

Testing of Electrically Connected Life Safety Systems February, 2008

By: Ark Tsisserev, P.Eng.,

In my last article that dealt with fire alarm system outputs, I promised to discuss the subject related to integrated commissioning of all electrically connected Life Safety Systems installed in a building.

Although this procedure is not specifically mandated by one particular Code or a Standard, there are various documents that govern testing of certain equipment comprising electrically connected Life Safety Systems.

But why should electrical practitioners be interested in this subject? The answer is quite simple: These systems are designed by the electrical engineers, specified in their plans and relevant technical documents and are installed by electrical contractors in accordance with the drawings accepted by the electrical safety regulators.

So, who will take responsibility for verifying that these Life Safety Systems perform as intended by their design? And this responsibility is assumed, what is the benchmark for such evaluation?

Let's start with clarification of these electrically connected Life Safety Systems. Subsection 3.2.7. of the National Building Code of Canada (NBCC) describes such systems as follows:

1. Fire alarm systems including voice communication features that are required in high buildings;
2. Emergency lighting;
3. Equipment necessary to provide smoke control in a high building (smoke control fans and dampers);
4. Equipment required for smoke venting (exhaust fans used to provide smoke venting in parkades);

5. A fire pump required to provide satisfactory operation of a sprinkler system;

6. Elevators in a high building

All this electrical equipment is mandated by the NBCC to be automatically con-



nected to an alternate source of power in the event of a failure of the normal power supply.

While the NBCC allows emergency lighting and fire alarm systems to be supplied from an emergency power source such as a battery or a generator, it requires that smoke control and smoke venting equipment, fire pumps and elevators must be supplied from an emergency generator that conforms to the CSA standard C282.

Some equipment comprising a Life Safety System is designed to be initiated not only manually (by fire respondents or by other authorized persons), but also to be actuated automatically by a signal from a building's fire alarm system. Thus, electrical designers must indicate on their drawings that "manual-auto" selector switches are installed at a Central Alarm and Control Facility (CACF) of a fire alarm system, and when such switches are being positioned into "auto" mode, all

Inside this issue:

Testing of Electrically Connected Life Safety Systems	1
Reasons behind the Rules	2
Continuation of the 2006 Electrical Code changes	3
Christmas Spirit	6
President's Message	8
Christmas Meeting Notice	9

(Continued on page 4)

The Continuation of 2006 Electrical Code Revisions

By: Ted Simmons, Chief Instructor, BCIT

This article, the seventh in a series, will continue to review the revisions to the 2006 CEC Part 1. In the previous edition, we examined the changes made to Sections 38 to 68. This article will focus on the revisions that have been incorporated into Sections 70 to 76.

Section 70 - Electrical Requirements For Factory Built Relocatable Structures And Non-Relocatable Structures

Rule 70-122 - Receptacle, Switches and Lighting Fixtures

The timer subrule (2), which identified the mounting height requirements for counter receptacles, was deemed unnecessary and has been removed.

To reduce the risk of fire, and comply with the requirement outlined in Rule 62-300(4), subrule (4) has been revised and now requires that a receptacle installed on the underside of a mobile home intended to supply a heating cable set or sets for freeze protection of plumbing pipes, shall be protected by a GFCI of the Class A type.

In addition, item (b) requires the receptacle to be labeled in a conspicuous, legible and permanent manner identifying it for the supply of heating cable set(s) for plumbing pipes. A new note explaining the intent of this rule has been added to Appendix "B".

Section 72 - Mobile Homes And RV Parks

Rule 72-110 - Connection Facilities for Recreational Vehicles and Mobile Homes

Subrule (4) has been revised and now requires that in addition to the 15A receptacles, all 20A, 125V, 2-pole, 3-wire type 5-20RA receptacles shall also be protected by a ground fault circuit interrupter of the Class A type.

Section 74 - Airport installations

This section has been extensively revised to reflect the use of series type constant-current circuitry supplying airport visual aid systems. Electrical personnel involved with these installations should be aware of the following changes.

Rule 74-002 - Special Terminology

New definitions have been added for.

Pullpit - which is defined as a below-grade junction box that can be used as a cable pulling point, but which may also be used to hot transformers or series lighting cable splices.

Series isolating transformer - a transformer specifically designed for use with airport series lighting circuits to maintain the continuity of the primary circuit when the continuity of the secondary circuit

is interrupted.

Rule 74-004 - Wiring Methods

This rule, which was previously titled "Conductors buried in earth", has been revised to incorporate three new subtitles.

Subrule (1) has been added and requires series cables utilized for 6.6A systems to be type ASLC and be installed in accordance with the requirements for underground installations outlined in Rule 12-012.

Subrule (4) has been added and requires that type ASLC cables be placed in a raceway when installed within a concrete or asphalt surface. In order to eliminate structural concerns pertaining to the installation of conduit within the surface of a runway, a new note has been added to Appendix "B" indicating that this type of installation should be designed by a civil engineer and the design be acceptable to the airport authorities. In order to enhance electrical safety, subrule (6) has been added and requires each cable of a series circuit to be identified with a cable marker indicating the circuit origin at each point where the cables are accessible including maintenance holes, pullpits and similar locations.

Rule 74-006- Direct Burial Transformers

Subrule (1) has been revised to ensure that both the transformer body, as well as the primary leads, are installed at a minimum depth of 450mm below grade.

Rule 74-010 - Ground Counterpoise

Items (f) and (g) have been added to subrule (3) and now require that the grounding counterpoise be connected to: metallic pullpits, lids or covers; and non-current carrying metallic parts of inset lights.

Section 76 - Temporary Wiring

The former Rule 76-002 - Inspection and re-inspection was considered redundant and has been deleted. The requirements pertaining to inspection and re-inspection are outlined in Section 2.

Rule 76-002 - Conductors

In subrule (4) the terms "acceptable manner" and "acceptable means" have been replaced with the term "other equally substantial means".

Rule 76-004 - Grounding and Bonding

In order to improve clarity and correct application, the term "bonding" was added to both the title and the rule.

Rule 76-008 - Distribution Centres

Subrule (3) which requires distribution centres in-

(Continued on page 5)

The INSPECTOR NEWSLETTER— FEBRUARY 2008

(Continued from page 1)

elevators, smoke control and smoke venting fans are automatically activated by the fire alarm system.

In addition to these interlocks, there are other devices in a building that must be actuated by a building's fire alarm system. These devices are known as hold open devices and electromagnetic locks.

Articles 3.1.8.12. and 3.4.6.15 of the NBCC mandate that under certain conditions each of these devices must be automatically released by the building's fire alarm system.



So, if such Life Safety Systems are required to be installed in a building, and a specific safety equipment must be interconnected with a fire alarm system, what particular methods and means are available to the design professionals, installers and

regulators to ensure that all this equipment actually functions as intended by its design?

Let's start with a fire alarm system. Article 3.2.4.5. of the NBCC states that when a fire alarm system is installed, it must be verified in accordance with all applicable provisions of ULC S537 to ensure that it is, indeed, installed in conformance with ULC S524 and with the CE Code, Part 1.

This latter subject has already been discussed in my column published in the last issue of "Electrical Line", and I will not dwell on it in this column. Article 3.2.6.10. of the NBCC requires that all smoke control and smoke venting equipment (fans and dampers) installed in a high building must be tested to ascertain their satisfactory performance.

When an emergency generator is provided in a high building to supply Life Safety Systems with emergency power, operation of the generator must be tested as required by the CSA standard C282. But is there a single technical document that mandates an integrated performance test for operation of all equipment and devices that are interlocked with a building's fire alarm system? The answer is simple: No, there is not. The CSA is

presently considering development of a standard that will govern such testing and commissioning of electrically connected life safety systems, as the industry is in great need for such a standard. Some local building codes provide requirements for coordinated testing and inspections of all Life Safety Systems and devices installed in a building.

For example, the BC Building Code has been revised to incorporate a very detailed explanatory material on a protocol for conducting such coordinated Life Safety Tests. This protocol states that a coordinating registered professional must take responsibility of ensuring that all integrated systems and devices perform the intended fire safety functions.

The City of Vancouver has adopted a procedure that allows testing operation of an emergency generator, transfer switches, a fire pump concurrently with a test of a fire alarm system and its interlocks with respective safety devices and smoke control/smoke venting equipment.

Such a procedure is based on two following parallel actions:

1. simulation of a sprinkler flow (which automatically initiates a fire pump); and
2. simulation of a power failure (by a manual disconnect of the main disconnecting means, which triggers activation of an emergency generator and operation of transfer switches).

The City of Vancouver electrical inspectors are well trained in the testing requirements of all electrically connected Life Safety Systems, and they consistently enforce provisions of the adopted procedure. Other jurisdictions may take a different approach to such coordinated tests, and each AHJ should be consulted accordingly.



Arkady (Ark) Tsisserev, is the Electrical Safety Manager/Chief Electrical Inspector for the City of Vancouver. He is a registered Professional Engineer with a Master's degree in electrical engineering. Ark is the Chair of the Technical Committee for the CE Code, Part I. He can be reached at: arkady.tsisserev@vancouver.ca.

(Continued from page 3)

cluding portable ones to be mounted in an upright position has been revised by the removal of the wording "on acceptable supporting structures and be acceptable".

Rule 76-012 - Branch Circuits

In subrule (1), the previous restriction pertaining to the use of non-metallic sheathed cables of the NMWU type has been removed provided the cables are installed in accordance with Rule 12-500 to 12-526. The previous restriction requiring minimum conductor sizes of No. 12 copper and No. 10 aluminum has also been removed.

Rule 76-016 - Receptacles

This is a new rule which requires all 15A and 20A receptacles installed to provide power for buildings or projects under construction or demolition to be protected by ground fault circuit interrupters of the Class A type.

In the next issue, we will complete the review of the changes made to the CEC Part I and include a summary of the key revisions.

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(Continued from page 2)

trode.

Rule 10-806(4) requires that magnetic materials (iron or steel) used to enclose grounding conductors must be bonded to the grounding conductors at each end. If a sleeve of iron or steel is used for mechanical protection, it amplifies the magnetic field around the conductor during current flow, increasing the voltage drop and impedance across the conductor. How does bonding help? To reduce the inductive reactance due to the magnetic field, both ends of the sleeve must be bonded to the conductor so that the metal sleeve can carry a portion of the ground-fault current and to avoid an increase in the voltage drop and impedance in the conductor. This preventative measure is not required when using non-magnetic sleeves for mechanical protection.

According to **Rule 10-700(3)(a)** a field assembled grounding electrode may consist of a copper conductor at least 3 metres long, sized in accordance with Table 43, enclosed in the bottom 50 mm of a concrete foundation footing and at least 600 mm below grade. How does enclosing a conductor in concrete provide an effective

grounding electrode? Concrete located below grade has a somewhat lower resistivity than average loam soil. For this reason, in earth of average or high resistivity, encasement of a wire in concrete will result in lower resistance. This is due to the reduction of grounding resistance closest to the electrode. (From our earlier discussion, we already know that most of the overall grounding resistance will be found nearest the copper conductor.)

Rule 10-702 specifies that where there are multiple grounding systems for electrical, communications, community antenna and lightning protection systems, they must be separated by at least 2 metres from each other and bonded together by a minimum 6 AWG copper conductor. In the case of lightning protection, bonding between systems must be at or below grade. What are the advantages of this rule? Separation and bonding together is required since a ground fault could occur on any of the systems and therefore to ensure a low impedance fault path, to clear faults on any of the systems as quickly as possible. Bonding between grounding systems is also required so that in the event of a lightning strike on any of the systems, damage may be avoided due to side flashes between the grounding systems.

If you are interested in finding out more on the background of any of the CEC rules, we will do our best to find out for you. As with past articles, you should always consult the electrical inspection authority in each jurisdiction for a more accurate interpretation of any of the above.

Courtesy, IAEI News



Treasurer Jack Ball checking the winners' ticket ; Sam Catroppa for the 50/50 draw, with President David Shavalier presiding.

The Christmas Spirit

For the fifteenth year the Electrical Inspector's Association once again had a great Christmas Dinner Meeting and gave away lots of door prizes. Eighty two people were able to attend. Along with the door prizes purchased by our association, there were many prizes donated by some of our members as well. This article is to show our appreciation to the following people and organizations for their generous support making the meeting another grand success.

Dave Broadbent of Gescan
Bill Strain of Villa Electric
Malkit Sanbhau of Indy Electric
Wayne Kirk of Allan Bell and Associates
Randy & Barry of Osram Sylvania Lighting
Richard Campbell of the ECA of BC
Ilie Baliban of Lion Canadian Contracting
Gurmit Rooprai of Roop Electric
Ramtin Mahavian of Chambers Electric Corp.
Onkar Singh Hundal of O.J. Electric
Bijan Valagohar of Bert's Electric
Farmand Ghafari, Safety Manager
Christoferson Eng. & West Jet
Mr. Gillavan of Gough Electric
Balihar Sangha of Balsangha Electric
Peter Murray-Driver of the Abbey Group Contracting
Kim Davies & Barry Anderson of T & B Ready Lite

Bob Reimer (retired)
Roger Tuttle, Inspector
Harold Steenson (retired)
Ivan Pye, Safety Manager
Bob Cornwell, Inspector
Kerry Peterson of CSA
Paul Stevens of Earth Tech
SAAB Electric
John Murphy of ULC
Talon Electric
Phil Haig of Remax
Westco
Michael Atherley, Inspector
Dwayne Askin, Inspector
The City of Surrey

The generosity of the group came to light at the end of the evening when the money for the 50/50 draw for the Canuck Place Children's Hospice fund raising was counted. \$420.00 was raised through the sale of 50/50 tickets. Mr. Sam P. Catroppa won the draw.



In closing the executive would like to thank all those who attended the meeting and as well as those who couldn't, but donated door prizes never the less and last but not least Santa Len and his elves for making the evening another great success. Ho, ho, ho!

Renewal Time!

According to the EIA records as of January 9, 2008, the following members have not yet renewed. If you find your name on the list, and would like to renew just circle your name and return this page with your renewal fee of \$50.00 per year. Thanks, *Jack Ball*

Suher Alhashimi	John Arnott	Dwayne Askin
Michael Atherley	Jack Ball	Malcolm Balmer
Carlo Bolognese	Fred Bray	Keith Broad
Ben Chesshire	Ian Cornwall	Robert Cornwell
Ken Cornwell	Don Daunais	Kim A. Davies
Randy De Gryp	Peter Den Uyl	Kavinder Dhillon
Cam Duncan	Brian Esau	John Falkenholt
Gordie Forrest	Lorne Fowler	John Gali
Farmand Ghafari	Keiller Gowans	Warren Hancock
Doug Hann	David Hansen	Bruce Harwood
Dan Harwood	Onkar Singh Hundal	Dan Ip
Roy Jurgensen	Paul Kelly	Wayne Kirk
Michael Krygier	Greg Lavia	Jeff Lueck
Steve Mah	Norm McGladdery	
John McMahon	Bob Moisey	Peter Murray-Driver
Doug Nott	Ross Patterson	Francesco Perrizzolo
Kerry Peterson	Len Rhodes	Dan Robertson
Derek Rodgers	Gurmit Rooprai	Russell Roper
Jason Rowley	Mauro Rubini	Balihar Sangha
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Eric Sipila	Ian Skedd	Robert Smith
Jeffrey Su	Ram Surup	Roy Swallow
Frank Szeto	Scott Tilley	Frank Tridico
Ark Tsisserev	Carlo Turra	Roger Tuttle
Matthew Ward	Kurt Wensler	Kevin Wiersma
Paul Wilson	Randy Wryha	Vincent Yu
Don Zaklan	Bernie Zimmermann	Ralf Zimmermann

Has anything changed, if so please complete the renewal form on the last page of this Newsletter.



Presidents Message

This will be my last article to you as my time will finish with the elections at our February meeting. I would like to thank our entire executive whose tireless efforts allowed our organization to carry on and mark, in 2007, our 60th anniversary as an association. It is the unselfish efforts of the members of the executive who get on with the daily business and shoulder the burdens of our association that bring us success.

Over the last few years, with Rick Porcina building on the efforts of others, we have developed and maintain a credible website that gets us recognition and code questions from around the country. As well, he has redesigned our newsletter and has undertaken the principal roles of editor and publisher to distribute an effective and interesting publication. Thank you, Rick for continually going above and beyond.

If all of our members could watch an executive meeting, you would I hope, be as amazed as I always am at how efficiently and effectively things get done. Yes there is arguing and dis-

cord (no fist fights yet); but there is always viable solutions coming out of these sessions. In the end it is the charities we support and our association as a whole that benefits from the executive's efforts.

I would like to thank you all for your support and hope that you will endeavor to attend as many general meetings in support of your association as your busy schedules will allow. I wish you all success and good health in this New Year and thank you for your support. It has been my great honour and privilege to have been your President. Thank you,

David N. Shavalier



The INSPECTOR NEWSLETTER— FEBRUARY 2008

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ELECTRICAL INSPECTORS' ASSOCIATION of B.C. ANNUAL GENERAL MEETING

Monday, February 25, 2008

"Cheers Restaurant"

**125 — East 2nd Street, North Vancouver, B.C.
(just off Lonsdale Avenue)**

SOCIAL HOUR: 5:15 — 6:00 p.m.
DINNER: 6:00 — 7:00 p.m.
MEETING: 7:00 — 9:00 p.m.

Dinner: \$25

AGENDA

- *The Canadian Electrical Safety Regulatory System and the Product Certification Process.* Presenter is William (Bill) Burr, Director of Regulatory Relations and Code Development for CSA International.
- *Election of Officers*

Most Important for Reservations: Please Phone Dwayne Askin (604) 660-0885 or Email: Dwayne.Askin@safetyauthority.ca

Membership Application & Renewal Form	
Please accept my application for membership in the EIA of B.C.	
<input type="checkbox"/> For 1 year (Jan 1, 2008—Dec. 31, 2008)	\$ 50.00
<input type="checkbox"/> For 2 year (Jan 1, 2008—Dec. 31, 2009)	\$ 100.00
<input type="checkbox"/> For 3 year (Jan 1, 2008—Dec. 31, 2010)	\$ 150.00
<input type="checkbox"/> New Membership	Name (Please Print) _____
<input type="checkbox"/> Renewal	Address _____
<input type="checkbox"/> Inspector	City _____ Postal Code _____
<input type="checkbox"/> Associate	Company _____ Title _____
	Phone _____ Fax _____
	Email _____
Mail to: The EIA of BC, 201— 3989 Henning Drive, Burnaby, B.C., V5C 6N5	