ELECTRICAL DESIGN LIBRARY

NEIS: A Bridge Between Safety & Quality

NECA
NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION

Contents

Electrical Design Library (EDL) publications are prepared for architects, consulting engineers, and qualified electrical contractors, as well as owners, developers, investors, and their electrical construction specifying personnel. Issued periodically by the National Electrical Contractors Association (NECA), the publications provide factual explanations of the increasing variety of sophisticated electrical systems and the economics of their installation by professional electrical contractors. They are distributed by the Association's chapters, located in all sections of the United States.

Published by the National Electrical Contractors Association, 3 Bethesda Metro Center, Bethesda, Maryland 20814.

Index No.
3025116
Marketing
9K/12/05

Introduction

NECA now offers more than 30 National Electrical Installation Standards (NEIS). But the program is only eight years old. How did the NEIS program get off the ground?

Frustration.

These voluntary standards were the idea of frustrated electrical contractors. Conversations typically went like this (between Contractor A and Contractor B).

A: "I'm losing electrical work because my company provides quality work. Isn't that a crime?

B: "Sure. How do you figure?"

A: "We know the right way to install lighting fixtures. Our conduit runs are parallel, all of the circuits are labeled—all the installation tricks that we know will make our work easy for the building owner to maintain. When we put a price on a given job, we include the time and effort we know it takes to provide work that the owner will appreciate on down the line."

B: "And you lose the job anyway?"

A: "When it's a bid, we're a bit too high. When it's negotiated work, someone comes in below our price. It's frustrating."

B: "Won't the owners regret going for the low price?"

A: "No doubt. But don't forget, most of what we do, other than the lighting, is invisible—behind the walls. The difficulties don't show up 'til later, when the owner tries to upgrade the building's electrical system. And the owner's people will have difficulties maintaining it, which will last the life of the building. All of this stuff shows up on their bottom line—but later."

B: "So the owners will become your customers later."

A: "Maybe. But meantime, they've got a subpar electrical installation. The owner's cost goes up every day, long after construction is done. And our company's out of luck."

B: "Why don't you get some of this stuff written into the National Electrical Code? The inspectors enforce the Code. Then, everyone will have to do it the quality way."

A: "That might sound like a good idea, but it will not work in practice. The NEC is an electrical safety code. It's about protecting human life, preventing fires, and avoiding damage to equipment."

B: "Isn't there anything about quality in the Code?"

A: "Only one phrase. In Section 110.12, the NEC says electrical installations should be installed in a 'neat and workmanlike manner.' That's as far as it goes. What's interesting, I guess, is that 'neat and workmanlike' is not even defined!"

B: "So—you want the Code to include quality specs?"

A: "No. Electrical safety is too important in protecting human life by preventing fires and shock hazards. That's probably as far as the National Electrical Code should go.

B: "So what's the answer? Maybe you should stop doing quality work?"

A: "That's the worst possible outcome. What we really need is a way for building owners—and the engineers and architects who work for them—to specify, as part of the electrical contract, how a job is to be installed. An industry consensus."

B: "…a way for someone to specify quality, then."

A: "Yes—that would level the playing field. If the contract specifies quality, then we can go ahead and provide it. Any competitor that doesn't normally do that would have to struggle to get the job done the right way."

While that conversation seems "apocryphal," it isn't. A series of conversations like this between electrical contractors, and between contractors and NECA staff, led to the NEIS.

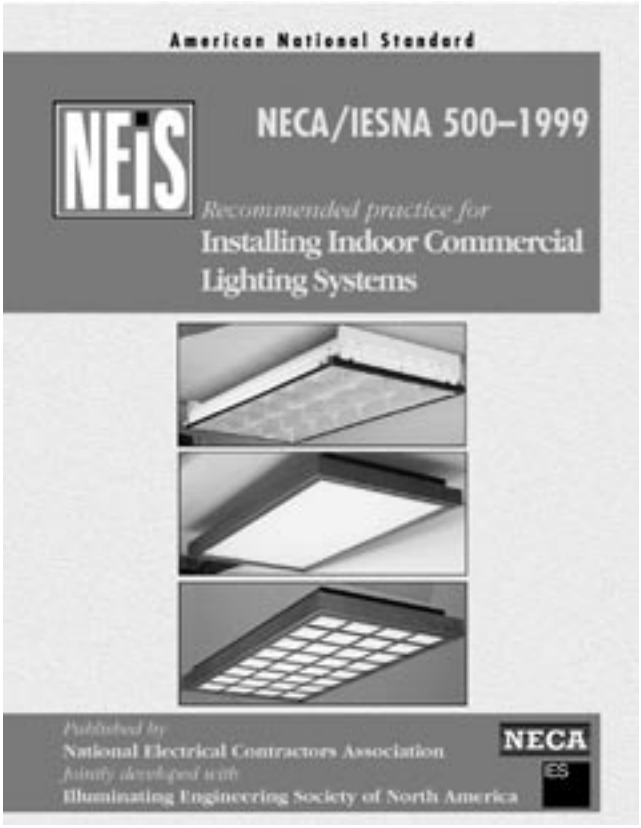
In essence, the NEIS program—and each individual document—is the answer to the question, "How can a building owner or developer specify and enforce a quality installation?"

Using the NEIS

NEIS go beyond the basic safety requirements of the National Electrical Code to clearly define what is meant by installing products and systems in a "neat and workmanlike" manner.

Referencing NEIS saves spec-writing time, and provides unprecedented control over workmanship and long-term performance. As an enforceable part of the contract documents, NEIS significantly reduce misunderstandings among engineers, electrical contractors, owners, and facility managers.

So how do you—as an owner or electrical specifier—implement the NEIS and what do electrical contractors get out of it? Read on.



Ideas for Owners

If your installation violates the National Electrical Code in some way, you open yourself up to problems. Most places in the United States adopt the NEC as their local law. Violate the NEC, break the law…and spend more money than you would otherwise need.

Further, the NEC exists for a reason—safety, for humans and property. If an NEC violation leads to fire, explosion, shock hazard, or some other harm, you face liability concerns. If the worst that happens is a no-human-injury fire, the result is "good"…if that's the word you use for a significant hit to your bottom line.

In comparison, installations that ignore the body of NEIS installation standards are put in place every single day. In fact, nonprofessional electrical installations can seem to be almost the norm. One electrical industry magazine regularly features snapshots of disastrous-looking electrical work.

But wait: Don't you expect a high-quality electrical installation? Of course. If your electrical contractor meets the NEC in every way, but provides a poor-quality electrical installation, where's the problem? Your people will be safe; your equipment will function; your building won't burn down.

However, you'll pay for a poor-quality electrical installation. Your system will be more difficult to operate; upgrades and renovations will be more costly; maintenance and repairs will be anything but "routine."

What's worse, the higher costs and longer time-frames for routine procedures will be, at heart, your fault.

By not specifying how you want the electrical work installed, you leave it to the contractor's discretion. If you've chosen the electrical contractor via the low-bid method, that company and its managers and workers may well see finishing the job quickly as a main driver.

At one time, there was a very good reason for you to omit quality specifications; they didn't exist. Today, with the National Electrical Installation Standards, you can include—in your specifications, RFPs/RFQs, bid, and contract documents—one or more standards that specify the quality you need in your electrical infrastructure.

As an enforceable part of your contract documents, NEIS will reduce miscommunication between you, your

NEIS Fact Sheet

Here's an idea of what the National Electrical Installation Standards are and are not.

- NEIS documents are the first-ever industry performance standards for electrical construction.
- NEIS standards are not promulgated by the National Fire Protection Association (as is the National Electrical Code). However, the 2005 NEC refers to NEIS in seven places. NEIS supplement the safety requirements of that regulatory Code with additional quality and workmanship provisions.
- NECA has submitted a package of 24 change proposals to add additional references to NEIS throughout the 2008 NEC. This improvement should greatly increase use and awareness of NECA's performance standards for electrical construction.
- NEIS do not substitute for or conflict with the National Electrical Code. Each document "picks up" where the NEC "leaves off." NEIS documents are about quality electrical and datacom installations. The NEC is about electrical safety.
- While NECA sponsors NEIS, these documents are true industry standards. Many NEIS are developed in conjunction with other industry groups that have expertise in a given installation area. All NEIS are developed via the consensus procedures established by the American National Standards Institutes (ANSI).
- Do NEIS have the force of law? No. But electrical inspectors are one of the groups that vote to approve each NEIS. And the International Association of Electrical Inspectors conducts training classes for its members on how to inspect a given installation to NEIS standards.

As of 2005's end, there were 30 NEIS standards published and 15 in some stage of development. Further, several existing standards were undergoing revisions. Upon publication, NEIS standards are available as paper books or as electronic files available via CD or Internet download. To find NEIS standards or get more information about them, visit *www.neca-neis.org*.

We Take ANSI Seriously—You Should, Too

Founded in 1918, the American National Standards Institute (*www.ansi.org*) is a private, non-profit organization that "administers and coordinates the U.S. voluntary standardization and conformity assessment system."

The Institute provides the means for the United States to influence global standardization activities and the development of international standards. The Institute's mission is to enhance both the global competitiveness of U.S. business and the U.S. quality of life by promoting and facilitating voluntary consensus standards and conformity assessment systems, and safeguarding their integrity.

It is the dues paying member and sole U.S. representative of the two major non-treaty international standards organizations, the International Organization for Standardization (ISO) and the International Electrotechnical Commission, via the U.S. National Committee.

Whenever possible, National Electrical Installation Standards are developed via the ANSI voluntary-standards process. Some key points:

- ANSI does not develop American National Standards.
- Instead, ANSI provides all interested parties (in the U.S.) with a "neutral venue." Via ANSI, consensus standards can be developed. The Institute assures access to the standards-development process for all parties directly or materially affected by a standard that is under development.
- Further, ANSI specifies an appeals mechanism. If one of those affected parties feels that a standard (such as one of the NEIS developed under the ANSI process) has been developed unfairly, there must be a method for hearing such an appeal.
- By the end of 2003, more than 10,000 American National Standards had been developed.

Three quick facts on the NEIS and ANSI:

1. NECA, publisher of the NEIS standards, is one of 270 ANSI-accredited standards developers, and it works with other ANSI-accredit standards developers. For example, NECA has worked with the Illuminating Engineering Society of North America (IESNA), also an ANSI-accredited standards developer, on four lighting-related standards.
2. ANSI's Board of Standards review has 12 board members, one of whom is a NECA staff member.
3. NECA takes the ANSI consensus process very seriously; it's not for show. While NECA is an organization of union electrical contractors, NEIS standards are routinely routed to representatives of the non-union sector during the standard-development and approval process.

Associations Help Develop Standards

To be worthwhile, NEIS standards must be the resource for specifying quality electrical and datacom installation work. Wherever possible, NECA has developed standards in conjunction with associations that have offered significant expertise.

- **The Aluminum Association** — *Recommended Practice For Installing Aluminum Building Wire and Cable* – NECA/AA 104-2000
- **BICSI, A Telecommuincations Association** — *Standard for Installing Commercial Building Telecommunications Systems* – NECA/BICSI 568-2001
- **Copper Development Association** — Under development at this writing: A new standard, to be named NECA/CDA 108 – *Standard for Copper Wiring Applications*
- **Electrical Generating Systems Association** — *Recommended Practice For Installing Generator Sets* – NECA/EGSA 404-2000
- **Fiber Optic Association** — *Standard for Installing and Testing Fiber Optic Cables* – NECA/FOA 301-2004
- **Illuminating Engineering Society of North America** — *Recommended Practice for Installing Indoor Commercial Lighting Systems* – NECA/IESNA 500-1998; *Recommended Practice for Installing Exterior Lighting Systems* – NECA/IESNA 501-2000; *Recommended Practice for Installing Industrial Lighting Systems* – NECA/IESNA 502-1999
- **National Armored Cable Manufacturers Association** — Under development at this writing: A new standard, to be named NECA/NACMA 120 – *Standard for Installing Armored Cable (Type AC) and Metal-Clad Cable (Type MC)*.
- **National Electrical Manufacturers Association** — *Recommended Practice for Installing Metal Cable Trays* – NECA/NEMA 105-2002; *Installing Underground Nonmetallic Utility Duct* – NECA/NEMA 605-2005
- **Steel Tube Institute of North America** — Standard for Installing Steel Conduit (Ridig, IMC, EMT) – NECA 101-2001

Note to readers: The list above does NOT include all NEIS standards in existence or under development. It comprises only the standards created with the active cooperation of the specific industry groups named.

Okay—They're Great. But…What's Actually In a Standard?

Here's a quick review of a specific NEIS document: NECA/IESNA 500-1999, *Recommended Practice for Installing Indoor Commercial Lighting Systems*.

Scope: 1 page.

Definitions: 1.25 pages.

General Installation Procedures: 4.65 pages.
Subheads in this area include (this is a selected list, by no means comprehensive):

- Moving Material on Site;
- Site Preparation;
- Special Care Items;
- Information on safety, suspension, and seismic reinforcements;
- Modular Wiring Systems;
- Interior Clean-Out;
- Completion of luminaire installation; and
- Punchlist and acceptance,

Recessed Lighting Systems: 2 pages. Includes step-by-step procedure for installing recessed downlights, wallwashers, and accent lights with a housing above the ceiling. The standard includes: "Wear cotton gloves if necessary to prevent smudging or fingerprinting of finished surfaces."

Surface & Suspended Lighting Systems: 2.5 pages. Here's the paragraph (5.1.6b) covering track lighting installed in suspended grid ceiling systems:

> "Identify track location and cut a hole in the ceiling tile at the end or floating feed location. Install a junction box with lighting-outlet extension ring, secured to the building structure by threaded rod or wire suspension. Connect the outlet box to the power source using cable, or conductors in raceway. Install track feed connector using the junction box ring as support and power source."

Troffer Compatability Considerations: an "annex," not considered part of the standard, covering 2.65 pages (includes one table and eight illustrations).

engineers, your electrical contractor, and—later on—your building maintainers and facility managers.

Ideas For Electrical Specifiers

Let's say, for argument's sake, that a building's owner/developer wants a new or to-be-modernized building to include high-quality electrical infrastructure. How can the architect, electrical engineer, and/or construction manager accomplish that?

NEIS standards are the logical alternative to researching installation specifications and developing them on your own. Developed by the electrical construction industry, with many approved by the American National Standards Institute, each NEIS standard is organized as a technical manual.

"Practical" is the watchword for the NEIS. Implementation (not just theory) is the key. Each document provides practical guidance for all sectors of the electrical construction industry.

Referencing the NEIS is easily done. It simplifies and speed the writing of electrical specifications.

All NEIS conform to the National Electrical Code. That's routine for NECA and those that help us in developing these standards.

When the engineer specifies the installation effort using one or more NEIS, the chance of miscommunication among the building owner/developer, the engineer, and the electrical contractor is reduced or eliminated.

Detailed installation procedures are written for electrical contractors by the leading national association in their field. With this level of detail, it is entirely possible to see a reduction in the owner's potential vulnerability to change orders and delays.

What's In It For Contractors?

While electrical contractors are not the primary audience for these Electrical Design Library publications, they will have obvious questions. Here are three clarifying points:

1. NEIS standards create a level playing field. Inclusion of one or more NEIS in contract documents will be transparent to all competitors for that work.
2. The owner (or an engineer or other specifier acting on the owner's behalf) is the only entity that can mandate one or more NEIS standards be included on a given job.
3. While NECA has 4,400 members and consists primarily of contractors employing union labor, the NEIS standards are not written to favor any union, or jurisdiction. They are all about delivering value to the owner.

Conclusion

For the buildings you own or manage, covering both safety and quality in the electrical installations is vital. NECA's NEIS are voluntary standards covering recommended installation and maintenance practices for electrical products and systems.

These standards supplement and illustrate the requirements contained in ANSI/NFPA 70, National Electrical Code, and ANSI/IEEE C2, National Electrical Safety Code.

NECA does not develop safety requirements for electrical products and systems. The organization's standards are intended to establish a minimum level of electrical construction **quality** and to define what is meant by a "neat and workmanlike" installation.

Referencing NEIS saves spec-writing time and provides unprecedented control over workmanship and long-term performance.

EDL Order Form

The following monographs are $4.00 each for NECA members and $10.00 for nonmembers. Prices for bulk quantities will be quoted upon request.

	Date	Title	Index No.
❑	8/99	Energy Savings Performance Contracting—A New Frontier	302597
❑	6/00	National Electrical Installation Standards	302599
❑	12/00	Intelligent Building Distributed Networks	3025100
❑	6/01	The Essentials of Quality Power	3025102
❑	9/01	Specifying Integrated Building Systems	3025103
❑	12/01	Guide to Energy Efficiency Options: Using Today's Electrotechnologies	3025104
❑	12/02	Guide to Quality Electrical Installations	3025105
❑	12/02	Quality Lighting Design and Installation	3025106
❑	4/03	Tips for Ensuring "Best Quality" Voice-Data-Video Installations	3025107
❑	9/03	Aspects of Electrical Testing	3025108
❑	12/03	Lighting Trends: Energy Rules and Technology Rolls	3025109
❑	12/03	Should Owners Use—Or Break—the Electrical Equipment Supply Chain?	3025110
❑	10/04	Electrical Maintenance Pays Dividends	3025111
❑	11/04	Concerns About Critical Facilities	3025112
❑	12/04	Sustainable Design: Turning Theory into Reality	3025113
❑	10/05	LEED: Make Lighting Green	3025114
❑	11/05	Create Electronics-Friendly Facilities	3025115
❑	12/05	NEIS: A Bridge Between Safety & Quality	3025116

Please send me the EDL(s) checked above. I have enclosed a check in the amount of $_____ for these copies.

Name _____

Address _____ _____ _____

City State Zip

Please mail this EDL Order Form and your check (made payable to NECA) to:

NECA Chapter Locations

The National Electrical Contractors Association, Inc., was founded in 1901. It represents the electrical contracting industry and is organized into independent, local chapters throughout the United States, Australia, Canada, and New Zealand. The headquarters office is located at 3 Bethesda Metro Center, Suite 1100, Bethesda, MD 20814-5372. Field service regional offices are located in Covington, LA, Glendale, WI, Novato, CA, and Wakefield, RI. For help in locating a qualified electrical contractor in your area or for more information concerning this publication, contact the NECA Chapter Office nearest you.

ALABAMA: Mobile (251-479-9534)
ALASKA: Anchorage (907-561-1958)
ARIZONA: Phoenix (602-263-0111), Tucson (520-323-1622)
ARKANSAS: Little Rock (501-758-2224)
CALIFORNIA: Bakersfield (661-325-5937), Dublin (925-828-6322), Fresno (559-263-9683), Los Angeles/Pasadena (626-792-6322), Martinez (925-372-3222), Menlo Park (650-328-3100), Orange (714-634-8777), Petaluma (707-765-1050), Sacramento (916-376-8980), Salinas (831-751-2080), San Bernardino (909-824-7050), San Diego (858-571-6322), San Francisco (415-703-8333), San Jose (408-288-6100), Santa Maria (805-348-1200), Stockton (209-478-8105)
COLORADO: Denver (303-937-3900), Colorado Springs (719-636-3901)
CONNECTICUT: Hamden (203-287-1444)
DELAWARE: Philadelphia, PA (215-732-1444)
DISTRICT OF COLUMBIA: Annandale, VA (703-658-4383)
FLORIDA: Jacksonville (904-636-0663), Miami (305-828-9918), Orlando (407-426-9050), Tampa (813-253-0887)
GEORGIA: Atlanta (770-454-6400), Atlanta [Southeastern Line Constructors] (770-969-9209), Augusta (706-262-6322), Savannah (912-355-1252)
HAWAII: Contact NECA Marketing Services in Bethesda, MD (301-215-4525)
IDAHO: Boise (208-322-4744)
ILLINOIS: Chicago (630-876-5360), Joliet (815-729-2288), Northeastern Illinois (630-876-5360), Peoria (309-673-6900), Rockford (815-874-8400), Quad Cities (563-322-5371), Springfield (217-585-9500)
INDIANA: Evansville (812-422-3259), Indianapolis (317-846-5680), Michigan City (219-872-3151)
IOWA: Des Moines (515-278-2341)
KANSAS: Wichita (316-265-7067)
KENTUCKY: Louisville (502-893-2713)
LOUISIANA: Baton Rouge (225-752-7970), Monroe (318-387-4411), New Orleans (504-733-9370), Shreveport (318-686-9541), Westlake (337-436-0886)
MAINE: Boston, MA (617-969-2521)
MARYLAND: Baltimore (410-590-1189)
MASSACHUSETTS: Boston (617-969-2521), Springfield (413-785-1337), Worcester (508-752-6422)
MICHIGAN: Detroit (248-355-3500), Lansing (517-372-3080)
MINNESOTA: Duluth (218-722-8115), Minneapolis (952-591-1800), St. Paul (651-224-3377)
MISSISSIPPI: Jackson (601-373-1623)
MISSOURI: Kansas City (816-753-7444), Kansas City [Southwestern Line Constructors] (816-891-8570), Kansas City [Missouri Valley Line Constructors] (816-891-9066), St. Louis (314-644-3030)
MONTANA: Helena (406-442-8330)
NEBRASKA: Omaha (402-397-5105)
NEVADA: Las Vegas (702-876-7860)
NEW HAMPSHIRE: Boston, MA (617-969-2521)
NEW JERSEY: Mountainside (908-654-5770), Mt. Laurel (856-722-6777)
NEW MEXICO: Albuquerque (505-883-6677)
NEW YORK: Albany (518-785-5876), Binghamton (607-723-8824), Finger Lakes, NY (315-451-4278), Hudson Valley (845-928-3575), Long Island (631-462-0490), New York City (212-481-0534), Potsdam (315-742-1060), Rochester (585-292-5190), Scarsdale [Northeastern Line Constructors] (914-723-2527), Western NY State (716-810-1664)
NORTH CAROLINA: Richmond, VA (804-672-2234)
NORTH DAKOTA: Fargo (701-293-1300)
OHIO: Akron (330-384-1242), Cincinnati (513-791-8777), Cleveland (216-398-8440), Columbus (614-224-4408), Dayton (937-299-0384), Toledo (419-666-6040), Vandalia [American Line Builders] (937-898-5824), Youngstown (330-726-5525)
OKLAHOMA: Tulsa (918-749-9449), Oklahoma City (405-848-8621)
OREGON: Portland (503-233-5787), Springfield (541-736-1443)
PENNSYLVANIA: Philadelphia (215-732-1444), Pittsburgh (412-432-1155)
RHODE ISLAND: Providence (401-785-2990)
SOUTH CAROLINA: Richmond, VA (804-672-2234)
SOUTH DAKOTA: Fargo, ND (701-293-1300)
TENNESSEE: Chattanooga (423-894-4357), Memphis (901-366-9010), Nashville (615-885-4441)
TEXAS: Amarillo (806-373-0281), Arlington (817-633-3332), El Paso (915-778-4295), Houston (713-977-2522), San Antonio (210-226-6331), Wichita Falls (940-761-6020)
UTAH: Salt Lake City (801-486-6900), Midvale [Western Line Constructors] (801-566-8600)
VERMONT: Springfield, MA (413-785-1337)
VIRGINIA: Richmond (804-672-2234)
WASHINGTON: Everett (425-258-2644), Seattle (206-284-2150, Spokane (509-328-9670), Tacoma (253-584-4095)
WEST VIRGINIA: Charleston (304-346-1331)
WISCONSIN: Madison (608-221-4650), Milwaukee (414-778-0305)
WYOMING: Casper (307-234-8142)

INTERNATIONAL CHAPTERS
AUSTRALIA: NECA National Office [Australia] (61-3-9645-5566), New South Wales (02-9744-1099), Queensland (7-3251-2444), South Australia (61-8-8272-2966), Western Australia (618-9321-8637)

Thinking "Best Value?"

For Integrating Power, Light and Building Systems, NECA Contractors Define "Best Value."

Experts in the design, specification, installation management and integration of all electrical and specialty systems.

- **Power distribution**
- **Data and communications**
- **Safety and security**
- **Automated control systems**

Integration can make all the difference—in managing costs, delivering the best value and making sure that all power, light and sophisticated specialty systems perform as they should for years to come. With experience in all aspects of electrical contracting and staff trained in the most advanced installation and maintenance techniques, a NECA contractor can assume full accountability for all electrical contracting projects of any size or scope. To find NECA contractors, contact your local NECA chapter or visit www.necanet.org.

Think Best Value. Think NECA Contractors.

NECA