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— Chicago Section —

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FEATURES

UPCOMING EVENTS

DEPARTMENTS

Chicago Section Executive Committee Meeting
Tuesday, February 8, 2005, 7:00 p.m.
DeVry DuPage, Room TBA, 1221 N. Swift Rd., Addison, IL
No Registration Needed

The importance of being properly grounded

By Paul Zukowski

Sometimes with the rapid advancement of electronic technology, the basics can be overlooked. The classic help-line questions such as "Is the device plugged in?" and "Did you turn it on?" illustrate this tendency.

Back when there were no solid-state electronics, power quality had little or no effect on most loads connected to electrical distribution systems. Induction motors didn't shut down a voltage sag, they just spun out fewer horsepower. Incandescent or fluorescent lighting systems similarly affected just decreased their lumen output temporarily.

Nowadays electronic equipment in industrial applications is much more sensitive to voltage, current, or frequency deviations, and if they fail or malfunction, complex processes can experience expensive downtime costs.

Disturbances as brief as one-half cycle can affect the operation of sensitive electronic equipment. Ideally the power-supply voltage is an uninterrupted sinusoidal waveform of constant amplitude. The first line of defense against various transients is the transient voltage surge suppressor.

When complaints about electrical power occur, inspecting power-system wiring and system grounding is extremely important because studies show that incorrect wiring and grounding errors cause from 50-80 percent of power-quality problems.

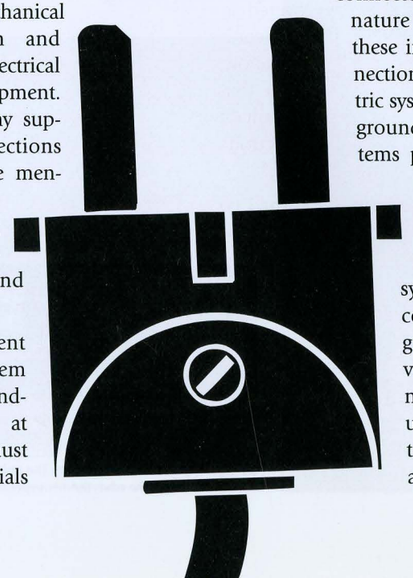
The IEEE Green Book, Std. 142-1991, "IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems," provides electrical engineers with the most current, reliable information on grounding. For equipment, it recommends the use of both a metal conduit/raceway and a green conductor wire with each circuit. All terminations, connectors and fittings must be tightly installed on the conductor/raceway.

Equipment grounding for safety typically involves meeting NEC requirements on interconnecting metal equipment enclosures such as racks and cabinets, metal conduit/raceway systems and equipment grounding conductors. It includes supplementary grounding conductor connections such as grounding/bonding jumpers or other electromechanical connections from and between items of electrical or electronic equipment. It also includes any supplementary connections between the above mentioned items and structural building steel, earth grounding electrodes, and similar items.

The equipment grounding system must conduct ground-fault current. And at the same time, it must keep touch potentials under control so personnel do not experience any significant shock hazards.

Emergency power systems require special grounding considerations. Electrical power systems require two types of grounding, system grounding and equipment grounding. In large building complexes, consideration should be given to possible power disruption within the facility and the need for area protection. Due consideration should be given to effects of multiple ground connections, need for ground-fault protection, selection of transfer switches and conformance to current code requirements.

System grounding is concerned with how and where the grounded conductor is connected to earth. The nature and location of these intentional interconnection between the electric system conductors and grounding electrode systems provide an effective connection to ground. According to the National Electrical Code, system and circuit conductors are grounded to limit voltages due to lightning, line surges, or unintentional contact with higher voltage lines, and to stabilize the voltage to ground during normal operation. Systems rated 600 volts or less are solidly grounded to facilitate overcurrent device operation in case of ground faults.



With equipment grounding, it is important that all exposed metallic parts of electrical equipment be bonded to a grounding electrode. This includes metallic parts such as engine generator frames, metallic electrical conduit and raceway enclosures, cable trays, cable shields and metallic racks and ladders in vaults.

Electric-shock hazard and fire hazard are avoided by providing adequate equipment grounding paths for metallic enclosures in a way that assures adequate current-carrying capability and an adequately low value of ground-fault circuit impedance.

The National Electrical Code permits the grounding electrode to be a metal underground water pipe, which may be part of a municipal water piping system or a well on the premises. However, buried portions of a water pipe system less than 10 feet in length or that may include plastic or cement materials should not be used. Before reliance can be placed on any existing electrodes, it is essential that their resistance to earth be measured to insure that some unforeseen discontinuity has not seriously affected their suitability. Also, care should be exercised to ensure that all parts which might become disconnected are effectively bonded with flexible bonding jumpers.

Another aspect of grounding covered in the Green Book concerns transferred earth potential (TEP). It is defined as, "the voltage-to-earth of grounding systems that will appear on conductors as a result of the source system grounding electrode being above normal earth potential."

Larger voltages are usually developed by ground fault currents returning to their source through earth. An example is a ground fault of a conductor supplying a substation transformer primary to the station ground grid. If this grounding grid is not connected to the high-voltage source system ground, there can be a significant voltage rise above earth as the fault current flows into the earth. Low voltage conductors leaving the area where the ground or the grounding electrode voltage has been affected will have that voltage added to their normal line-to-ground voltage. The total voltage may exceed the insulating rating of the conductors or the equipment to which they are connected.

The principles apply to facility grounding as well. In a poorly grounded facility, fault and lightning stroke conditions may cause substantial current flow to ground. The current flow interacting with the impedance of the facility grounding will develop voltage. This voltage, in turn, will cause ground voltage to rise within the facility. The rise in potential can be measured at equipment. An earthed reference such as a water pipe or driven ground provides a good measurement point. Watch for seasonal variations in earth resistivity due to low moisture content or frozen temperatures that can lead to thousands of ohms per centimeter earth resistivity. In this case, even small amounts of current flowing to earth can cause elevated potentials within a facility.

When data connectivity provides a metallic path between one device affected by TEP and another device at earth potential, upset or hardware damage can occur. At the very least, data transmission problems may occur. At the worst, potentials will exceed the dielectric withstand capabilities of the network cards and hardware damage will occur.

In summary, thorough consideration should be given to protecting against power disruption within a building or facility by providing adequate ground-fault protection. Techniques for both equipment grounding and system grounding should be such as to provide optimum safety and assure maximum continuity of power to essential loads. ■

Sources:

Rene Castenschiold, P.E., "Grounding of Alternate Power," Int. Assoc. of Electrical Inspectors magazine, Nov./Dec. 2003

Joseph R. Knisley, "Solving power-quality problems," Electrical Wholesaling Electrical Marketing magazine, Oct 1, 1998

Tom Shaughnessy, "Transferred Earth Potential," Power Quality Assurance magazine, March/April 1998

Lunch Meeting

Chicago Chapter of the IEEE Power Engineering Society

Asset Management

Wednesday, February 9, 2005

Wanda Reder, S&C Electric
Cheryl Maletich, Exelon

About the Topic:

Over the last decade, electric utility industry leaders have been confronted by many changes like deregulation, industry restructuring, changing risk profiles of investors, increased customer demand for reliable service (100% availability), and competition. Meanwhile, in many cases there has been less funding available to design, engineer and operate Energy Delivery. As a result, managers have turned to new ways of balancing the many needs with limited resources to best manage the energy delivery assets. One concept that has been introduced in the last decade is Asset Management.

The presentation will discuss the process of utilizing asset management, typical objectives, and compare this approach to the traditional delivery management model. Furthermore the role of the asset manager will be reviewed along with critical success factors.

About the Speakers:

Wanda Reder recently joined S&C Electric Company as Vice President of the Power Systems Services Division, which offers consulting and engineering services, field services, and project management to utilities and power users.

Since 1987, Wanda has held numerous leadership positions in the utility industry, involving distribution system automation, long-range system planning, and development of conservation and load management initiatives. As VP-Energy at Davies Consulting, she developed asset management and reliability improvement strategies for various utilities.

Wanda joined ComEd as VP of Engineering and Planning in 2001 where she had responsibility for system planning, engineering standards, maintenance, reliability, and mapping. Later, she assumed leadership of Exelon Energy Delivery Asset Management and was additionally responsible for asset investment strategy, electric transmission, substation standards, new business engineering, delivery engineering, and work management for both ComEd and PECO in Philadelphia.

Wanda has served on the IEEE Power Engineering Society Governing Board since 2002 and was Chairperson of the 2002 IEEE PES Summer Meeting. She has been a distinguished lecturer at many conferences and has also served in leadership positions with EEI T&D. Most recently, Wanda has researched the aging workforce of the power industry in the U.S., to prepare a "road map" for actions to be taken. Wanda earned an Engineering B.S. from South Dakota State University in 1986 and MBA from the College of St. Thomas in 1990.

Cheryl Maletich has been employed with Exelon since 1991 and is currently the Manager of Performance Analysis. Her most recent experiences include the implementation of Asset Management at Exelon Energy Delivery which included the prioritization of Exelon Energy Delivery work, the recommended portfolio and the corresponding O&M and Capital budgets.

Prior to Cheryl's role with Asset Management she provided leadership for supporting technical tools used in the delivery organization like the Engineering Design tool, GIS and Passport. Cheryl also has experience in distribution engineering, procurement, supply, and system planning. She has an Electrical Engineering degree from University of Illinois at Chicago and received a MBA from DePaul in June, 2002.

Meeting Location:

Chicago Bar Association, 321 South Plymouth Court, Chicago, IL (near the intersection of Jackson and Dearborn)

Time:

11:30 Social
12:00 Lunch (optional)
12:00 Presentation
1:00 Adjourn

Reservations:

Lunch tickets can be purchased in the lobby bookstore ($12.00). Please call the IEEE Business Office by noon on Monday 7 February 2005 at (312) 253-4333 or (800) 898-IEEE to make your reservation.

Information:

For more information, please visit the Chicago Chapter IEEE PES web site: http://peschicago.org

Continuing Education:

IEEE technical meetings may be acceptable as continuing education where required for maintenance of professional engineering licensure. Refer to the individual state's requirements for details.

Technical Seminar

IEEE-IAS Chicago Chapter

February Technical Seminar 2005
2005 NEC® Changes

February 19, 2005 • 7:30 a.m. to 4:00 p.m.

Midwest Conference Center • 401 West Lake Street, Northlake, Illinois 60164
Presenter: NFPA recognized National Electrical Code expert

This one day seminar covers the most significant 2005 NEC® code changes, including their relationship to the design, installation, and maintenance in residential, commercial, and industrial locations.

Agenda:

7:30 am	Registration and Continental Breakfast
8:00 am	Analysis of Definitions; Branch-Circuit Analysis; Service and Feeder Applications; Feeder or Service Neutral Load
9:45 am	Break
10:00 am	Grounding and Bonding; Wiring Methods; Conductors for General Wiring; Boxes and Fittings
12:00 pm	Lunch
12:30 pm	Motors, Motor Circuits and Controllers; Hazardous (Classified) Locations; Health Care Facilities; Emergency and Standby Systems
2:00 pm	Break
2:15 pm	Signaling Circuits; Communications Circuits; CATV Circuits; NFPA 70E - Electrical Safety in the Workplace

Each On-Site Seminar participant receives:

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SCANFAX

PLAN NOW for 2005

IEEE

THE MARKET SERVED

SCANFAX magazine is the official publication of the Institute of Electrical and Electronics Engineers (IEEE) Chicago Section. Those in the Chicago area who are influential in the electrical, electronics, and computer industry receive *SCANFAX* each month (except June, July and August). It provides a forum for manufacturers, consultants, sales representatives, universities, and colleges to exchange ideas and information.

READERSHIP

Approximately 7,000 professionals are members of IEEE Chicago Section. These members represent more than 200 companies in the Chicago area. You can reach this targeted audience with your advertisement in *SCANFAX*.

From the size and attractive masthead to the full color cover and additional information provided, we intend to make *SCANFAX* even more of an essential handbook for IEEE Chicago Section members.

MECHANICAL REQUIREMENTS

ELECTRONIC SUBMISSION REQUIREMENTS: All ads must be submitted electronically on Macintosh disks (Zip or CD) and include a hard copy of ad for verification. Ads that bleeds need to allow 1/8″ for bleed on all sides. Accepted software: QuarkXpress, Adobe Illustrator and Adobe Photoshop. Fonts, linked graphics and laser proofs must be sent with electronic files. PDF files will be accepted, but fonts and graphics must be embedded and/or included. Minimum 300 dpi on graphics and photos. Disks submitted will be returned upon request.

NOTE: Any ads not supplied properly could incur additional charges.

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1/6 Page	260	230	205

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Include your business in the "Professional Card" section of each issue of SCANFAX throughout the year, for the low cost of $330.00 (includes production). Dimensions of a Professional Card are 3-5/8" wide x 7/8" high. Your advertisement can include your logo, slogan and key information about your business. Ads will be listed alphabetically. Sign up today!

EDITORIAL SCHEDULE*

2005 January Issue
Editorial Focus: Circuits and Devices
Space Reservations and Camera Ready Materials Due: Nov. 25, 2004

February Issue
Editorial Focus: Industrial Applications
Space Reservations and Camera Ready Materials Due: Dec. 25, 2004

March Issue
Editorial Focus: Communications Technology
Space Reservations and Camera Ready Materials Due: Jan. 26, 2005

April Issue
Editorial Focus: Electromagnetics and Radiation
Space Reservations and Camera Ready Materials Due: Feb. 25, 2005

May Issue
Editorial Focus: Education/ Universities
Space Reservations and Camera Ready Materials Due: March 25, 2005

September Issue
Editorial Focus: Energy and Power Engineering
Space Reservations and Camera Ready Materials Due: July 26, 2005

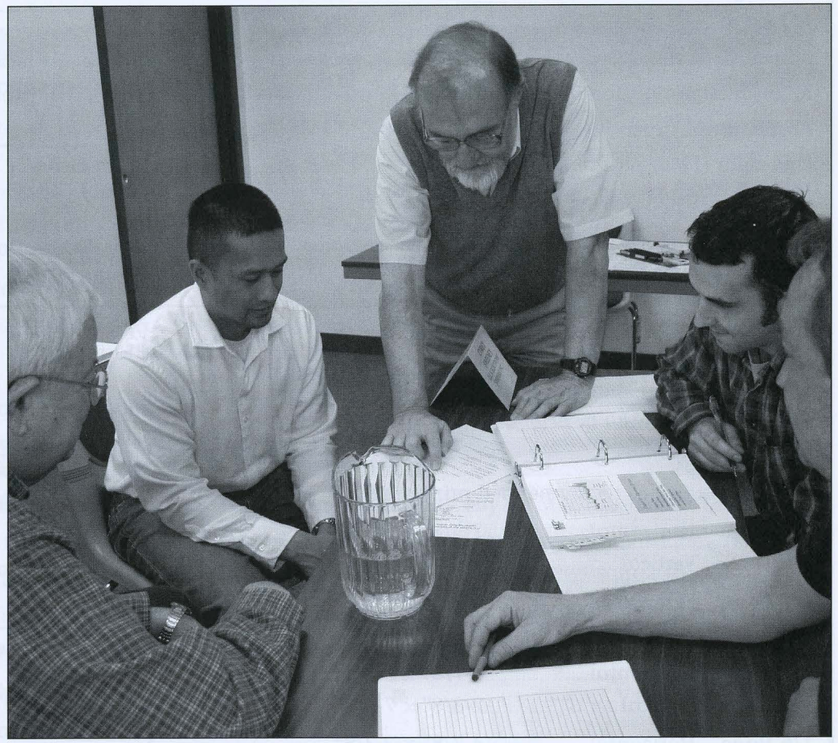
October Issue
Editorial Focus: Computers
Space Reservations and Camera Ready Materials Due: Aug. 25, 2005

November Issue
Editorial Focus: Signals and Applications
Space Reservations and Camera Ready Materials Due: Sept. 27, 2005

December Issue
Editorial Focus: Systems and Control
Space Reservations and Camera Ready Materials Due: Oct. 25, 2005

*Features subject to change without notice

New Proprietary Computer Programs to Solve the Most Complex EMC Issues



As part of the curriculum in Donald Sweeney and Roger Swanberg's new EMC Practical Applications Seminar/ Workshop students will use, and then take home, a copy of the computer program designed by the instructors. It addresses design considerations from component level, through circuit boards, to enclosure level. The seminar/workshop is presented in a practical, hands-on style providing the step-by-step design process to avoid EMC problems. Attendees can then put their acquired knowledge to immediate use in an optional free 45 minute design evaluation of their own product. To register call Carol at 847-537-6400 or email her at cgorowski@dlsemc.com. For more information click on www.dlsemc.com.

EMC Practical Applications
Seminar/Workshop
April 14-15 and 18-19, 2005
Hilton Hotel, Northbrook, IL

Professional AND Business Directory

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