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2023 Construction Forecast

Business conditions in the electrical market could be more challenging next year, but there may be some bright spots.
Read more on ***pg. 18***

IN THIS ISSUE

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NATIONAL ELECTRICAL CODE

EC&M®
December 2022 • Volume 121 • Number 12

DEPARTMENTS

ISSN 1082-295X (print); ISSN 2771-6384 (digital)
EC&M, December 2022, Volume 121, Issue 12 is published monthly for no charge only to electrical contractors and their employees, consulting electrical engineers, and persons performing electrical construction, installation, and maintenance work in manufacturing, commercial, and institutional facilities in the U.S. by Endeavor Business Media, LLC. 1233 Janesville Ave, Fort Atkinson, WI, 53538. Printed in the U.S.A.

Periodicals postage paid at Fort Atkinson, WI, and additional mailing offices. Current and back issues and additional resources, including subscription request forms and an editorial calendar, are available on the Web at www.ecmweb.com. Canadian GST #R126431964. Postmaster: Send address changes to EC&M, P.O. Box 3257, Northbrook, IL 60065-3257.

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EC&M ON AIR PODCAST — WOMEN IN ELECTRICAL CONTRACTING

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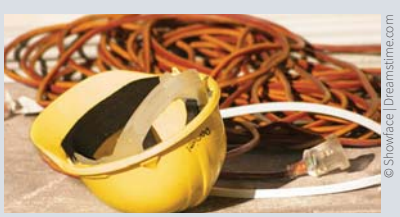
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Safety ▶ Reporting an employer to OSHA is a last resort. Electrical Consultant Mark Lamendola shares the correct way to do it.

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Subscription Rates: Free and controlled circulation to qualified subscribers. Non-qualified persons may subscribe at the following rates: USA (one year) $55.00; Canada (one year) $90.00; international (one year) $130.00. Single copy prices are $10.00 (USA) and $15 (Canada), and $20 (International). Prices subject to change.

Subscription Services Department: For subscriber services or to order single copies, call customer service at (847) 559-7598 or send an email to electricalconstmaint@omeda.com.

Postmaster: Send address changes to EC&M, P.O. Box 3257, Northbrook, IL 60065-3257 U.S.A.

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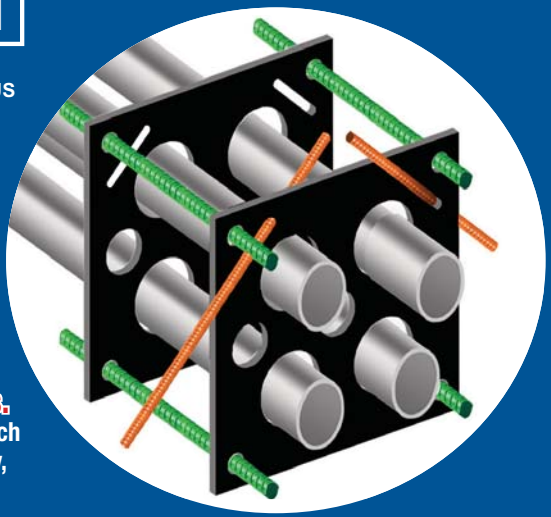

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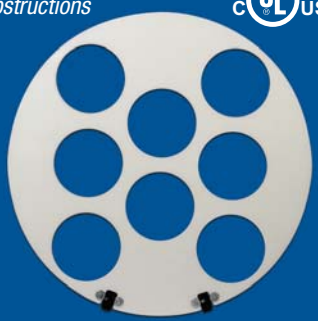

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A Tale of Two Construction Outlooks

By Ellen Parson, Editor-in-Chief

Last year at this very same time, as we presented our annual construction outlook to our audience, we were cautiously optimistic that the electrical industry was poised for prosperity. The global economy was on a more solid footing, we certainly had a better handle on COVID-19 than in past months/years, and most economists were expecting modest growth. Based on the performance of both our Top 40 Electrical Design Firms and Top 50 Electrical Contractors from 2022, I'd say that projection definitely rang true for the *EC&M* audience. Companies comprising our 2022 Top 40 Electrical Design Firms (ranked by annual revenue reported from the previous year's business with the annual survey completed in spring of 2022) logged combined electrical design-specific revenues of $3.167 billion, a 13% increase from the previous year. The Top 50 contractors (survey conducted in late summer of 2022) showed even greater progress — with a 20% gain from the previous year, hitting almost $40 billion as a collective group. According to the Top 50 piece: "That eye-popping gain may be partly due to the timing of revenue bookings for firms and even the inflation spike, but its sheer magnitude — easily the biggest year-over-year jump in at least 15 years — suggests that, despite speed bumps, electrical contractors as a group have been busier than ever the last two years — from the start of the pandemic, through its depths, and beyond."

Writing *EC&M's* annual construction forecast, Jim Lucy, editor-in-chief of sister magazine *Electrical Wholesaling*, who has 40 years of experience covering the electrical industry, also got it right last year, predicting: "The recently passed Infrastructure Bill is also expected to provide some real financial benefits for the electrical construction industry. All in all, the 2022 construction forecast adds up to what should be a decent year for electrical contractors, facility maintenance workers, and other electrical professionals. There is one caveat, however — that is, if they can navigate the higher material prices, supply chain issues, and worker shortages that continue to cause serious challenges."

Fast forward to today, and these "serious challenges" only continue to plague electrical professionals, creating a tale of two construction market outlooks if you will. On the one hand, we're hearing mostly optimistic projections from electrical contractors and design engineers about the current state of the market (thanks in large part to a slew of backlogged projects going into 2023). However, skilled worker shortages, inflation, supply chain issues (equipment delays and material shortages), and rising material prices continue to create uncertainty and instability. Reiterating that sentiment, respondents to our Top 50 survey almost unanimously named the most pressing issue inhibiting their ability to get a job done on time and within budget as "delays with material delivery and logistics." Citing "delayed projects" as having the greatest short-term impact on their companies in 2021, this year's results revealed a new nemesis: "supply chain issues". For a much more detailed analysis on how experts expect the electrical industry to fare in 2023, read the "2023 Construction Outlook," starting on page 18. Although the chances for at least a mild recession seem pretty good, some economists still believe we may narrowly escape a serious downturn.

Without the luxury of a real-life crystal ball when contemplating the industry's path forward, a reassuring quote from one of my recent podcast guests (in which we discussed how supply chain issues are affecting the electrical industry) kept popping into my head: "Prices do matter. People do adjust, and these things don't go on forever — they are transitory." Do not miss this latest edition of *EC&M* On Air, coming to our website in late December (https://bit.ly/3UO8Z6K), in which I talk with Don Leavens, vice president and chief economist at NEMA; Madeleine Bugel, senior manager of trade and international government relations at NEMA; and Chris Sokoll, president of Disc Corp. These experts provide fascinating perspective and commentary on this very complex issue, offering their thoughts on everything from the underlying factors that are converging to create instability and disruption in the supply chain, how they believe things will play out going forward, and, most importantly, what electrical professionals can do to help alleviate the strain.

Ellen Parson

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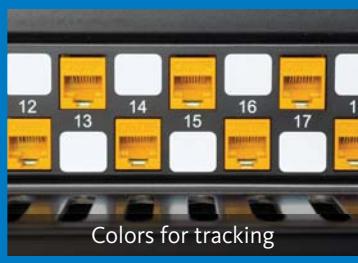

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Why Paying Attention to Branch Circuit Work on Electrical Jobs Is So Important

Having a "don't sweat the small stuff" attitude can cost you, especially when it comes to the often overlooked impact of branch circuits on a job.

By Phil Nimmo and Dr. Heather Moore, MCA, Inc.

Whether you're building small residential homes, or large, towering high-rise commercial buildings, chances are you're doing the branch circuit wiring and the device installation as well as the larger elements. We've all heard the euphemism "don't sweat the small stuff," but it doesn't apply to branch circuit work in electrical construction.

If you use cost codes, you can see how much of your work is in branch circuit wiring. For many contractors, it is north of 25%. Yet, most tend to give branch circuit work to the lowest guy/gal on the totem pole. The expectation is that the harder, more challenging tasks that require more skill and experience should be left to the most tenured electricians with the most experience and skill. Often these highest-paid electricians have earned the right to do their own thinking and use their own creativity and ingenuity to solve problems on the fly. This article explains why small stuff matters and adds to your job-site intelligence arsenal of questions/things to look for on your next job-site visit.

DECISION MAKING AND SKILL LEVEL

As construction continues to evolve toward industrialization, amidst an irreversible workforce shortage, we must find ways to get the most "bang for the buck." How often can you make up the losses on branch circuit work by gaining huge efficiency on feeder circuits? How often can you make up losses on devices and device terminations with productivity gains on luminaires or underground work? If you're like most contractors, the answer is, not very often. But why not? Why can't matching the skill set and experience of the installer with the work required guarantee you'll make as much profit as possible? There are two reasons this doesn't just happen.

First, all work requires decisions. Who makes those decisions (and when the decisions get made) are critical components to the outcome of any task. MCA, Inc.'s Industrialization Litmus test (based on MCA's 2020 research report, "Industrialization of Construction: Signal or Noise? Threat or Promise?" with

Photo 1. This is an example of overbuilding by running control wiring for HVAC equipment outside of the electrical scope, which was done as a favor to the mechanical contractor who was responsible for this scope of work.

Photo 2. Had the electrical contractor not seen an opportunity to prefabricate the entire headwall as a preassembled section, then all of the work would have been completed on the job site as originally scheduled. Recognizing this opportunity saved thousands of hours.

ELECTRI International) shows that 80% to 90% of the decisions about manpower, material, tools, and information are made by individual electricians. When these decisions are allowed to be made at the point of installation, highly skilled and experienced field supervisors (e.g., crew leads, foremen, general foreman) are still required to ensure a satisfactory outcome. If the highly skilled decision-makers are only looking at 10% to 15% of the total work on the project, the other 85% to 90% is left in the hands of the least qualified decision-makers. Regardless of whether you break it down with hours, dollars, or headcount, the results are the same; there typically just isn't enough of that complex highly skilled work to overcome losses in the lesser skilled work.

Second, the lesser-skilled workers are still less productive on the simpler tasks because they haven't done them enough to be good at them. The same model that allows the skilled worker the decision-making authority on the challenging tasks also allows the lesser skilled worker to have decision-making authority on their assigned tasks. This doesn't imply that the lesser-skilled worker makes bad decisions, only that with less experience they take more time to make the decisions, and this time spent planning "on the fly" degrades productivity. For this very reason, an experienced skilled worker can perform simple tasks far more productively than a lesser skilled worker.

Here are a few things you can expect to see (and should look for) when not "sweating the small stuff."

OVERBUILDING

If you're still able to walk the job and see exposed rough-in, look at what was required for the installation compared to what was done. Do you see any of the following:

- Unnecessary bends
- Unnecessary conduit routing
- Use of additional boxes or junctions boxes
- Unnecessary supports
- If you do both electrical and technology work, rough-in work being done for multiple systems (e.g., branch wire for power and low-voltage cabling) in the same space
- Oversized conduit for the application
- Unnecessary (and more expensive) materials used than what is specified (e.g., installing EMT when the spec permitted MC cable)
- Work being performed that is not part of the scope — either knowingly helping other trades or not understanding the details of the contract (**Photo 1** on page 8)

Recognizing overbuilding before it occurs is difficult and requires planning by someone who has experience that includes various means and methods. Even though branch circuit work is physically "small," the decisions made at the layout phase can reduce overbuilding by understanding the specs and requirements, which are often not part of the newer electrician's experience.

MISSED PREFAB OPPORTUNITIES

Prefab planning requires prefab thinking, which results from prior experience with prefabricated assemblies and their installation (**Photo 2**). The branch circuit lends itself well to prefabrication; however, this needs to be brought to the lesser-experienced worker by management and supervision. Prefab thinking starts with leadership and is best translated through training and reference materials, such as the checklist below for identifying branch opportunities.

- Kitting by location (both components and hardware)
- Labeling by kit and location

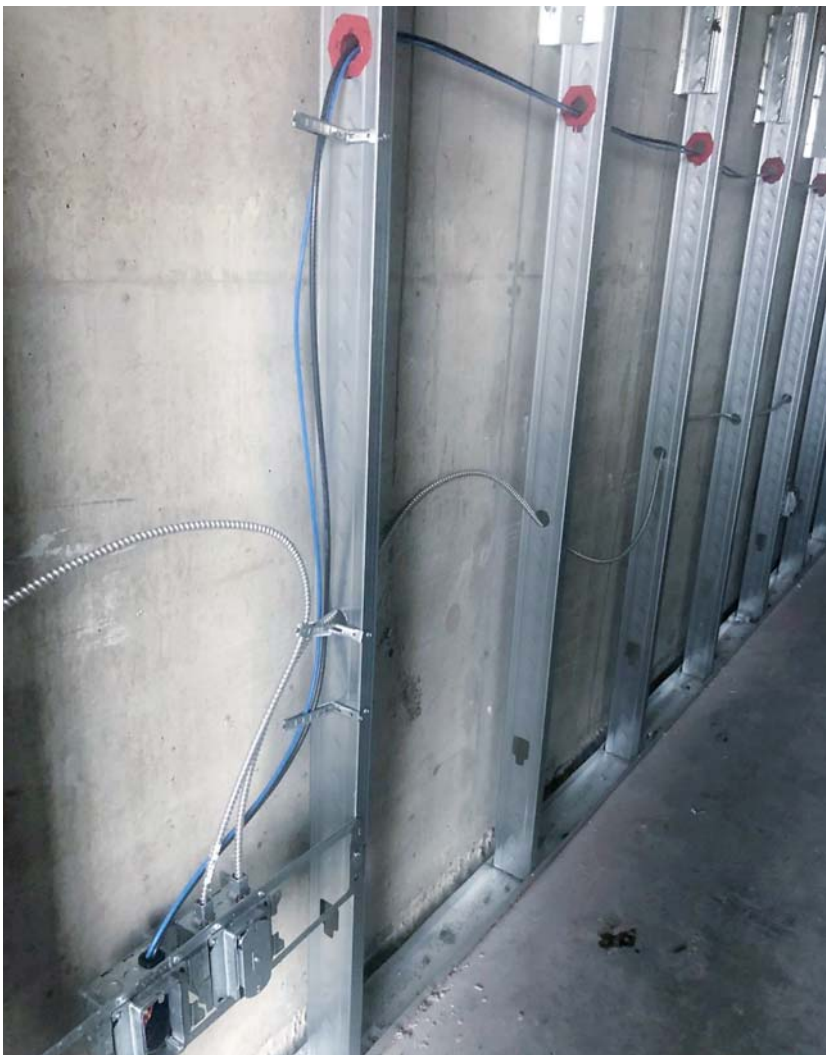

Photo 3. In this example, there are both low-voltage and electrical branch wiring present. Both scopes were done by the same company and installers but conducted in two passes. This work could have been combined into a single pass, using far less material-handling effort.

- Color-coding to reduce identification errors
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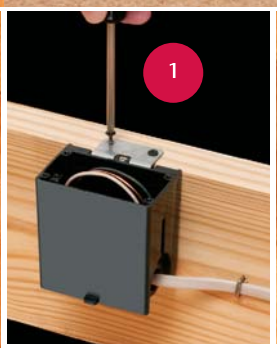

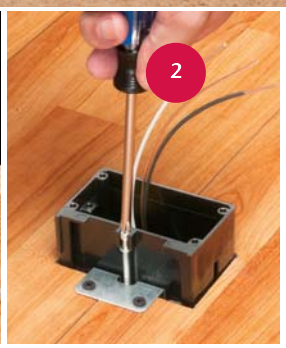

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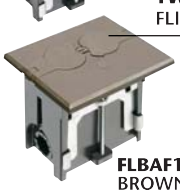

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One of the biggest cost events associated with weak or inexperienced planners is rework or extra work (**Photo 3** on page 10). Running wires around other trades or where they need to be redone is prevalent with inexperienced planners. Not taking the time to fully visualize the completed project will lead to incomplete or ineffective coordination. Missing early coordination opportunities is a common root cause of poor layout, especially on BIM-coordinated projects.

Even though this discussion may simply reiterate observations that you've made throughout your career, how do you know what to do about it? It's not best to simply use all highly skilled workers, at a much higher wage, the needed productivity comes from the experience with the decisions.

Work that is repetitious or minimally unique can be planned in advance. Planning for branch circuit installation should be done during the job start-up, kick-off, and development of the initial work breakdown structure of the job. Procurement, prefabrication, and installation are all planned before assemblies are designed and drawn in BIM (before components are ordered and shipped to the job site and before work is assigned). Making the biggest portions of the work the most well-planned and executed installations is the key.

Planning is the first thing, but it isn't everything. A productive installation also requires management support. Management in the form of detecting issues and anomalies early enough to send help and correct the problems before they become irreversible. Tools like short-interval scheduling can tell us when we can afford to let the simple stuff go. Oversight and visibility of the plan and the daily progress is the best way to allow the lesser-skilled workers to gain experience without repeating mistakes and retain the learning already achieved by others. By efficiently bringing visibility to the little things and with proper planning, you can align the installation skillset with the work difficulty and minimize project labor costs/overruns. EC&M

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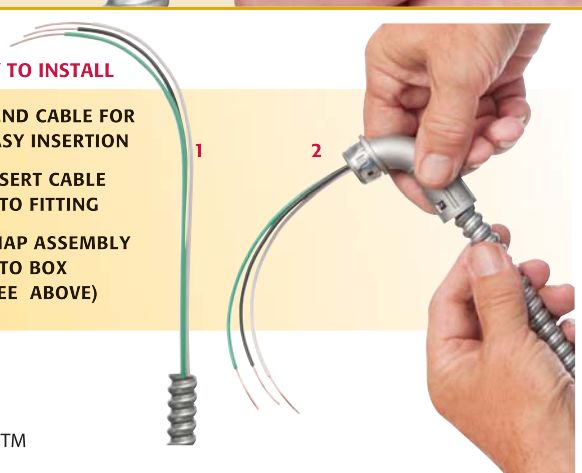

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How to Safely Secure Operational Technology Networks

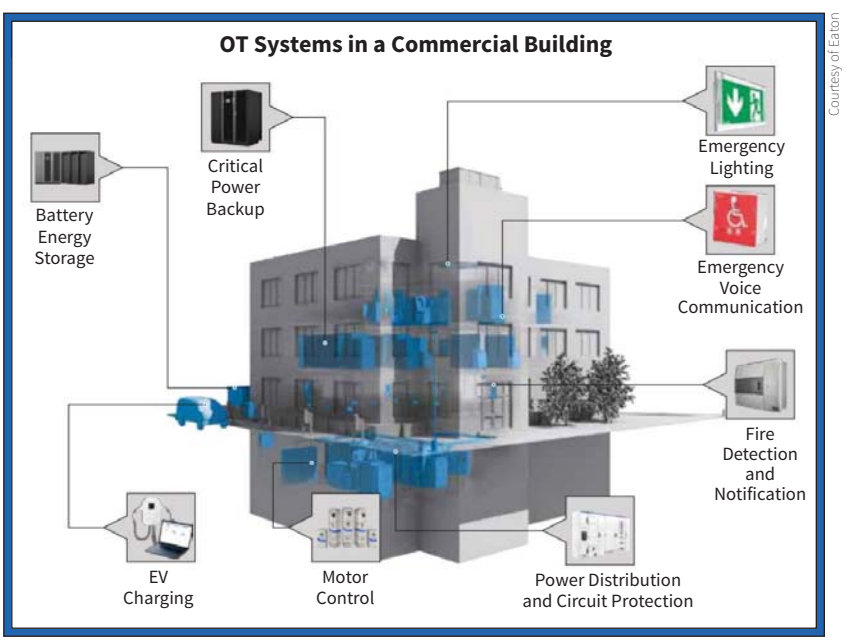
Prioritizing electrical safety and cybersecurity

By Anthony Ciccozzi, Eaton

Electrical power is so intrinsic to our daily lives, it is easy to take it for granted. But as digitalization accelerates across all sectors and applications, so does electrification. You can't have digital transformation without electrification. When an application is critical, such as a hospital, airport, or industrial control system, the supporting electrical infrastructure automatically becomes mission-critical. This, in turn, means cybersecurity measures should be in place to prevent power system disruptions that could impact the uptime of those critical applications.

Cybersecurity is often associated with data and information technology (IT) personnel, but the traditional responsibilities of IT and operational technology (OT) teams are steadily converging as equipment connectivity and electrification increase in critical environments. This means facility managers and OT engineers need to understand more about networking and systems administration, while IT teams must know more about the types of technology they use and its availability needs.

When defining the responsibility of managing OT cybersecurity, it is first important for an organization to ensure electrical safety and reliability are not an oversight. This means employing personnel or trusted third parties who fully understand electrical safety codes and standards in addition to a facility's technology, connectivity systems, critical processes, and cybersecurity risks. In this article, the importance of electrical safety as it relates to OT cybersecurity will be explained by exploring:



Courtesy of Eaton

A representation of types of operational technology (OT) systems in a commercial building.

- Electrical safety risks of securing OT,
- The essential role of qualified workers, and
- Safe management of OT cybersecurity.

WHAT ARE THE ELECTRICAL SAFETY RISKS OF SECURING OT?

OT networks monitor and ensure the safety of building and facility infrastructure that operates critical processes, including motor controls, power distribution and projection, fire detection systems, and more (see the **Figure** above). When these systems and components are networked for monitoring, data collection, and insights, they can form an attack surface from which cybercriminals can gain access.

An IT security professional who has not completed proper training on handling electrical equipment or been through a facility safety briefing does not have the requisite preparation to make informed decisions when it comes to securing these environments.

Unlike today's cutting-edge IT networks, OT systems often contain a mix of legacy and modern equipment. In the past, OT equipment was simply cut off or "air-gapped" from all communication

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System components get the job done quickly and easily.

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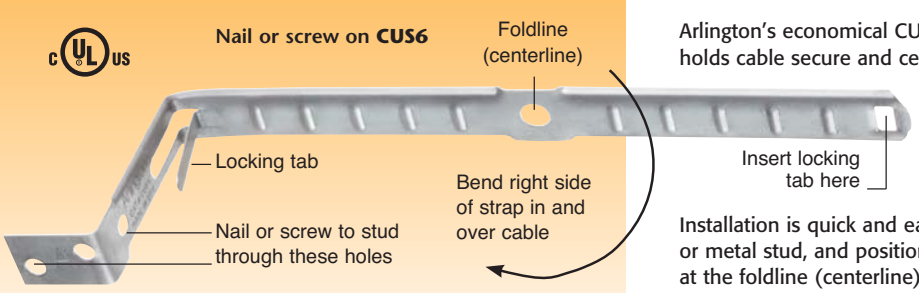


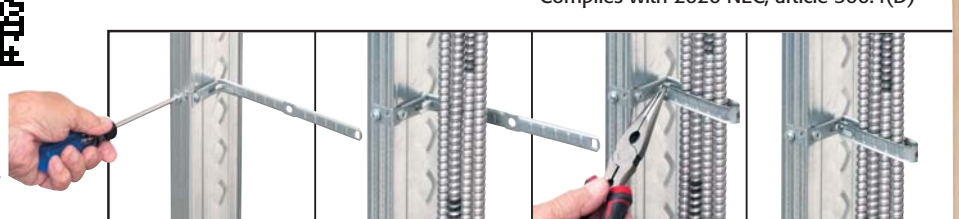
Holds up to four MC cables centered on a 2x4!

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)



CUS6 holds **FOUR metal cables**...or **SIX NM cables**

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networks to minimize vulnerability. Today, operational technology needs to be connected to broader communication networks to support more informed, real-time decisions.

This means cybersecurity professionals can be required to open energized electrical enclosures to capture network traffic or update the firmware. Interacting with energized equipment is a high-risk activity, requiring a thorough understanding of electrical safety codes and standards outlined by the National Fire Protection Association (NFPA) in the following documents:

- NFPA 70 (2020), *National Electrical Code (NEC)*
- NFPA 70E (2021), *Standard for Electrical Safety in the Workplace*
- NFPA 70B, *Recommended Practice for Electrical Equipment Maintenance*

NFPA 70E includes requirements for safe work practices to protect personnel by reducing exposure to major electrical hazards, including shock, electrocution, arc flash, and arc blast. These requirements rely on proper installation (per the NEC) and maintenance (performed per NFPA 70B).

NFPA 70B also covers critical requirements for safely accessing and evaluating many common OT technologies, such as motor controls, automatic transfer switches, and more. It provides guidance on topics such as:

- Required personal protective equipment
- Safety/hazards assessment
- Safety instrumented systems
- Lockout/tagout and safe work procedures
- Common failure modes for equipment under control

It typically takes upward of a year of in-person training and support before maintenance professionals are prepared to safely work on or around energized equipment on their own. It seems logical this requirement should also apply to professionals tasked with securing OT networks and systems.

WHY ARE QUALIFIED WORKERS SO IMPORTANT?

Traditionally, trained cybersecurity personnel are well-versed in the system characteristics of confidentiality, integrity, and availability — but they are not trained to operate with electrical safety and system reliability in mind. This challenge goes both ways. For example, electrical engineers aren't often taking classes on cybersecurity, and cybersecurity personnel aren't often trained on electrical safety.

Addressing cybersecurity on OT networks requires comprehensive cross-functional consideration and typically is not the responsibility of any single discipline or entity within an organization, resulting in distributed or ambiguous ownership.

Specific real-time consideration of the availability, performance, safety, and other needs of the system should be considered. Often, given the embedded nature of components in these networks, typical IT methods, tools, and policies are either not effective or can damage the system. Scanning a system of laptops and workstations with a tool designed for these assets is different than scanning a network of controllers and other embedded devices. The impact of improper interaction with these systems can range from a device failure or process disruption to random data dumped onto a network.

So, how do you address safety and cybersecurity for OT systems?

A SOLUTION FOR SAFELY MANAGING OT CYBERSECURITY

There is an essential need to advance safety, reliability, and cybersecurity throughout the entire life cycle of the facility. The ability to safely assess, interact, and harden the equipment found in critical power systems helps minimize risk to personnel and reduces the likelihood of downtime.

For example, a failure in physical processes used to evaluate the cybersecurity of critical power system architecture can result in a direct failure in the critical application. Extreme efforts are made at the design, build, and operational phases to ensure continuous operation and reliability in critical environments. Electrical infrastructure is complex and requires highly qualified personnel to secure it. If an individual is not familiar with the basic principles of electrical safety, accidents are more likely and can result in personal injury and downtime.

Therefore, action items for personnel tasked with the OT cybersecurity of any operation should include the ability to:

- Inventory all connected hardware, software and dataflows.
- Assess facility OT networks and assets to evaluate the attack surface and discover known vulnerabilities and weaknesses.
- Understand critical processes and how cybersecurity processes could negatively impact uptime.
- Evaluate the electrical safety codes and requirements associated with life-cycle cybersecurity maintenance to support personnel safety, uptime, and compliance.

Together, these tasks require comprehensive knowledge of:

- OT and ICS applications and processes
- Electrical safety codes and standards
- Electrical reliability and uptime
- Industrial network defense
- Cybersecurity regulation and guidance
- Cybersecurity assessment and vulnerability detection
- Defensive technologies and approaches
- Life-cycle cybersecurity maintenance

PRIORITIZING SAFE LIFE-CYCLE SECURITY FOR CRITICAL SYSTEMS

Cybersecurity risks to connected systems have never been greater, as malicious threat actors look to exploit system vulnerabilities, which often exist on electrical system assets with the least cybersecurity oversight.

To address these potential vulnerabilities, critical industries require expertise in power systems engineering and cybersecurity. The goal is to safely assess, interact, and secure critical power system networks without risking the safety of personnel or uptime of critical processes. This is complex and requires in-depth training and experience.

At the end of the day, the most important thing is protecting what matters: your personnel, data, and critical processes. EC&M

Anthony Ciccozzi is an industrial control system cybersecurity specialist who is responsible for leading cybersecurity product assessments for the Secure Development Lifecycle (SDLC) process at Eaton. He can be reached at cybersecuritycoe@eaton.com.

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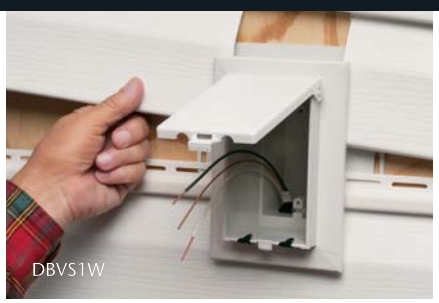

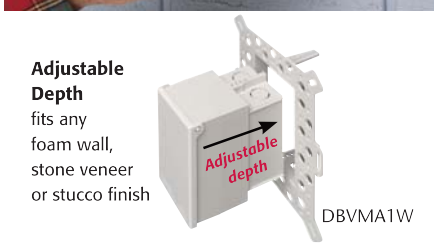

No extra parts to buy or handle mean you save big on labor and materials!

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.

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- Single and two-gang, vertical and horizontal, for a variety of new and old work applications
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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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2023 CONSTRUCTION FORECAST

Business conditions in the electrical construction market could prove to be more challenging in 2023, but some fast-growing market segments and new federal incentives are poised to fuel growth.

By Jim Lucy, Editor-in-Chief, *Electrical Wholesaling*

It's tough to say if forecasting 2023 market conditions for the electrical construction market will be harder this year than it has been in the past. That's because you'll have to factor in a unique mix of new and old macroeconomic factors — not to mention industry-specific market conditions — when developing your electrical 2023 market forecast, including price increases, product shortages, and concerns over the long-term demand for office space. What's different about this year's construction outlook are the concerns about a possible 2023 recession and figuring out how (or if) any downturn will affect your company's business mix and local market's economic conditions.

NATIONAL VIEW

As you prepare for 2023, remember that local market conditions can vary wildly from any macroeconomic prognostication. Be sure to use any national outlook just as a point of comparison to see how your local market, state, or region compares in terms of any forecasted rate of change in revenue. Forecasts for the 2023 nonresidential construction market vary widely. For example, in its Consensus Construction Forecast, the American Institute of Architects (AIA) relies on forecasts from eight leading construction economists — Dodge Construction Network, S&P Global Market Intelligence, Moody's Analytics, FMI, ConstructConnect, Associated Builders & Contractors, Wells Fargo Securities, and Markstein Advisors.

AIA's consensus forecast for the 2023 nonresidential market calls for a 6% increase. The panel of economists' forecasts reflected the diversity of opinion on 2023's business prospects and ranged from three double-digit increases — 14.7% by FMI; 12.9% by ConstructConnect; and 10.6% by Dodge Construction Network — to three forecasts that were less than half the growth rate of AIA's Consensus Forecast for the nonresidential segment. Calling for less growth were economists from Wells Fargo Securities, Associated Builders & Contractors, and Markstein Advisors. They see nonresidential market growth coming in at less than a 3% increase next year.

Bookmark AIA's website, www.aia.org, if you want regular analysis of construction market conditions. AIA

While housing starts will struggle in most markets, the Teravalis mega-development recently broke ground in the Phoenix metro area. When complete, it will have 100,000 homes.

Chief Economist Kermit Baker provides updates on the AIA Consensus Construction Forecast twice a year and manages AIA's Architecture Billings Index (ABI), which provides an indication of design and billings activity at architectural firms. Because architects typically are involved in the construction cycle at least nine to 12 months before a project breaks ground, the ABI is a trusted leading indicator for nonresidential construction activity.

While the ABI has been strong for most of 2022, Baker said in the most recent report that some signs of an economic slowdown are emerging. AIA's ABI score for October was 47.7 points — the first decline in billings since January 2021 (any score below 50 indicates a decline in firm billings). Inquiries into new projects continued to grow in October with a score of 52.3 points, while the value of new design contracts declined (with a score of 48.6 points).

"Economic headwinds have been steadily mounting and finally led to weakening demand for new projects," he said. "Firm backlogs are healthy and will hopefully provide healthy levels of design activity against fewer new projects entering the pipeline should this weakness persist."

While presenting his 2023 construction forecast in a November 15 webinar, Richard Branch, chief economist for Dodge Construction Network, said that although he has built out both downside and upside 2023 forecasts, his base forecast for the construction industry does not call for a recession. He believes spending on total U.S. construction starts will register little change on a percent basis and drop fractionally in 2023 to $1,068 billion from $1,083 billion. "Assuming there is no recession, construction is flat in 2023," he said.

Branch's base case for U.S. GDP growth calls for a 0.7% increase, while his downside/recessionary scenario ratchets GDP growth down 2%. His "Upside Forecast" sees a 4.1% increase in GDP growth for next year.

He said that while the number of developers still building, the recent easing in price increases for construction materials, some large hospital and industrial projects in the pipeline, and passage of some large local bond measures for construction could stop a recession in the construction market, pricing pressures are still a major concern. "Pricing will be challenging going into first half of 2023 but will see improvement in the back half," he said.

The largest of the recently passed major bond measures that will support construction in some local markets include $2.4 billion for technology and stadium improvements by the Austin, Texas, Independent School District (ISD); $3.2 billion for facility improvements by the San Diego Unified School District (USD); and $1.7 billion by the Long Beach, Calif., USD.

While some local metros may have reason to cheer in the institutional, educational, and industrial market, Branch said widespread challenges in the residential market will be a drag on construction. That's an issue for contractors and their suppliers as well as design professionals because of the impact housing has on other segments of the business.

"I have always viewed the construction sector as a train, and residential leads the train as the engine," said Branch, explaining that the housing market will continue to suffer from buyers' affordability issues, higher mortgage rates, increases in lot acquisition costs, building material costs, and labor shortages. He believes the trough in spending on

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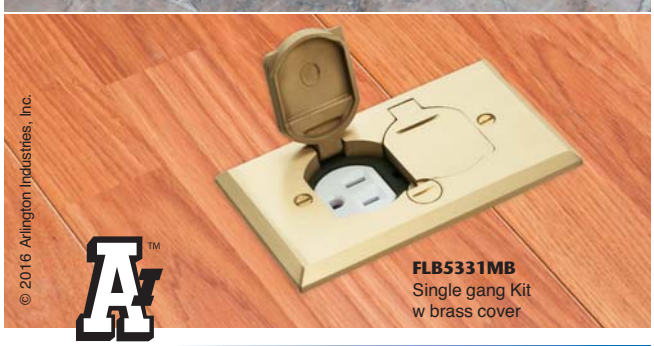
Single gang
steel box kit
w nickel-plated brass cover



FLB5331MB
Single gang Kit
w brass cover

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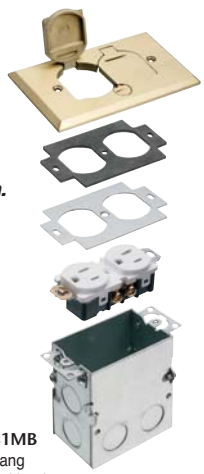
Arlington's **STEEL FLOOR BOX KITS** give installers a low cost, *convenient* way to install a receptacle *in a new or existing floor*.

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.



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steel box kit w brass cover

for NEW or existing floors

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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**

...and **plastic** in FIVE colors.

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Electrical Marketing's Electrical Price Index					
Products	**Oct. 2022**	**Sept. 2022**	**% Change Month**	**Oct. 2021**	**% Change Year**
Total Index					
Total Index	197.6	199.0	-0.7	181.3	9.0
Wire & Cable					
Building Wire & Cable	257.5	258.4	-0.3	254.5	1.2
Power Wire & Cable	373.2	365.6	2.1	336.8	10.8
Lighting					
Lamps	191.4	191.4	0.0	175.4	9.1
Industrial Fixtures	168.6	168.6	0.0	156.5	7.7
Ballasts	224.3	225.0	-0.3	208.2	7.7
Residential Lighting	177.4	177.4	0.0	167.4	6.0
Switchgear, Panelboards & Transformers					
Panelboards & Switches	211.1	211.2	-0.1	179.9	17.3
Switchgear	231.7	231.3	0.2	189.9	22.0
Transformers	161.1	159.1	1.3	151.1	6.6
Conduit & Boxes					
Metal Conduit	238.9	238.7	0.1	217.6	9.8
Nonmetallic Conduit	253.1	262.7	-3.6	226.1	11.9
Boxes	298.4	298.7	-0.1	252.9	18.0
Overcurrent Protection					
Circuit Breakers	220.0	220.0	0.0	186.1	18.2
Fuses	208.9	208.7	0.1	174.3	19.8
Wiring Devices, Connectors, Fittings, & Fasteners					
Wiring Devices & Connectors	159.9	159.6	0.2	148.1	8.0
Conduit Fittings	248.7	261.1	-4.7	228.1	9.1
Fasteners	207.6	209.9	-1.1	182.4	13.8
Electric Heat, Air Conditioning & Fans					
Electric Heating Equipment	176.9	176.9	0.0	159.4	11.0
Fans & Blowers	203.5	201.3	1.1	183.2	11.1
Air Conditioners	198.9	202.7	-1.9	167.4	18.9
Tools & Test Equipment					
Hand & Power Tools	164.7	163.9	0.5	154.2	6.8
Electric Measuring & Integrated Instruments	134.8	134.8	0.0	128.4	5.0
Other					
Industrial Controls	201.0	201.0	0.0	171.5	17.2
Pole Line Hardware	282.0	283.9	-0.7	249.2	13.2
Motors	206.3	206.3	0.0	175.9	17.3
Generators	191.0	191.0	0.0	165.3	15.6
Telephone	227.5	226.6	0.4	225.2	1.0
Appliances	136.9	137.4	-0.4	123.2	11.1
Electrical Marketing's monthly Electrical Price Index (EPI) is compiled by S&P Global/HIS Markit Insight and is available as part of a subscription to *Electrical Marketing* newsletter (www.electricalmarketing.com) for just $99 per year. To subscribe, visit https://bit.ly/3FBLr0G					

Table 1. Electrical contractors were challenged with another year of double-digit price increases. According to *Electrical Marketing*'s Electrical Price Index, the key electrical products with the biggest year-over-year increases through October 2022 were boxes, (18%); fuses (19.8%); pole-line hardware (13.2%); and switchgear (22%).

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EASIEST CABLE INSERTION • NO TOOLS • SECURE HOLD

Fully assembled, **SNAP²IT®** 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® ring. Twist. Remove connector.

CATALOG NUMBER	DESCRIPTION Snap2It® connectors	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
NEW! **4141107ST**	Duplex Snap in, 3/4" KO	(2) .525 to .690

Easy to Snap into Box!

NEW! 4141107ST

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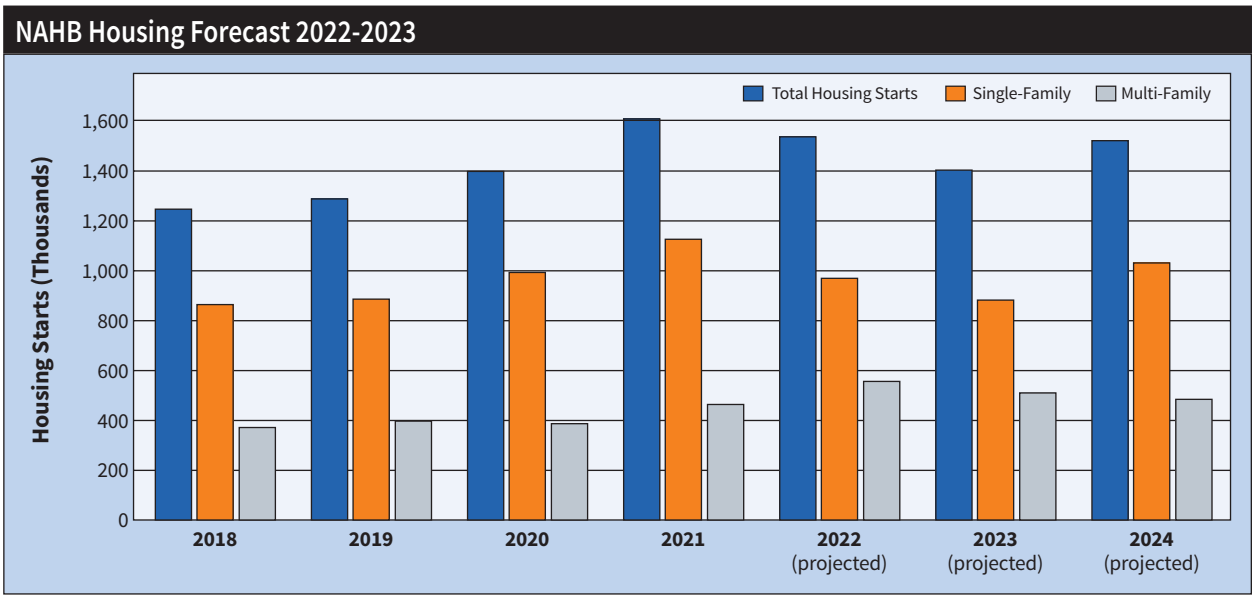

The National Association of Home Builders (NAHB) expects single-family starts to drop 9.4% in 2023 to an 886,000 annual rate. The association says multi-family starts will drop 8% to a 515,000 annual rate.

single-family housing will occur late in 1Q or early 2Q of 2023, but that the market overall will see a 6% decline next year, assuming there is no recession. Multi-family housing will continue to be the stronger segment, he said.

NEXT YEAR'S CHALLENGES

2023 macroeconomic outlook. Monthly surveys of senior executives can offer valuable market insight to get a broad sense of economic conditions in the electrical market and the overall U.S. economy. In its "Electrostats" column, *Electrical Wholesaling* publishes regular updates of the ElectroBusiness Conditions Index (EBCI), a monthly survey of executives at electrical manufacturers who are members of the National Electrical Manufacturers Association (NEMA). The EBCI Index has been sliding deeper into negative territory in 3Q 2022. In the most recent report published in late October, NEMA said, "Economic headwinds, including rising interest rates and a deeply unsettled geopolitical environment contributed to the general malaise, but policy support for 'electrification and energy efficiency' provided a backstop to the otherwise glum outlook."

The Conference Board offers two solid monthly macroeconomic indicators — its Measure of CEO Confidence and its U.S. Leading Economic Indicators (LEI). The most recent reports were both pessimistic. The Conference Board said CEO confidence sunk further to start Q3 and is at its lowest level since the Great Recession, while the association's LEI report said a recession is likely before year-end.

Price increases continue for electrical products. Year-over-year price increases for electrical products are decelerating but remain at near historically high levels, according to E*lectrical Marketing*'s monthly Electrical Price Index (EPI). The October 2022 EPI data showed additional cooling in prices for key electrical products, with a monthly decline of 0.7% and a 9% year-over-year (YOY) increase to a 197.6 reading for the total index. Power wire & cable bucked this trend with a 2.1% monthly increase that supported its 10.8% YOY pricing gain. With a decline of 4.7%, conduit fittings had the biggest monthly drop. In "normal" times, you rarely see monthly price increases in the EPI of more than 1%. That's why the string of double-digit YOY price increases that hit the market each month from April 2021 through August 2022 is so out of the ordinary. See **Table 1** on page 22 for data on other price increases in the EPI.

Long lead times. Although lead times for many electrical products aren't as bad as they used to be, in many cases, they are still months from normal. Switchgear has seen lead times that extend out more than a year, according to one distributor's response in the *Electrical Marketing*/Vertical Research Partners (VRP) quarterly survey. They are also still an issue with products like lighting controls and automation equipment powered or controlled by semiconductor chips.

A tough slog for single-family construction. Single-family construction will probably be the slowest market sector over the next year or two, as sky-high interest rates, affordability issues, and lack of buildable lots in many popular markets are pummeling home builders. Market conditions for multi-family construction aren't as dismal. While some Sunbelt markets are scratching out increases in single-family construction, the national data on housing starts and building permits is downright ugly. Multi-family construction is also expected to slow, but according to National Association of Home Builder's (NAHB) 2022 forecast, it will be up 18.1% this year before sliding 8% in 2023. See the **Figure** above.

"This will be the first year since 2011 to post a calendar year decline for single-family starts," said Robert Dietz, chief economist, NAHB. "We are forecasting additional declines for single-family construction in 2023, which means economic slowing will expand from the residential construction market into the rest of the economy."

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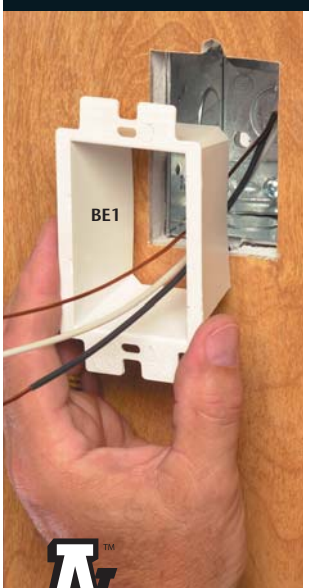
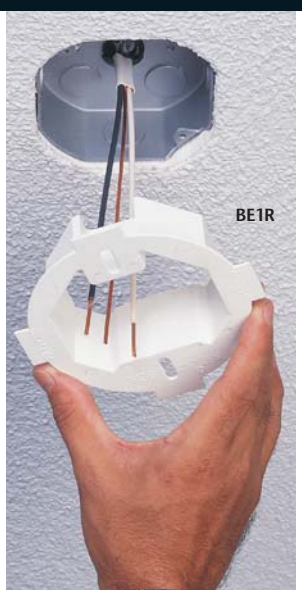
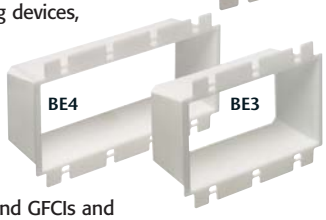




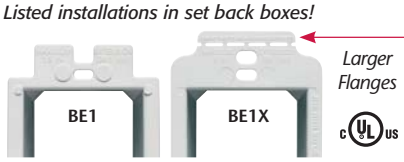
Arlington's **UL/CSA Listed** Box Extenders extend set back electrical boxes up to 1-1/2".

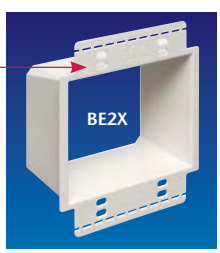
Made of heavy-duty, non-conductive plastic, they level and support wiring devices, protecting wires against damage and stripping.



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 **'Larger Flange' one-, two-, three- and four-gang styles**, for the safe, easy way to obtain Listed installations in set back boxes!*





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Product info http://www.aifittings.com/landing/box-extenders/

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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.

Aluminum T...C...LR...LL

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Jerry Konter, NAHB chairman and a home builder/developer from Savannah, Ga., echoed this sentiment. "Mirroring ongoing falloffs in builder sentiment, builders are slowing construction as demand retreats due to high mortgage rates, stubbornly elevated construction costs, and declines for housing affordability," he added.

The impact of hybrid/remote work on office construction and renovation. While work-at-home trends vary and evolve by region and type of industry, the post-COVID reality or remote officing is definitely affecting demand for new office space.

It's a huge issue in New York, for example. While the Big Apple has some major office projects underway, the results of a survey by the Partnership for New York City points to what could be the long-term trend of fewer people working five days a week in the city's offices. The survey of more than 160 major Manhattan office employers said that, as of mid-September 2022, only 49% of Manhattan office workers are currently at the workplace on an average weekday. The Partnership said return-to-office rates are projected to increase gradually through the rest of 2022, with 54% of workers expected in the office on an average weekday by January 2023 (see **Table 2** for the largest markets for office space in the United States).

Labor shortages persist. Even though total U.S. employment at electrical contracting firms is trending at more than 1 million employees for the first time ever, electrical contractors seem to be having the most trouble attracting and keeping new employees. This challenge has created a market opportunity for companies on the supply side that can provide new tools and preassembled electrical products that help electrical contractors work smarter and more efficiently in the field. Check out **Table 3** on page 28 to see which local markets added the most electrical contractor employees over the past year.

Top 25 Markets in Office Inventory

Markets	Office Inventory (Sq Ft)	Total Office Vacancy (Sq Ft)	Vacancy Rate (%)	Offices Under construction (Sq Ft)
United States Total	**4,764,335,528**	**909,994,765**	**19.1%**	**104,374,064**
New York	464,113,665	71,451,742	15.4%	23,788,116
Washington, DC	353,184,278	72,937,929	20.7%	6,261,450
Chicago	267,762,383	59,458,075	22.2%	3,380,741
Dallas	213,331,573	51,911,550	24.3%	5,384,569
Los Angeles	194,361,119	41,488,571	21.3%	3,740,023
Houston	192,613,671	49,450,180	25.7%	878,017
Atlanta	176,388,598	37,732,129	21.4%	3,718,848
New Jersey	169,741,921	41,214,199	24.3%	234,318
Boston	168,084,475	29,871,747	17.8%	4,620,415
Philadelphia	148,462,134	27,146,677	18.3%	308,000
Denver	127,155,750	26,162,209	20.6%	1,988,558
Seattle	120,117,183	19,139,081	15.9%	11,293,321
Baltimore	100,912,736	16,736,090	16.6%	1,837,916
Orange County	100,676,970	15,735,352	15.6%	659,685
Minneapolis	99,846,911	18,902,236	18.9%	345,000
Detroit	93,466,061	17,501,192	18.7%	454,000
San Diego	87,149,150	10,485,616	12.0%	2,109,621
San Francisco	85,908,427	20,717,948	24.1%	618,522
Portland	77,808,637	12,584,638	16.2%	616,404
Salt Lake City	75,031,582	13,361,984	17.8%	623,231
Phoenix	74,771,825	18,257,634	24.4%	263,766
Austin	70,654,281	12,663,533	17.9%	6,468,497
Silicon Valley	69,694,616	12,388,160	17.8%	3,917,829
Kansas City	65,947,375	10,921,802	16.6%	357,107
Charlotte	65,209,247	11,481,003	17.6%	3,667,571

Source: U.S. Office Outlook – Q3 2022

Table 2. Despite concerns about the long-term impact of employees working at home on the office construction market, there's currently still an enormous amount of office space under construction. According to JLL, New York now has more than 23 million sq ft of office space under construction.

REASONS TO BE CHEERFUL

Federal infrastructure spending programs will spark investments in infrastructure, renewables and construction of massive factories to produce semiconductors, electric vehicles and lithium batteries for EVs, photovoltaic systems, and microgrids. Funds from federal programs like the Infrastructure Investment and Jobs Act (IIJA), CHIPS and Science Act, and the Inflation Reduction Act (IRA) will have a direct impact on the electrical construction market because of their intent to fund the installation of residential and commercial PV systems, microgrids, EV charging systems, grid upgrades, and renovation of commercial facilities with more efficient electrical and mechanical systems. At least one electrical manufacturer told *EC&M* recently that this influx of federal funding will be a "once-in-a-lifetime opportunity" for the electrical industry.

By now, many folks have heard about all of the federal stimulus funding for electric grid modernization, EV charging stations and residential PV installations. But there's a lesser-know source of tax deductions that could be of interest to many of your customers that you can use to land new energy-retrofit jobs. A post at www.cbh.com says that in its Section 179, which covers the Energy-Efficient Commercial Building Deduction, the IRA will almost triple the per-sq-ft tax deduction in 2023 that building owners can get for energy-efficient retrofits in commercial or multi-family building from $1.88 per sq ft to $5 per sq ft.

Life-science laboratories and data centers — two patches of growth. In the latest Dodge Momentum Index, Sarah Martin, senior economist for

FLUSH-WITH-THE-CEILING INSTALLATIONS

Made in USA

NEW

FAN/FIXTURE BOX

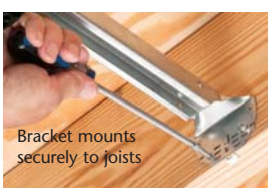
THE LOW COST BOX...WITH ADJUSTABLE STEEL BRACKET AND *PLASTIC* BOX

Arlington's low cost, economical *steel* fan/fixture bracket with *plastic* box delivers super-secure, versatile on-center mounting between joists spaced 16" to 24".

- Easy mounting in new construction... fan bracket installation screws ship captive
- Bracket ends adjust for flush installation on ceilings up to 1-1/4" thick. They're pre-set for a 1/2" ceiling. Bend along score line for other ceiling depths.

- 23.0 cu. in. plastic box is positionable anywhere along bracket
- UL/CSA Listed

*** 2-HOUR FIRE RATING**



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Product info aifittings.com/landing/fbr423

PRESS-ON INSTALLATION

EMT BUSHINGS

ECONOMICAL CABLE PROTECTION

- Fast & easy press-on installation
- Holds tight as cables are pulled
- Protects cable from abrasion
- Less expensive alternative to costly fittings when used just for wire
- Meets NEC requirements (2020) for 300.15 protection. Listed for use in environmental air handling per NEC 300.22(c)

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NON-METALLIC NM3100 SERIES

QUICKLATCH™

EASIER TO USE THAN A PIPE HANGER

Patent pending

MOUNT. PRESS PIPE INTO QUICKLATCH. DONE!

NEW

Pre-installed strut clip for **faster installation on strut**

UV rated for use outdoors

Listed for environmental air handling spaces

c UL us

SAVES 20 SECONDS per Installation!

...about 33¢ each at $60/hr labor!

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1/2" NM3105 for RIGID, IMC, PVC – **NM3100** for EMT
3/4" NM3115 for RIGID, IMC, PVC – **NM3110** for EMT
1" NM3125 for RIGID, IMC, PVC – **NM3120** for EMT

Info aifittings.com/landing/quicklatch_series

Fastest-Growing Markets for Electrical Contractor Employment

Rank	Metropolitan Statistical Area (MSA)	Estimated Electrical Contractor Employment	YOY # Change	YOY % Change
1	Houston-The Woodlands-Sugar Land, TX	31,473	4,138	15.1
2	Los Angeles-Long Beach-Anaheim, CA	34,680	1,941	5.9
3	Dallas-Fort Worth-Arlington, TX	30,151	1,486	5.2
4	Chicago-Naperville-Elgin, IL-IN-WI	25,064	1,166	4.9
5	Seattle-Tacoma-Bellevue, WA	18,265	1,075	6.3
6	Riverside-San Bernardino-Ontario, CA	14,720	910	2.3
7	Miami-Fort Lauderdale-West Palm Beach, FL	18,872	715	3.9
8	Denver-Aurora-Lakewood, CO	14,985	715	5.0
9	Orlando-Kissimmee-Sanford, FL	10,014	698	-7.4
10	Phoenix-Mesa-Scottsdale, AZ	18,950	693	3.8
11	Seattle-Bellevue-Everett, WA	14,946	676	8.2
12	Salt Lake City, UT	7,744	650	9.2
13	Boise City, ID	4,260	620	3.9
14	Oakland-Hayward-Berkeley, CA	9,785	602	1.2
15	Portland-Vancouver-Hillsboro, OR-ID	10,972	520	7.2
16	New York-Newark-Jersey City, NY-NJ-PA, NY	52,000	503	1.0
17	Lebanon, PA	7,566	472	1.2
18	San Diego-Carlsbad, CA	11,436	472	4.3
19	Boston-Cambridge-Nashua, MA-NH	17,645	455	6.3
20	San Antonio-New Braunfels, TX	7,414	446	-1.7
21	Oklahoma City, OK	4,095	446	2.3
22	North Port-Sarasota-Bradenton, FL	3,753	446	5.0
23	Washington-Arlington-Alexandria, DC-VA-MD-WV	21,545	425	2.0
24	Tampa-St. Petersburg-Clearwater, FL	11,345	381	1.6
25	Kansas City, MO-KS	8,030	351	8.1
26	Cincinnati, OH-KY-IN	6,942	334	5.0
27	Albuquerque, NM	3,818	316	15.5
28	Sacramento-Roseville-Arden-Arcade, CA	10,270	308	3.1
29	Providence-Warwick, RI-MA	3,857	290	10.1
30	Midland, TX	4,329	290	8.2
31	Memphis, TN-MS-AR	3,432	277	7.2
32	El Paso, TX	2,310	273	1.7
33	Cape Coral-Fort Myers, FL	4,641	273	3.3
34	Provo-Orem, UT	4,268	269	17.3
35	St. Louis, MO-IL	10,222	260	9.7
36	Tacoma-Lakewood, WA	3,319	260	-1.8
37	Minneapolis-St. Paul-Bloomington, MN-WI	12,645	256	2.1
38	Baltimore-Columbia-Towson, MD	10,998	251	5.2
39	Hartford-West Hartford-East Hartford, CT	2,843	251	4.6
40	Greeley, CO	2,093	199	2.3
41	Cleveland-Elyria, OH	5,399	195	3.7
42	Urban Honolulu, HI	3,393	191	-2.7
43	Corpus Christi, TX	2,448	169	0.5
44	Fayetteville-Springdale-Rogers, AR-MO	1,863	160	1.9
45	Kansas City, MO	4,702	156	7.6
46	Austin-Round Rock, TX	9,442	147	-2.9
47	Jacksonville, FL	6,383	139	2.2
48	Bergen-Hudson-Passaic Counties, NJ	3,714	139	-6.3
49	Virginia Beach-Norfolk-Newport News, VA-NC	5,326	121	2.0
50	Greenville-Anderson-Mauldin, SC	2,500	121	-3.8
50	Portland-South Portland, ME	1,469	121	2.4
50	Charleston-North Charleston, SC	2,838	121	1.9

Source: *U.S. Bureau of Labor Statistics data for construction employment and* Electrical Wholesaling *estimates for local electrical contractor employment based on historical trends.*

Table 3. Five MSAs have seen YOY increases through September 2022 in electrical contractor employment of at least 1,000 employees: Houston (4,138); Los Angeles (1,941); Dallas (1,486); Chicago (1,166); and Seattle (1,075).

CONVENIENT • LOW COST

FLOOR BOX KITS

FOR EXISTING FLOORS

FLUSH TO FLOOR INSTALLATION

Nickel **FLBR101NL**
Brass **FLBR101MB**

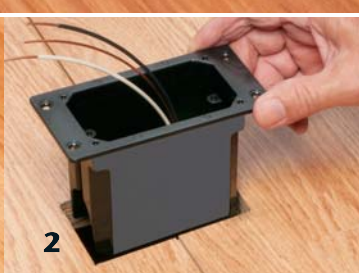
Brown **FLBR101BR**

Non-Metallic covers in FOUR COLORS

Brass **FLBRF101MB**
Nickel **FLBRF101NL**

EASY TO INSTALL!

1



2

3

4

UL LISTED FLOOR BOXES... the low cost way to install a receptacle flush in an EXISTING FLOOR

WHITE
FLBRF101W
ASSEMBLED

BLACK
FLBRF101BL

LIGHT ALMOND
FLBRF101LA

BROWN **FLBRF101BR**
KIT COMPONENTS

- Oversized rectangular covers hide miscut flooring; gaskets prevent water intrusion; **threaded plugs or flip lids** protect box when it's not in use
- **Rectangular Covers**
  Non-Metallic
  White, light almond, brown, black
  Metal Nickel-plated brass and Brass

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Photo courtesy of ARX Solutions

Miami continues to be one of the nation's hottest markets for multi-family construction. The 100-story Waldorf Astoria Hotel & Residences will have 360 condos and a 200-room hotel.

Dodge Construction Network, said data centers and life science laboratories "have thrived in 2022 and continue to support strength in planning activity."

Life-science laboratories are an interesting niche because of the money biotech companies are investing in the development of new pharmaceutical drugs. Demand for the construction of these facilities has not been as affected by the work-from-home trend as other real-estate sectors because folks can't bring home the high-dollar lab equipment and work stations. If you ever want to learn more about the growth in this sector, check out the investment analyses of Alexandria Real Estate Equities (Ticker symbol: ARE), which can often be found as a top pick for REIT (Real Estate Investment Trust) stocks.

The world of mega-projects. *EC&M*'s editors don't remember ever seeing so many billion-dollar factories underway at the same time — and it's even more unusual that so many of them are in these same areas (semiconductors, electric vehicle plants, and EV battery plants). U.S. Census Bureau data is picking up on this spending. For the better part of 2022, industrial construction spending has been one of the strongest elements of the overall construction market, and the YOY increases in spending in some segments leap off the page. Through September 2022, total manufacturing construction spending was up 43.3% over September 2021 to $113,399 million. The computer/electronic/electrical segment hit $4,291 million in September 2022, an amazing 319.7% increase in one year. Tech spending on data centers and all that EV and battery plant construction is pushing spending into the stratosphere.

The IRA and CHIPS legislation mentioned earlier will certainly spark construction of plants in these areas, but even before these bills became law, manufacturers had announced their intentions to invest billions of dollars in these areas. **Table 4** on page 32 highlights the largest of these plants, but it seems like a week doesn't go by when you hear about another new project hitting the drawing boards. In mid-November, AP reported that a Freyr Battery, a Norwegian company, will invest $2.6 billion in an electric battery factory located in Newman, Ga. (near Atlanta). Many of the new projects that made the news over the past year in the EV or semiconductor industries were substantially larger than this facility. For example, Intel announced plans this year that it would build a $20-billion semiconductor campus in Licking, Ohio, and make a $20-billion investment in its existing Ocotillo plant in Chandler, Ariz. Not to be outdone, Intel competitor Texas Instruments will spend $30 billion on several semiconductor chip fabrication plants in Sherman, Texas, and Taiwan Semiconductors has a $6-billion plant underway in Phoenix.

In the EV market, some of the larger plants involve Ford and SK Innovation, its EV battery partner, which plan to spend $11 billion on several EV and battery facilities in Glendale, Kan., and Stanton, Tenn. Ford has plenty of competitors building U.S.-based EV plants, too. Rivian plans to build a $5-billion plant straddling Morgan and Walton Counties in Georgia; Hyundai broke also ground on a $5.5-billion factory in Ellabell, Ga., in late October.

The Sunbelt and Intermountain states — the gift that keeps on giving. Yes, the Sunbelt's coastal hotspots seem to continually get lashed by hurricanes or lower-grade tropical storms, and many of the region's roadways are choked with traffic at rush hour. But if you want to find many of the nation's

A NEAT COVER UP...

Made in USA

NON-METALLIC BOX COVER

FOR UNUSED FAN/FIXTURE BOXES – FITS PAN BOXES TOO!

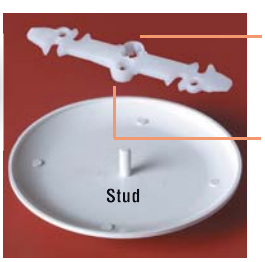
Our non-metallic, paintable **CP3540** Box Cover is the neatest way to cover unused fan/fixture boxes, pan boxes or poorly cut drywall.

- No visible screws on ceiling plate
- Fits 3.5", 4" round or octagonal boxes

Versatile bracket design with 'A' and 'B' openings for use on flat or uneven ceilings.

Versatile Bracket Design

Easy installation. Attach the bracket to the box with #8 or #10 screws. Back the screws out enough to slip the bracket on.



'A' for flat ceilings
Push stud into opening to seat cover

'B' for uneven or textured ceilings
Thread stud into opening until tight

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Product Info aifittings.com/landing/CP3540

ONE-PIECE • NON-METALLIC

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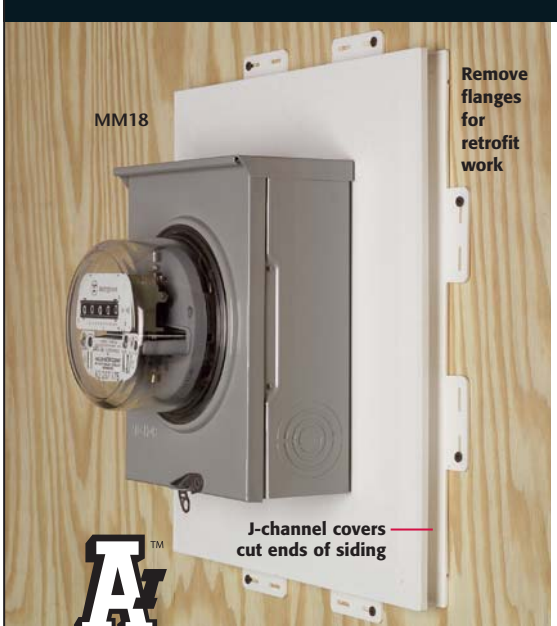
METER MOUNTING BASE

INSTALLS ON SIDING – AND OTHER SURFACES



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Arlington's one-piece, non-metallic Mounting Bases provide a smooth, flat mounting surface for most electric meters, *including the largest sizes* – as well as a variety of other products such as timers, disconnects, inlet boxes and more.

UV rated, paintable plastic for long outdoor life.

Available with squared-off corners, they're *gangable* so you can create the mounting base you need for the product you're installing.

NEW 5x7

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NEW

MM7	**5" X 7"**	MM18	15-7/8" X 17-5/8"
MM10	7" X 10"	MM23	17-5/8" X 23"

MM7 info aifittings.com/landing/mm7
Other aifittings.com/landing/meter-mounting-bases

Large Construction Projects Now Underway or on the Drawing Boards

Contract Value ($ Millions)	Project	City	State	Project Type	Status	Source
30,000	Texas Instruments fab plants	Sherman	TX	Semiconductor	Plans announced	www.ti.com
20,000	Intel Ohio semiconductor plants	Licking County	OH	Semiconductor	Plans announced	www.intel.com
17,000	Samsung semiconductor plant	Taylor	TX	Manufacturing	Plans announced	www.npr.org
11,000	Ford electric vehicle & battery plants	Multiple	KY & TN	Electric vehicle/ EV battery	Plans announced	www.ford.com
9,500	New Terminal One at JFK Airport	Jamaica	NY	Airport	Broke ground August 2022	construction.com
8,500	Venture Global LNG Export facility	Plaquemines Parish	LA	Oil & gas	Broke ground Oct. 2021	construction.com
7,000	General Motors electric vehicle EV plants	Multiple	MI	Manufacturing	Plans	www.gm.com
7,000	Hall Park mixed-use mega-project	Frisco	TX	Mixed-use	Fall 2023 start	Dallas Morning News
6,000	First phase of Taiwan Semiconductor plant	Phoenix	AZ	Semiconductor	Broke ground Oct. 2021	construction.com
5,700	Oil platforms in the Gulf of Mexico	Gulf of Mexico	US	Energy - oil	Broke ground September 2022	construction.com
5,600	Mayo Clinic - multi-year expansion project	Rochester	MN	Hospital	Plans announced	Becker's Hospital Review
5,500	Hyundai Motor Group electric vehicle factory	Savannah	GA	EV factory	Broke ground in October	www.apnews.com
5,000	Helios Health and Wellness campus in Las Vegas	Las Vegas	NV	Medical space & mixed-use	Broke ground October 2022	constructiondive.com
5,000	Rivian electric vehicle plant	Morgan and Walton Counties	GA	Electric vehicle	Plans announced	www.rivian.com
4,000	Panasonic battery plant	De Soto	KS	EV battery	Plans announced July 2022	kansascity.com
3,750	University of California - Davis Health - 16-story hospital and 5-story pavilion	Sacramento	CA	Hospital	Plans announced	Becker's Hospital Review
2,900	Metro-North Penn Station project	New York	NY	Mass transit-rail	Broke ground September 2022	construction.com
2,600	Terminal 1 Replacement at San Diego International Airport	San Diego	AZ	Airport	Broke ground in Nov. 2021	construction.com
2,500-3,000	Five-phase revitalization project at UC San Diego's Hillcrest campus	San Diego	CA	Hospital/ University	Broke ground Dec. 2021	UC San Diego Health
2,500	The Railhead mixed-use development	Frisco	TX	Mixed-use	Expected to break ground in early 2022	constructiondive.com
2,300	GreenCity mixed-use project	Richmond	VA	Mixed-use	Plans announced July 2022	richmond.com
2,000	Multiple projects throughout NJ Transit system	State-wide	NJ	Mass transit-rail	Underway	northjersey.com
2,000	Massachusetts General Brigham - multiple projects in Mass. and NH	Boston	MA	Hospital	Plans announced	Becker's Hospital Review
2,000	Facebook expansion of existing campus	Prineville	OR	Data center	Plans announced	bisnow.com
2,000	Phase 1 EV plant by VinFast, a Vietnamese care manufacturer	Raleigh	NC	Electric vehicle factory	July, 2024 start data	prnewswire.com
2,000	Expansion of Inova's Alexandria Hospital and related projects	Alexandria	VA	Mixed-use & Medical	2023 start date	constructiondive.com
2,000	Fields West mixed-use development	Frisco	TX	Mixed-use	Plans announced	fieldsfrisco.com
1,800	SkyWater Technology semiconductor plant	West Lafayette	IN	Semiconductor plant	Plans announced July 2022	constructiondive.com
1,740	Harborview Medical Center renovation	Seattle	WA	Hospital	Plans announced	Becker's Hospital Review
1,600	Vineyard Wind	Barnstable	MA	Offshore wind	Broke ground in November	construction.com
1,600	Harbor-UCLA Medical Center - 346-bed tower & outpatient building	West Carson	CA	Hospital	Plans announced	Becker's Hospital Review

Table 4. At least 11 semiconductor fabrication plants, EV factories, and EV battery production facilities with a total construction value of at least $2 billion are now underway or on the drawing boards.

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PVC JACKETED MC CABLE

ONE FITTING FITS MULTIPLE CABLE SIZES

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Save time and money with Arlington's *rain-tight, concrete-tight* fittings for PVC jacketed MC cable.

ONE fitting FITS MULTIPLE cable sizes!

LTMC50 *ships ready to use on #10, #12 or #14 PVC jacketed MC cable. Try the NEW SIZES too... LTMC507 and LTMC75.*

Because they fit more than one cable size, these fittings reduce inventory, saving the cost of stocking several *different* fittings.

Ideal for Parking Decks,
High-rise Residential

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Catalog Number	Cable Ranges (Outer Cable Diameter)	
LTMC50	.415" - .565"	
LTMC507	.550" - .765"	goes into 1/2" KO
LTMC75	.725" - .980"	goes into 3/4" KO

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Product Info aifittings.com/landing/ltmc507-ltmc75/

LOWEST COST • L-SHAPED

Made in USA

FAN/FIXTURE BOX

SECURE MOUNTING TO SINGLE, DOUBLE JOISTS

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

Patented

Product info aifittings.com/landing/joist-mount-fan-fixture-box

Arlington®

800/233-4717 • www.aifittings.com

WEATHERPROOF

Made in USA

OUTLET BOX

EASY TO INSTALL ON ANY SIDING TYPE

Our one-piece FS8091F outlet box is your best buy for a fast, easy device installation on siding.

- Works with all single-gang devices, including GFCIs
- Installs on any siding, before or after it's up
- For use where a weatherproof-in-use cover is not required – Accommodates a weatherproof-in-use cover for wet locations

Product info aifittings.com/catalog/siding-mounting-blocks/weatherproof-fs-outlet-box/FS8091F

Arlington®

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Top 50 Metropolitan Statistical Areas (MSAs) for Single-Family Building Permits Year-to-Date							
Rank	Name	1 Unit Building Permits - Sept. 22	# Change YOY	% Change YOY	5 Units+ Building Permits - Sept. 22	# Change YOY	% Change YOY
1	Houston-The Woodlands-Sugar Land, TX	39,590	(665)	-1.7	20,474	9,106	80.1
2	Dallas-Fort Worth-Arlington, TX	36,445	(2,716)	-6.9	22,974	2,485	12.1
3	Phoenix-Mesa-Chandler, AZ	23,399	(4,135)	-15.0	12,451	2,136	20.7
4	Atlanta-Sandy Springs-Alpharetta, GA	21,743	(3,185)	-12.8	14,500	10,542	266.3
5	Austin-Round Rock-Georgetown, TX	17,256	(1,994)	-10.4	18,304	(1,211)	-6.2
6	Charlotte-Concord-Gastonia, NC-SC	15,496	729	4.9	6,005	(924)	-13.3
7	Orlando-Kissimmee-Sanford, FL	13,017	(449)	-3.3	9,606	(605)	-5.9
8	Nashville-Davidson-Murfreesboro-Franklin, TN	12,781	156	1.2	2,476	(7,637)	-75.5
9	Tampa-St. Petersburg-Clearwater, FL	12,639	(2,805)	-18.2	9,177	4,860	112.6
10	Jacksonville, FL	11,395	(1,330)	-10.5	7,184	2,348	48.6
11	Raleigh-Cary, NC	10,422	(774)	-6.9	6,141	868	16.5
12	Riverside-San Bernardino-Ontario, CA	10,333	1,392	15.6	2,181	716	48.9
13	New York-Newark-Jersey City, NY-NJ-PA	9,888	94	1.0	37,488	8,815	30.7
14	Washington-Arlington-Alexandria, DC-VA-MD-WV	9,583	(1,059)	-10.0	15,398	5,149	50.2
15	North Port-Sarasota-Bradenton, FL	9,195	(286)	-3.0	3,230	823	34.2
16	Myrtle Beach-Conway-North Myrtle Beach, SC-NC	9,154	1,725	23.2	413	(61)	-12.9
17	Los Angeles-Long Beach-Anaheim, CA	8,639	367	4.4	14,367	163	1.1
18	Denver-Aurora-Lakewood, CO	8,586	(1,325)	-13.4	10,565	(48)	-0.5
19	San Antonio-New Braunfels, TX	8,555	(2,606)	-23.3	10,742	4,252	65.5
20	Las Vegas-Henderson-Paradise, NV	7,932	(1,151)	-12.7	2,857	363	14.6
21	Cape Coral-Fort Myers, FL	7,885	(432)	-5.2	2,616	1,263	93.3
22	Lakeland-Winter Haven, FL	7,758	564	7.8	2,223	583	35.5
23	Minneapolis-St. Paul-Bloomington, MN-WI	7,602	(1,122)	-12.9	12,322	2,333	23.4
24	Indianapolis-Carmel-Anderson, IN	7,539	31	0.4	3,594	2,114	142.8
25	Chicago-Naperville-Elgin, IL-IN-WI	6,822	(889)	-11.5	5,420	172	3.3
26	Sacramento-Roseville-Folsom, CA	6,646	(426)	-6.0	2,007	73	3.8
27	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	6,115	(459)	-7.0	3,676	(6,766)	-64.8
28	Seattle-Tacoma-Bellevue, WA	5,694	(1,284)	-18.4	13,802	93	0.7
29	Miami-Fort Lauderdale-Pompano Beach, FL	5,580	(1,084)	-16.3	10,184	(1,756)	-14.7
30	Boise City, ID	5,261	(1,221)	-18.8	3,122	774	33.0
31	Deltona-Daytona Beach-Ormond Beach, FL	5,150	1,236	31.6	1,778	1,695	2042.2
32	Oklahoma City, OK	5,061	(977)	-16.2	368	197	115.2
33	Greenville-Anderson, SC	5,054	(1,940)	-27.7	1,085	405	59.6
34	Portland-Vancouver-Hillsboro, OR-WA	4,933	(1,745)	-26.1	5,134	(67)	-1.3
35	Provo-Orem, UT	4,700	(1,281)	-21.4	2,026	(938)	-31.6
36	Charleston-North Charleston, SC	4,678	(3)	-0.1	1,488	(295)	-16.5
37	Fayetteville-Springdale-Rogers, AR-MO	4,584	143	3.2	1,177	189	19.1
38	Columbus, OH	4,567	(683)	-13.0	4,482	1,178	35.7
39	Kansas City, MO-KS	4,404	(826)	-15.8	4,536	1,744	62.5
40	Ocala, FL	4,284	(36)	-0.8	1,167	1,095	1520.8
41	Port St. Lucie, FL	4,066	(189)	-4.4	2,245	1,171	109.0
42	Detroit-Warren-Dearborn, MI	4,020	(443)	-9.9	2,444	497	25.5
43	Richmond, VA	3,821	(829)	-17.8	4,205	2,457	140.6
44	Columbia, SC	3,714	(895)	-19.4	1,125	693	160.4
45	St. Louis, MO-IL	3,641	(734)	-16.8	3,467	1,650	90.8
46	Punta Gorda, FL	3,542	1,160	48.7	624	295	89.7
47	McAllen-Edinburg-Mission, TX	3,395	(76)	-2.2	409	233	132.4
48	San Jose-Sunnyvale-Santa Clara, CA	3,328	1,461	78.3	2,423	813	50.5
49	Cincinnati, OH-KY-IN	3,307	(968)	-22.6	1,120	(712)	-38.9
50	Salisbury, MD-DE	3,274	(427)	-11.5	200	36	22.0
Source: *Building permits through Sept. 2022 from U.S Census Bureau*							

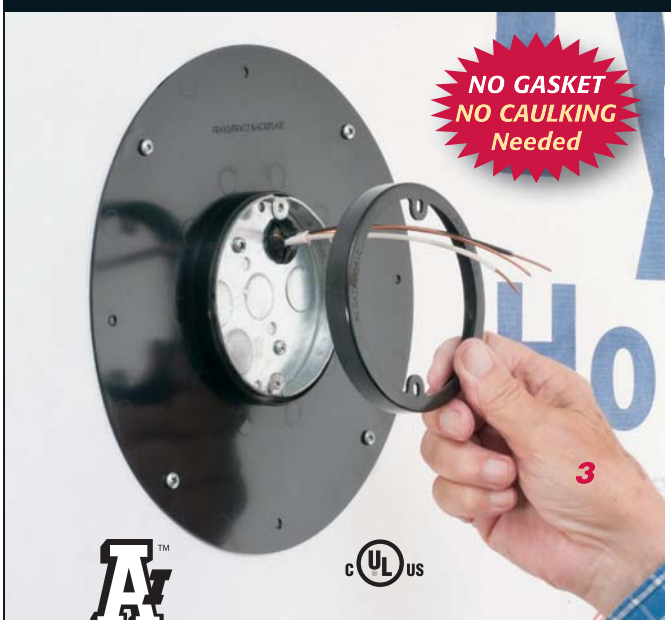
Table 5. As has been the case over the past few years, Texas once again dominated *EC&M*'s list of the 50 Metropolitan Statistical Areas (MSAs) with the most single-family building permits through September 2022, with three MSAs in the Top 5 – Houston (39,590); Dallas (36,445); and Austin (17,256).

NON-CORROSIVE • FOR INSTALLED EXTERIOR FIXTURE BOXES

Made in USA

VAPOR/WATER BARRIER

PREVENTS AIR & WATER FROM ENTERING BOX



Designed for exterior fixture boxes, Arlington's LISTED vapor/water barrier prevents water and air from entering around a box installed on exterior sheathing, **without the need for caulking – or a gasket.**

FR410F saves time and money!

Easy to install, the backplate flange mounts over an *installed* fixture box. And comes with two flanges for use on a pan box *or a deeper octagonal box.*

Easy to install on installed fixture box

Arlington® 800/233-4717 • www.aifittings.com

Product info aifittings.com/landing/fr410F

ECONOMICAL SINGLE and TWO-GANG NON-METALLIC

Made in USA

VAPOR BOX for Devices

NAILS TO STUD IN NEW CONSTRUCTION

FN102FX
Two-gang
40.5 cu in
vapor box

Designed for devices, Arlington's *economical* single and two-gang **Vapor Boxes** offer easy nail-on installation in new construction.

These cost-saving boxes don't include gaskets, but when caulked around the NM cable during installation, they **meet the requirements of NEMA 0S-4.** And help meet International Energy Conservation Codes (IECC), and other codes *where required.*

- Nails ship captive. Plugs and NM cable connectors supplied.

2-hour Fire Rating

Patented

Product info
aifittings.com/landing/fn101fx-fn102fx/

LISTED

Arlington® 800/233-4717 • www.aifittings.com

Looking for Population Growth? Follow the Moving Trucks to These Top Metros							
Metropolitan Statistical Area	**New Residents Per Day**	**Population Estimate 2021**	**Net Migration 2020-2021**	**2020-2021 Increase**	**2020-2021 % Change**	**2015-2020 Increase**	**2015-2020 % Change**
Phoenix-Mesa-Scottsdale, AZ	192	4,946,145	70,097	78,220	1.6	479,564	10.5
Dallas-Fort Worth-Arlington, TX	172	7,759,615	62,921	97,290	1.3	651,816	9.3
Tampa-St. Petersburg-Clearwater, FL	125	3,219,514	45,625	36,129	1.1	258,488	8.7
Austin-Round Rock, TX	117	2,352,426	42,541	53,301	2.3	292,489	14.6
Riverside-San Bernardino-Ontario, CA	93	4,653,105	33,986	47,601	1.0	219,371	4.9
Houston-The Woodlands-Sugar Land, TX	87	7,206,841	31,921	69,094	1.0	483,675	7.3
North Port-Sarasota-Bradenton, FL	81	859,760	29,691	22,653	2.7	86,764	11.3
Cape Coral-Fort Myers, FL	73	787,976	26,813	23,297	3.0	90,524	12.9
Charlotte-Concord-Gastonia, NC	73	2,701,046	26,652	31,381	1.2	234,770	9.6
San Antonio-New Braunfels, TX	73	2,601,788	26,622	35,105	1.4	211,375	8.9
Jacksonville, FL	71	1,637,666	25,857	26,278	1.6	142,273	9.8
Lakeland-Winter Haven, FL	70	753,520	25,517	24,287	3.3	95,729	14.8
Atlanta-Sandy Springs-Roswell, GA	69	6,144,050	25,049	42,904	0.7	399,179	7.0
Boise City, ID	66	795,268	24,261	25,687	3.3	95,180	14.1
Raleigh, NC	64	1,448,411	23,279	28,186	2.0	148,708	11.7
Myrtle Beach-Conway-North Myrtle Beach, SC	60	509,794	21,921	18,212	3.7	82,816	19.2
Deltona-Daytona Beach-Ormond Beach, FL	53	685,344	19,414	14,475	2.2	58,271	9.4
Port St. Lucie, FL	46	503,521	16,645	13,717	2.8	46,129	10.2
Las Vegas-Henderson-Paradise, NV	42	2,292,476	15,395	19,090	0.8	218,131	10.4
Knoxville, TN	39	893,412	14,382	11,784	1.3	39,799	4.7
Provo-Orem, UT	38	697,141	13,912	22,174	3.3	79,332	13.6
Nashville-Davidson-Murfreesboro-Franklin, TN	36	2,012,476	13,234	17,133	0.9	155,244	8.6
Palm Bay-Melbourne-Titusville, FL	34	616,628	12,470	8,621	1.4	42,326	7.5
Salisbury, MD-DE, DE	32	429,223	11,748	9,826	2.3	29,656	7.5
Ocala, FL	31	385,915	11,440	8,545	2.3	31,125	9.1
Greenville-Anderson-Mauldin, SC	31	940,774	11,238	10,609	1.1	59,585	6.8
Oklahoma City, OK	29	1,441,647	10,731	12,938	0.9	67,851	5.0
Naples-Immokalee-Marco Island, FL	29	385,980	10,724	8,901	2.4	36,685	10.3
Orlando-Kissimmee-Sanford, FL	27	2,691,925	9,939	14,238	0.5	249,797	10.5
Punta Gorda, FL	26	194,843	9,526	6,883	3.7	22,104	12.8
St. George, UT	25	191,226	9,204	9,302	5.1	30,074	19.4
Fayetteville-Springdale-Rogers, AR	25	560,709	9,123	11,143	2.0	56,556	11.5
Charleston-North Charleston, SC	24	813,052	8,882	10,091	1.3	73,561	9.9
Tucson, AZ	24	1,052,030	8,857	6,431	0.6	51,685	5.1
Indianapolis-Carmel-Anderson, IN	24	2,126,804	8,854	13,104	0.6	104,099	5.2
Huntsville, AL	24	502,728	8,832	8,710	1.8	36,891	8.3
Sacramento-Roseville-Arden-Arcade, CA	23	2,411,428	8,325	12,077	0.5	111,707	4.9
Richmond, VA	22	1,324,062	8,122	8,328	0.6	56,039	4.5
Columbia, SC	20	838,250	7,288	7,483	0.9	37,598	4.6
Coeur d'Alene, ID	20	179,789	7,283	7,143	4.1	21,062	14.1
Prescott, AZ	20	242,253	7,268	5,186	2.2	19,207	8.7
Tulsa, OK	20	1,023,988	7,207	7,399	0.7	25,055	2.6
Greeley, CO	18	340,036	6,730	8,678	2.6	47,490	16.6
Spokane-Spokane Valley, WA	18	593,466	6,714	6,200	1.1	42,039	7.9
Spartanburg, SC	18	335,864	6,632	6,500	2.0	29,464	9.9
Portland-South Portland, ME	18	556,893	6,436	4,804	0.9	16,973	3.2
Stockton-Lodi, CA	17	789,410	6,199	8,893	1.1	46,048	6.4
Winston-Salem, NC	17	681,438	6,179	5,069	0.7	23,242	3.5
Killeen-Temple, TX	17	486,101	6,112	9,317	2.0	35,415	8.2
Des Moines-West Des Moines, IA	17	719,146	6,096	8,303	1.2	48,112	7.3
Lake Havasu City-Kingman, AZ	17	217,692	6,045	3,622	1.7	12,316	6.0
Source: U.S Census Bureau's 2021 Population Data. Net migration is the difference between the number of residents moving into and out of a geographic area.							

Table 6. A quick-and-easy method of tracking a local market's growth is to calculate the number of residents moving into areas each day. The Phoenix and Dallas metros once again led the pack with 192 and 172 new residents per day, respectively. Tampa moved ahead of Austin this year with 125 new residents.

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

STEEL TV BOX™ KIT

COMBO BOXES FOR USE WITH METAL RACEWAYS

Arlington's recessed STEEL combination power/low voltage **TV BOX**™ is the best way to mount an LED or Hi-Def TV flush against a wall.

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
- Easy, secure installation
- Optional covers

NEW WORK

Mounting screws hold box on stud

2-GANG
TVBS505

Patented

3-GANG
TVBS507

NEW!

1-GANG
TVBS503

Arlington®

800/233-4717 • www.aifittings.com

Product Info aifittings.com/landing/recessed-tv-boxes

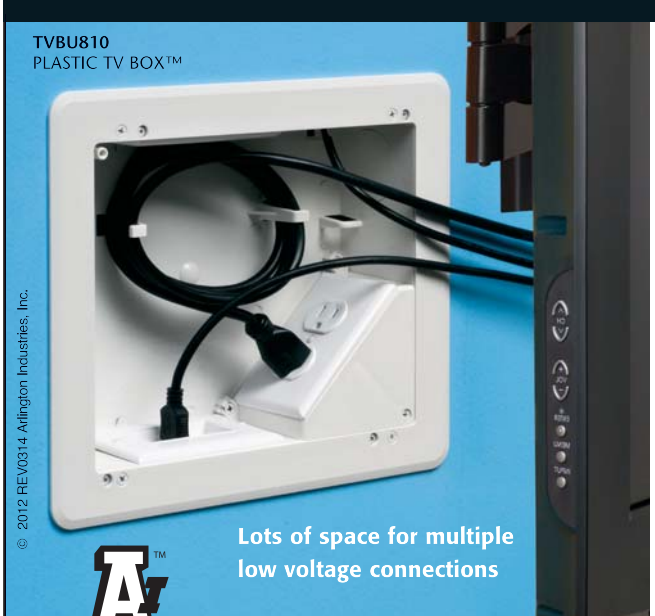
VERTICAL OR HORIZONTAL • RETROFIT & NEW WORK INSTALLATIONS

Made in USA

Non-Metallic 8x10 TV BOX™

PERFECT FOR HOME THEATER SYSTEMS

TVBU810
PLASTIC TV BOX™



Arlington's PLASTIC 8X10 **TV Box**™ delivers the *ultimate in versatility* for installing flat screen TVs in new *and* retrofit projects. There's more room in the box for wires and it installs horizontally or vertically to properly position low voltage connections behind the TV.

- Ideal for home theater systems: multiple connections for sound systems, satellite TV, CATV, DVRs
- Brackets for neater cables, with a 1-1/2" knockout for ENT and other low voltage wiring
- Box mounts to stud in new work; for retrofit, mounting wing screws secure box in wall

Mounts to stud in NEW work

Secure installation in RETROFIT

includes box, trim plate, duplex receptacle, line voltage box, wall plates, cable entry device, knockout plugs

Arlington®

800/233-4717 • www.aifittings.com

Product info aifittings.com/landing/TVBU810

The NFL's Buffalo Bills hope to move into a new $1.4-billion stadium by 2026.

hottest construction markets, look no further than the Sunbelt region.

Let's start in Nashville to see the tremendous residential and commercial growth Music City has seen over the past decade. From there, let's wander through the country roads hugging the shoulders of North Carolina's Smoky Mountains to see all the new vacation/retirement homes being built there. Swing through all the new commercial development in Charlotte and Raleigh-Durham, N.C., and then hit the Outer Banks — another magnet for vacation/retirement homes. After that, it's time to venture further south down Route 95 past South Carolina's island-speckled coastline and retirement getaways, and check out what's promoted as the I-85 Industrial Boom Belt from South Carolina to Georgia. And don't forget to venture on to the state's hub city of Atlanta. Figure out the best time to beat the traffic, but now it's time to move on to Florida and its seemingly ever-growing metros of Orlando, Tampa-Clearwater Beach-St. Petersburg, Sarasota, Fort Myers, and Naples. Catch your breath and grab a grouper sandwich, but then motor through Texas and the colossal new residential developments you see in Houston, Dallas, Austin, and San Antonio (**Table 5** on page 34). Don't forget the gushing oil business of Midland-Odessa either. Take a break for a bit, but then head on to Intermountain Region, the other U.S. region with a major concentration of fast-growing markets. Start in the sprawling Valley of the Sun in Phoenix, which once again leads the nation in net migration (**Table 6** on page 36), before heading north to the bright lights of Las Vegas. Pack your skis or hiking boots and explore all the growth in Salt Lake City, Orem, Ogden, Provo and Logan, Utah, along the 80-mile Wasatch Mountains front and the epic outdoors adventures in the nearby peaks. You can either head north to Boise, Idaho, to see how that metro has grown over the past few years, or east to Colorado's Front Range that stretches about 175 miles from Fort Collins south through Boulder, Denver, and Colorado Springs — home to millions of new residents and hundreds of new businesses drawn to the outdoor lifestyle. Complete this road trip, and you will have seen most of the metros that continually rank as the fastest-growing markets in the United States.

Canoo is one of several companies investing in EV manufacturing facilities. The company plans to refurbish this plant in Oklahoma City to produce its electric delivery vans.

Looking ahead. The chances for a mild recession in 2023 seem pretty good, but you can still find some economists who think the U.S. economy can escape any serious downturn next year. Of course, if the war in Ukraine took an unexpected turn (or the current meltdown in parts of the cryptocurrency market spread to equities and bonds) we could be looking at a "Black Swan" event that could radically change economic conditions. However, this generation of managers in the electrical construction market have already guided their companies through the depths of the pandemic. Therefore, the crisis management skills they developed/utilized in the COVID-19 era should be enough to get them through any new and nasty economic surprises. EC&M

ADJUSTABLE BRACKET • EASY INSTALLATION IN EXISTING CEILING

FAN/FIXTURE BOX

HIGHER WEIGHT RATINGS

Arlington's extra heavy-duty, plated steel fan/fixture box with adjustable bracket has ***higher UL Weight Ratings***:
at 24" on-center: **70 lb Fan, 90 lb fixture**
at 16" on-center: **70 lb Fan, 150 lb fixture**

The 20.0 cu. inch FBRS4200R installs *between* rafters with 16" to 24" on-center spacing, holding a fan or fixture securely in place. It's easy...

REMOVE BOX from bar.
INSERT BAR in opening. Embed bracket ends in joist. Tighten hex, first by hand then with a wrench. Pull wire.
REATTACH BOX to bar.

No parts to lose. Installation screws ship captive, along with a mud cover and installed NM cable connector.

CSA Rated: at 16" or 24" oc 50 lb fan or fixture

Product info aifittings.com/landing/fbrs4200r

Arlington® 800/233-4717 • www.aifittings.com

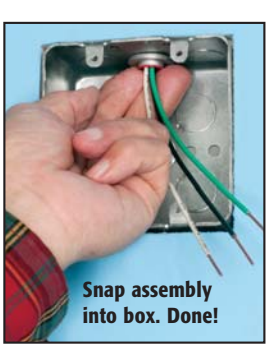
NO TOOLS • EASY SNAP-IN INSTALLATION • *SAVES TIME!*

SNAP2IT® CONNECTORS

FOR RETROFIT INSTALLATIONS

Arlington's new one-piece **RETROFIT SNAP2IT®** fittings are *easy to use in an OLD WORK installation*, and handle the widest variety of cables! They're ideal for adding additional circuits to a load center. And you get the same labor-savings in a retrofit installation!

Easy snap-in installation - NO TOOLS. Install connector into the knockout in an ***existing* box**, pulling cable/conduit through the knockout. Slip the fitting onto the cable, then snap the assembly into the box. That's it... a secure installation with *no pullout*.



Patented

Widest total cable ranges 14/2 to 10/3
Widest variety of cables AC, MC, HCF, MC continuous corrugated aluminum cable, MCI-A cables (steel and aluminum), AC90, ACG90 and FLEX

Arlington® 800/233-4717 • www.aifittings.com

Product info aifittings.com/landing/38rast-40rast/ c UL us Made in USA

By embracing the digitization of fire and life safety codes/standards, electrical professionals can stay up to date wherever they are.

The Benefits of Digitized Codes and Standards for Electrical Contractors

Three reasons contractors should have access to information anytime, anywhere, and on any device

By Erik Hohengasser, NFPA

Hybrid and/or remote work have become mainstream buzzwords since the onset of the pandemic, spurring accelerated digital transformation across multiple industries. However, even before the pandemic, electrical contractors worked in hybrid and remote settings. This is one reason why the electrical industry has always been ripe with opportunities to leverage digital transformation and drive efficiency and collaboration.

The goal of electrical contractors is to meet customer needs in an effective, safe, and compliant manner. Fire and life safety codes/standards serve as the foundation for meeting that goal, so they must be accessible to all employees. Emerging digital platforms that house codes and standards

ADJUSTABLE • NON-METALLIC

Made in USA

IN/OUT™ BOX for Fans & Fixtures

EASY TO INSTALL... IN NEW CONSTRUCTION

Arlington® 800/233-4717 • www.aifittings.com

Arlington's IN/OUT BOX ***for fans and fixtures*** adjusts up to 1-1/2" to accommodate varying ceiling thicknesses, like single or double drywall.

- Pre-set for 1/2" ceiling...use depth adjustment screw *after the ceiling's in place* to position the box flush with the ceiling
- Complies with 2020 NEC, 314.20 for set back boxes
- (4) screws attach box securely to joist in new work
- **2-Hour Fire Rating** ***Listed for fans up to 70 lbs; fixtures up to 100 lbs***

Product info aifittings.com/landing/fba426

1 Cutaway: Box set back in double drywall

2 After ceiling's installed, (if necessary) use the depth adjustment screw to position box flush with ceiling.

Patented

ADJUSTABLE BRACKET • FOR NEW CONSTRUCTION

FAN/FIXTURE BOX

FLUSH CEILING INSTALLATIONS

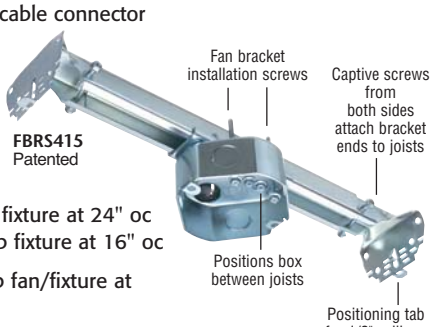
Arlington® 800/233-4717 • www.aifittings.com

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

FBRS415 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



FBRS415
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

are helping democratize code content and expertise so that they can be more readily leveraged in the field. Below are three benefits digital codes and standards can provide to electrical contractors.

1. GREATER ACCESS TO INFORMATION DRIVES EFFICIENCY AND PROFESSIONAL DEVELOPMENT.

Electrical contractors often rely on word of mouth and physical code books to access electrical codes and standards. For example, an electrician looking for clarification on a specific code requirement might call up the foreman, superintendent, or inspector to get the context they need. They might also flip through the pages of a physical code book. But what happens when the resident code expert is unavailable, the code book is nowhere to be found, or the electrician is simply looking for a quicker, more self-sufficient way to find the information?

Digitized codes and standards grant electrical contractors access to multiple publications and their various editions on mobile devices as small as a smartphone. Within this vast digital library, electricians can easily search by section or keyword across publications, bookmarking information as needed for quick access to the sections they find themselves referencing frequently.

With digital tools, instead of fielding several calls a day from employees with questions, the foreman or superintendent can bookmark relevant sections, add notes, and create collections to be shared with teammates. Putting the source of knowledge in employees' hands helps cut out the middleman and allows electrical contractors to make more informed decisions when faced with challenges. It also encourages self-reliance and professional growth. Additionally, housing-specific expertise in future-proofed digital platforms helps coordinate generational knowledge more widely for young electricians and can be a valuable tool in training and upskilling employees.

Installers are better when they have the information they need and know how to find it themselves. Making codes and standards more widely accessible not only increases efficiency and promotes professional growth, but it also helps ensure installations are safe and accurate from the outset, thus avoiding expensive and time-consuming rework.

2. SITUATIONAL NAVIGATION AND SUPPLEMENTAL CONTENT ADD CONTEXT.

When it comes to codes and standards, the whole story always lives in more than one place. Digital tools not only provide electrical contractors with access to several publications and editions at the click of a button, but they also offer more intuitive avenues to locate relevant information.

Electricians build electrical systems to meet specific customer needs — sometimes that means taking on a project they've never done before. Let's say a contractor is tasked with wiring a generator. He may find specific requirements for generators in NEC Art. 445, but he'll still need to know some of the general requirements that live within earlier Articles in the Code. Digital tools enable users to search through context and locate relevant information when the subject matter cuts across multiple Articles in the NEC.

In addition to situational navigation, digital tools can help add further context/color to codes and standards with supplemental content. This can include expert commentary, visual/audio aids, or added handbook content. Since digital platforms are not static, they can continuously onboard new, up-to-date content as needed.

3. CHANGE INDICATORS AND NOTE TRANSFER IN AN EVOLVING SAFETY LANDSCAPE.

The fire and life safety ecosystem is constantly evolving. This makes it critical for teams to have real-time access to the newest updates. Digitization helps new information about codes and standards, such as changes from edition to edition, tentative interim amendments (TIAs), and errata get disseminated quickly and accurately to keep projects compliant. Digital platforms not only update new editions or changes, but they also flag new information with interactive change indicators to ensure nothing goes unnoticed. This helps teams know any requirements that may have changed between editions as they plan for their next installation.

When it comes to codes and standards, the whole story always lives in more than one place.

Amid constant updates, it's also important for electrical contractors to have a future-proofed way to take notes. For example, the state of Massachusetts implements a new Code every three years, so electricians may be hesitant to put notes within a physical codebook, knowing they'll have to get a new book within the next few years. Within digital platforms, however, notes are retained and transferred from older to newer editions. That means that electricians can fill up the virtual margins with technical knowledge and experience to build a repository history that can remain with them throughout their careers. This allows them to better invest in their code content and gain perspective on how the codes and standards have evolved throughout the years. EC&M

THE BOTTOM LINE

The digitization of fire and life safety codes and standards empowers electrical professionals to better invest in their people, democratize knowledge, add context to standards, and stay up to date. By embracing these emerging digital tools, they can unlock a new standard of safety and efficiency.

Erik Hohengasser is the electrical technical lead for NFPA, directing and advancing the development of content and services that support NFPA products and stakeholders. He can be reached at NFPAPR@matternow.com.

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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
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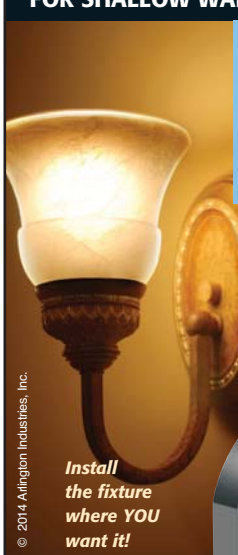

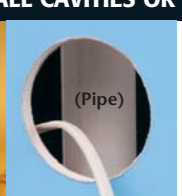

Arlington's **Low Profile Sconce Box** is perfect for retrofit installations with shallow wall cavities or obstructions in the wall.

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CS14

Quick, easy installation. *Just nail or screw The SPACER to a wood or metal stud!*

- Holds single or double row of power or low voltage cables:
  -One to eight 14/2
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- Positions, fastens, routes power or datacom cable
- Complies with article 300.4(d) of NEC

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Screw-on CS14SC

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Focus on Fittings, Fasteners, Hangers, and Accessories

Cable Lacing Bar

With numerous lacing slots and a 2-in. offset for added functionality, the ERLBAR-RA is designed to provide important strain relief to cabling and connections while also promoting good bend radius to help maintain data speeds. The bar fits standard 19-in. racks, provides valuable cable management, and helps eliminate wire clutter. The product contains multiple cable lacing points and includes 10-32 and 12-24 rack screws.

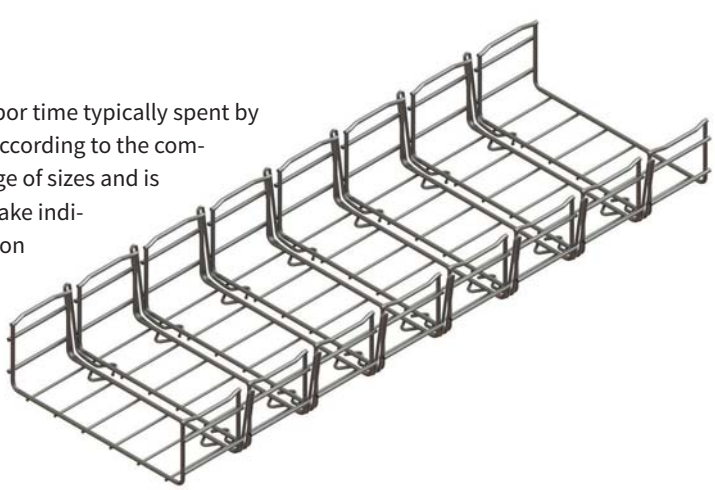
Video Mount Products

Concrete Anchors

Power Pro concrete anchors are designed for light- and medium-duty concrete, block, and brick applications. The anchors are corrosion resistant and ICC-ES code compliant. The product is available in various lengths and 3⁄16-in., ¼-in., and 5⁄16-in. diameters. Unlike traditional anchors, the Power Pro concrete anchors feature a fully threaded tip to enable quick penetration into wood and other materials. The wide serrated threads and mid-crossband threads offer a cleaner and faster cut while providing strong pullout and shear load strength, according to the company. The anchors are available in a hex washer head and flat head with star drive.

Hillman

Wire Mesh Fitting



Cablobend is a flexible wire mesh fitting that saves labor time typically spent by contractors to create vertical drops for data centers, according to the company. The product line now encompasses a wider range of sizes and is designed to make it even simpler for contractors to make individual bends and drops up to 90°. The system expansion allows these bends and drops to be made without having to cut the tray. The product is available in three heights (2 in., 4 in., and 6 in.), five widths (6 in., 8 in., 12 in., 18 in., and 24 in.), and two finishes (EZ and BL).

Legrand

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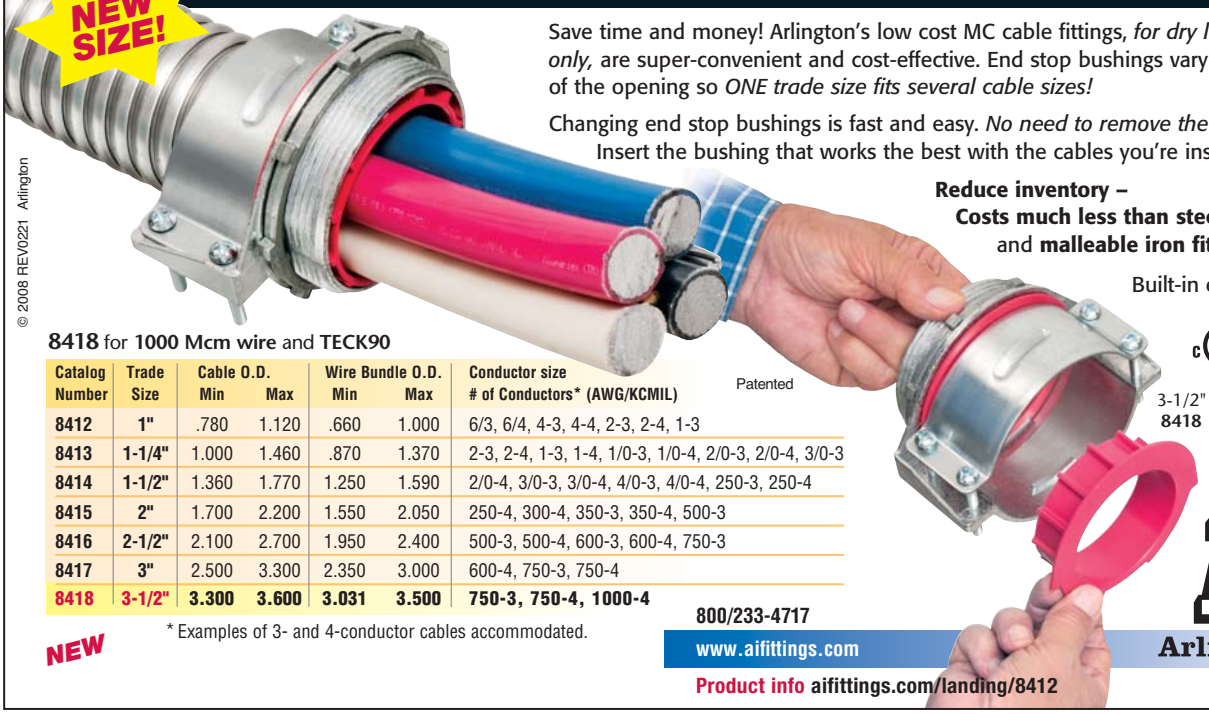
MC CABLE FITTINGS

NEW SIZE! 3-1/2"

THAT FIT SEVERAL CABLE SIZES



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

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Patented

3-1/2" **8418**

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)
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**

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

NEW

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Arlington®

Product info aifittings.com/landing/8412

NON-METALLIC • VENTED FOR EASIER STACKABILITY

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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®

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Product info aifittings.com/landing/concrete-pipe-sleeve

Pre-Fabricated Channel System

Fast Trak is a prefabricated trapeze suspension solution (consisting of vertical tracks and horizontal brackets) that brings great speed of installation to electrical containment, piping, and HVAC services. The Fast Trak bracket comes in stocked sizes from 9 in. to 61 in., has attachment points on all four faces, and can be suspended from the tracks in any of those four orientations. The bracket is also compatible with traditional strut accessories, as well as quick-twist accessories from the company. In addition, the bracket is equipped with a push-button latch at both ends that allows the bracket to slide up and down the tracks without the need for tools.

Gripple

Electrical Connectors

These push-on connectors install quickly with no tools and are designed for use with rigid PVC Schedule 40 and 80 conduits. The product is made to UL, IP66, and NEMA45 standards. In addition, the connectors are watertight, dust-tight, and concrete-tight — and rated for direct burial. The fittings (including locknut and gasket) seal the installation with a raintight connection to the box. Finally, the connectors are made of UV-resistant PVC, which protects against the damaging effects of ultraviolet light, making them a good fit for outdoor environments.

Quick Fitting

Cable Manager System

The ER-HCM series horizontal cable manager system provides a functional management system for a variety of cables. The product fits EIA standard 19-in. racks and cabinets and allows for easy cable routing, adds, changes, and moves. In addition, the product features a snap-on cover that opens up or down, smooth edges that prevent cable snags and damage, and comes with 12-24 and 10-32 rack screws.

Video Mount Products

WHITE BUTTON® • NON-METALLIC

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NEW

CABLE CONNECTORS

EASY PUSH-IN INSTALLATION OF ONE OR TWO CABLES

from ***OUTSIDE*** *a* ***New Work Box...***

Save money with Arlington's non-metallic NM cable connectors – the *lowest cost* NM cable connectors on the market – and the fastest to install! Easy push-in installation...

Listed for single or multiple cables, Arlington's new **White Button**® 1/2" NM94X and the ***NEW 3/4" NM95X*** offers smooth, easy cable insertion of one *or two* cables into a single opening from inside or outside the box.

NM94X... BETTER than our popular NM94 AT THE SAME PRICE!

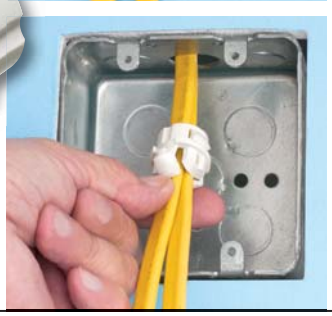
- 1/2" trade size NM94X holds:
  (1) 14/2 to 6/2, (1) 14/2/2, (1) 12/4,
  (1) 12/2/2, (1) 14/3 to 10/3,
  (2) 14/2 to 10/2, (2) 14/3,
  (2) 12/3,
  (1) 14/2 and (1) 12/2,
  (1) 14/2 and (1) 10/2,
  (1) 12/2 and (1) 10/2

NM94X

Patented

- **Easy** removal with pliers or screwdriver
- **Listed.** Exceeds UL/CSA pullout requirements

or ***INSIDE*** *an* ***Existing Box.***



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NON-METALLIC

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FIXTURE BOXES for Siding

EASY INSTALLATION

BOTH INSTALL *BEFORE OR AFTER SIDING*

Arlington's **8141F** and **8081F** boxes deliver the fastest, easiest way to install light fixtures and receptacles on siding. *Good looks. Smooth vertical mounting!*

- Easy to install one or two-piece styles for any siding type
- NM cable connector included
- UV rated for long outdoor use
- Textured, paintable finish

ONE piece 8141F Fixture Box	VS	TWO piece 8081F Electrical Box
No extra cover to lose or store		Separate cover and box
For light fixtures		For light fixtures, standard receptacles
Costs less than 8081F		

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Fire Sleeve

The CFS-MSL Modular Firestop Sleeve is designed to bring flexibility along with optimized cable capacity and airflow performance. The product provides firestopping low-voltage cable penetrations for single cable and cable bundles and is usable in small- to medium-sized rectangular openings in walls, ceilings, and floors. The product features a fire-rated cable pathway for low-voltage installations, a symmetrical half-shell design to ensure it is always retrofittable, and it can be easily ganged in any combination of modular sleeve sizes.

Hilti

Circuit Tracer Kit

The advanced circuit tracer kit provides reliable tracing of energized or non-energized breakers, fuses, and wires. By using the product, users can easily adjust the receiver sensitivity level to detect the transmitted signal through drywall, cement block, and underground. The receiver has visual indicators and an audible beep to denote signal strength. It features a flashlight for illumination in low-light areas and an NCV function to test if wires are energized. Finally, the transmitter has AC/DC external voltage indicators of 12V, 48V, 120V, 240V, and 480V.

Klein Tools

Life Safety Solution

The FA-TBAR-4R is a ready-to-install solution for mounting 4O-compatible life safety devices in drop ceilings. The bracket adjusts from 15-in. to 25-in. to span the T-grid, while riveted clips sit easily into the grid channel. A 4-in. octagon box adjusts vertically from 0 in. to 1.5 in. to ensure the opening is flush with the tile surface, which is preset at ⅝ in. raised. The 4O box measures 2⅛ in. deep and is designed for smoke detectors and exit signs. The UL-listed box is powder coated with a red finish and includes holes for branch line restraints.

Orbit Industries

Conduit Stub-Ups

Stub-EASE is designed to maintain a coupling within the slab or below the grade of concrete to keep future extensions of the conduit from projecting beyond the top of concrete. Stub-EASE is attached to the embedded conduit via a threaded coupling, be it set screw or compression connection. This can be accomplished with a 90° bend on the conduit or using a threaded short radius 90° elbow, depending on the depth of the concrete slab. After the concrete pour, the high-density polyethylene (HDPE) sleeve and support is cut down to the top of concrete elevation and left in the slab until the future raceway is ready to be safely extended into a wall cavity. Then, electricians can use their pliers to unscrew the sleeve using the plastic partition wall in the middle of the sleeve to expose the embedded threaded coupling.

Emergent Safety Supply

Arc Isolation and Prevention

ArcBlok is a line-side arc isolation and prevention technology for low-voltage motor control centers and switchboards. The product is designed to not only reduce the possibility of an arc flash event, but also greatly reduce the duration and intensity of an arc flash event to less than 1.2 cal/cm^2 on the line side. Incorporating the principles of circuit breaker technology into the design, ArcBlok self-clears in less than a cycle (16.6 msec) without any active elements. According to the company, ArcBlok has nothing to adjust, turn on, or forget to turn off to better protect personnel.

Schneider Electric

EV Charger

The company's Green Motion EV chargers utilize smart breaker technology to combine fast AC charging, revenue-grade metering, and remote access within the traditional footprint of a circuit breaker. The EV smart breaker chargers install directly in a load center, EV wallbox, or single- or dual-port pedestals, depending on where the car is parked. According to the company, this means efficient and simple installation with fewer components/hardware and multiple options that are easy and fast to deploy.

Eaton

Wiring Methods—Part 1 of 2

Do you know the rules for installing cables, conductors, and raceways?

By Mike Holt, NEC Consultant

Article 300 of the National Electrical Code (NEC) contains the general requirements for wiring methods and materials for power and lighting [Sec. 300.1(A)]. It includes the general requirements for all wiring methods included in the NEC but does not apply to twisted-pair cable and coaxial cable (covered in Chapters 7 and 8) unless Art. 300 is specifically referenced. Nor does it apply to the integral parts of electrical equipment [Sec. 300.1(B)]; such equipment is covered by various product standards [Sec. 90.7].

CONDUCTORS

Conductors must be installed in a Chapter 3 wiring method such as in a raceway, cable, or enclosure [Sec. 300.3(A)]. Table 300.1(C) provides the designators for raceway trade sizes.

All conductors of a circuit (including the neutral and equipment grounding conductors) must be run in the same raceway, cable, trench, cord, or cable tray except as permitted by Sec. 300.3(B)(1) through (4). For example, if you run conductors in parallel per Sec. 300.10(G), this requirement applies separately to each run [Sec. 300.3(B)(1)].

Connections, taps, or extensions made from paralleled conductors must connect to all conductors of the paralleled set. Exception: Parallel phase and neutral conductors can be installed in individual underground nonmetallic raceways (Phase A in raceway 1, Phase B in raceway 2, etc.) as permitted by Sec. 300.5(I) Exception No. 2 if the installation complies with Sec. 300.20(B).

Power conductors rated 1,000V or less can occupy the same raceway, cable, or enclosure if all conductors have an insulation voltage rating of at least that of the maximum circuit voltage [Sec. 300.3(C)(1)]. But control, signaling, and communications wiring must be separated from power and lighting circuits so the higher-voltage conductors do not accidentally energize the control, signaling, or communications wiring.

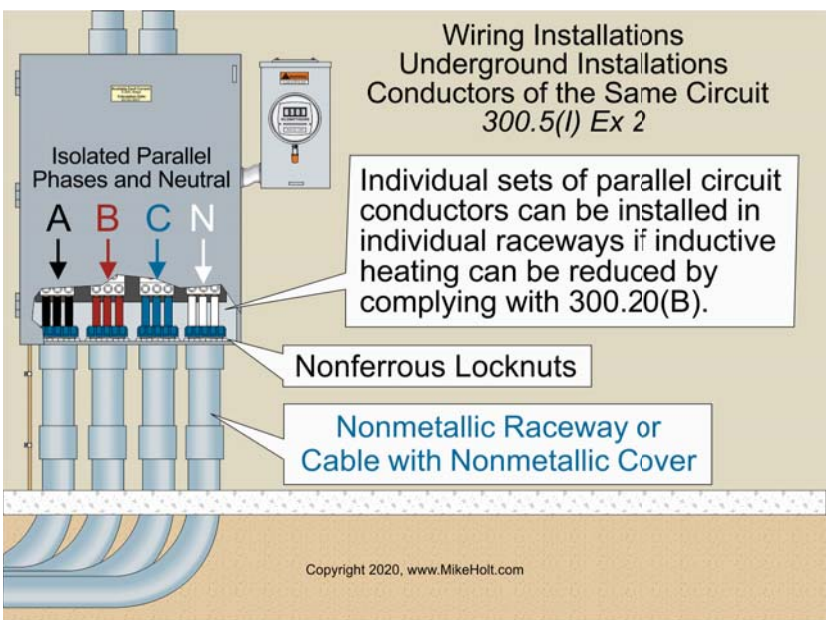


Fig. 1. Not all underground conductors of the same circuit have to be installed in the same raceway.

Where subject to physical damage, conductors, raceways, and cables must be protected [Sec. 300.4]. This principle is repeated throughout the NEC. For example, Sec. 300.4 is followed by a long enumeration of specifics in Sec. 300.4(A) through (H). The particulars of running nonmetallic cable through bored holes in wood frame members [Sec. 300.4(A)] certainly won't apply to process heating equipment [Art. 425]. That said, you will find many of these instances to be nearly verbatim to Sec. 425.12(A): "Where subject to physical damage, fixed industrial process heating equipment shall be protected in an approved manner."

When cables or raceways are installed underground, they must have a minimum cover per Table 300.5 [Sec. 300.5(A)]. Cables and insulated conductors installed in underground enclosures or raceways must be listed as suitable for a wet location [Sec. 310.10(C)].

Cables and conductors installed under a building must be within a raceway that extends past the outside walls of the building [Sec. 300.5(C)]. Exception No. 2: Type MC Cable listed for direct burial or concrete encasement is permitted under a building without installation within a raceway [Sec. 330.10(A)(5) and Sec. 330.10(A)(11)].

Direct-buried conductors and cables, such as Types MC, UF, and USE installed underground, must be protected from damage per Sec. 300.5(D)(1) through (4). For example, underground conductors and cables that

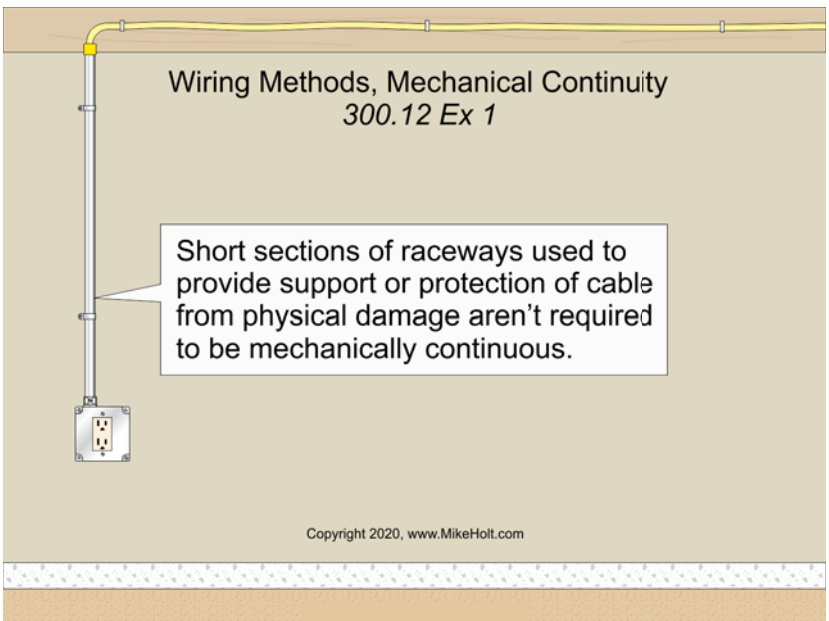


Fig. 2. Not all sections of raceway need to be mechanically continuous.

enter a building must be protected to the point of entrance.

Direct-buried conductors or cables can be spliced or tapped underground without a splice box [Sec. 300.15(G)] if the splice or tap is made per Sec. 110.14(B) [Sec. 300.5(E)].

Backfill material for underground wiring must not damage underground raceways, cables, or conductors [Sec. 300.5(F)]. Large rocks, chunks of concrete, steel rods, mesh, and other sharp-edged objects can damage the underground conductors, cables, or raceways, so don't use them in backfill.

If moisture could contact energized live parts through an underground raceway, a seal identified for use with the cable or conductor insulation must be installed at either or both ends of the raceway [Sec. 300.5(G)]. Raceways that terminate underground must have a bushing or fitting at the end of the raceway to protect emerging cables or conductors [Sec. 300.5(H)].

Underground conductors of the same circuit (including the equipment grounding conductor) must be installed inside the same raceway or multiconductor cable, or be near each other in the same trench [Sec. 300.5(I)]. See Sec. 300.3(B).

Exception No. 2: Underground parallel conductors can have the conductors of each phase or neutral in separate nonmetallic raceways where inductive heating at raceway terminations is reduced by the use of aluminum locknuts and by cutting a slot between the individual holes through which the conductors pass as required by Sec. 300.20(B) and shown in **Fig. 1** on page 49.

RACEWAYS

If a raceway is subjected to different temperatures — and where condensation is a known problem — the raceway must be filled with a material (approved by the authority having jurisdiction) that will prevent the circulation of warm air to a colder section of the raceway.

Sealants must be identified for use with cable insulation, conductor insulation, a bare conductor, a shield, or other components [Sec. 300.7(A)]. One common product used for this is electrical duct seal, and it is so identified. Typical expanding foams used to seal buildings are not identified for this application.

Raceways must be provided with expansion, expansion-deflection, or deflection fittings (where necessary) to compensate for thermal expansion,

deflection, and contraction [Sec. 300.7(B)].

Note: Table 352.44 provides the expansion characteristics for PVC conduit. The expansion characteristics for steel conduit are determined by multiplying the values from Table 352.44 by 0.20. Those for aluminum raceways are determined by multiplying the values from Table 352.44 by 0.40. Table 355.44 provides the expansion characteristics for reinforced thermosetting resin conduit (RTRC).

The interior of raceways installed in wet locations above ground is considered a wet location. Insulated conductors and cables installed in raceways in aboveground wet locations must be listed for use in wet locations per Sec. 310.10(C) [Sec. 300.9]. In addition to Sec. 310.10(C), Table 310.4(A) can be used to find other insulation types permitted in wet locations.

Metal raceways, cable armor, and other metal enclosures must be metallically joined into a continuous electrical conductor to provide effective electrical continuity [Sec. 300.10]

Exception No. 1: Short lengths of metal raceways used for the support or protection of cables are not required to be electrically continuous, nor are they required to be connected to an equipment grounding conductor [Sec. 250.86 Exception No. 2 and Sec. 300.12 Exception No. 1].

The purpose of electrical continuity between metal parts is to establish the effective ground-fault current path necessary to operate the circuit overcurrent protective device in the event of a ground fault [Sec. 250.4(A)(5)].

Raceways, cable assemblies, and enclosures must be securely fastened in place [Sec. 300.11(A)]. You can't use ceiling-support wires or the ceiling grid to support raceways or cables [Sec. 300.11(B)]. Independent support wires secured at both ends can be used to support raceways or cables.

Electrical wiring within the cavity of a fire-rated ceiling assembly can be supported by independent support wires attached to the ceiling assembly. The independent support wires must be distinguishable from the suspended-ceiling support wires by color, tagging, or other effective means [Sec. 300.11(B)(1)].

Outlet boxes [Sec. 314.23(D)] and luminaires can be secured to the suspended-ceiling grid if the luminaire is securely fastened to the ceiling-framing members by mechanical means, such as bolts, screws, or rivets, or by the use of clips or other securing means identified for use with the type of ceiling-framing member(s) used [Sec. 410.36(B)].

Cables cannot support other wiring methods [Sec. 300.11(D), but a raceway can if the raceway:

- Is identified as a means of support [Sec. 300.11(C)(1)].
- Supports Class 2 and 3 cables and supplies power to the equipment controlled by the Class 2 or 3 circuits [Sec. 300.11)(C)(2)].
- Supports boxes or conduit bodies per Sec. 314.23 or luminaires per Sec. 410.36(E) [Sec. 300.11)(C)(3)].

Raceways and cable sheaths must be mechanically continuous between boxes, cabinets, and fittings [Sec. 300.12].

- *Exception No. 1: Short sections of raceways used to provide support or protection of cables from physical damage are not required to be mechanically continuous* [Sec. 250.86 Exception No. 2 and Sec. 300.10 Exception No. 1], as shown in **Fig. 2** on page 50.
- *Exception No. 2: Raceways and cables installed into the bottom of open-bottom equipment, such as switchboards, motor control centers, and floor or pad-mounted transformers, are not required to be mechanically secured to the equipment.*

UNDERSTANDING IS EVIDENT

Article 300 is primarily concerned with how to install, route, splice, protect, and secure conductors and raceways. How well you understand and apply the requirements of this Article will usually be evident in the finished work. Many of its requirements affect the appearance and longevity of the installation. 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.

Stumped by the Code?

By Mike Holt, NEC Consultant

All questions and answers are based on the 2020 NEC.

Q. What are the rules related to installing raceways and cables underground?

A. You can find these requirements in Sec. 300.5. Here's a short recap for your review.

(A) Minimum Cover Requirements. When cables or raceways are installed underground, they must have a minimum cover per Table 300.5 (see **Figure**).

(B) Wet Locations. Cables and insulated conductors installed in underground enclosures or raceways must be listed as suitable for a wet location [Sec. 310.10(C)].

(C) Cables and Conductors Under Buildings. Cables and conductors installed under a building must be installed within a raceway that extends past the outside walls of the building.

(D) Protecting Underground Cables and Conductors. Direct-buried conductors and cables such as Types MC, UF, and USE installed underground must be protected from damage per (1) through (4).

(1) Emerging from Grade. Direct-buried cables and conductors that emerge from grade must be protected against physical damage. Protection is not required to extend more than 18 in. below grade, and protection above ground must extend to a height of not less than 8 ft.

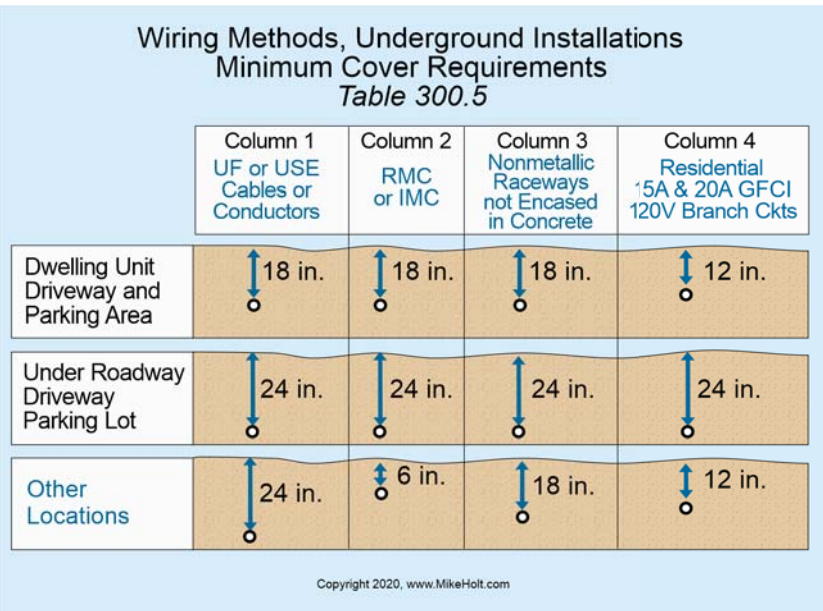
(2) Conductors Entering Buildings. Underground conductors and cables that enter a building must be protected to the point of entrance.

(3) Underground Service Conductors. Underground service conductors must have their location identified by a warning ribbon placed in the trench at least 12 in. above the underground conductor installation.

(4) Raceway Damage. Where a raceway is subject to physical damage, the conductors must be installed in EMT, RMC, IMC, RTRC-XW, or Schedule 80 PVC conduit.

(E) Underground Splices and Taps. Direct-buried conductors or cables can be spliced or tapped underground without a splice box [Sec. 300.15(G)] if the splice or tap is made per Sec. 110.14(B).

(F) Backfill. Backfill material for underground wiring is not permitted to damage underground raceways, cables, or conductors.



When cables or raceways are installed underground, they must have a minimum cover per Table 300.5.

Q. What are the requirements for securing and supporting raceways and cable assemblies?

A. Raceway and cable assemblies must be secured and supported per the requirements in Sec. 300.11.

(A) Secured in Place. Raceways, cable assemblies, and enclosures must be securely fastened in place.

(B) Wiring Systems Installed Above Suspended Ceilings. Ceiling-support wires or the ceiling grid are not permitted to support raceways or cables. Independent support wires secured at both ends can be used to support raceways or cables.

(C) Raceways Used for Support. Raceways are not permitted to support other wiring methods, except as follows:

(2) Class 2 and 3 Circuits. Class 2 and 3 cables can be supported by the raceway that supplies power to the equipment controlled by the Class 2 or 3 circuits.

(D) Cables Not Used as Means of Support. Cables are not permitted to support other wiring methods. EC&M

These materials are provided to us by Mike Holt Enterprises in Leesburg, Fla. To view Code training materials offered by this company, visit www.mikeholt.com/code.

Clarification Needed on GFCI Requirements

Some patience may be needed while waiting for this rule to evolve.

By Russ LeBlanc, NEC Consultant

Based on the 2020 NEC.

Patience is a virtue, or so I've been told. Some patience may be needed while waiting for this rule to evolve into something easier to decipher.

Section 422.5(A) requires GFCI protection to be provided for seven specific appliances. This requirement is based solely on the voltage rating and amperage rating of the appliance. The branch circuit voltage rating is irrelevant because there is no mention of the branch circuit voltage in this rule. There are also no exceptions to this rule. What about low-voltage appliances? Will a 12V sump pump need GFCI protection too? I'm hopeful that some changes may come to this rule to provide some much-needed clarification.

Presently, the requirement only applies to appliances with a voltage rating of 150V or less to ground and an amperage rating of 60A or less. This includes single-phase or 3-phase appliances. A 230V sump pump would be excluded from needing GFCI protection, but a 115V pump would need it. Looking at other appliances, neither a 3-phase, 208V nor a single-phase, 230V commercial dishwasher installed in the kitchen of a restaurant is required to have GFCI protection, but a 115V dishwasher is required to have GFCI protection. The branch circuit for each of those dishwashers may be operating at less than 150V to ground, but the voltage rating of the branch circuit seems to be irrelevant for applying this rule. Was the intent to specifically exclude the branch circuit voltage rating from this requirement? Or was it merely overlooked unintentionally? That is the one-million-dollar question.

You may remember that something similar happened in the 2017 Code with Sec. 210.8(B) GFCI protection requirements for receptacles. The branch circuit voltage was not mentioned in Sec. 210.8(B) for 2017, and only the voltage rating and amperage rating of the receptacle mattered. Thankfully, that error of omission was corrected in the 2020 NEC. The wording now includes the branch circuit voltage rating in addition to the receptacle ratings.

Clarifications didn't happen in Sec. 422.5(A) for 2023. Maybe we will need to wait until 2026 for some exceptions and branch circuit voltage ratings to be added to this requirement. Until then, I think some discussion with your AHJ would be a good idea for this one. EC&M

Illustrated Catastrophes

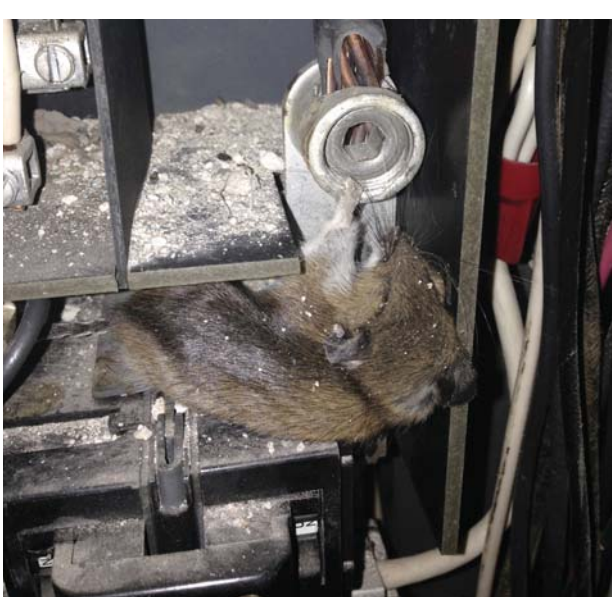
By Russ LeBlanc, NEC Consultant

All references are based on the 2020 edition of the NEC.

MISMATCHED WIRING METHODS

EC&M reader Fred Bauer, a journeyman electrician with Hartery Construction, was kind enough to share this photo with us. He spotted this transfer switch installation in Hunter Mountain, N.Y. Using rigid PVC conduit couplings with liquidtight flexible nonmetallic conduit (LFNC) does not satisfy Code requirements. Section 300.15 requires fittings and connectors to be "used only with the specific wiring methods for which they are designed and listed." Section 356.42 states "only fittings listed for use with LFNC shall be used." PVC conduit fittings are not listed for use with LFNC. Misusing fittings in this manner is also a violation of Sec. 110.3(B), since they are not listed for this application. On a positive note, the installer did take the time to install expansion couplings on the PVC conduits emerging from the ground. Section 300.5(J) requires direct-buried cables, conductors, and raceways subject to movement from ground settlement or frost heaves to be arranged to prevent damage to the raceway or the enclosed conductors. Using flexible wiring methods or expansion fittings can also be used to satisfy this requirement. For PVC conduit exposed to physical damage, schedule 80 PVC conduit should be used as specified in Sec. 352.10(F).

UNLUCKY RODENT



This photo was sent in by Stephen M. Daniels, president of Daniels Electrical Contractors in Lancaster, Pa. "I was doing a service call for a dead circuit (forgive the pun) and took the panel cover off," says Daniels. "There were missing knockouts, and that's how the furry panel guest got in. This is another reason why the Code calls for no open KO in panels or boxes." I completely agree with you, Stephen. Installing knockout seals in unused openings can help keep out the critters. It can also help keep out dust, moisture, and other contaminants/foreign objects that can damage the equipment. Section 110.12(A) requires unused cable and raceway openings to be closed in a manner that provides "protection substantially equivalent to the wall" of the enclosure. Installing knockout seals can also help keeps arcs and sparks from escaping the enclosure and possibly igniting adjacent combustible materials. Section 408.7 requires unused circuit breaker and switch openings to be closed with identified closures or some other approved means providing protection equivalent to the enclosure walls. Keeping the unused openings closed can also reduce the risk of accidental contact with energized parts.

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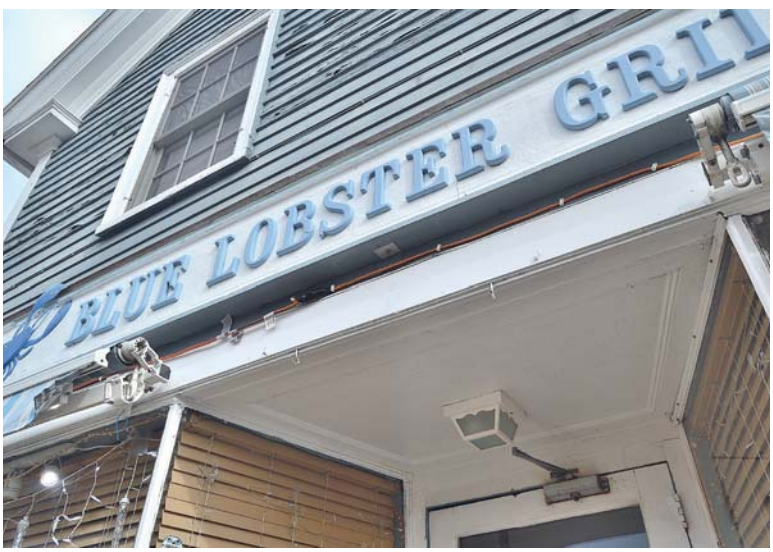
What's Wrong Here?

By Russ LeBlanc, NEC Consultant

How 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 2020 NEC.

Hint: Is that an extension cord I see below the sign?



'TELL THEM WHAT THEY'VE WON...'

Using the 2020 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, 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.

OCTOBER WINNERS

Our winners this month are: Dean Miller, an *EC&M* reader in Tipp City, Ohio; Hanna Camp, a registered professional engineer with Provost & Pritchard Consulting Group in Bakersfield, Calif.; and Craig Thoroughgood, a master electrician, State of New Hampshire, and air monitoring systems supervisor with Air Resources Division in Concord, N.H. They were all able to correctly cite the working space violation in front of this panelboard enclosure.

The shelving built in front of the panelboard encroaches into the working space required by Sec. 110.26(A). This space must provide working clearance for a minimum depth of 3 ft as specified in Table 110.26(A)(1) — and this space extends from the floor to a height of at least 6½ ft as required by Sec. 110.26(A)(3). Section 110.26(B) prohibits the required working space from being used for storage. With all the obstructions in front of this panelboard impeding access to the overcurrent devices, we could also cite Sec. 240.24(A), which requires circuit breakers to be readily accessible.

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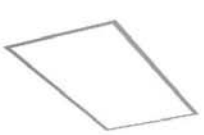

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