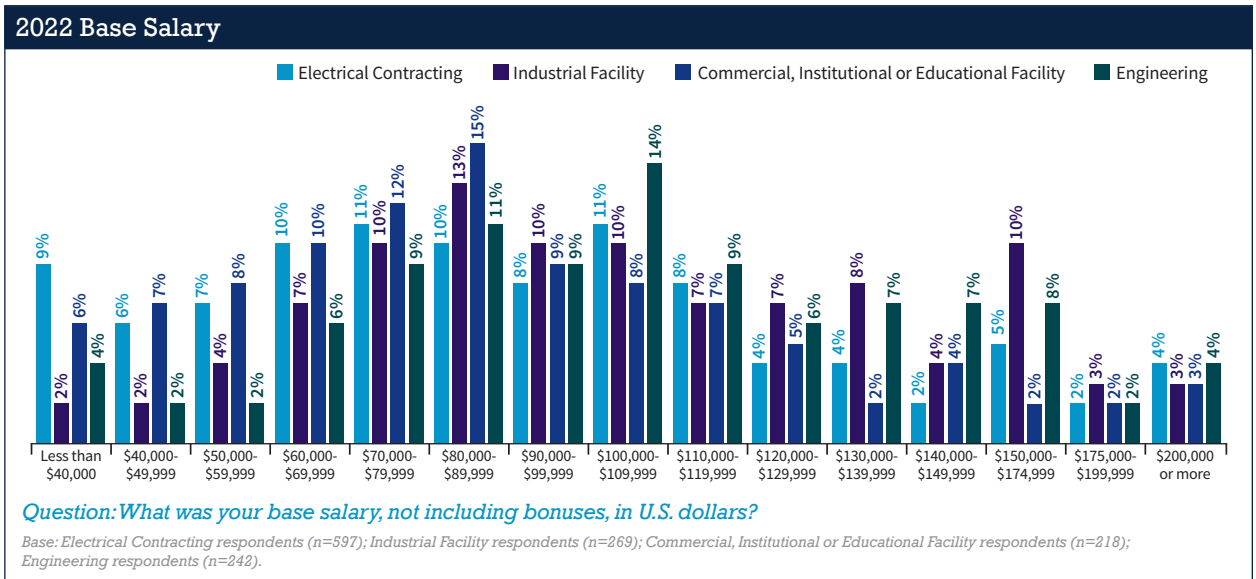


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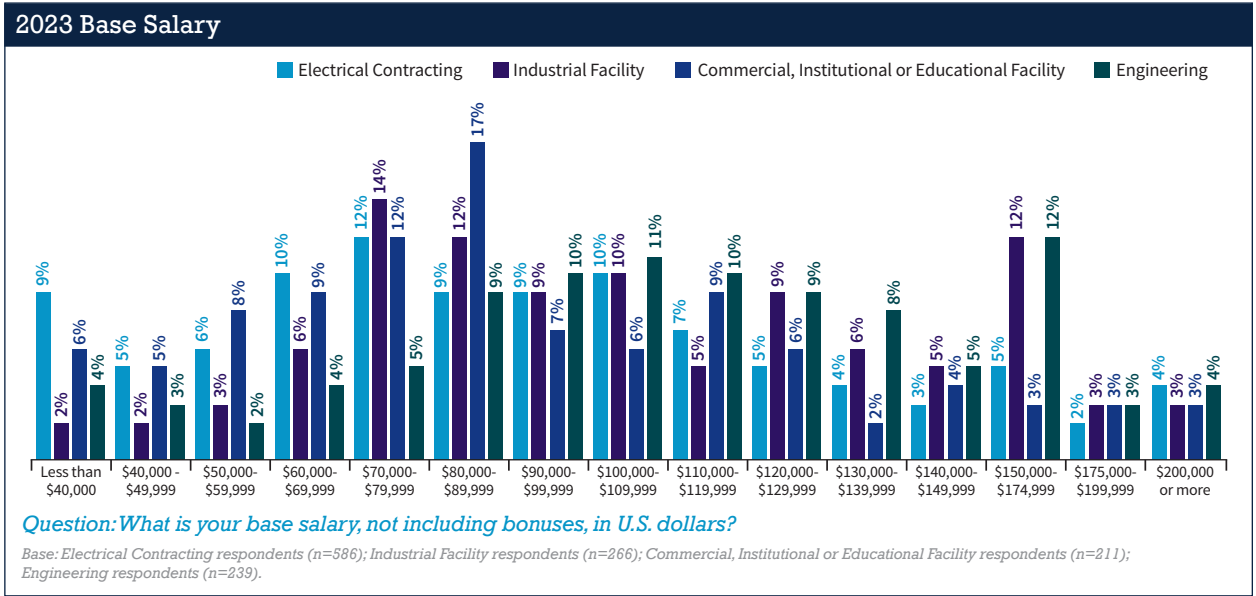
Product info [aifittings.com/landing/scoop-series/](http://aifittings.com/landing/scoop-series/)

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**Fig. 17.** Averaging the four sectors, the share of respondents making over \$100,000 in base salary increased 12% between 2019 and 2022 with those in the industrial group showing the biggest gains.



**Fig. 18.** When it comes to 2023 base salaries, the engineering respondents reporting a salary of \$100,000 or more increased from 59% the previous year to 62% this year.

pay pacts, new contracts, more work, and a change in employers.

The small share of respondents saying their 2022 salary decreased from 2021 — most prevalent among electrical contractor and CIE staffers — cited various reasons, few a likely result of outright pay cuts (Fig. 16 on page 26). Roughly half attributed the reduction to at least one of three possible factors: economic conditions that impacted employers, new lower-level position, or new company. The other half said there were “other” reasons; some specified among them were “retirement,”

“reduced hours,” “less overtime,” and “insurance costs.”

**MORE JOIN THE 100K CLUB**

Steady pay boosts that have been ramping up in the labor economy over the past several years have brought some notable changes to the reported salary ranges of electrical professionals (Fig. 17). A handy measure — those making over \$100,000 in base salary — shows that these workers have made pay gains, some of which were significant.

Averaging the four sectors, the share making over that amount increased 12%

between 2019 and 2022. Those employed in the industrial sector showed the biggest gain in \$100,000-plus earners — from 30% to 52%. The CIE worker share went from 21% to 32%; engineering from 51% to 59%; and electrical contracting from 34% to 40%.

On another scale, median reported salary ranges for both 2022 and 2023 for all sectors increased or stayed steady compared to 2019 survey results. The median range for professionals working for electrical contractors was \$80,000 to \$89,000, in line with 2018 when the mean salary was \$87,588. Also in



LOW VOLTAGE • COMMERCIAL GRADE, HEAVY-DUTY ZINC

# MOUNTING BRACKETS

FOR CLASS 2 LOW VOLTAGE WIRING

**NEW!**  
COMMERCIAL  
GRADE  
EXTRA HEAVY  
DUTY

Sturdy  
Non-bendable zinc

Save Time!  
Threaded holes  
for easy device  
installation



LV1M  
Extra heavy-duty ZINC for Existing Walls

Arlington's mounting brackets are the best way to install Class 2 wiring. They seat wall plates flush with the mounting surface and install fast!

Our new single gang, zinc mounting bracket, LV1M, for existing construction, offers extra rigidity so it won't bend as easily as plastic. Plus, it has threaded holes for easy, fast device installation – and LABOR SAVINGS.



Also available, a variety of single-, two-, three- and four-gang NON-METALLIC low voltage brackets, and others for specialty applications.



Patent pending



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Product Info [aifittings.com/landing/lvm1](http://aifittings.com/landing/lvm1)

LOW COST • ZINC

# MC CABLE FITTINGS

THAT FIT SEVERAL CABLE SIZES

**NEW SIZE!**

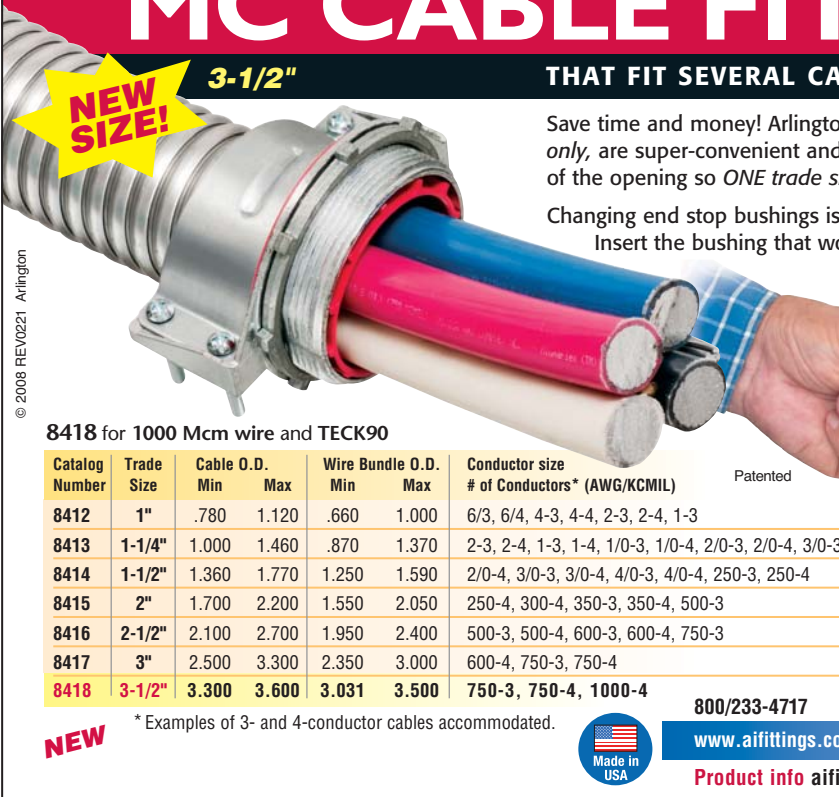
3-1/2"

Save time and money! Arlington's low cost MC cable fittings, for dry locations only, are super-convenient and cost-effective. End stop bushings vary the size of the opening so ONE trade size fits several cable sizes!

Changing end stop bushings is fast and easy. No need to remove the strap. Insert the bushing that works the best with the cables you're installing.

Reduce inventory –  
Costs much less than steel  
and malleable iron fittings

Built-in end stop



8418 for 1000 Mcm wire and TECK90

Catalog Number	Trade Size	Cable O.D. Min	Cable O.D. Max	Wire Bundle O.D. Min	Wire Bundle O.D. Max	Conductor size # of Conductors* (AWG/KCMIL)	Patented
8412	1"	.780	1.120	.660	1.000	6/3, 6/4, 4-3, 4-4, 2-3, 2-4, 1-3	
8413	1-1/4"	1.000	1.460	.870	1.370	2-3, 2-4, 1-3, 1-4, 1/0-3, 1/0-4, 2/0-3, 2/0-4, 3/0-3	
8414	1-1/2"	1.360	1.770	1.250	1.590	2/0-4, 3/0-3, 3/0-4, 4/0-3, 4/0-4, 250-3, 250-4	
8415	2"	1.700	2.200	1.550	2.050	250-4, 300-4, 350-3, 350-4, 500-3	
8416	2-1/2"	2.100	2.700	1.950	2.400	500-3, 500-4, 600-3, 600-4, 750-3	
8417	3"	2.500	3.300	2.350	3.000	600-4, 750-3, 750-4	
8418	3-1/2"	3.300	3.600	3.031	3.500	750-3, 750-4, 1000-4	

NEW

\* Examples of 3- and 4-conductor cables accommodated.



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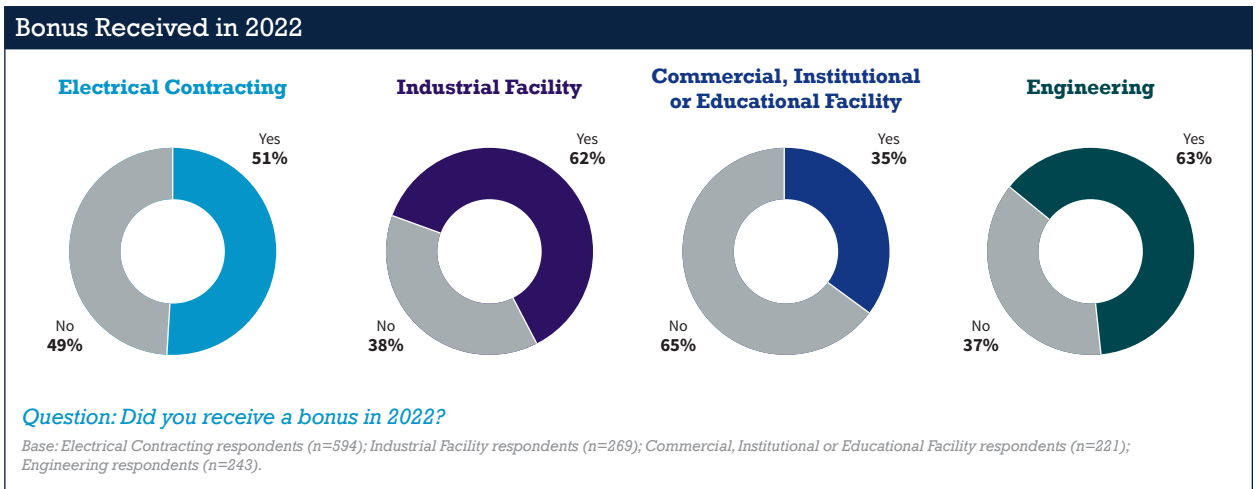
Product info [aifittings.com/landing/8412](http://aifittings.com/landing/8412)



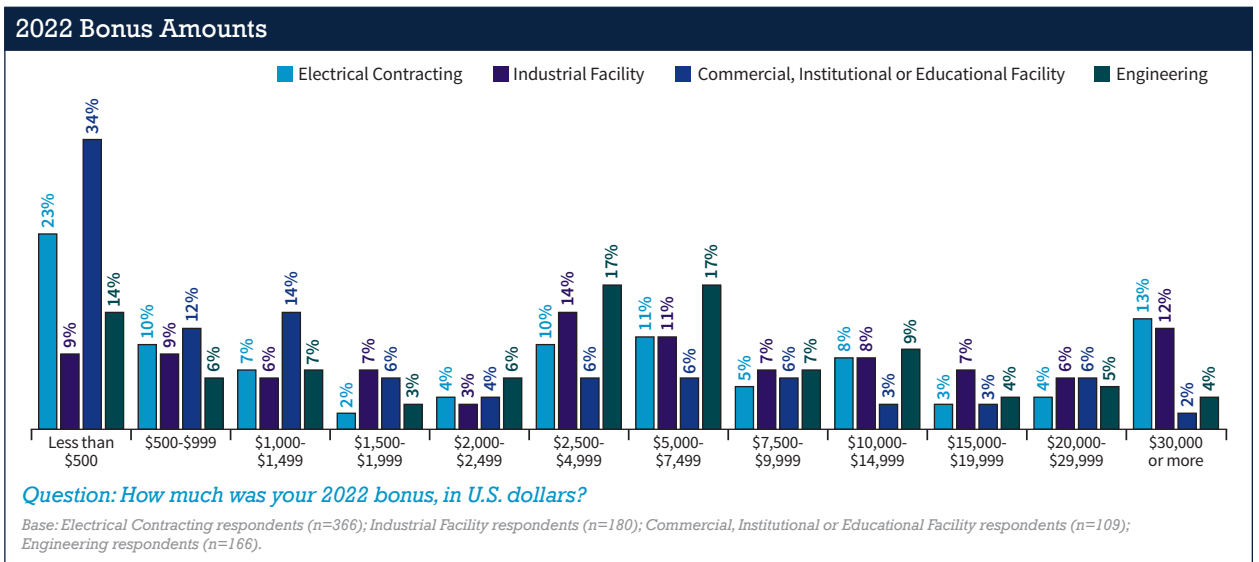
3-1/2"  
8418



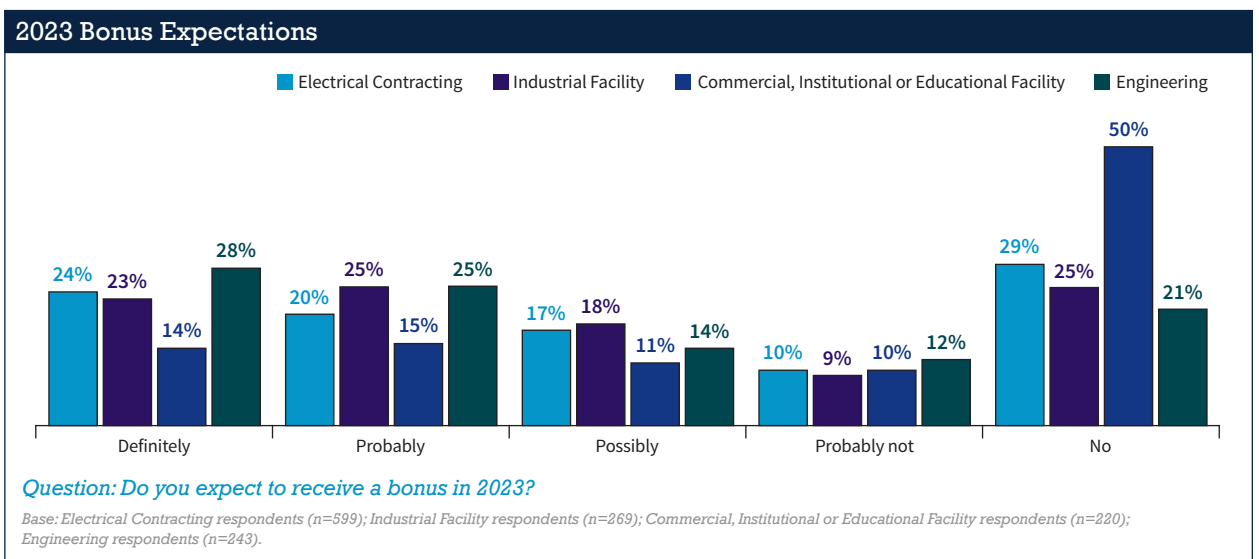
Arlington®



**Fig. 19.** While slightly more than half of respondents reported getting a bonus last year, roughly two-thirds each in the engineering and industrial settings got one, but only one-third in CIE did. Electrical contractor respondents were split down the middle.



**Fig. 20.** Although bonus amounts in 2022 varied, the mean range overall fell roughly in the \$2,000 to \$2,499 range.



**Fig. 21.** The engineering sector held the highest confidence levels when it came to expecting a bonus this year.





ADJUSTABLE • NON-METALLIC • 2-HOUR FIRE RATING

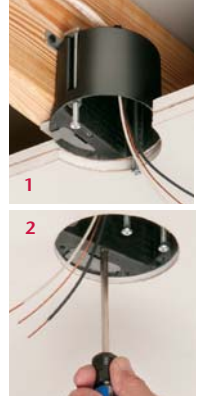
## IN/OUT™ BOX for Fans & Fixtures

EASY TO INSTALL... IN NEW CONSTRUCTION



Arlington's **IN/OUT™ fan/fixture boxes** adjust up to 1-1/2" to accommodate varying ceiling thicknesses, like single or double drywall. **FBA426** is Listed for fans up to 70 lbs; fixtures up to 100 lbs.

- Pre-set for 1/2" ceiling – depth adjustment screw positions the box flush with the ceiling *after it's in place*
- Complies with 2020 NEC, 314.20 for set back boxes
- (4) screws attach box securely to joist in new work
- **2-Hour Fire Rating**



- 1 Cutaway: Box set back in double drywall
- 2 Install ceiling. If necessary use depth adjustment screw to position box flush with ceiling.

20.0 cu in **FA426** for Fixtures *only* up to 50 lbs



Patented



Product info [aifittings.com/landing/tba426](http://aifittings.com/landing/tba426)



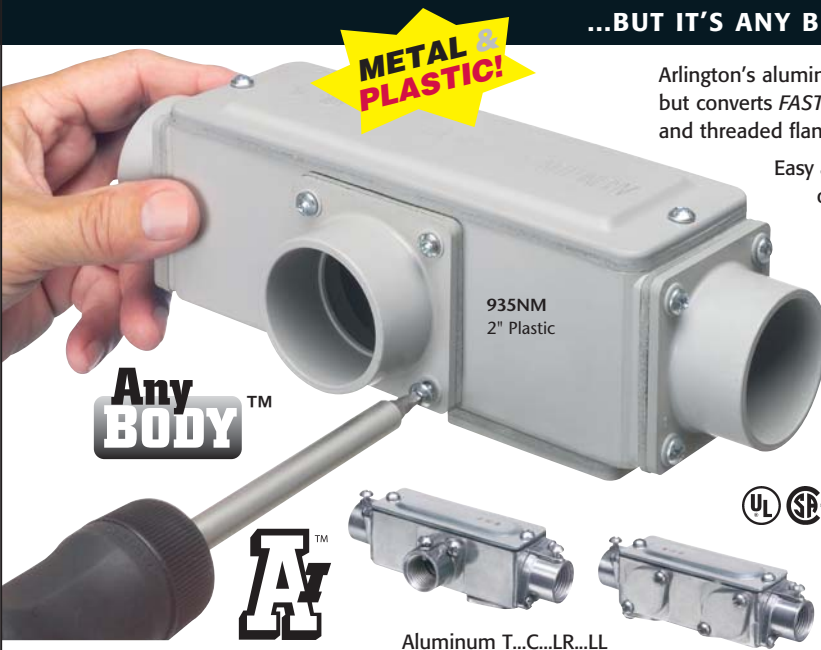
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## SHIPS AS AN 'LB'... ANYBODY®

...BUT IT'S ANY BODY YOU WANT IT TO BE!



Arlington's aluminum *or plastic* **AnyBODY™** ships as an LB, but converts **FAST** to a T, LL, LR or C by switching the cover plates and threaded flanges to create the style you need.

Easy and convenient, it saves you the hassle and cost of carrying five different conduit bodies.

- Competitively priced with LBs – **NO EXTRA COST for the normally more expensive T** – UL/CSA Listed
- **Plastic 1/2" to 4"** includes three flanges w/ glue-in pipe joint.
- **Aluminum 1/2" to 4"** includes threaded flanges for three openings. 1/2" to 2" are combination bodies: threaded for rigid, they also have a set-screw for use with EMT.

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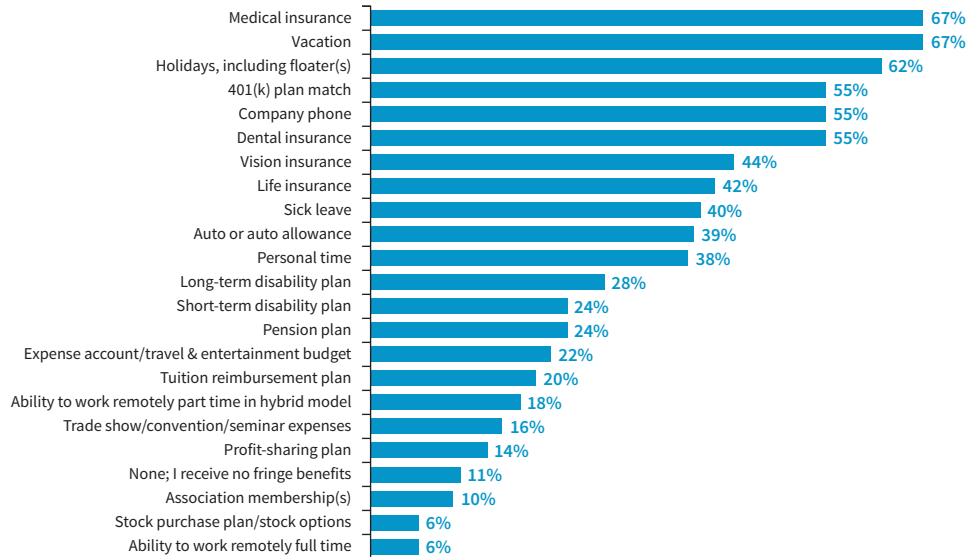
Product info [aifittings.com/landing/anybody](http://aifittings.com/landing/anybody)



## Fringe Benefits — Electrical Contracting Respondents

Question: Please indicate the fringe benefits you receive either fully or partially paid by your company

Base: Electrical Contracting respondents (n=590)



**Fig. 22.** Electrical contracting respondents were less likely to list any benefits than other demographic groups answering the survey. In fact, they had the highest share (11%) saying they get zero fringe benefits.

line were engineers, with \$100,000 to \$109,000 being the statistical middle group, the range 2018's mean salary of \$103,985 was in. But the median range for industrial facility electrical professionals whose 2018 mean salary was \$82,185 rose from \$80,000 to \$89,000 to \$100,000 to \$109,000, and the median for CIE workers, whose 2018 mean was \$77,155, ticked up to \$80,000 to \$89,999.

With inflation and low unemployment still bearing down, employers appear "willing" to throw more money at workers. But there are signs the pace may be slowing as inflation cools and the labor market softens amid growing recession worries. Some of that flux showed up in 2022 and 2023 salaries reported in the survey. While roughly similar, the pay range breakdown appeared to shift slightly higher over that period for electrical professionals.

The biggest change was in the share of engineering sector workers making \$100,000 and up (Fig. 18 on page 28). Sixty-two percent reported being in that group with their 2023 base salary, up from 59% saying their base was \$100,000-plus in 2022. Percentages in that tier for the other three sectors were little changed. Top earners continue to cluster in the engineering and industrial sectors; between 14% and 20% of those professionals sit in the lofty \$150,000-and-up class in both years, at least double the share in the other two sectors.

### BONUSES SWEETEN THE POT

A sharp divide is also evident in another element of compensation that employers have embraced: bonuses. While slightly more than half overall said they got one in 2022 (Fig. 19 on page 30), roughly two-thirds each in the engineering and industrial settings got one, but only one-third in CIE did. Electrical contractor respondents were split down the middle.

But bonuses are now a bigger part of compensation. In the 2019 survey, 43% of respondents overall said they got a bonus in 2018. That's seven percentage points lower than in 2022. But bigger gaps are evident in three sectors: industrial, where just 43% got a bonus in 2018, compared with 62% in 2022; electrical contracting, 40% compared to 51%; and engineering, where it was 55% compared to 63%. Only CIE had a lower spread than the overall, 29% compared with 35% in 2018.

Bonus amounts in 2022 also varied by sector (Fig. 20 on page 30), but the mean range overall fell roughly in the \$2,000-\$2,499 range. Sector highlights include one-third clustered in the \$2,500 to \$7,500 range for engineering, where the mean range was \$2,000 to \$2,499; 17% in the \$20,000-and-up range for an electrical contractor, which had the highest mean range of \$2,500 to \$4,999; the most equal dispersion evident in industrial, which had a mean of \$2,000 to \$2,499 but a quarter clustered between \$2,500 to \$7,500; and 60% not exceeding \$1,500

in CIE, where the mean was \$1,000 to \$1,499, the lowest.

Most surveyed think employers will continue to be generous with bonuses. In all but CIE, about two-thirds see some chance of one in 2023 (Fig. 21 on page 30), with the highest confidence (67%) in engineering. Only 40% of CIE respondents have any level of confidence they'll see one. Half say they don't expect one — the highest share by far.

### CORE BENEFITS VARY

Gains on the pay front have been accompanied by some progress — or at least minimal losses — on the fringe benefits side. Among common benefits listed (Fig. 22 through Fig. 25 on page 36), the leading ones and those around at least half say they get — 401(k) plan matches, holidays (floaters included), life, medical, dental and vision insurance, sick leave, and vacation — have increased in mentions since 2019. Benefits that are down in prevalence include personal time, trade show/convention/seminar expenses, and company phone.

As with salary and bonuses, the survey found some notable differences in access to benefits by employment sector: Electrical contracting respondents were generally less likely to say they get a listed benefit, and that group had by far the highest share (11%) saying they get zero fringe benefits. For 10 of 22 listed benefits, including 401(k),

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# IN BOX RECESSED BOX

## EXTRA-DUTY, LOW PROFILE COVER



DBVS1W



for New & Existing Vinyl Siding

DBVS1C



for New Brick

in brown, white

DHB1BRC



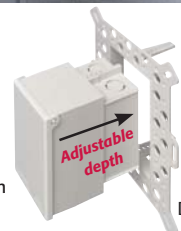
ONE PIECE  
FAST, EASY  
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for Retrofit Flat Surfaces including brick

DBVR1C

Adjustable Depth fits any foam wall, stone veneer or stucco finish



DBVMA1W



Fixed Flange for 1-1/2" wall systems

DBVME1W



No extra parts to buy or handle mean you save big on labor and materials!

One-piece **IN BOX**®, the recessed, EXTERIOR electrical box, eliminates installing multiple pieces: the box, then the bubble cover assembly, and a mounting block on siding. Plus, the job looks great because IN BOX installs *in the wall*. It's that simple.

Cost savings. Time savings. UL Listing. Great Looks.

Get it all in Arlington's one-piece IN BOX!

- Non-metallic, 22.0 cu. inch electrical box with *extra duty* weatherproof-while-in-use white or clear cover
- Single and two-gang, vertical and horizontal, for a variety of new and old work applications
- Accepts single-gang devices - no gaskets required



Installs *in the wall*. Less shows outside.

**IN BOX** meets 2020 NEC, Section 406.9 for the protection of exterior outlets which require the use of an extra-duty weatherproof while-in-use cover for all outdoor 15 or 20 AMP receptacles.

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Patented. Other patents pending.

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Product info [aifittings.com/landing/outdoor-inbox/](http://aifittings.com/landing/outdoor-inbox/)

## Fringe Benefits — Industrial Facility Respondents

Question: Please indicate the fringe benefits you receive either fully or partially paid by your company

Base: Industrial Facility respondents (n=268)

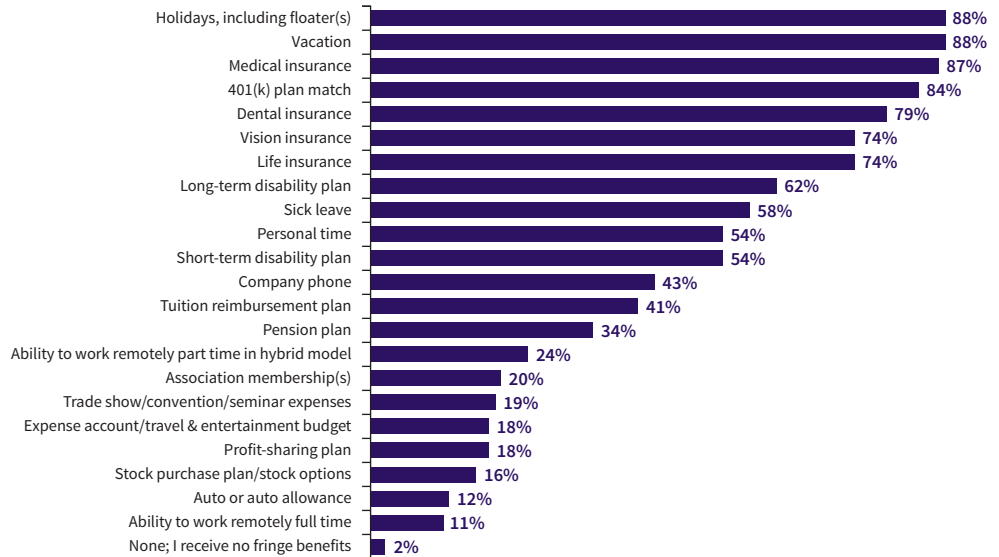


Fig. 23. Among industrial respondents, the majority named holidays, vacation, medical insurance, and 401(k) match as top incentives.

## Fringe Benefits — Commercial, Institutional or Educational Facility Respondents

Question: Please indicate the fringe benefits you receive either fully or partially paid by your company

Base: Commercial, Institutional or Educational Facility respondents (n=220)

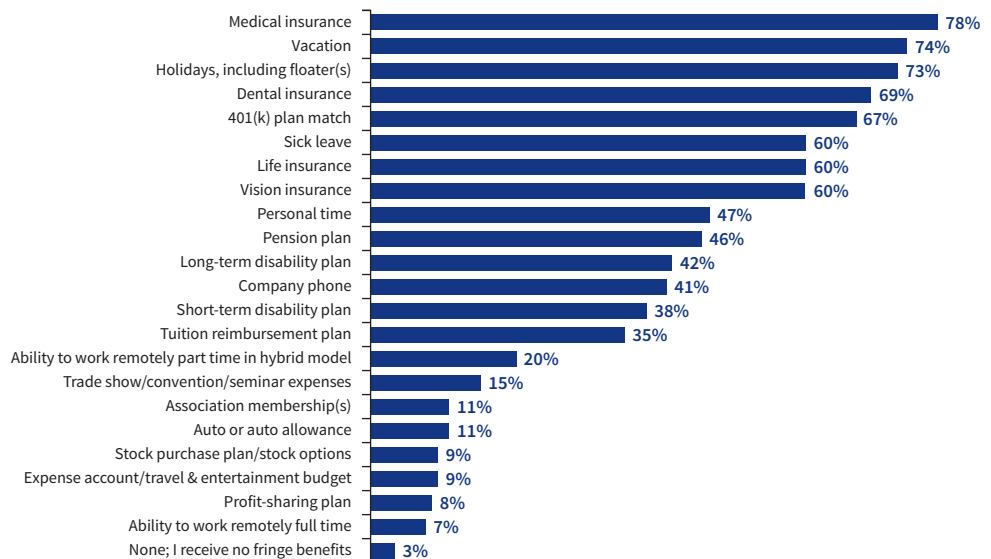


Fig. 24. The most common benefit cited among CIE respondents was medical insurance followed by vacations and holiday time off.

holidays, medical insurance, vacation, and personal time, more than half of engineering and industrial workers said they were receiving them, followed by eight for CIE and six for electrical contracting. Industrial and engineering stood out from the others, most starkly from electrical contracting, with notably higher numbers in 401(k), holidays, personal time, disability plans, and vacation.

An emerging fringe benefit is the ability to work away from the office. While remote and hybrid arrangements — combined

office and remote work — took hold where feasible out of necessity during the pandemic, they've since receded, but far from disappeared. Their appeal among workers (and even among some employers) has endured, making them negotiable perks in many workplaces.

But among electrical professionals, the ability to work from home either full time or in a hybrid capacity, each an option added to the list of possible fringe benefits, is either not broadly sought or not available — unless you're

in engineering. Less than 10% of workers in electrical contracting, CIE, and industrial say a full-time remote work arrangement is offered, and fewer than a quarter say a hybrid one is available. With engineering workers, though, the numbers are 25% and 54%, respectively. That gap is understandable because unlike tasks electricians and many others who work in contracting, CIE, and industrial perform, many in the engineering world are readily adaptable to digital- and virtual-only platforms.



ADJUSTABLE BRACKET • FOR NEW CONSTRUCTION

## FAN/FIXTURE BOX

FLUSH CEILING INSTALLATIONS



Captive screws attach bracket ends to joists

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Attach to joists, adjust box position



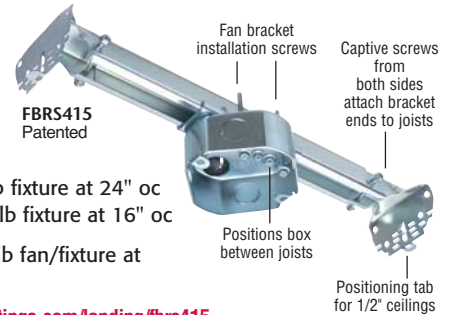
Arlington's heavy-duty, plated steel fan/fixture box has an adjustable bracket that mounts securely between joists spaced 16" to 24" o.c.



### Flush ceiling installations

FBR5415 is designed for ceilings up to 1-1/4" thick. For 1/2" ceilings, use the pre-bent positioning tab. For other ceiling thicknesses, bend along the appropriate score line.

- 15.6 cu. inch box ships with captive screws, mud cover, installed NM cable connector



FBR5415 Patented

### UL ratings

70 lb fan/90 lb fixture at 24" oc  
70 lb fan/150 lb fixture at 16" oc

CSA rated 50 lb fan/fixture at 16" and 24"

Product info [aifittings.com/landing/fbrs415](http://aifittings.com/landing/fbrs415)

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POWER & LOW VOLTAGE

## COMBO BOX

FOR RETROFIT PROJECTS

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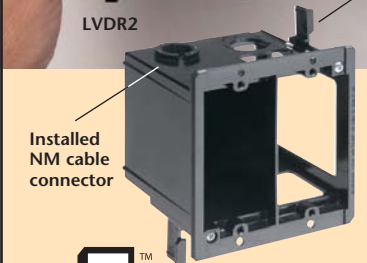
LVDR2

This convenient combo box has power and low voltage openings in the same box for a neat, time-saving installation.

The box adjusts to fit wall thicknesses from 1/4" to 1-1/2". Mounting wing screws hold it securely in place.

- 2-Hour Fire Rating
- Low voltage side has a combo 1/2" and 3/4" KO for raceway
- Includes NM cable connector (power side)

Installed NM cable connector



Product info [aifittings.com/landing/combo-boxes](http://aifittings.com/landing/combo-boxes)



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## FAN/FIXTURE BOX

SECURE MOUNTING TO SINGLE, DOUBLE JOISTS



UL rated fans up to 70 lbs; fixtures to 200 lbs.

FB442 13.4 cu. inch

Super-secure installation! Our lowest cost, L-shaped fan/fixture box mounts to single or double joists with a captive center screw.

No loose parts! Installation screws ship captive, ready to install box and bracket.

- For 1/2" or 5/8" drywall
- Fast, easy installation
- Locator posts assure proper positioning of fan/fixture bracket
- 2-hour Fire Rating



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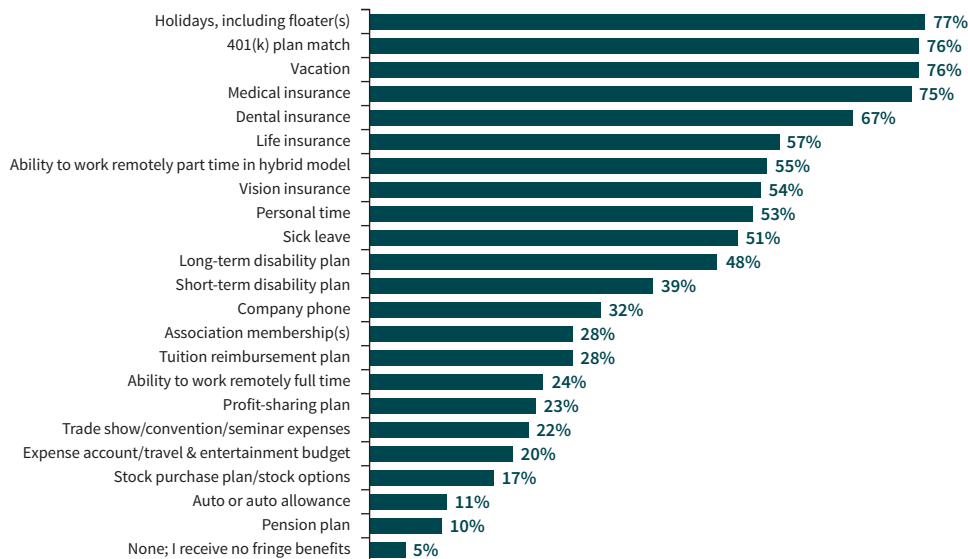
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### Fringe Benefits — Engineering Respondents

*Question: Please indicate the fringe benefits you receive either fully or partially paid by your company*

*Base: Engineering respondents (n=241)*

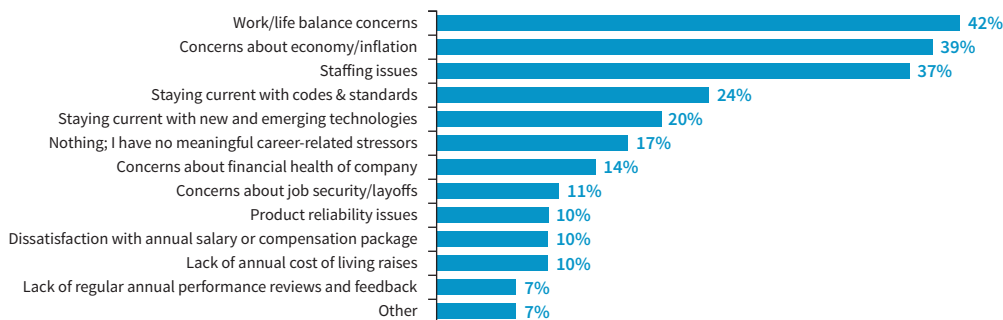


**Fig. 25.** Holiday time off, 401(k) match, vacation, and medical insurance were top benefits cited by engineering respondents.

### Career Stressors — Electrical Contracting Respondents

*Question: With regard to your career, what, if anything, keeps you up at night?*

*Base: Electrical Contracting respondents (n=588)*



**Fig. 26.** In the 2019 survey, electrical contractors were the only group to list concern about the financial health of their companies as the most pressing issue. This year, that fear was replaced by work/life balance concerns, inflation, and staffing issues.

The low number of contracting, CIE, and industrial workers reporting the availability of remote work arrangements could mean many workers have seen them snatched away. Annual surveys of electrical contracting and electrical design firm professionals by *EC&M* have found they were commonplace during the pandemic but have since tailed off.

#### WORRIES APLENTY

The loss of that perk for those who had it — and may have liked it because it made their lives more manageable — could partly explain why this year’s salary and job satisfaction survey finds “work/life balance concerns” rising sharply to the top spot on a list of possible nagging career-related worries. From a list of nearly a dozen possible things “that keep you up at night,” (Fig. 26 through Fig. 29 on page

38) it was ranked No. 1 across all sectors, drawing mentions from 43% on average.

That’s not surprising. The pandemic brought more attention to the work/life balance and employment conditions issue, and it has stuck. Human resources consulting firm Gartner, Inc., put efforts to equalize workplace flexibility on a 2023 list of workplace trends to watch. Having granted many desk workers remote work, employers will be looking to offer frontline workers more work schedule control and stability, more liberal paid leave, and more say in what’s worked on, how, and with whom.

Close behind work/life balance on the worry list were staffing issues (35% average); economy/inflation (33%); staying current with codes and standards (26%); staying current with new and emerging technologies (19%). Additionally, a

trio of separately listed concerns closely linked to the issue of remuneration — satisfaction with salary/compensation; annual performance reviews/feedback; and annual cost-of-living raises — combined to produce an average of 36%.

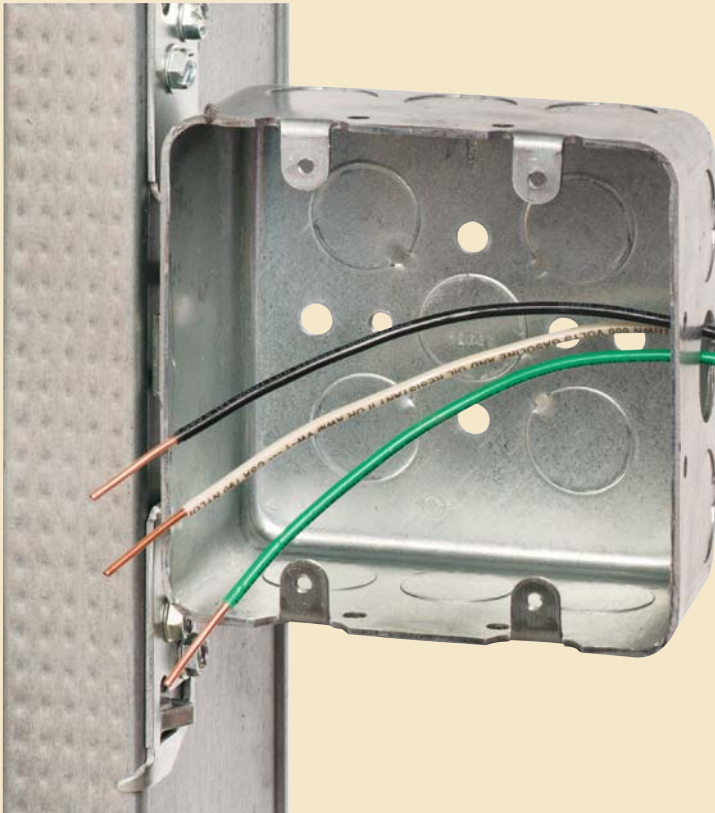
The rankings offer strong proof that despite data showing rising salaries, attractive bonuses, and ample fringe benefits packages, pocketbook and working conditions issues remain top of mind. But they also show that there may be a lot of free-floating job- and career-related anxiety — maybe a lot more than just four years ago.

This year, around 17% checked the “I have no meaningful career stressors” box. That was seven percentage points lower than in 2019. Other comparisons are notable. Work/life balance concerns registered an increase of 10 percentage points

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# SNAP<sup>2</sup>IT<sup>®</sup> 90° CONNECTORS

WITH and WITHOUT INSULATED THROAT



**FAST, EASY  
REMOVE CLIP  
to REMOVE  
CABLE**



38900AST



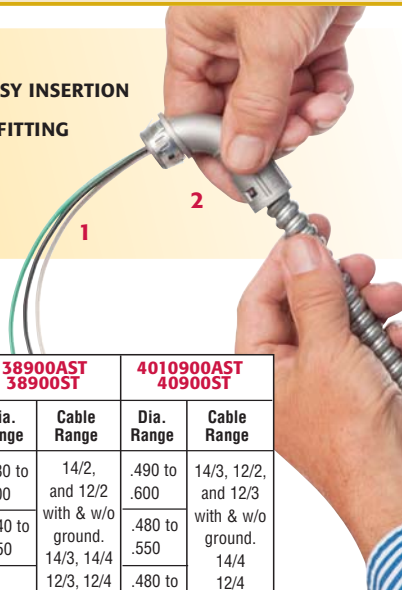
4010900AST



40900ST

**EASY TO INSTALL**

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- 2 INSERT CABLE INTO FITTING
- 3 SNAP ASSEMBLY INTO BOX  
(SEE ABOVE)



**90° SNAP2IT<sup>®</sup>  
CABLE RANGES**

CABLE TYPE	38900AST 38900ST		4010900AST 40900ST	
	Dia. Range	Cable Range	Dia. Range	Cable Range
MC/HCF/AC Steel & Aluminum	.380 to .600	14/2, and 12/2 with & w/o ground.	.490 to .600	14/3, 12/2, and 12/3 with & w/o ground.
MCI-A Steel & Aluminum	.440 to .550	14/3, 14/4	.480 to .550	14/4
AC90, ACG90		12/3, 12/4 10/2	.480 to .550	12/4 10/2
Flexible Metal Conduit Steel & Aluminum (RWFMC)	3/8" Flex* *CSA Listed w anti-short bushing ONLY			

- Easy snap-in cable installation *Save time over 90° 2-screw MC Connectors at same cost per connector*
- Handles widest range & variety of cables: 14/2 to 10/2 AC, MC, HCF, MC continuous corrugated aluminum cable, MCI-A cables (steel & aluminum), AC90 and ACG90
- Fast, secure installation...No pullout
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1 MINUTE  
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over 2-screw  
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**Arlington<sup>®</sup>**



with and without insulated throat



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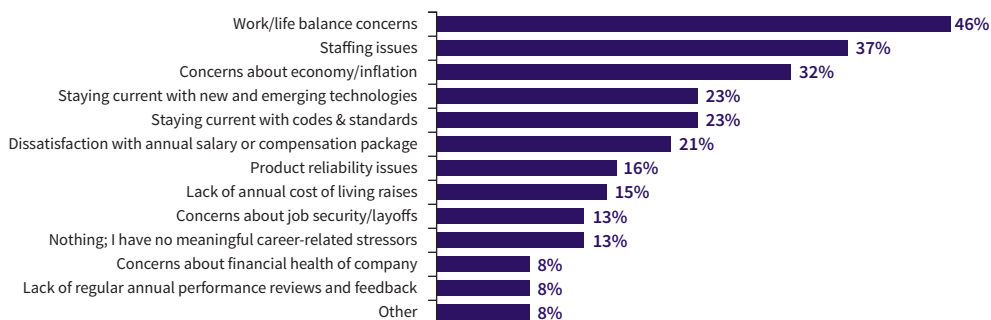
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Product Info [aifittings.com/landing/90-degree-connectors/](http://aifittings.com/landing/90-degree-connectors/)

### Career Stressors — Industrial Facility Respondents

*Question: With regard to your career, what, if anything, keeps you up at night?*

*Base: Industrial Facility respondents (n=261)*

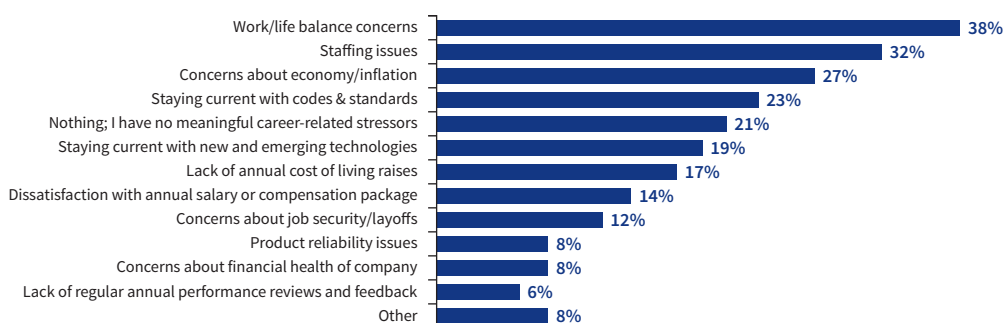


**Fig. 27.** Work/life balance (46% in 2022 compared to 38% in 2019) came in as the primary stressor among industrial respondents.

### Career Stressors — Commercial, Institutional or Educational Facility Respondents

*Question: With regard to your career, what, if anything, keeps you up at night?*

*Base: Commercial, Institutional or Educational Facility respondents (n=216)*

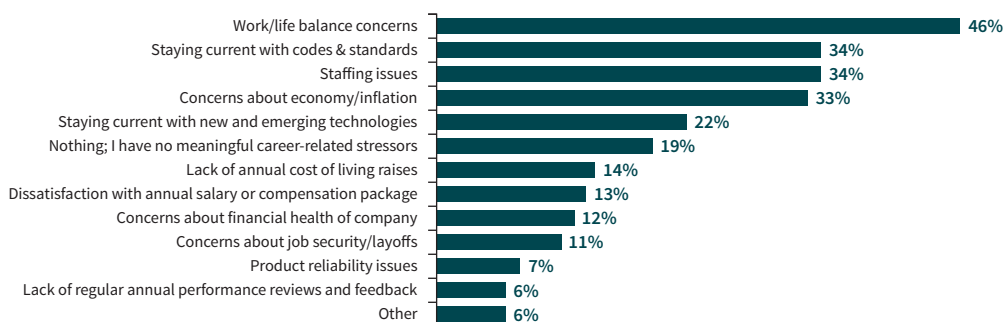


**Fig. 28.** Similar to their industrial counterparts, CIE respondents named work/life balance concerns as their leading career stressor.

### Career Stressors — Engineering Respondents

*Question: With regard to your career, what, if anything, keeps you up at night?*

*Base: Engineering respondents (n=241)*



**Fig. 29.** In 2019, 42% of engineering respondents named work/life balance concerns as their top career stressor. In 2022, that number increased slightly to 46%, indicating that this concern continues to keep many electrical engineers up at night.

over 2019; economy/inflation concerns, 15 points higher; staffing issues, 12 points higher; the challenge of staying current on codes/standards, 12 points higher; keeping pace with technological changes, two points higher; and concerns about job security/layoffs, seven points lower.

#### DEMANDING, BUT MANAGEABLE WORK

The leading stressors seem to share a common thread: anxiety about the ability to keep pace — with the rising cost of living

and rate and nature of change in their fields that could ultimately impact job security — without sacrificing a well-rounded life. On that top-line score, the survey finds electrical professionals are persevering and, thanks to seemingly supportive employers, ultimately finding that middle ground.

Though work/life balance tops the list of stressors, a core constituent of that — time spent on the job — seems reasonable to most respondents. Two-thirds strongly or somewhat agree they can get their work done in a 40- to 45-hour work

week (Fig. 30 on page 40), a slightly higher share than in 2019. The “strongly agree” group rose six percentage points. Electrical contracting and engineering workers scored notably higher on agreement in both years. Still, about 20% of total respondents disagreed in 2023, a slightly lower number than in 2019.

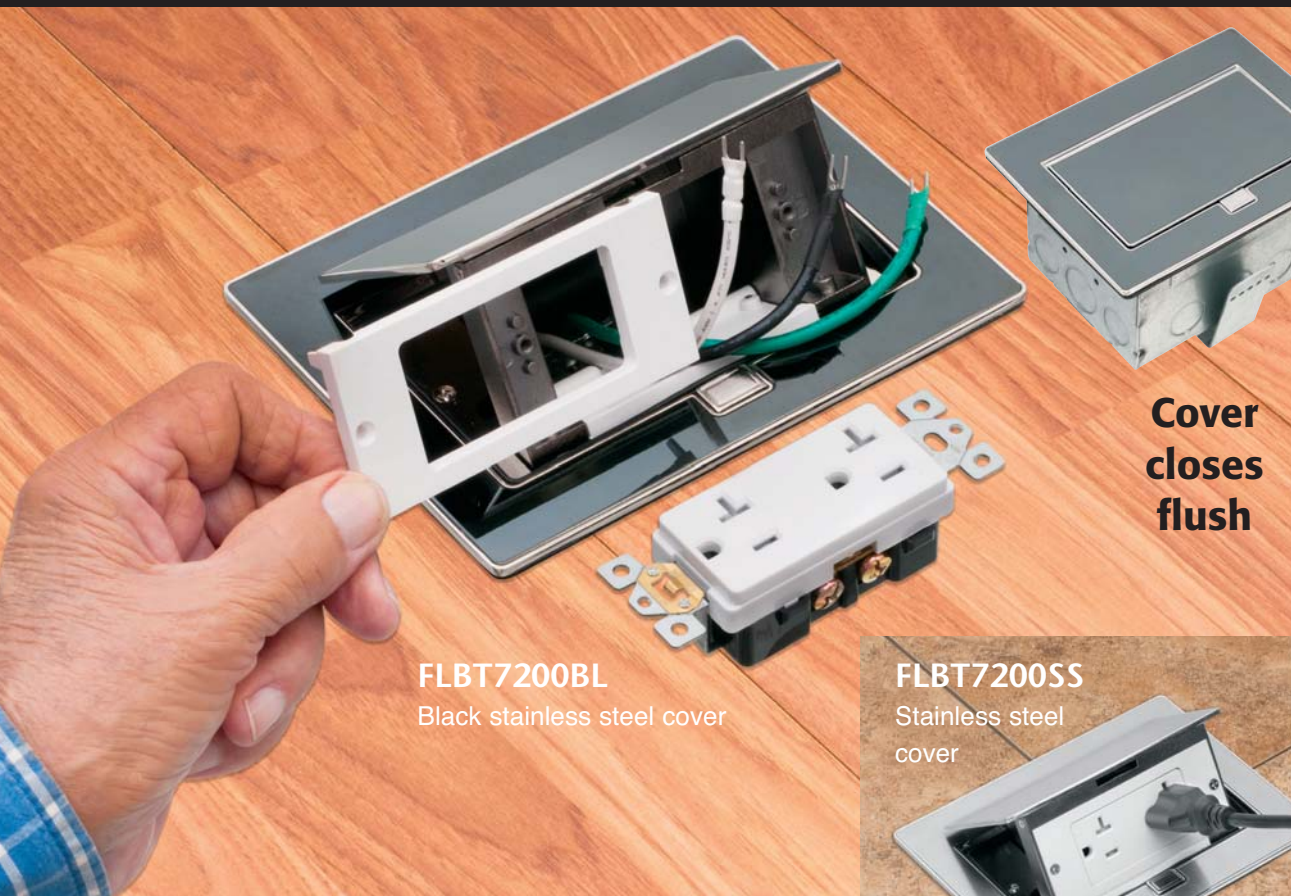
Likewise, keeping up with emerging technologies and codes and standards may be stress points for a fair number of workers, but most indicate they have resources that should help them cope.



STAINLESS STEEL • POP UP COVER

# FLOOR BOX KITS

EASY RECEPTACLE INSTALLATION • **NO DISASSEMBLY!**



**Cover  
closes  
flush**

**FLBT7200BL**  
Black stainless steel cover



**FLBT7200SS**  
Stainless steel  
cover

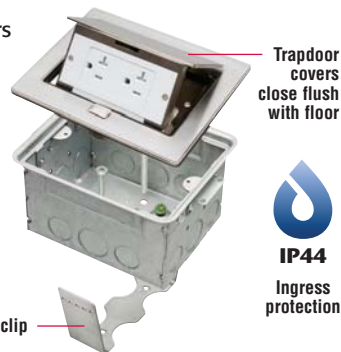
Arlington's **Pop-up COVER/BOX KITS** provide options for installing a device in a floor – or a countertop!

The kits include a 20A receptacle OR you can install one of your own. It's *easy*.

The device installs from the front. There's no need to dismantle the hinge mechanism. Just remove the white cover plate, install the receptacle and replace the cover plate.

Gasketed stainless steel or black stainless trapdoor covers close flush with the surface, preventing damage to the device and minimizing trip hazards in a floor installation.

- Easy **'No Glue'** installation – the spring steel clip holds box securely against the surface when screws are tightened
- Fits surfaces up to 1-1/2" thick
- Uses standard rectangular receptacle, and GFCI, and GFCI/combination receptacles



Trapdoor covers close flush with floor

**IP44**  
Ingress protection

Spring steel clip holds box against surface

Patent pending



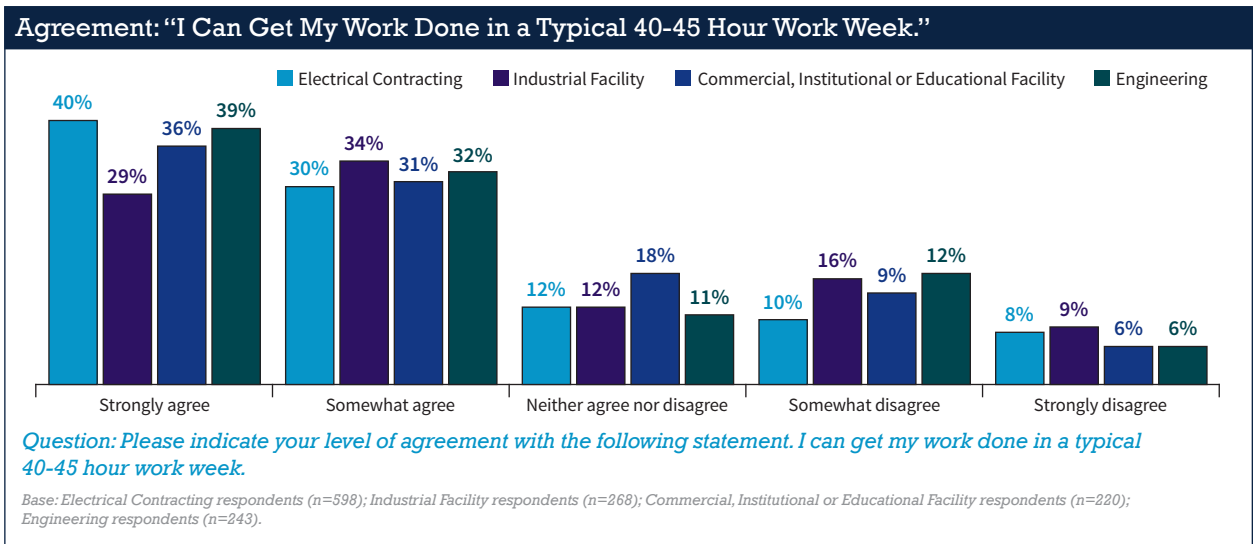
**UL** US  
Listed as floor box



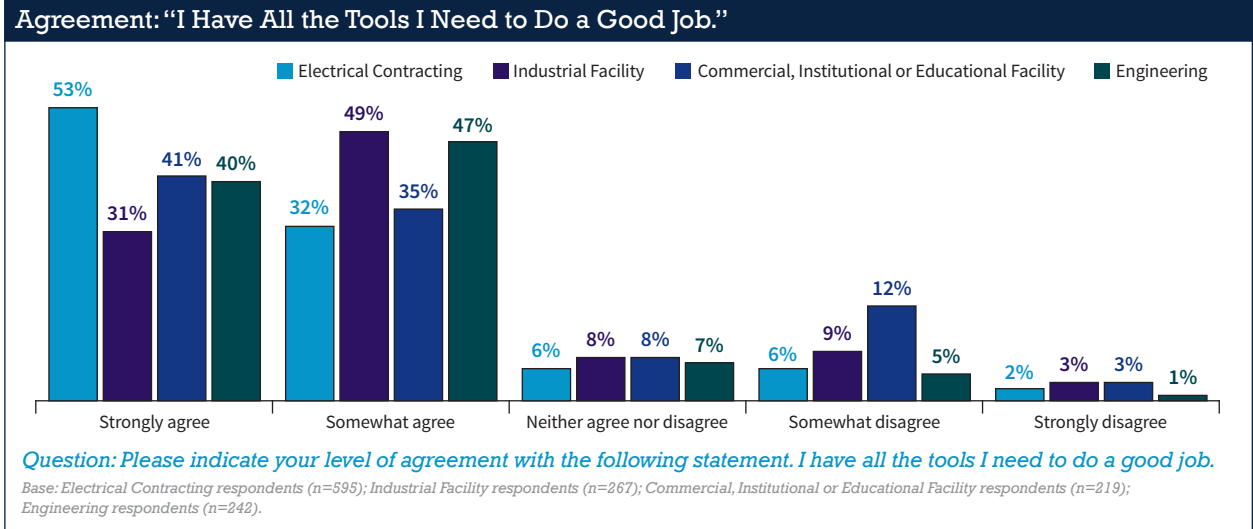
**Arlington**<sup>®</sup>

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Product Info [aifittings.com/landing/flbt7200-floorbox-kits](http://aifittings.com/landing/flbt7200-floorbox-kits)



**Fig. 30.** In the 2023 survey, a greater percentage of respondents in every single category either somewhat agreed or strongly agreed they could complete their work in 45 hours a week or less compared with respondents in the 2019 survey.



**Fig. 31.** Mirroring the results from 2019, the majority of respondents felt like they have the tools needed to do their jobs well.



**Fig. 32.** Most respondents from all four industry groups reported having all the training they need to do a good job.



DUPLEX • DIECAST ZINC

Made in USA

## COMBINATION COUPLINGS

TRANSITION from EMT to FLEXIBLE METAL CABLE... THE EASY WAY!



3/4" EMT

**8675**  
SNAP<sup>2</sup>IT®

**NEW**

BOTH STYLES  
secure cables  
independently

**8675SG**  
Saddle Grip®



**Arlington®** 800/233-4717 • [www.aifittings.com](http://www.aifittings.com)

Arlington's new duplex diecast couplings save time and money! They allow **easy transitions from 3/4" EMT to 3/8" trade size flexible metal cables** – perfect for running MC cable above a drop ceiling and connecting to **surface mounted EMT** to feed a box or switch.

**8675** and **8675SG** combination couplings install easily on AC, MCI-A, HCF steel and aluminum cable, flexible metal conduit (steel and aluminum, regular and reduced wall), MCI cable and continuous corrugated aluminum. And offer independent securing of different size cables.

- Tested, LISTED to exceed UL ground fault requirements
- **Ships Assembled** – Compatible with 3/4" EMT

Available in Snap<sup>2</sup>It® ...and SADDLE GRIP® styles



8675

8675SG



Patent pending

Product info [aifittings.com/landing/zinc-combination-couplings](http://aifittings.com/landing/zinc-combination-couplings)

NON-METALLIC • VENTED FOR EASIER STACKABILITY

## CONCRETE PIPE SLEEVE

THE EASY, ECONOMICAL WAY TO SLEEVE THROUGH CONCRETE POURS!



CPS40  
Pipe Sleeve  
for 4" hole

Arlington's **Concrete Pipe Sleeves** are the economical way to sleeve through concrete pours in tilt-up construction WALLS – and FLOORS *allowing cable and conduit to run easily from one floor to the next.*

No costly core drilling – No cutting holes in the form. Plus, you can position the hole prior to pouring the concrete.

- Attaches to form with nails or screws
- Stackable up to 23" h for extra deep pours
- Vents keep wet pipe sleeves from sticking together
- Multiple hole sizes: 1-1/2" • 2" • 3" • 4" • 5" • 6"



CPS40



Nail sleeve to form.



After concrete sets, cut sleeve flush with surface.



Insert conduit into sleeve.



**Arlington®** 800/233-4717 • [www.aifittings.com](http://www.aifittings.com)



Product info [aifittings.com/landing/concrete-pipe-sleeve](http://aifittings.com/landing/concrete-pipe-sleeve)

Some 80% at least basically agreed they “have all the tools I need (Fig. 31 on page 40) to do a good job.” Though undefined, “tools” could mean anything from technology and resources to authority and physical tools. Engineering and electrical contracting workers were more likely to agree. And agreement took a jump from 2019. Then, only about three-quarters expressed some agreement that they had the necessary tools.

In the same vein, roughly three-quarters strongly or somewhat agreed they had all the training needed to do their jobs well (Fig. 32 on page 40). Fewer industrial respondents agreed, while more engineers did. Another gauge of employer support, as well as the level of readiness a worker brings to the job, training is a factor that

can influence a wide range of overall job satisfaction measures.

### ANGST ASIDE, SATISFACTION REIGNS

On that big-picture front, despite ample areas of concern and stress, electrical professionals are mostly in accord. By wide margins, they say they’re not only content in their jobs, but they’re also passionate about what they do for a living.

Those sentiments aren’t equally shared across sectors, but roughly three-quarters overall strongly or somewhat agree they “love their current job,” (Fig. 33) and an even higher share are similarly inclined to agree they’re “satisfied with their current position.” (Fig. 34) The share of CIE workers in agreement

was lower than the others on both questions. Electrical contracting and engineering workers showed the most agreement. The findings overall were little changed from the 2019 survey.

But the share reporting very high levels of job satisfaction may not stack up to that of the general U.S. workforce. A recent Pew Research Center survey of U.S. workers found about half are extremely or very satisfied with their jobs; the *EC&M* survey found about 42% agreeing they were extremely satisfied. But in another comparison, a 2023 survey of U.S. workers from The Conference Board found 62% satisfied, the highest level since the survey began in 1987. That’s lower than the 80% of electrical professionals saying they were extremely or somewhat satisfied.

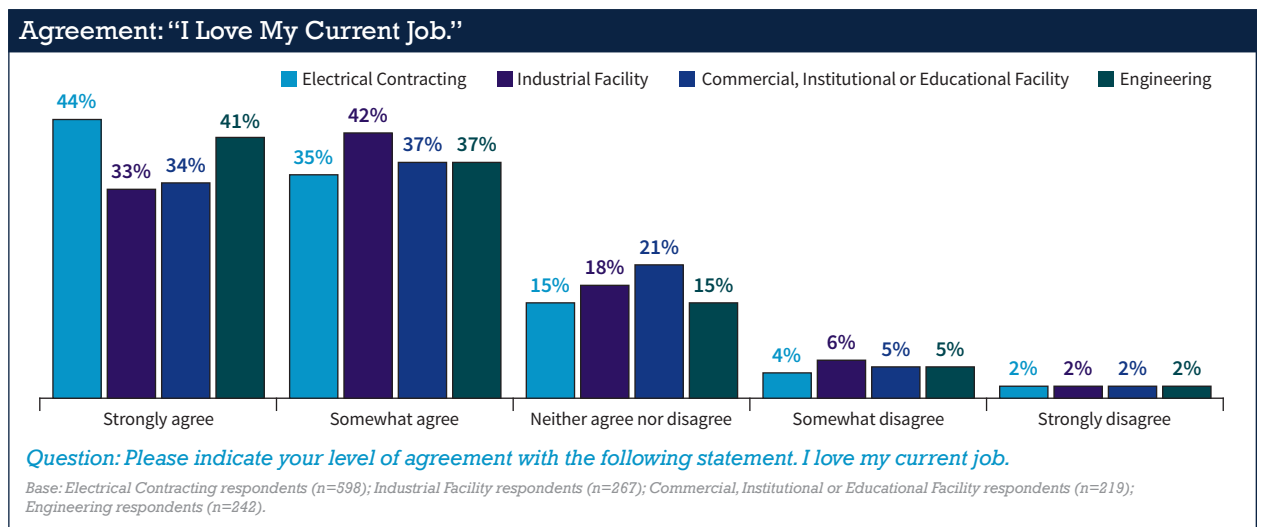


Fig. 33. Roughly 75% of respondents overall strongly or somewhat agreed with the statement: “I love my current job.”

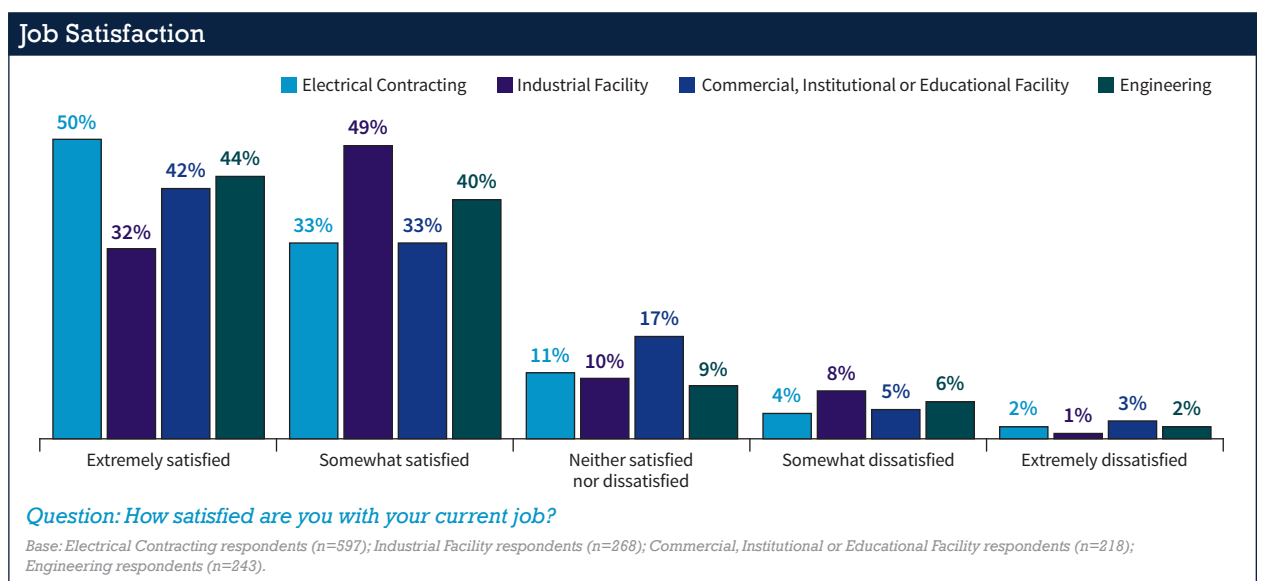


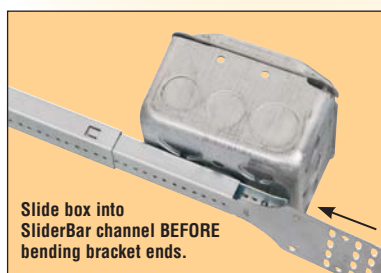
Fig. 34. The overwhelming majority of respondents from all groups seemed to be satisfied with their current position.

LISTED • LOOKS GREAT • SAVES TIME

# ADJUSTABLE SLIDERBAR<sup>®</sup>

**NOW**

## WITH FLAT BRACKETS



Here's the easy way to mount single or two-gang boxes between wood or metal studs with non-standard stud cavities.

Arlington's steel SLIDERBAR<sup>™</sup> looks great and **saves about 20 minutes per box** over cutting, nailing and placing extra 2x4s! It's available in two styles – with pre-bent brackets – or FLAT BRACKET ends. And in two adjustable sizes for studs spaced 12 to 18 inches – or 15 to 24 inches apart.

The extra convenient SliderBar with FLAT brackets comes with a steel mounting bracket for installing almost any metal box, and our plastic SLB101 and SLB102 boxes, on the bar anywhere in the stud cavity.

Use the SL18BKT mounting bracket to add another metal box on FLAT SliderBar.

- **Guides on bracket ends** assure proper positioning on studs
- **Interlocking tab stop** prevents accidental disassembly
- **Pre-punched pilot holes** on BOTH sides of SLIDERBAR allow for easy attachment of boxes



**SL18F FLAT SLIDERBAR KIT** Adjusts to fit between studs, 12" to 18" o.c.

**SL24F FLAT SLIDERBAR KIT** Adjusts to fit between studs, 15" to 24" o.c.

SL18F, SL24F include flat SliderBar, steel mounting bracket, (2) #8 x 1/2" screws

**SL18BKT** Steel Mounting Bracket w mounting screws

**SLB101 PLASTIC BOX** Single gang • pre-formed screw holes

**SLB102 PLASTIC BOX** Two gang • pre-formed screw holes



Metal boxes mounted on SliderBar are rated for non-metallic and MC, AC and Flexible Metal Clad cable

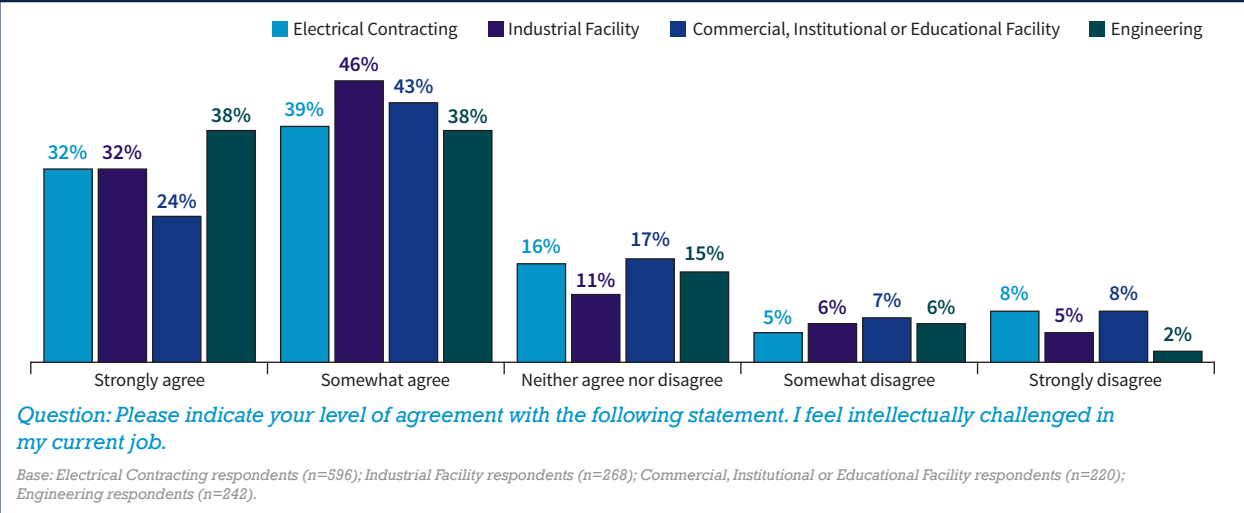
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Product info [aifittings.com/landing/sliderbar](http://aifittings.com/landing/sliderbar)

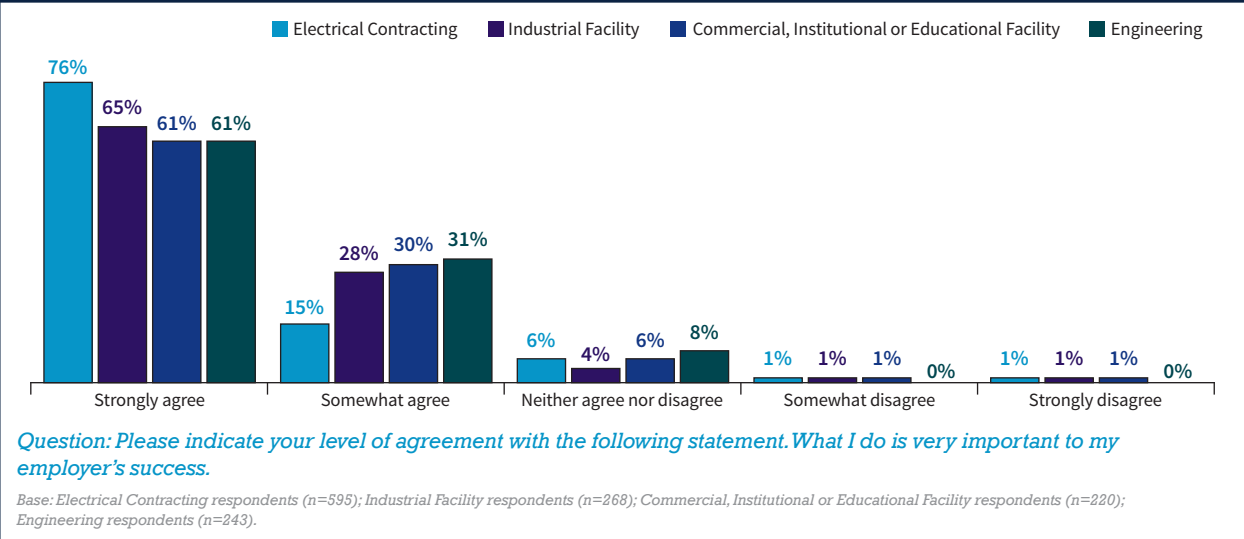


### Agreement: "I Feel Intellectually Challenged in My Current Job."



**Fig. 35.** Across the board, a solid majority of respondents strongly or somewhat agreed to feeling intellectually challenged at work.

### Agreement: "What I Do is Very Important to My Employer's Success."



**Fig. 36.** Approximately 90% of respondents indicated their work had a direct impact on their employers' success, which is much higher than the 62% average among a national Pew survey of the general population.

The ingredients for job satisfaction are many. On par with compensation for many is a sense of utilizing skills and talents in pursuit of attaining fulfillment, personal growth, and contribution. That comes through in the survey.

A solid majority strongly or somewhat agreed they "feel intellectually challenged" in their jobs (Fig. 35). That share has gone up since the 2019 survey, especially for electrical contracting workers, 61% to 71%. Across sectors, only about 10% voiced disagreement.

On the ultimate measure of job satisfaction, the one that creates the important two-way street that brings workers and

employers together in pursuit of their goals, electrical professionals are of almost one mind. On the question of whether they feel what they do is "very important to my employer's success," 90% agreed (Fig. 36), most strenuously so. That percentage edged up from 2019 by around three percentage points on average. Moreover, it is much higher than the 62% who told the Pew survey they felt their employers valued their contributions either a great deal or a fair amount.

In coming years, success — hard-earned and fairly shared — could be ripe for the taking for many electrical professionals and the organizations

that employ them. Highly trained and skilled electricians and engineers will be in demand and possibly in ever shorter supply as the profession battles an aging workforce and a dearth of new entrants. A growing and dynamic economy will look to their employers to execute projects that will be a bedrock of the infrastructure growth, ongoing maintenance, and energy transformation challenges ahead. The 2023 Electrical Survey and Career Report shows both parties are moving toward that promised land — maybe haltingly at times — but ultimately together and to each other's mutual benefit. **EC&M**

# SNAP<sup>2</sup>IT<sup>®</sup> STEEL CONNECTORS

NO TOOLS

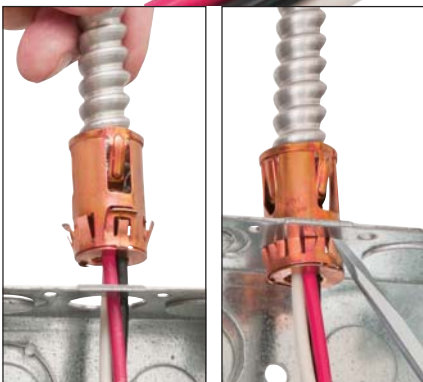
EASY SNAP IN INSTALLATION

**NEW!**  
**ONE-PIECE**  
**ALL STEEL**



TINTED 40STS

38STS



**Easy Snap-in  
Insertion**

**Easy Screwdriver  
Removal  
NO SPECIAL  
TOOL**



Arlington's new, *one-piece* Snap2It<sup>®</sup> **steel** connectors offer easy, secure installation. And save time! Just push the cable into the connector and rotate it clockwise.

Available in 3/8" trade size, both connectors install into a 1/2" knockout, and are listed for steel and aluminum AC, HCF, MCI and MCI-A cable.

*The tinted 40STS has more room inside for easier cable insertion.*

In Canada both connectors are Listed for use with AC90 and ACG90 cable.

- Tested to UL 514B and Listed to meet UL ground fault requirements
- **Removable** Unscrew the connector counterclockwise to remove it *from the cable*. Remove the connector *from the box* using a flat blade screwdriver. Release the snap tangs from the inside of the box while pulling the connector out of the knockout.



• Packed in heavy-duty, 200 piece boxes



**Arlington<sup>®</sup>**

**CATALOG  
NUMBER**

**CABLE RANGES** STEEL Snap2It<sup>®</sup> connectors

**38STS**

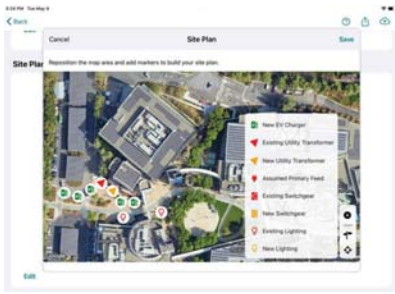
**AC, HCF, MCI, MCI-A** 14/2 w ground, 14/3, 14/2  
12/2 w ground, 12/3, 12/2 • 10/2 w ground, 10/3, 10/2  
.405" Dia. **Minimum** to **.605" Dia. Maximum**

**40STS**  
Tinted

**AC, HCF, MCI, MCI-A** 12/2 w ground, 12/3, 12/2 • 10/2 w ground, 10/3, 10/2  
.480" Dia. **Minimum** to **.605" Dia. Maximum**

Patented. Other patents pending.

www.aifittings.com • 800/233-4717 Scranton, PA 18517



## Mobile App

The company introduced the interactive Site Plan feature to its existing app, which is available for download from the App Store and Google Play. The feature is designed to aid in cataloging existing equipment and capturing information for proposed new equipment by automatically rendering an image of the job site's location via Google Maps site information. Users can then place markers for assumed primary feeds along with existing and new electric vehicle (EV) chargers, utility transformers, switchgear and lighting.

*Conduit*



## LED Tube

The ComboDrive X3 LED tube is a UL Type A and B tube with selectable color select technology (CTT) and can be used as either a UL Type A LED tube with an instant start ballast or a UL Type B LED tube in a ballast bypass application. It features five selectable color temperatures (3,000K, 3,500K, 4,000K, 5,000K, and 6,500K), which can be easily changed with a switch. The tube can be installed via plug-and-play method by switching out the old fluorescent tube without any changes to the original ballast wiring, or it can be installed via ballast bypass by connecting the tube directly to the 120V-277V line voltage. Additionally, the lamps feature a 50,000-hr lifetime and are dimmable with compatible dimming ballasts.

*Keystone Technologies*



## Brushless Tools

The company recently added new options to its family of M18 compact brushless tools: the M18 compact brushless ½-in. drill and the M18 ¼-in. hex impact driver. These tools are designed to improve access in tight spaces while providing faster application speeds. The drill features metal chunks and gearcases for durability on the job site. It also comes in a ½-in. brushless hammer drill option designed for light-duty concrete drilling applications. The hex impact driver measures 4.4 in. long by 2.1 in. wide and offers fast driving speeds, durable all-metal gear case/premium components for durability, and an optional 3-speed version.

*Milwaukee Tool*



## Smart Lighting

Netatmo smart lighting solutions offer users the ability to set scenes, create automated schedules, and control lighting remotely. The solutions are offered in three kit options that include pre-paired devices that are designed to work together to allow for wireless control of existing loads connected to switches, dimmers, or outlets. These solutions are installed in place of standard switches and outlets and can connect to Amazon Alexa, Google Assistant, Apple HomeKit, or other home automation devices.

*Legrand*



## Cable Cleat

The CCSSQD3339-X stainless-steel quadrafoil cable cleat is designed to offer strong cable protection in challenging environments and high short-circuit current scenarios. Certified to IEC 61914 standards and tested for fault currents up to 190kA peak, its main purpose is to securely anchor cables, even in short-circuit situations. Features include compatibility with 33-mm to 39-mm diameter cables, flexible installation options via a separate bracket, or direct attachment using a fixing hold and M8 bolt. The cable cleat is crafted from corrosion-resistant 316L stainless steel and also features a removable spacer for installation convenience.

*Panduit*



## Cable Installation Manual

The company recently released a concise cable installation manual, titled "Top 20 Best Practices and Guidelines for Cable Installations." Published by the company's CableTechSupport services, it covers the purpose of conduit, cleaning instructions, dealing with conduit in low or extreme temperatures, maximum pulling tension, cable sheaves, sidewall bearing pressure, and more. It is available for download in PDF format.

*Southwire*



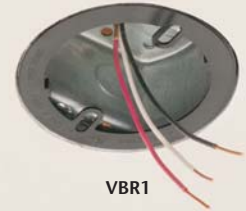
# PREVENT AIR INFILTRATION

## AROUND STEEL AND PLASTIC BOXES

**NEW**  
Multi-Gang  
and Round



Round or Octagonal  
ceiling boxes



VBR1



Single and  
Multi gang boxes



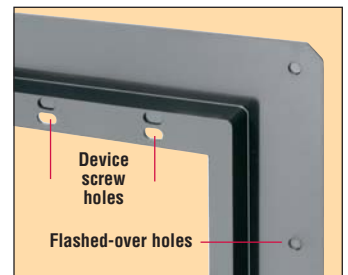
VB2



Arlington's vapor barrier covers prevent air infiltration around single, and **NOW two- and three-gang outlet boxes and round and octagonal ceiling boxes, without the need for a gasket.**

Installation is easy. Two screws hold the vapor barrier cover temporarily in place during the installation of 1/2" or 5/8" drywall, through the device screw holes or the flashed-over holes in the flange. After the drywall's installed remove the screws, *if using the device screw holes*, and install the device.

Designed for new work, VB1 and the **new VB2, VB3** and the round **VBR1** install on most plastic or steel boxes.



**Arlington**®



VB1



VB2



VB3

for single-gang round  
or octagonal boxes



VBR1

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### Box

RACO's Grand Slam box is designed to provide a quick and easy way to terminate home run branch circuits and other electrical wiring. Designed for commercial applications, the box features the company's STAB-iT II connectors for MC, built-in ground bar and cable management.

Hubbell



### Smart Remote

The Pico paddle remote is designed to feel like a classic paddle switch with smart capabilities. It works with the company's residential smart devices, including the Caséta family of products as well as RadioRA 3 and Homeworks connected lighting control systems. The remote can be placed on walls/pedestals or controlled by hand and doesn't need Wi-Fi to operate. Users can add an additional point of control anywhere to control multiple dimmers at once from a single device. It features a 10-yr battery life and requires little ongoing maintenance.

Lutron Electronics



### Conduit Hub

The T&B Fittings cylinder hub is designed for hygiene-critical applications and is available in 1/2-in. to 2-in. NPT trade sizes. Made of 316 stainless steel for hygiene and corrosion resistance, the product features an NSF-certified seal to cover exposed threads, helping reduce the opportunity for microbes to pool and grow within those threads. The hub meets UL Type 4X, IP 66, and IP 67 standards to withstand harsh washdown environments.

ABB



## Presents Jobsite360 Lighting and Power Distribution Solution



### Power Distribution Box

Serviceability and durability designed for the modern jobsites.



Beacon120 Highbay



Beacon360 Blaze



Beacon360 Spark

### Temporary Lighting

Plug and play lights purpose-built to save contractors time & money while creating a safer, more efficient jobsite.



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[info@lindequipment.net](mailto:info@lindequipment.net)

1.877.475.5463



## STEEL BOX WITH BRASS COVER

LISTED  
SINGLE GANG

# FLOOR BOX KITS

CONVENIENT, FLUSH-TO-THE-FLOOR RECEPTACLE INSTALLATION



**FLB5331NL**  
Single gang  
steel box kit  
w nickel-plated brass cover



**FLB5331MB**  
Single gang Kit  
w brass cover

Arlington's **STEEL FLOOR BOX KITS** give installers a low cost, *convenient* way to install a receptacle *in a new or existing floor*.

**Our Listed Single Gang Steel Floor Boxes deliver easy, flush-to-the-floor installation.**

- Brass covers hide miscut flooring; gaskets prevent water intrusion; flip lids protect the box when it's not in use.
- Single gang brass and nickel-plated **Brass Covers** fit our boxes *and other manufacturers' single gang boxes*.

*Covers also sold separately.*



**FLB5331MB**  
Single gang  
steel box kit w brass cover



**for NEW or existing floors**



Product info [aifittings.com/landing/flb5331-flb5551-kits](http://aifittings.com/landing/flb5331-flb5551-kits)

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# IN BOX® RECESSED COVER KITS

INSTALLS INSIDE 4.5" CONCRETE BOXES



Plugs  
stay inside  
recessed  
cover



**FLBC4560DNL**



**Slotted in-use cover**



**Easy to install in concrete box**

**FLBC4500**

**FLOOR BOX FOR NEW CONCRETE**

Arlington's **IN BOX® Recessed Cover Kits** are the neat way to install a receptacle in an installed 4.5" concrete floor box, including our **FLBC4500** or **FLBC4502** boxes.

**IN BOX** covers install fast, *inside the can* reducing trip hazards caused by plugs sticking out of the box. They look great. And, you can have power and low voltage in the same box.

Assembled **IN BOX**, comes with matching in-use slotted cover and cover blank for unused boxes in **brass or nickel-plated brass**

**FLBC4560DMB**  
Brass

**FLBC4560DNL**  
Nickel-plated

**Cover blank**  
**Slotted cover**

**FLBC4560DBR**  
Brown

...and plastic in FIVE colors.

**FLBC4560DGY**  
Gray

**FLBC4560DCA**  
Caramel

**FLBC4560DBL**  
Black

**FLBC4560DLA**  
Light almond



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Product info [aifittings.com/landing/inbox-cover-kits/](http://aifittings.com/landing/inbox-cover-kits/)

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# Motors, Drives, Motor Controls, Power Distribution Equipment

## VFD Motor

According to the company, the SynRA variable-frequency motor provides the starting benefit of an induction motor, the operating benefit of a pure synchronous reluctance motor, and suitability benefit from the simple volts/hz drive. The design allows installers to replace components individually instead of the entire system. Integrated smart building technology gives less wear and tear on pump systems by preventing overexertion and more speed than necessary to meet application demand. In addition, the motor's synchronous reluctance rotor with an aluminum cage design has an absence of magnets to allow for easy programming and compatibility with existing variable-frequency drives (VFDs) or simple VFDs. The SynRA motor is also available already fully-integrated with the company's ID300 VSD.

**Nidec Motor Corp.**



## Modular Induction Motor

The AMI 5800 NEMA modular induction motor offers energy efficiency and reliability in demanding applications, such as pumps, compressors, fans, extruders, conveyors, and crushers. Rated for a power output of up to 1,750 hp, it features a modular mechanical construction and flexible electrical design to suit both new build and retrofit projects. Its high-strength welded steel frame lowers stress on the motor while mitigating vibrations/resonance to ensure reliable operation in harsh conditions with a design life of 25 yr or 20,000 starts, according to the company. In addition, the AMI 5800 has a shorter bearing-to-bearing span compared to previous models.

**ABB**

## Severe-Duty Motors

The SIMOTICS SD200 severe-duty motor in frame size 440 is the latest offering in the low-voltage SIMOTICS motor family. Providing high productivity and energy-efficient operation in all torque ranges, the cast-iron motors are built to power pumps, fans, compressors, hoists, winders, and similar equipment in harsh environments. They offer 75-hp to 800-hp output and feature 444-5013 cast-iron frames for operation in 460V and 575V ranges. According to the company, they meet or exceed NEMA Premium MG1 Table 12-12 efficiencies. A wide selection of options is offered, including IP 56 ingress protection, encoders, brakes, blowers, and more. Additionally, the motors feature cast-iron end shields, frame, fan guard, and an easily accessible, diagonally split, oversized terminal box, along with zinc-plated hardware, epoxy paint, and stainless steel nameplates. The offset rotor bar improves efficiency, while larger bars/end rings reduce resistance. Each die-cast aluminum rotor assembly also includes a high-strength C1045 carbon steel shaft. Premium C5-grade steel laminations and copper magnet wire are standard. The insulation system meets NEMA MG1 2014 Part 31 standards.

**Siemens**

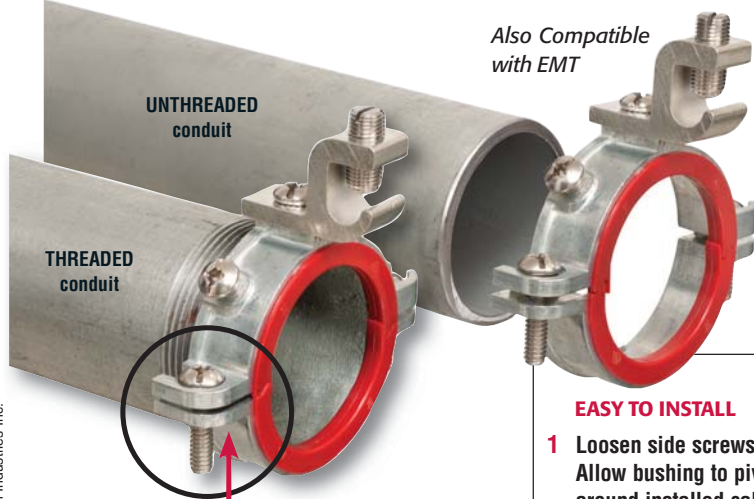




## SPLIT GROUNDING BUSHINGS

for THREADED and UNTHREADED RIGID and IMC

**EC&M**  
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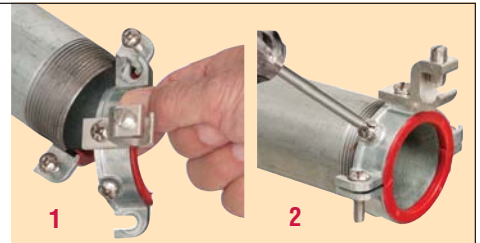
Also Compatible with EMT

Get convenience and time-savings with Arlington's 550 series **SPLIT grounding bushings**. The split allows the addition of a bushing **AFTER** conductors are installed in threaded or unthreaded Rigid/IMC conduit. Great for tight spaces!

- In 1/2" to 4" trade sizes – Ships Assembled
- Compatible with EMT, 2-1/2" to 4" trade sizes, and threaded electrical fittings

### EASY TO INSTALL

- 1 Loosen side screws. Allow bushing to pivot around installed cables
- 2 Tighten set screw to seat bushing on conduit



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**SPLIT**



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### GALVANIZED STEEL



# CABLE SUPPORT

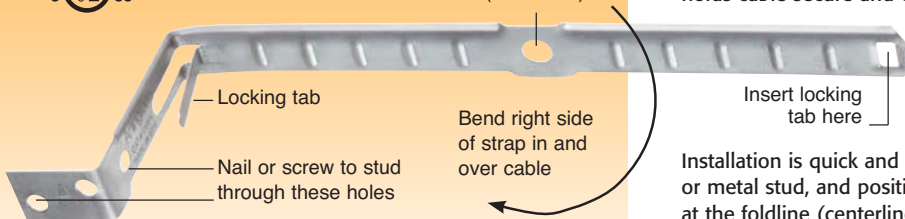
**ECONOMICAL...HOLDS UP TO FOUR MC CABLES • EASY TO INSTALL**



Nail or screw on **CUS6**

Foldline (centerline)

Arlington's economical CUS6 galvanized steel Cable Support holds cable secure and centered on a metal or wood stud.



It's perfect for fastening and positioning *up to four* individual metal clad cables – or six NM cables on a 2x4.

Installation is quick and easy. Nail or screw **CUS6** to a wood or metal stud, and position the cables. Next bend the strap at the foldline (centerline). Fold the strap over the cables and insert the locking tab in the opening as shown to hold them securely in place.

- Complies with 2020 NEC, article 300.4(D)

*Holds up to four MC cables centered on a 2x4!*



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## Battery Energy Storage Systems

The zero-emissions SBE series of stationary battery energy storage systems (BESSs) pairs with the company's line of gas and diesel generators for full-facility resilience during long-duration blackouts and pairs with on-site solar to help reduce both carbon footprint and energy costs. Available in energy capacities ranging from 200kWh to 1,000kWh, the new stationary BESSs enable commercial and industrial customers to save on energy costs by reducing peak charges and taking advantage of utility time-of-use rates. The products can also provide site resilience during brownouts/power quality issues and back up critical loads during shorter-duration blackouts. Customers also have an opportunity to earn additional revenue by monetizing the energy storage asset to support grid resilience.



**Generac Power Systems**



## Combination Starter

The XT compact combination starter is designed to provide complete motor circuit protection in a cost-effective, compact solution. It is a UL 508A Type F combination motor controller that consists of an XT contactor and a manual motor protector (MMP). Standard options, including a control power transformer (CPT), cover controls, and terminal blocks, reduce product complexity while still providing the flexibility to meet application-specific needs, according to the company. The optional BACnet communication module allows for simple integration into building automation systems. Finally, the reduced footprint, cohesive layout, and replaceable components make it easy to start and maintain.

**Eaton**

## Home Standby Generators

The new PowerProtect home standby generator line features NGMax technology that delivers maximum power on natural gas fuel. The line includes 13kW, 18kW, 22kW, and 26kW PowerProtect home standby generators. The 13kW home standby generator provides essential power homeowners need during an outage. With 37kVA of motor starting power, the 13kW generator offers a lot of power in a small package. Also in the line, the 18kW and 22kW standby generators are equipped with 45kVA of motor starting power. The 22kW generator can power large appliances. Designed for emergency use, the 18kW and 22kW generators are also certified for non-emergency use. Finally, the 26kW home standby generator is designed to keep homes running as usual during an outage.

**Briggs & Stratton**



## Branch Motor Control & Protection Solutions

The company has announced the complete revision of its Allen-Bradley branch motor control & protection solutions of motor control components. The recent overhaul of its motor control components was brought on by the need for updating full systems where components are used to turn on and off motors of all sizes while helping protect the motors from overloading during operation. Basic across-the-line motor starters remain ubiquitous in industrial applications, despite the proliferation of solid-state motor starting technologies.

**Rockwell Automation**



RECESSED FOR FLUSH-TO-THE-WALL MOUNTING OF LED, HI-DEF TVs

## STEEL TV BOX™ KIT

COMBO BOXES FOR USE WITH METAL RACEWAYS



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**NEW WORK**

Mounting screws hold box on stud

2-GANG TVBS505



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TV BOX provides power and/or low voltage in one or more of the openings. Plugs and connectors stay inside the box, without extending past the wall.

Designed for use in new or retrofit commercial construction where metal raceway is used, we have a STEEL TV BOX for almost any application!

- Steel box; non-metallic paintable white trim plate
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3-GANG TVBS507



**RETROFIT**

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**NEW!**

1-GANG TVBS503



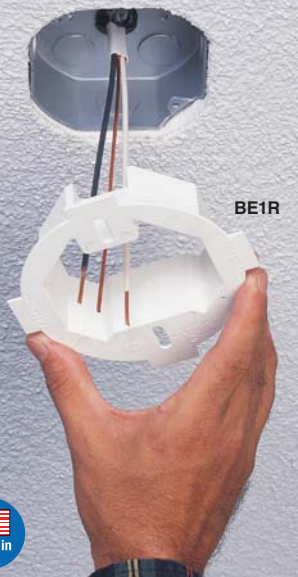
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UL LISTED • 2-HOUR FIRE RATING

## LISTED BOX EXTENDERS

EXTENDS SET BACK BOXES UP TO 1-1/2 INCHES

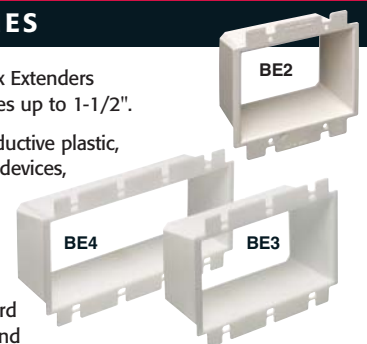


Arlington's **UL/CSA Listed** Box Extenders extend set back electrical boxes up to 1-1/2".

Made of heavy-duty, non-conductive plastic, they level and support wiring devices, protecting wires against damage and stripping.

BE1R for round or octagonal boxes, the single-gang (BE1), two-gang (BE2) for all standard devices, switches and GFCIs and **three- and four-gang box extenders for multiple gang boxes!**

Try them all, including our Patented 'Larger Flange' one-, two-, three- and four-gang styles, for the safe, easy way to obtain Listed installations in set back boxes!



Larger Flanges (patented)



**TWO HOUR FIRE RATING** for use with Metallic and Non-Metallic boxes

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# NEC Requirements for EV Equipment

The electrical conductors and equipment for connecting an electric vehicle to premises wiring must meet specific guidelines.

By Mike Holt, NEC Consultant

Electric vehicles (EVs) have been around for a long time. Factories and warehouses often use electric lift trucks, and, of course, there's the familiar golf cart. These and other off-road vehicles have charging requirements that are easily accommodated by small charging systems.

Now a new challenge is increasingly common: the electrically powered passenger car, truck, bus, or motorcycle. Such vehicles, especially an electric car or bus, can weigh considerably more than a golf cart, so just moving one takes a proportionately larger drive motor. Some have multiple drive motors.

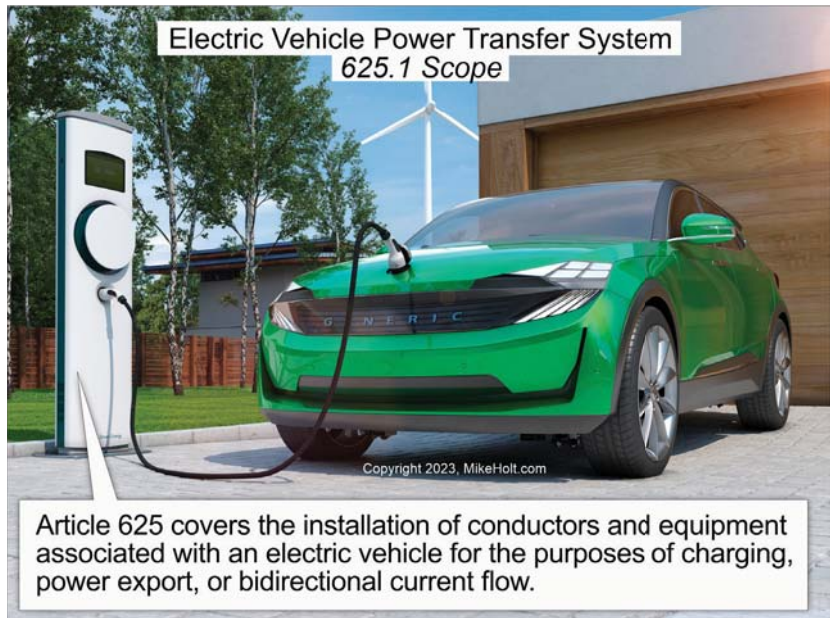
Those motors are powered by batteries. Adding to the battery sizing requirement are other demands. For example, these vehicles:

- Must be able to travel at highway speeds over distances comparable to those traveled by their internal combustion engine counterparts.
- Have powered accessories that you typically don't find on a golf cart, such as air conditioning, electric windows, stereo systems, windshield wipers, security systems, and window defrosters.

• Are expected to start in the summer heat and in the brutal winter cold.

The battery system for an electrically powered passenger vehicle is therefore considerably larger than that for a golf cart or other typical off-road EV.

An electrically powered passenger vehicle needs a dedicated charging circuit. Article 625 provides the requirements for installing the conductors and equipment for electric vehicle charging,



**Fig. 1.** An electrically powered passenger vehicle needs a dedicated charging circuit. Article 625 provides the requirements for installing the conductors and equipment for electric vehicle charging, power export, or bidirectional current flow.

power export, or bidirectional current flow (**Fig. 1**).

This article consists of three parts:

1. Part I. General. This includes the scope, voltages, and listing/labeling requirements.

2. Part II. Equipment Construction. Most of this applies to the manufacturer, but you need to know some of the requirements.

3. Part III. Installation. This covers overcurrent protection and the disconnect, plus the requirements for indoor and outdoor locations.

## DEFINITIONS

Prior to the 2023 revision, the definitions important for applying Art. 625 were in Sec. 625.2. Now all definitions are in Art. 100. You should understand these three:

- EV Power Export Equipment (EVPE). The equipment, including the outlet on the vehicle, used to provide electrical power (at voltages greater than 30VAC or 60VDC) to loads external to the vehicle (as the source of supply).

- EV Supply Equipment (EVSE). Conductors, EV connectors, attachment plugs, personnel protection systems,



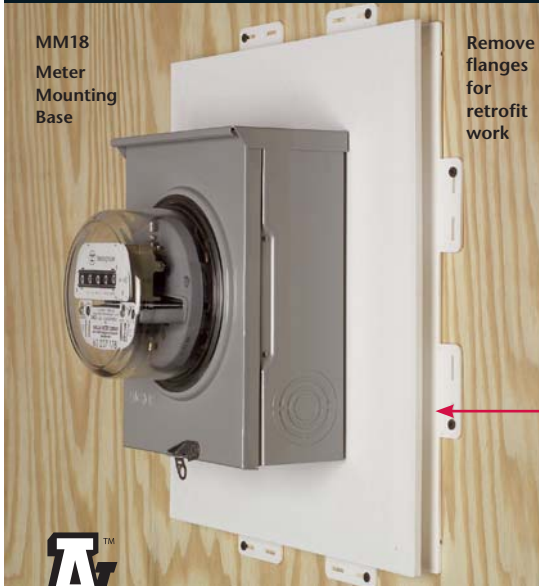


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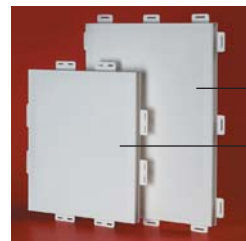
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Gangable...to hold most meters



Meter  
Mounting  
Base

MM23  
23" X 17-5/8"

MM18  
17-5/8" X 15-7/8"

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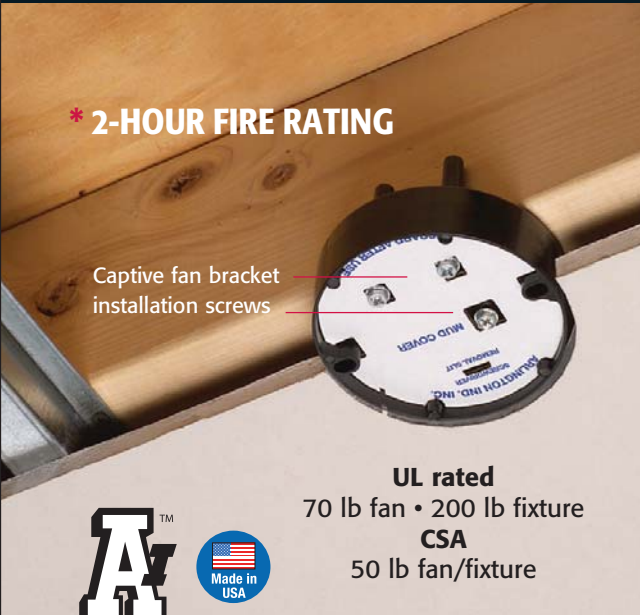
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70 lb fan • 200 lb fixture  
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- Easy mounting in new work
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- Secure joist-mount installation
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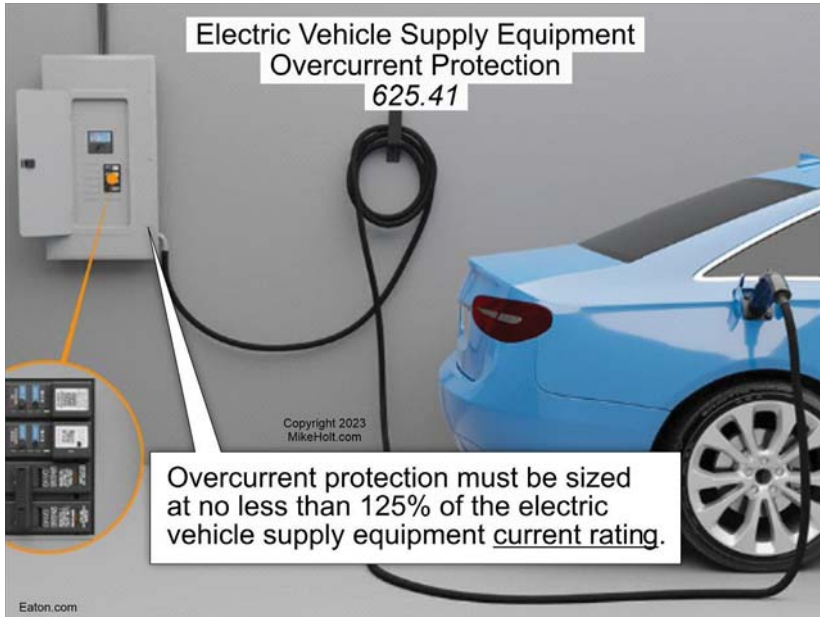


FB412 with 5/8" double drywall



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**Fig. 2.** Overcurrent protection for circuits supplying EVSE must be sized at least 125% of the maximum load of the EV supply equipment.

devices, and power outlets installed for the purpose of transferring energy between the premises wiring and the EV. Note: EVPE and EVSE are sometimes contained in one piece of equipment, which is a “bidirectional EVSE.”

- Wireless Power Transfer Equipment (WPTE). Equipment consisting of a charger power converter and a primary pad. The two devices are either separate units or they are contained within a single enclosure.

## VOLTAGES

Unless otherwise specified, equipment covered by this Article must be supplied by the following voltages:

- 120, 120/240, 208Y/120, 240, 480Y/277, 480, 600Y/347, 600, or 1,000VAC
  - DC system voltages up to 1,000V.
- Output voltages to the EV are not specified [Sec. 625.4].

## LISTING

All EV power transfer equipment for the purposes of charging, power export, or bidirectional current flow must be listed [Sec. 625.6].

## EQUIPMENT CONSTRUCTION

The power supply cord must comply with Sec. 625.17(A)(1), (2), and (3). For example, if it's 8 AWG or larger, its

ampacity must comply with the 60°C columns of Table 400.5(A)(2).

The power output cable must be either integral to the supply equipment or be one of the types listed in Sec. 625.17(B)(1).

Requirements for overall cord and cable length are in Sec. 625.17(C). These vary depending upon whether the equipment is portable or the cabling is interconnecting.

## INSTALLATION

Each outlet for EV supply equipment greater than 16A or 120V must be supplied by a dedicated branch circuit that serves no other outlets [Sec. 625.40].

Each outlet for EV supply equipment greater than 16A or 120V must be supplied by a dedicated branch circuit that serves no other outlets [Sec. 625.40].

Overcurrent protection for circuits supplying EVSE, including bidirectional EVSE and WPTE, must be sized at least 125% of the maximum load of the EV supply equipment [Sec. 625.41] (Fig. 2).

Consequently, the conductors must be sized to be protected by the circuit

overcurrent protective device per Sec. 240.4, including Sec. 110.14(C)(1) considerations, plus Sec. 310.16.

The power transfer equipment must have a sufficient rating to supply the load served. The NEC considers EV charging loads to be continuous loads. Services and feeders must be sized per the product ratings [Sec. 625.42]. Where an automatic load management system is used, the maximum equipment load on a service and feeder is the maximum load permitted by the automatic load management system [Sec. 625.42(A)].

Adjustable settings are allowed only on fixed-in-place equipment. If adjustments affect the rating label, those changes must be per the manufacturer's instructions, and the adjusted rating must appear on a label with sufficient durability to withstand the environment [Sec. 625.42(B)].

EV supply equipment with restricted access to an ampere adjusting means can have an ampere rating(s) equal to the adjusted current setting. Sizing the service and feeder to match the adjusting means is allowed.

Restricted access must prevent the user from gaining access to the adjusting means. Restricted access must be accomplished by one of the following:

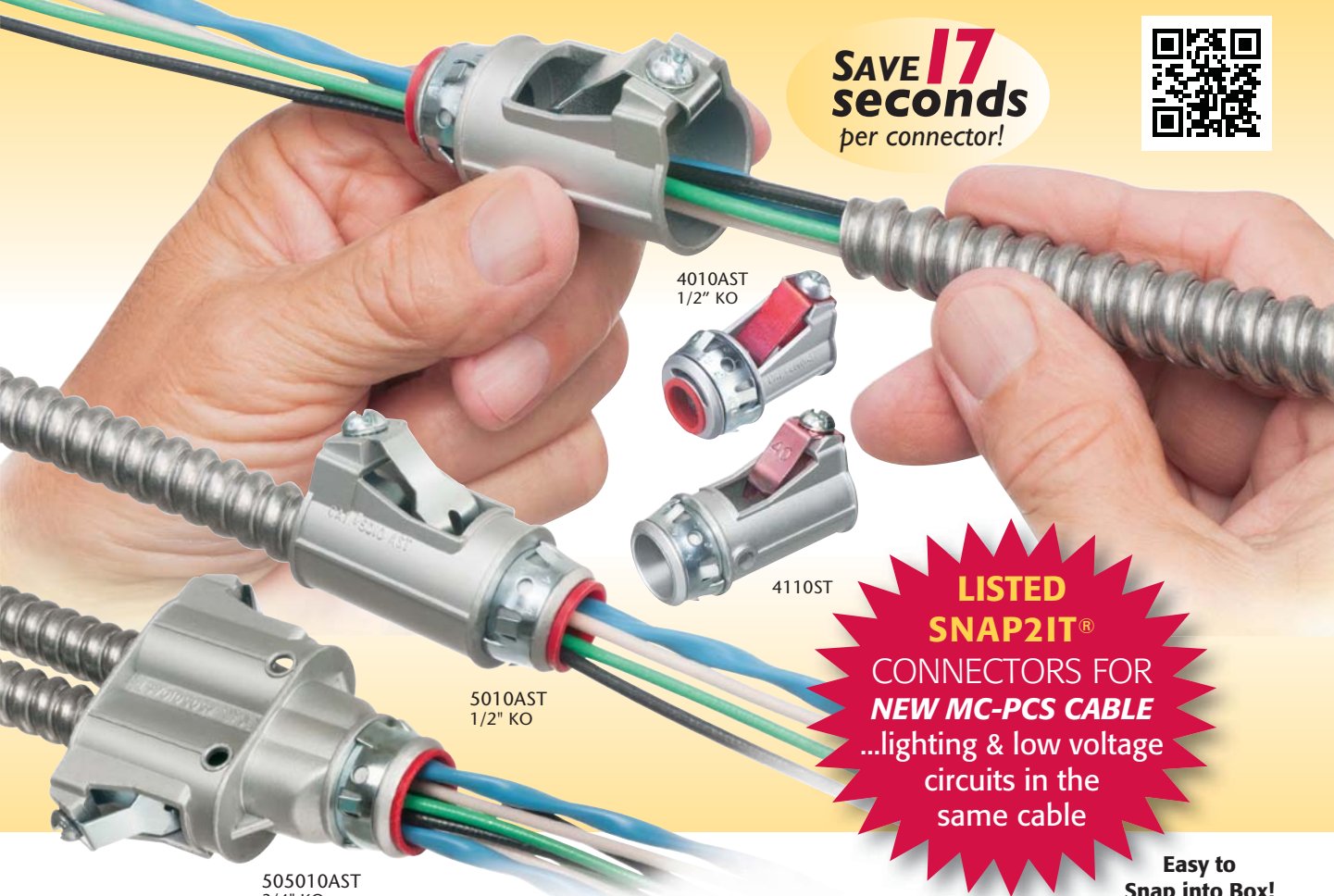
- (1) A cover or door that requires the use of a tool to open.
- (2) Locked doors accessible only to qualified personnel.
- (3) Password-protected commissioning software accessible only to qualified personnel.

EV equipment rated more than 60A or over 150V to ground must have a readily accessible disconnect capable of being locked in the open position with provisions for locking to remain in place whether the lock is installed or not [Sec. 625.43, 110.25].

# SNAP<sup>2</sup>IT<sup>®</sup> CONNECTORS

EASIEST CABLE INSERTION • NO TOOLS • SECURE HOLD

SAVE **17**  
seconds  
per connector!



4010AST  
1/2" KO

4110ST

5010AST  
1/2" KO

505010AST  
3/4" KO

**LISTED**  
**SNAP2IT<sup>®</sup>**  
CONNECTORS FOR  
**NEW MC-PCS CABLE**  
...lighting & low voltage  
circuits in the  
same cable

Easy to  
Snap into Box!

Fully assembled, SNAP<sup>2</sup>IT<sup>®</sup> fittings handle the widest variety of MC cable AND THE NEW MC-PCS cables.

Compared to fittings with a locknut and screw, you can't beat these snap in connectors for time-savings!

- **Fits widest range and variety of MC cable** 14/2 to 3/3 AC, MC, HCF, MC continuous corrugated aluminum cable and MCI-A cables (steel and aluminum)...including the new MC-PCS cable that combines power and low voltage in the same MC cable **ANY Snap2It Connectors LISTED for MC cable are also LISTED for MC-PCS cable!** These products offer the greatest time-savings.
- **Fast, secure snap-on installation**
- **Easy to remove, reusable connector**  
**From cable** Loosen screw on top. Remove connector from cable.  
**From box** Slip screwdriver under notch in Snap-Tite<sup>®</sup> ring. Twist. Remove connector.



**NEW!**  
4141107ST



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CATALOG NUMBER	DESCRIPTION	CABLE OUTSIDE DIA (OD)
4010AST	Snap in, 1/2" KO w insulated throat	.405 to .610
5010AST	Snap in, 1/2" KO w insulated throat	.580 to .780
505010AST	Duplex Snap in, 3/4" KO w insulated throat	(2) .590 to .820
4110ST	Snap in, 1/2" KO	.525 to .705
414110ST	Duplex Snap in, 1/2" KO	(2) .525 to .640
<b>NEW!</b> 4141107ST	Duplex Snap in, 3/4" KO	(2) .525 to .690

Patented. Other patents pending.

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**Fig. 3.** All receptacles installed for the connection of EV supply equipment must be GFCI protected.

Equipment connection rules depend upon whether the EV equipment is:

- Portable. Use one of the four methods in Sec. 625.44(A). It's going to be some type of non-locking, 2-pole receptacle.
- Fastened-in-place. Use one of the four methods in Sec. 625.44(B). It's going to be some type of non-locking, 2-pole or 3-pole receptacle.
- Fixed-in-place. Permanently wire it in.

EVSE that incorporates a power export function and is part of an interactive, optional standby system or electric power production source or a bidirectional power feed must be listed and marked as suitable for that purpose [Sec. 625.48]. When used as an optional standby system, the requirements of Art. 702 apply; when used as an electric power production source, the requirements of Art. 705 apply.

Locate EVSE to permit direct electrical coupling of the EV connector to the EV [Sec. 625.50].

Unless specifically listed and marked otherwise, the coupling means of the EVSE must be at least 18 in. above the floor for indoor locations and at least 24 in. above grade for outdoor locations.

Mechanical ventilation is not required where the EV supply equipment is listed for charging EVs indoors without ventilation [Sec. 625.52(A)].

Mechanical ventilation is required where the EV supply equipment is listed for charging EVs with ventilation for indoor charging [Sec. 625.52(B)]. The ventilation must include both supply

GFCI breakers or receptacles typically used in dwelling units are not suitable for back feeding. That prohibits their use for a bidirectional EVSE.

and exhaust equipment permanently installed and located to intake and vent directly to the outdoors.

Ventilation requirements must be determined by one of these four methods:

1. Table values. Use the appropriate value from Table 625.52(B)(1)(1) (cubic meters per minute) or Table 625.52(B)(1)(2) (cubic feet per minute) [Sec. 625.52(B)(1)].

2. Other values. If the tables do not cover it, calculate it using one of the general formulas in Sec. 625.52(B)(2).

3. Engineered systems. It's permitted to integrate the EV supply ventilation with the building ventilation if a qualified person performs the calculations for the design [Sec. 625.52(B)(3)].

4. Supply circuit interlock. The supply circuit can be electrically interlocked to the mechanical ventilation equipment if the arrangement meets the requirements of Sec. 625.52(B)(4).

EV charging receptacles in wet locations must have a weatherproof enclosure [Sec. 625.56]. All receptacles installed to connect EV supply equipment must be GFCI protected [Sec. 625.54] (**Fig. 3**).

GFCI breakers or receptacles typically used in dwelling units are not suitable for back feeding. That prohibits their use for a bidirectional EVSE. This GFCI requirement applies to all cord- and plug-connected EVSE, making hard-wired EVSE the only type suitable for bidirectional use.

Alternating-current receptacles installed in EVs and intended to allow for connection of off-board utilization equipment must be listed and rated a maximum of 50A, 250V, single-phase [Sec. 625.60(A) and (B)]. The over-current protection for these must be integral to the power export system [Sec. 625.60(C)]. All receptacles must be GFCI protected. The GFCI reset and indication must be in a readily accessible location [Sec. 625.60(D)].

## AVOIDING MISTAKES

Much of the push for EVs now comes from the notion that electricity is an energy source rather than an intermediary between an energy source and the utilization equipment. This flawed thinking leads to flaws in planning and communication. Before installing any EV-related equipment, ensure the user/owner completely understand whether it is charging only or bidirectional. Assess exactly what equipment is needed versus what's been provided for you to install and resolve any differences. **EC&M**

*These materials are provided by Mike Holt Enterprises in Leesburg, Fla. To view Code training materials offered by this company, visit [www.mikeholt.com/code](http://www.mikeholt.com/code).*

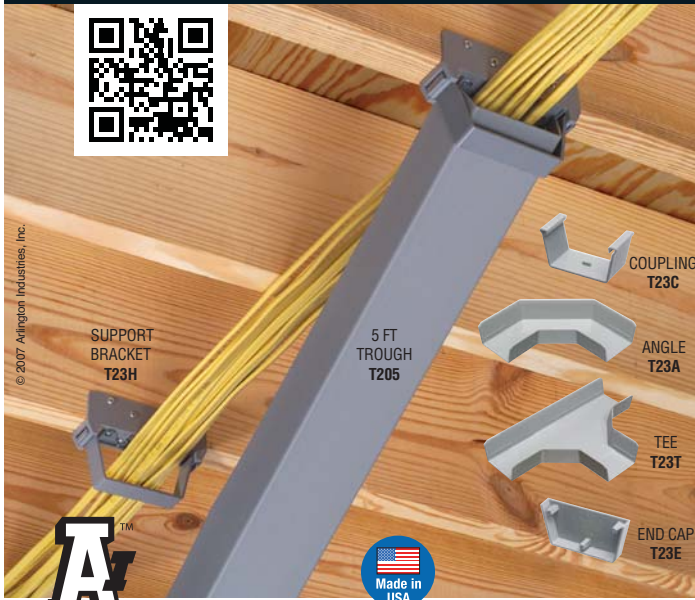


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Try Arlington's easy to install **CableWay™**, for a secure, UL Listed cable runway support system.

**System components** get the job done quickly and easily.

**Support Brackets** attach directly to framing members, without structural damage. They hold cables securely in place, and open for easy cable insertion!

The **Slide-On Trough** holds and protects cable. To add length, install more sections that join together with **Coupling**.

**Angles and Tees** make turning corners a breeze.

Push-on **End Caps** complete the job!

FLAT SURFACE SUPPORT BRACKET T23F



WALL MOUNT SUPPORT BRACKET T23W



SUPPORT BRACKET T23H OPEN



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LOW PROFILE, EXTRA DUTY COVER • **TWO STYLES** for 1-1/2" and Foam Wall Systems



DBVMA1C clear cover



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One-piece **IN BOX®**, the recessed electrical box for exterior use, eliminates installing an electrical box and bubble cover assembly, so you *save big* on labor and materials.

IN BOX installs in the wall – so less shows outside. Fewer parts to handle. Time savings. A *great-looking job with Arlington's IN BOX!*

- Non-metallic, 22.0 cu. in. box with EXTRA-DUTY weatherproof-in-use clear or white cover
- Accepts single-gang devices; no gaskets required

for Help in Maintaining **CONTINUOUS INSULATION** in foam sheathing applications



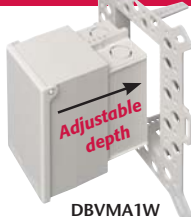
DBVME1W

**Built-in FIXED FLANGE**



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Fits ANY foam board on 2-3/4" to 5" wall or custom stucco finishes 1/4" to 2-1/2" thick.



DBVMA1W white cover



Product Info [aifittings.com/landing/db-series](http://aifittings.com/landing/db-series)



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**IN BOX MEETS 2020 NEC Section 406.9** for protection of exterior outlets which require the use of extra-duty weatherproof-in-use cover for all outdoor 15 or 20 AMP receptacles.

For 1-1/2" wall systems, including foam. Eliminates separate flashing.



DBVME1W white cover

Patented/Additional patents pending

# Stumped by the Code?

By Mike Holt, NEC Consultant

All questions and answers are based on the 2023 NEC.

**Q.** What are the conditions in which PVC can be used and installed?

**A.** As stated in Sec. 352.10, type PVC conduit is permitted in the following applications:

*Note:* In extreme cold, PVC conduit can become brittle and is more susceptible to physical damage.

(A) Concealed. PVC conduit can be concealed within walls, floors, or ceilings, as shown in the **Figure** on the right.

(B) Corrosive Influences. PVC conduit is permitted in areas subject to severe corrosion for which the material is specifically approved by the authority having jurisdiction (AHJ).

(D) Wet Locations. PVC conduit is permitted in wet locations such as dairies, laundries, canneries, car washes, and other areas frequently washed. It is also permitted in outdoor locations. Support fittings such as straps, screws, and bolts must be made of corrosion-resistant materials or must be protected with a corrosion-resistant coating in accordance with Sec. 300.6(A).

(E) Dry and Damp Locations. PVC conduit is permitted in dry and damp locations except where limited in Sec. 352.12.

(F) Exposed. Schedule 40 PVC conduit is permitted for exposed locations where not subject to physical damage. If the conduit is exposed to physical damage, the raceway must be identified for the application.

*Note:* PVC Schedule 80 conduit is identified for use in areas subject to physical damage.

(G) Underground. PVC conduit is permitted to be installed underground and in concrete and must comply with the burial requirements of Sec. 300.5.

**Q.** Under what conditions can PVC not be used and installed?



PVC conduit is permitted to be installed within concealed locations such as walls, floors, or ceilings.

**A.** Section 352.12 gives the conditions where PVC cannot be used and installed.

PVC conduit is not permitted in the following environments:

(A) Hazardous (Classified) Locations. PVC conduit is not permitted to be used in hazardous (classified) locations except as permitted by Sec. 501.10(A)(1)(a) Exception, Sec. 501.10(B)(6), Sec. 503.10(A), Sec. 504.20, Sec. 514.8 Exception No. 2, and Sec. 515.8.

(B) Support of Luminaires. PVC conduit is not permitted to be used for the support of luminaires or other equipment.

(C) Physical Damage. Type PVC conduit is not permitted to be installed where subject to physical damage unless identified for the application.

*Author's Comment:* PVC Schedule 40 conduit is not identified for use where subject to physical damage, but PVC Schedule 80 conduit is [Sec. 352.10(F) Note].

(D) Ambient Temperature. PVC conduit is not permitted to be installed if the ambient temperature exceeds 50°C (122°F).

*Author's Comment:* PVC conduit and fittings are not permitted to be installed in environmental air spaces (plenums) [Sec. 300.22(C)].

**Q.** What is the minimum and maximum PVC trade size permitted?

**A.** The minimum and maximum PVC trade size permitted is stated in Sec. 352.20.

(A) Minimum. PVC conduit smaller than trade size ½ is not permitted to be used.

(B) Maximum. PVC conduit larger than trade size 6 is not permitted to be used.

**EC&M**

*These materials are provided by Mike Holt Enterprises in Leesburg, Fla. To view Code training materials offered by this company, visit [www.mikeholt.com/code](http://www.mikeholt.com/code).*

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"...as for me and my house, we will serve the Lord." [Joshua 24:15]

# Illustrated Catastrophes

By Russ LeBlanc, NEC Consultant

All references are based on the 2023 edition of the NEC.

## A RECEPTACLE BEYOND REPAIR

There is no hope for saving or resurrecting this GFCI receptacle. Throw it in the trash! I found this water-damaged GFCI receptacle when a customer called me to investigate why the string of twinkle lights she had wrapped around the pole for the basketball net in her backyard was not lit up. Believe it or not, this receptacle was only one year old when I found it and replaced it. The branch circuit feeding this device was still energized, and the breaker never tripped, despite the significant damage to this receptacle. The GFCI receptacle did trip and stopped working. The twinkle lights were plugged into this GFCI receptacle 24 hours a day, 365 days a year, which probably would not have been a problem if the original installer had used the correct cover. A cover that was only weatherproof with no attachment plug inserted and with the cover closed was installed instead of a “bubble cover” or another type of cover that is weatherproof even when an attachment plug is inserted as required by Sec. 406.9(B)(1). Section 210.2 makes it very clear that damaged GFCI-type receptacles or other equipment that provides GFCI protection cannot be reconditioned.



## EXTERIOR ENT INSTALLATION



The refrigeration line set and the electrical nonmetallic tubing (ENT) in this photo are connected to an air conditioning unit sitting on the ground below this window. While securing wiring methods to the refrigeration line set may not be specifically prohibited or permitted, installing ENT where it is exposed to the direct rays of the sun is specifically prohibited by Sec. 362.12(7) unless the ENT is identified as being sunlight resistant. This ENT was not identified as sunlight resistant. Even if this ENT was sunlight resistant, it is not one of the wiring methods specified in Sec. 225.10 for installation as outside wiring on buildings or other structures, so its use here would be questionable at best. The white thermostat cable is also secured to this bundle of wiring methods and piping. Section 722.3(J) requires power-limited cables, like this Class 2 thermostat cable, installed in corrosive, damp, or wet locations such as this to comply with several requirements in Art. 110 and Art. 300, including Sec. 300.6, which requires cable sheathing to be made of materials suitable for the environment where they are installed. In this case, that would include being suitable for this wet location and being sunlight resistant.



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## What's Wrong Here?

By Russ LeBlanc, NEC Consultant

**H**ow well do you know the Code? Think you can spot violations the original installer either ignored or couldn't identify? Here's your chance to moonlight as an electrical inspector and second-guess someone else's work from the safety of your living room or office. Can you identify the specific Code violation(s) in this photo? *Note:* Submitted comments must include specific references from the 2023 NEC.

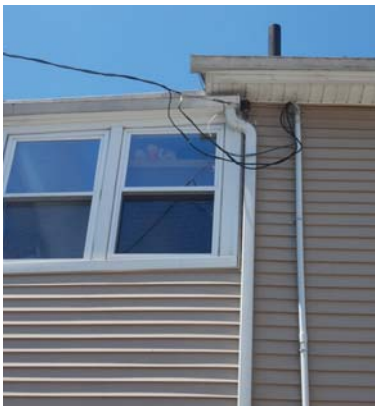
**Hint:** A scary switchboard situation

— 'TELL THEM WHAT THEY'VE WON..' —

Using the 2023 NEC, correctly identify the Code violation(s) in this month's photo — in 200 words or less — and you could win an Arlington Industries 18-in. Slider Bar and plastic box for mounting between studs with non-standard spacing. E-mail your response, including your name and mailing address, to [russ@russleblanc.net](mailto:russ@russleblanc.net), and Russ will select three winners (excluding manufacturers and prior winners) at random from the correct submissions. Note that submissions without an address will not be eligible to win.



### SEPTEMBER WINNERS



Our winners this month were: Mark Varisco, P.E., lead electrical engineer for Engineering & Inspection Services, LLC, Metairie, La.; and Patrick Connolly, an *EC&M* reader and contest participant from Detroit. They knew these service conductors are installed way too close to the windows.

A person could easily open the window and grab those wires with their bare hands or decide to hang a plant basket from those wires. We certainly don't want either of those things to happen. Section 230.9(A)

requires service conductors to have a clearance of at least 3 ft from any windows designed to be open, doors, balconies, porches, fire escapes, stairs, or similar locations. This 3-ft clearance does not apply to conductors in a raceway or cable assembly having an overall outer jacket. The exception for Sec. 230.9(A) allows conductors run above the top level of a window to be less than 3 ft, but that exception does not apply to wires such as these drip loops, which are installed right next to the side of a window.

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