

CAN/ULC-S1001 INTEGRATED SYSTEMS TESTING OF FIRE PROTECTION AND LIFE SAFETY SYSTEMS

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Agenda

- CAN/ULC-S1001
 - Building/Fire Code requirements
 - Requirements of the Standard
- ULC Online Resources



CAN/ULC-S1001 "Integrated Systems Testing of Fire Protection and Life Safety Systems" Where does it start?

National Building Code Fire Alarm Installation & Verification



- 3.2.4.5 (1) Fire Alarm Systems shall be installed to CAN/ULC-S524, "Installation of Fire Alarm Systems"
- 3.2.4.5 (2) Fire Alarm Systems shall be verified to CAN/ULC-S537 "Verification of Fire Alarm Systems"



Where does it start? NBC 2010

Commissioning of Life Safety and Fire Protection Systems

• 3.2.4.6.(1) & 9.10.18.10

Where life safety and fire protection systems are installed to comply with the provisions of this Code or the Fire Code, the commissioning of these integrated systems must be performed as a whole to ensure the proper operation and inter-relationship between the systems.





Where does it start? NBC 2010

Appendix A

- A-3.2.4.6.(1) When commissioning a building, the owner must ensure that the life safety systems and their components are functioning according to the intent of their design. The commissioning provides the documented confirmation that the building systems satisfy the intent of the code.
- This responsibility may fall on the designer, owner, contractor or a commissioning body. The Building Code does not specify who must fulfill this role.



National Building Code 2015

Integrated Fire Protection and Life Safety Systems

• 3.2.9.1.(1) & 9.10.1.2.(1)

Where fire protection and life safety systems and systems with fire protection and life safety functions are integrated with each other, they shall be tested as a whole in accordance with CAN/ULC-S1001, to verify that they have been properly integrated.





National Building Code 2015

Appendix A

 A-3.2.9.1(1) Clause 6.1.5 of CAN/ULC-S1001 allows the Integrated Testing Coordinator to accept documented evidence of any tests that have been performed on a system as part of its acceptance testing for the purpose of demonstrating compliance with the integrated testing requirements of that standard, so as to avoid duplication of work.





Scope:

- Standard prescribes the methodology for verifying and documenting that all <u>interconnections</u> between systems provided for fire protection and life safety functions are installed and operating in conformance with their design criteria.
- Examples: Fire alarm, emergency generator, fire pump, elevators, audio/visual systems, lighting control systems





Scope cont'd:

- The Standard prescribes the following:
 - Integrated Systems Testing
 - Qualifications, Process, Requirements and documentation
- Periodic Integrated Systems Testing
- Retro-Integrated Systems Testing
- Integrated Systems Testing for Modification





Glossary:

• INTEGRATED FIRE PROTECTION AND LIFE SAFETY SYSTEMS

– A combination of <u>two or more</u> fire protection and life safety systems, which may or may not be physically connected with one another, but that are designed to operate together to achieve an overall fire protection and life safety objective.





Glossary:

- INTEGRATED TESTING COORDINATOR
 - The person, firm, corporation, or organization responsible for the development and implementation of the integrated testing plan.
 - Where a firm, corporation, or organization is responsible for integrated fire protection and life safety systems testing, a representative of that firm, corporation, or organization shall be designated as the integrated testing coordinator.





Glossary:

• INTEGRATED TESTING PLAN

 A written project specific document, prepared by the integrated testing coordinator, outlining the required tests and necessary functional results to conduct integrated fire protection and life safety systems testing.

• INTEGRATED TESTING REPORT

 A written project specific document, prepared by the integrated testing coordinator, documenting the implementation of the integrated testing plan.



INTEGRATED SYSTEMS TESTING QUALIFICATIONS

• Integrated Systems Testing Participants

- Person(s) shall be knowledgeable and experienced in design, installation and operation of their system(s)
- Integrated Testing Coordinator
 - Shall be knowledgeable.... in the fire protection and life safety functions of building systems
 - Codes and Standards, how systems are designed to operate



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INTEGRATED SYSTEMS TESTING PROCESS

- Design professional(s) is responsible for the design criteria for integration of various systems –They shall document the integration performance of each system for which they hold responsibility
- Any deficiencies found by coordinator in the implementation of testing plan shall be documented and forwarded to the design professional for resolution





INTEGRATED SYSTEMS TESTING PLANNING PHASE

- Design professional(s) shall provide documentation detailing each interconnection to coordinator.
- Documentation used to prepare the testing plan
 - i.e. Building floor plans, drawings and specifications of fire protection and life safety systems, manufacturer's operating and testing instructions, documentation of any alternative solutions
- With this documentation coordinator prepares the testing plan



INTEGRATED TESTING PLAN

• Shall consist of a report outlining:

- Functional objectives of system integrations
- Sequence of operations normal and fire conditions
- Test protocol and procedures
- Procedure for notifying building occupants of testing
- Alternative measures notifications and safety protocols for ensuring occupant safety during testing





INTEGRATED TESTING PLAN cont'd

- Testing plan shall consider phased in occupancy
- Testing plan provided to design professional review/acceptance
- <u>WHERE REQUIRED</u>, the testing coordinator shall provide testing plan to the AHJ for review



INTEGRATED SYSTEMS TESTING IMPLEMENTATION PHASE

- Written confirmation from <u>design professional(s)</u> conducted acceptance testing and systems are installed in accordance with design and are ready
- Written confirmation from <u>installing contractor(s)</u> systems are installed in accordance with design and are ready
- Documentation from <u>verifying parties</u> confirming that systems have been installed in accordance with their design



INTEGRATED SYSTEMS TESTING IMPLEMENTATION PHASE cont'd

- Confirmation of Electrical Inspection & Elevator/Escalator Inspection.
- Confirmation of implementation of occupant notification procedures and alternate measures for ensuring occupant safety
- WHERE REQUIRED sufficient notification shall be provided to AHJ to witness integrated systems testing
- Design professional(s), installing contractor(s) and verifying party(s) shall participate in test protocol and procedures as required by test plan



INTEGRATED SYSTEMS TESTING IMPLEMENTATION PHASE cont'd

- Failure of any systems test shall result in correction and re-test of affected systems
- Upon successful completion of systems testing documentation shall be provided:
 - Building owner
 - AHJ, WHERE REQUIRED
 - Maintained on site as per Fire Code





INTEGRATED SYSTEMS TESTING REQUIREMENTS

- The tests described in the Standard shall be considered the <u>minimum</u> level of required testing. Additional testing maybe required by the coordinator to demonstrate the proper operation of the systems
- The tests shall include a functional operation of device or system, except simulation testing shall be permitted where:
 - Non-restorable devices or systems are required to be activated
 - Tests may result in harm to persons, or damage to a device, system or building



INTEGRATED SYSTEMS TESTING REQUIREMENTS

 Where the coordinator has been provided with specific documented evidence that an integrated test was performed during acceptance testing, such documentation may be considered acceptable to comply with the intent of this Standard at the discretion of the coordinator, and <u>WHERE REQUIRED</u>, in consultation with the AHJ

Appendix A A-3.2.9.1(1)





FIRE ALARM SYSTEMS

- Fire alarm systems integrated with other fire protection and life safety systems shall be tested to confirm correct operation in accordance with the design sequence of operation.
- Test method shall be a functional test
- Where provided, the interconnections with a fire signal receiving centre shall be confirmed:
 - Fire alarm transmission signal
 - Supervisory transmission signal
 - Trouble transmission signal
 - Fire signal receiving centre disconnect results in trouble at fire alarm system and transmit trouble signal



MASS NOTIFICATION SYSTEMS

- Each interconnection between mass notification system and other system(s) shall be tested to conform correct operation
 - Mass notification systems typically consist of multiple integrated systems which function together to provide emergency messaging to a campus, complex, open space, or similar facility
 - The remote monitoring by the fire alarm system are to be tested





ELEVATORS

- Where elevators are integrated with other systems, each system interconnection shall be tested to confirm operation
- Elevator integration includes fire alarm systems and integration to standalone fire detectors
- Confirmation:
 - Recall to primary level
 - Recall to alternate level





EMERGENCY GENERATORS

- Each emergency generator interconnection shall be tested to confirm correct change of status
 - Generator trouble
 - Generator start-up (automatic and manual start system are required to operate)
 - Loss of power shall be simulated
 - All systems shall be confirmed as operating on emergency power





SPRINKLER AND STANDPIPE SYSTEMS

- Each interconnection shall be tested to confirm correct operation of the integration
- Where integrations are verified and documented in accordance CAN/ULC-S537, tests may not be required





FIRE PUMPS

- Each fire pump interconnection shall be tested to confirm correct change of status
- Input/output correlations and supervision functions
 - Pump Running
 - Pump Trouble
 - Pump Phase reversal
 - Pump Loss Phase





WATER SUPPLIES

- Each interconnection shall be tested to confirm correct operation of the integration
 - Water level supervisory devices
 - Pressure supervisory devices
 - Temperature supervisory devices
 - Control Valves
 - Freeze protection
- Where integrations are verified and documented in accordance CAN/ULC-S537, tests may not be required



WATER SUPPLY CONTROL VALVES AND FREEZE PROTECTION SYSTEMS

- Each interconnection shall be tested to confirm correct operation of the integration
- Where integrations are verified and documented in accordance CAN/ULC-S537, tests may not be required



FIXED & COOKING EQUIPMENT FIRE SUPPRESSION SYSTEMS

- Each interconnection shall be tested to confirm correct change of status in accordance with the design sequence of operation
- Shall be a functional test however release of agent is not required
- Minimum number of initiating devices required to cause input/output correlation function shall be tested





HOLD-OPEN DEVICES

- Each interconnection shall be tested to confirm correct operation in accordance with the design sequence of operation
 - Shall include confirmation that <u>each</u> door equipped with a holdopen device has returned to closed and latched position
 - Includes integration with fire alarm system and integration to standalone initiating devices





ELECTROMAGNETIC LOCKS

- Each interconnection shall be tested to confirm correct operation in accordance with the design sequence of operation
 - Shall include correct operation that each electromagnetic lock has de-energized



- Common release integrations shall be tested by activation of minimum of one initiating device
- Local release integrations shall be tested by activation of all local initiating devices



SMOKE CONTROL SYSTEMS

Emergency Pressurization Systems

- Each interconnection shall be tested to confirm correct operation in accordance with the design sequence of operation
- Shall be a functional test
 - Automatic pressurization fan control
 - Manual pressurization fan control
 - Automatic pressurization air relief control
 - Manual pressurization air relief control
 - Door opening forces



SMOKE CONTROL SYSTEMS

Smoke Exhaust Systems

- Each interconnection shall be tested to confirm correct operation in accordance with the design sequence of operation
- Shall be a functional test
 - Automatic and manual fan control
 - Fan and damper status monitoring
 - Automatic and manual damper control
 - Firefighter smoke control station
 - Building management system interface





ADDITIONAL SYSTEMS

AUDIO/VISUAL AND/OR LIGHTING CONTROL SYSTEMS

NOTIFICATION SYSTEMS

HAZARDOUS PROTECTION MONITORING

SMOKE ALARMS

• All systems interconnections shall be tested to confirm correct operation of the integration



INTEGRATED SYSTEMS TESTING DOCUMENTATION

INTEGRATED SYSTEMS TESTING FORMS

- The documentation shall provide the results of the implementation of the integrated testing plan
 - Integrated testing plan and the integrated testing report may be combined
- Integrated testing forms are developed by the coordinator
- Forms shall be signed by each participant



INTEGRATED SYSTEMS TESTING DOCUMENTATION

INTEGRATED TESTING REPORTS

- Coordinator shall prepare an integrated testing report upon successful completion of testing
- Shall include:
 - The integrated testing plan
 - Initial integrated testing forms
 - Re-test integrated testing forms



 Documentation provided as required from the Integrated Systems Testing Implementation Phase



PERIODIC & RETRO-INTEGRATED SYSTEMS TESTING

Only applies <u>WHERE</u> mandated by local Building and Fire Codes

- PERIODIC INTEGRATED SYSTEMS TESTING
 - 1 year after initial, subsequent tests shall not exceed 5 years
- RETRO-INTEGRATED SYSTEMS TESTING
 - Is existing and has not undergone an initial integrated test
 - Subsequent tests shall not exceed 5 years



INTEGRATED SYSTEMS TESTING FOR MODIFICATIONS

Only applies <u>WHERE</u> mandated by local Building and Fire Codes

- Applies to:
 - Systems which have undergone a modification
 - Systems which are affected by a modification to building or facility



APPENDIX A & B (INFORMATIVE)

• Appendix A

• Provides supporting information for numerous clauses

• Appendix B

 Provides a guideline for preparing integrated systems testing plans and reports



SUMMARY OF CAN/ULC-S1001

- Building & Fire Code requirements
- Definitions
- Qualifications
- Testing process and requirements
- Documentation
- Periodic systems testing and retro-integrated
- Systems testing for modifications



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- Discussed CAN/ULC-S1001
- ULC Online Resources



THANK YOU.

Questions

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