

September, 2006

Electrical Safety in Health Care Facilities What should we know?

By Ark Tsisserev, P.Eng.

Do electrical installations in a hospital have to be different than, for example, in an outpatient clinic, a dental office or a rehabilitation facility?

In which areas of a health care facility must electrical systems be tested for voltage difference between ground points, for ground return path voltage rise - in grounded systems or for test of impedance to ground - in isolated systems? Which loads of an electrical system in a health care facility are considered to be essential system loads and what kind of power supply must be provided to these loads?

These questions are often asked by the electrical designers and contractors.

The answer may be found in a combination of the following documents: the National Building Code of Canada (NBCC), the Canadian Electrical Code and the CSA Standard 232 "Electrical Safety and Essential Electrical Systems in Health Care Facilities."

Article 3.2..7.6. of the NBCC states that an emergency electrical power supply system **for emergency equipment required by the Building Code** (for elevators, smoke control and smoke venting fans, the pumps) must be installed in conformance with CAN/CSA-Z32.

Z32 defines an emergency electrical power supply system as **"one or more in-house electrical generator sets intended to be available if all other supplies fail, and capable of supplying all of the essential loads."**

"Essential electrical system" is also defined by this standard. It means **"an electrical system that has the capacity of restoring and sustaining a supply of electrical energy to special loads if the normal supply of energy is lost."**

Section 6 of Z32 provides requirements for essential electrical systems and explains that the essential system consists of the emergency equipment required by the NBCC (elevators, smoke control and smoke venting fans, fire pumps) and of special loads that are intended to

provide effective and safe patient care in a health care facility.

Table 8 of Z32 classifies essential system loads and branches and their intended performance (vital, delayed vital or conditional) for a specific type of patient care.

So, now some of our questions posed at the outset - appear to be answered.

But what about a difference in electrical installations between hospitals and let's say-doctors' offices?

Section 24 of the CEC helps to clarify this issue.

Until the 2002 edition of the CEC had been developed, Section 24 was limited only to electrical installation requirements in patient care areas of **hospitals**.

However, **Scope of Section 24** in the 19th Edition of the CEC, Part I (2202 edition) has been expanded to cover installations within patient care areas of **"health care facilities."** Respectively, definition of **"hospital"** has been deleted from Rule 24 with the CAN/CSA standard Z32 "Special Terminology" and a new definition **"Health care facility"** has been added.

This change from "hospital(s)" to "health care facility(ies)" has been made throughout Section 24 and Appendix B, to harmonize Section 24 with the CAN/CSA standard Z32 further subdivides health care facilities into three separate classes as follows:

Health care facility, Class A - a hospital, so designated by Canada or one of its Provinces or Territories, where patients are accommodated on the basis of medical need and are provided with continuing medical care and supporting diagnostic and therapeutic services;

Health care facility, Class B - a facility where residents, as a result of physical or mental disabilities, are unable to function independently and are accommodated due to a need for daily care by health care professionals;

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Health care facility, Class C - a facility where ambulatory patients are accommodated on the basis of medical need and are provided with supportive, diagnostic, and treatment services.

Z32 provides a variety of examples of such health care facilities, and in addition to hospitals these examples include surgical, outpatient and doctor's clinics, dentist offices, psychiatric and rehabilitation facilities.

The impact on installations is that facilities that were previously not included by Section 24 rules now have to follow the Patient Care Areas requirements (Rules 24-100 to 24-114 which have specific criteria for circuits, bonding, receptacles and other equipment.

Thus, in our example above, electrical installations in a patient care area of a large teaching hospital have to be similar to the installations in a typical doctor's office that is located in a unit of an office building. Of course, such installation requirements for a patient care area occupied by a psychiatrist or a massage therapist may appear to be very drastic, as offices of such health care practitioners may be established in a typical unit of a commercial building where the previous tenant was a travel agent or an alteration shop and where special needs for receptacles, bonding, etc. have not previously existed.

It should be understood that relevant Rules of Section 24 are intended to apply to the installation of electrical wiring and equipment within patient care areas **of those types of health care facilities where a permanently or cord connected electro medical equipment is used for the purpose of intentional contact at a patient's skin surface or internally during the patient's treatment, diagnostics or monitoring.**

The inspection authority may require involvement of a Professional Electrical Engineer at the permit and

installation stages in order to ascertain a specific class of a health care facility and conditions of use of the electro medical equipment and to supervise tests referenced in Appendix B Note on rules 24-104(1) and 24-112 of the Code.

Some jurisdictions provide additional clarifications to the electrical contractors on application of the requirements of Section 24 of the CEC.

The City of Vancouver, for example, has developed a special declaration form for completion by a Professional Electrical Engineer, where a statement is made that

a permanently or cord connected electro-medical equipment is not used for the purpose of intentional contact at a patient's skin surface or internally during the patient's treatment, diagnostics or monitoring; or that there will clearly be no danger from use of the electro-medical equipment when a typical commercial unit is intended to be occupied as a doctor's office, etc. where a patient care area as defined by Section 24 of the CEC will exist.

However, where the installation of electrical wiring and equipment is done in patient areas of those types of health care facilities where a permanently or cord connected electro medical equipment is used for the purpose of intentional contact at a patient's skin surface or internally during the patient's treatment, diagnostics or monitoring, then all applicable provisions of Section 24 of the CE Code must be met, and all test requirements for voltage drop test, voltage difference between ground points test, impedance to ground test, etc. as mandated by Section 5 of Z32 must be met.

As usual, authorities having jurisdiction must be consulted by designers and contractors contemplating electrical installations in patient care areas of health care facilities.

EIA Code Seminar

Saturday, October 21, 2006

8:00 a.m. - 4:30 p.m.

Telus Office Tower, 3777 Kingsway, Burnaby

See page 7 for Registration Form

Tricky Rules

By Leslie Stoch, P.Eng.

Several of the rules in the Canadian Electrical Code are quite complicated and it requires our close attention to get them right. This article discusses two of those rules, 28-604 for motor disconnects and 4-004 for underground conductor ampacities.

One of the trickiest CE Code rules to follow and interpret correctly is Rule 28-604 Location of Disconnection Means, which prescribes the locations of motor disconnects. Rules 28-604(1) and (2) deal with the location of disconnects for motor circuits. Rule 28-604(3) and (4) cover the disconnections of motors and motor controllers.

Rule 28-604(1) specifies that a motor circuit disconnect (circuit-breaker or switch) must be located at a point of supply (such as a motor control centre or distribution panel). The rule goes on to state that when the motor circuit disconnect also serves as the disconnect for the motor and its controller, the motor circuit disconnect must

be located within 9m and within sight of the motor and its controller.

However, the disconnect may also be located beyond 9m and out of sight of the motor and its controller if the motor circuit disconnect is arranged so that it can be locked OPEN, and is labeled to identify all of the loads that it supplies. But, there is also an exception. Rule 28-602(2) specifies that when a draw-out circuit-breaker is used to isolate a high voltage motor (above 750 volts), the draw-out circuit-breaker must be within 9m and within sight of the motor and its controller.

Rule 28-604(3) tells us that, except for air conditioning and refrigeration, the disconnect for a motor and its controller must be located within 9m and within sight of both the motor and its controller.

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ESFI Raises Awareness of New UL and CSA Requirements for GFCIs

To reduce electrically related deaths and injuries through public education, the Electrical Safety Foundation International (ESFI) has joined with the Canadian Standards Association (CSA), Underwriters Laboratories, Inc., the National Electrical Manufacturers Association (NEMA), and the Consumer Product Safety Commission to disseminate information on new requirements for ground-fault circuit interrupters. These new requirements offer a significant safety improvement for consumers.

The new requirements are being set by CSA and UL and apply to the harmonized standards, UL 943, Safety Standard for Ground-Fault Circuit Interrupters (GFCIs) and CSA C22.2 No. 144.1, Ground-Fault Circuit Interrupters.

Since the early 1970s, GFCIs have reduced household electrocutions by protecting residents from lethal currents. A GFCI is a wiring device that de-energizes a circuit when a current to ground could result in electric shock. The GFCI "interrupts" power before it reaches a level that would cause injury. The National Electrical Code requires GFCIs to be used in bathrooms, kitchens, garages, basements, crawlspaces, and outdoors. Similarly, the Canadian Electrical Code requires GFCIs to be used in many locations such as bathrooms, outdoors, basic care areas of hospitals, pools, spas, and hot tubs.

Before the introduction of GFCIs, more than 700 people died from household electrocutions each year. As of 2001, that number had been reduced to 400 cases annually. A 2001 field study from UL and NEMA, however, determined that a small but significant percent of GFCIs, particularly older ones, did not work after several

years. This created a demand for more stringent safety features that can alert users when a GFCI malfunctions.

The new UL and CSA requirements include:

End of Life Provision: when a GFCI receptacle is incapable of passing its internal test function (it can no longer provide ground-fault protection) it will either a) render itself incapable of delivering power, or b) indicate by visual or audible means that the device must be replaced.

Reverse Line-Load Miswire: a GFCI will deny power to the receptacle face if it is miswired.

In the USA, Manufacturers must stop producing old versions of GFCIs on July 28, 2006, and must introduce new, redesigned GFCIs after that date. Distributors can sell and contractors can install old GFCIs until their supplies run out.

The UL revisions will not affect the NEC which regulates installations, not products.

In Canada, the selection of the effective date involves a process that has not yet been completed. Once this occurs, the effective date will be included in the Certification Notice announcing the 2006 edition of CSA Standard C22.2 No. 144.1. The CSA revisions will not affect the CE Code, which regulates installations, not products.

For more information about GFCIs or the new UL and CSA requirements, contact ESFI at ((703) 841-3229 or visit www.esfi.org.

Courtesy: IAEI News, May-June 2006

"Tricky. . ." continued from page 3

Rule 28-604(4) provides an alternative to this requirement, stating that when a motor circuit disconnect cannot be locked OPEN, and an across-the-line manual motor starter is used as a disconnect, the starter may be located beyond 9m and out of sight of the motor as long as the starter can be locked OPEN and designed to safely interrupt the motor locked rotor current. This option applies only when installing a disconnect within 9m and within sight is impracticable.

Another complicated requirement, Rules 4-004(1)(d) and 4-004 (2)(d) provide the allowable ampacities for copper and aluminum underground conductors #1/0 AWG and larger. The rules are supported by sketches and tables. Great care is required to ensure the rules are interpreted correctly. Points to watch out for:

1. The permissible underground cable configurations are located in Appendix B. The tables that provide allowable ampacities relating to the cable configurations are located in Appendix D. It would be easier if both the cable sketches and their related tables were placed in the same electrical code appendix, preferably on pages opposite each other.

2. There are four sets of underground cable configurations in Appendix B, in single and parallel conductor arrangement, directly buried and in underground duct banks.
3. There are 16 tables that provide maximum allowable ampacities, four for each set of cable configurations as follows:
 - Eight A tables for single and multiple conductors that supply noncontinuous loads or continuous loads when not connected to any electrical equipment that contains fuses or circuit-breakers.
 - Eight B tables for single and multiple conductors that supply continuous loads that may be connected to electrical equipment that contains fuses or circuit-breakers.
 - The above arrangement also provides separate tables for copper and aluminum conductors.

I have made up the following tables in the hope that they might simplify interpretation of the rules for underground conductors.

See Tables "A" and "B" on page 5

President's Message

Another beautiful summer is coming to an end and we are moving into early fall. It is time for our thoughts to move away from scenic beach scenes and return to the tasks ahead.

Over the past many months members of your executive have been hard at work organizing the upcoming code seminar. A big thank you should go out to them for their efforts.

This year's seminar will cover all changes to the 2006 electrical code including amendments. As well, there will be a presentation on important changes to the Safety Standards Act and the Monetary Penalty Regulation. In our very competitive world it is important for the contracting industry to be up to date on all of these changes as it could save them time and money. The Seminar date is Saturday, October 21, 2006 at the Telus Tower 3777 Kingsway. Please spread the word to all contractors and trades persons and encourage them to attend. The registration forms should be out to the local wholesalers shortly.

On a sadder note, I want to notify you of the passing of two folks that were involved for many years in the BC Electrical Industry.

Nes Romaniuk, owner of Elworthy Electrical Services, passed away on May 28th. Although he was well past retirement age, Nes was still heavily involved and very passionate about the electrical industry. He was a long time member, director and past president of the Electrical Contractors Association of BC and was involved in setting up the Electrical Heritage Society. Nes was one of the truly nice people I have met and he will be missed.

Sid Collins, former Regional Supervisor for the Fraser Valley for the Electrical Safety Branch passed away on August 8th. Sid was a long time electrical inspector and supervisor who worked in the Abbotsford area until his retirement in the mid 80s. He was a distinguished pilot and Second World War veteran with the Royal Air Force. His passion for flying never left him and he was involved with both the Abbotsford Air Show and Abbotsford Flying Club.

That's it for now. See you at the meetings.

Roger Tuttle, President

Table A covers:

- Continuous loads other than connected to a service box, fusible switch, circuit-breaker or panelboard; or
- Noncontinuous loads connected to a service box, fusible switch, circuit-breaker or panelboard.

Table A

Table	Configuration	Conductors
D8A	B4-1 Direct Buried	Single Copper
D9A	B4-1 Direct Buried	Single Aluminum
D10A	B4-2 Duct Bank	Single Copper
D11A	B4-2 Duct Bank	Single Aluminum
D12A	B4-3 Direct Buried	Multiple Copper
D13A	B4-3 Direct Buried	Multiple Copper
D14A	B4-4 Duct Bank	Multiple Copper
D15A	B4-4 Duct Bank	Multiple Aluminum

Table B covers:

- Continuous loads connected to a service box, fusible switch, circuit-breaker or panelboard

Table B

Table	Configuration	Conductors
D8B	B4-1 Direct Buried	Single Copper
D9B	B4-1 Direct Buried	Single Aluminum
D10B	B4-2 Duct Bank	Single Copper
D11B	B4-2 Duct Bank	Single Aluminum
D12B	B4-3 Direct Buried	Multiple Copper
D13B	B4-3 Direct Buried	Multiple Copper
D14B	B4-4 Duct Bank	Multiple Copper
D15B	B4-4 Duct Bank	Multiple Aluminum

As with past articles, you should always consult with the local electrical inspection authority in each jurisdiction for a more precise interpretation of any of the above.

Courtesy: *IAEI News*, July-August 2006

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EIA GENERAL MEETING

Monday, September 25, 2006

“Cheers Restaurant”

125 East 2nd Street, North Vancouver

Social Hour: 5:00 - 6:00 p.m.

Dinner: 6:00 - 7:00 p.m.

Meeting: 7:00 - 9:00 p.m.

**Presentation on important changes to the
Safety Standards Act and the new
Monetary Penalty Regulation**

*Please confirm your dinner reservation by
calling: Dwayne Askin: Phone: (604) 660-0885;
Fax (604) 660-0187 or Email
Dwayne.Askin@safetyauthority.ca before
Thursday, September 21, 2006*

*Please book a seat by contacting Dwayne
Askin. Accurate numbers for the dinners result
in a savings on dinner costs and ensure a seat
for everyone.*

MEMBERSHIP APPLICATION & RENEWAL FORM

Please accept my application for membership in the EIA of BC

Name (Please print) _____ Phone: _____ Fax: _____

Address _____

City _____ Postal Code _____

Employer _____ Title _____

e-mail _____

New Membership

Renewal

Inspector

Associate

Enclosed is: \$50.00 for 1 year (Jan 1, 2006- Dec. 31, 2006)

\$100.00 for 2 years (Jan 1, 2006- Dec. 31, 2007)

\$150.00 for 3 years (Jan 1, 2006- Dec. 31, 2008)

Mail to: The EIA of BC, 201 - 3989 Henning Drive, Burnaby, B.C., V5C 6N5

EIA 2006 Electrical Code Seminar



The Electrical Inspector's Association of British Columbia will be putting on a code seminar once again. This code seminar will highlight the changes in the new 20th edition of the Canadian Electrical Code, as well as the many changes to the BC amendments and the provincial bulletins. There will also be a presentation on the Safety Standards Act, the Regulations and the Monetary Penalty Regulation. The new code books will also be on sale at the seminar.

The date has been set for **Saturday, October 21, 2006 , from 8:00 a.m. to 4:30 p.m.**

The spacious **Telus office tower at 3777 Kingsway, Burnaby** (otherwise known as The Boot) will be the location for the seminar. The seating will be limited to 300 people.

The fee will be **\$150.00 for EIA members and \$180.00 for non-members**. This will include lunch, coffee and treats, and a portfolio containing a booklet on the major changes. At this time a special invitation is extended to the non-members to join the EIA, with a 2007 EIA membership and attendance at the seminar for \$200.00. The following is a list of guest speakers and guest presenters:

Speakers:

Mr. Rick May, Electrical Safety Manager, BCSA
Mr. Lew Rogers, Lower Mainland Regional Manager, BCS

Presenters

Mr. Ark Tsisserev Electrical Manager, City of Vancouver
Mr. Farmand Ghafari Electric Safety Manager, City of Burnaby
Mr. Ted Simmons Chief Instructor, Electrical Apprenticeship, BCIT
Mr. Ken Cornwell Electrical Safety Officer BCSA, Squamish
Mr. George Razzo Electrical Safety Officer, BCSA Chilliwack
Ms. Judy Biluk Electrical Safety Officer, BCSA, Coquitlam
Mr. Dave Shavalier Electrical Safety Officer, BCSA Chilliwack
Mr. Bob Cornwell Electrical Safety Inspector, City of Vancouver
Mr. Michael Atherley Electrical Safety Officer, BCSA, Abbotsford
Mr. Neill Long Electrical Safety Officer, City of Burnaby
Mr. Cam Duncan Electrical Safety Officer City of North Vancouver
Mr. Keiller Gowans Electrical Safety Officer City of North Vancouver

Please register me for the EIA 2006 Code Seminar to be held on October 21, 2006

Name _____

Address _____

Phone _____ E-mail _____

I am an EIA member, and have enclosed my \$150.00 registration fee

I am not an EIA member, and have enclosed my \$180.00 registration fee

I have enclosed \$200.00 to register for the seminar and become a 2007 EIA member.

Return to: The Electrical Inspector's Association of British Columbia
201 - 3989 Henning Drive, Burnaby, BC V5C 6N5