

PRACTICE ADVISORY

CONSIDERATIONS FOR THE INTEGRATED SYSTEMS TESTING OF FIRE PROTECTION AND LIFE SAFETY SYSTEMS (CAN/ULC-S1001)

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This practice advisory has been issued to professional registrants of Engineers and Geoscientists British Columbia (BC) (herein after referred to as engineering professionals). This advisory describes expectations and obligations of professional practice related to integrated systems testing of fire protection and life safety systems for new and existing buildings. This advisory is intended to provide guidance to engineering professionals on meeting the requirements of the applicable building code, applicable fire code, and the Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems (CAN/ULC-S1001) (Underwriters Laboratories of Canada [ULC] Standard 2011), and to clarify related responsibilities.

Specifically, this advisory clarifies:

- When an engineering professional is the coordinating registered professional (CRP), they are responsible for the coordination and integration of functional testing of fire protection and life safety systems.
- The integrated testing coordinator must be a registered professional (i.e., an architect registered with the Architectural Institute of British Columbia [AIBC] or an engineering professional). The integrated testing coordinator could be the CRP or someone acting as a supporting registered professional to the CRP.
- The integrated testing itself need not be done by a registered professional but may need to be overseen by the registered professional(s) whose work is being tested.

Note that although the CRP role can be filled by either an architect or an engineering professional, the guidance in this advisory applies solely to engineering professionals registered with Engineers and Geoscientists BC. Similarly, the guidance in this advisory related to the responsibilities of the integrated testing coordinator applies only to engineering professionals in this role. Related guidance for projects in the City of Vancouver is provided in Bulletin 2022-005-AD/BU/FI Integrated Testing of Fire and Life Safety Systems (City of Vancouver 2022). This advisory may be of interest to authorities having jurisdiction (AHJs), architects, building owners, clients, and contractors.

BACKGROUND

In 2010, the National Building Code (NBC) introduced Articles 3.2.4.6. and 9.10.1.2. Commissioning of Life Safety and Fire Protection Systems. These articles instruct on the commissioning (testing) of life safety and fire protection systems, as required for Part 3 and Part 9 buildings, to ensure proper operation and integration. The fire protection and life safety systems that must work in tandem include, but are not limited to: fire alarm systems, sprinklers, standpipes, smoke control, ventilation, pressurization, door hold-open devices, elevator recalls, smoke and fire shutters and dampers, emergency power, emergency lighting, fire pumps, and emergency generators.

Following the publication of the 2010 NBC, the CAN/ULC-S1001 was developed and published. The general commissioning requirements of Articles 3.2.4.6. and 9.10.1.2. in the 2010 NBC, the 2012 British Columbia Building Code (BCBC), and the 2014 Vancouver Building By-law (VBBL) were removed. These articles were replaced with direct reference to CAN/ULC-S1001 in Articles 3.2.9.1. and 9.10.1.2. Testing Integrated Fire Protection and Life Safety Systems of the 2015 NBC, the 2018 BCBC, and the 2019 VBBL. In this advisory, the BCBC and the VBBL are referred to collectively as "the building code." CAN/ULC-S1001 was also adopted and directly referenced in Section 6.8. Integrated Fire Protection and Life Safety systems of the 2015 National Fire Code (NFC), the 2018 British Columbia Fire Code (BCFC), and the 2019 Vancouver Fire By-law (VFBL). In this advisory, the BCFC and the VFBL are referred to collectively as "the fire code."

Referencing CAN/ULC-S1001 in both the building code and the fire code does not represent a fundamental change of the underlying requirements; instead, it simplifies and harmonizes the requirement for testing of integrated fire protection and life safety systems, and removes the potentially confusing term "commissioning," which has a specific meaning to the commissioning community that is not in alignment with the intent of the fire code.

CAN/ULC-S1001 generally clarifies requirements for:

- testing;
- reporting (including a final testing report);
- the assignment of an integrated testing coordinator; and
- involvement from the registered professionals.

CODE REQUIREMENTS

Sentence 3.2.9.1.(1) and Article 9.10.1.2. of the building code require the testing of integrated fire protection and life safety systems as follows:

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, "Integrated Systems Testing of Fire Protection and Life Safety Systems," to verify that they have been properly integrated. (See Note A-3.2.9.1.(1).)

Similarly, Sentence 6.8.1.1.(1) of the fire code requires the testing and maintenance of integrated fire protection and life safety systems as follows:

Interconnections between fire protection and life safety systems shall be tested and maintained in conformance with CAN/ULC-S1001, "Integrated Systems Testing of Fire Protection and Life Safety Systems." (See Note A-6.8.1.1.(1).)

The above-mentioned sentences and articles are supplemented with notes (A-3.2.9.1.[1] and A-6.8.1.1.[1]) that provide the following additional guidance:

Building owners [“should verify” in the building code / “must ensure” in the fire code] that fire protection and life safety systems and their components (i.e., fire alarm systems, sprinklers, standpipes, smoke control, ventilation, pressurization, door hold-open devices, elevator recalls, smoke and fire shutters and dampers, emergency power, emergency lighting, fire pumps, generators, etc.), including their interconnections with other building systems, are functioning according to the intent of their design. CAN/ULC-S1001, “Integrated Systems Testing of Fire Protection and Life Safety Systems,” provides the methodology for verifying and documenting that interconnections between building systems satisfy the intent of their design and that the systems function as intended by the Code.

Clause 6.1.5 of CAN/ULC-S1001 allows the integrated testing coordinator to accept documented evidence of any tests that have been performed for the purpose of demonstrating compliance with the integrated testing requirements of that standard, to avoid duplication of work. For example, NFPA 13, Standard for the Installation of Sprinkler Systems requires testing to NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems and the building code (Sentence 3.2.4.5.[2]) requires fire alarm verification.

PROFESSIONAL PRACTICE

QUALIFICATION OF THE INTEGRATED TESTING COORDINATOR

Subsection 4.2 of CAN/ULC-S1001 establishes the requirements for the integrated testing coordinator. They must be knowledgeable and experienced in the design, installation, and operation of fire protection and life safety system(s), and the fire protection and life safety functions of building systems. Additionally, per Section 4.2.2:

“the integrated testing coordinator shall have knowledge and understanding of:

- *the Codes and Standards that regulate the design and installation of fire protection and life safety system(s);*
- *how individual and integrated fire protection and life safety system(s) are designed to operate during normal operating conditions and emergency conditions; and*
- *methods for validating the intended functionality of integrated fire protection and life safety system(s).”*

Furthermore, per Section 4.2.3:

“the integrated testing coordinator shall have all licenses and certifications if required by:

- *federal, provincial, territorial or other applicable regulations; and/or*
- *contractual obligations.”*

In Schedule A, Confirmation of Commitment by Owner and Coordinating Registered Professional, of the letters of assurance in the building code, the CRP:

“agrees to coordinate the design work and field reviews of the registered professionals of record required for the project as outlined in each attached Schedule B including coordination and integration of functional testing of fire protection and life safety systems.”

Schedule A then refers to A-2.2.7.3. Demonstration of the Coordinated Fire and Life Safety Systems in the Notes to Part 2 of Division C. Here, the building code specifies that the CRP—in consultation with the appropriate registered professionals of record (RPRs)—is responsible for:

- developing the project-specific test protocol and procedures;
- accumulating and submitting the necessary documentation;
- coordinating shop drawing and field reviews; and
- witnessing the demonstration of the testing of the fire and life safety systems to confirm that the as-built systems function as intended by design.

Integrated testing of fire protection and life safety systems is in the building code and the coordination and integration of functional testing is included as a responsibility in Schedule A. Therefore, Engineers and Geoscientists BC understands that these are professional services that must be done by, or under the direct supervision of, a registered professional, as defined in the building code.

Engineers and Geoscientists BC acknowledges that ULC has developed a program for certification of integrated systems testing services providers and the Canadian Fire Alarm Association (CFAA) has developed the Fire Alarm Technology Program for the certification of fire alarm technicians. However, these programs and certifications have not been formally recognized or adopted in the building code or fire code as acceptable qualifications for the role of integrated testing coordinator, and therefore the traditional reliance on registered professionals to implement the codes remain. So, in lieu of having clear expectations of the qualifications outlined in the building code and fire code, Engineers and Geoscientists BC provides the above interpretation and expectation for the qualifications of the integrated testing coordinator.

LETTERS OF ASSURANCE

The registered professional acting as the CRP is responsible for coordination and integration of functional testing and therefore may take on the role of the integrated testing coordinator. However, the integrated testing coordinator could also be a supporting registered professional to the CRP. When the integrated testing coordinator is a supporting registered professional to the CRP, the integrated testing coordinator should provide the CRP with Schedules S-B and S-C. See the *Joint Professional Practice Guidelines—Professional Design and Field Review By Supporting Registered Professionals* (including Model Schedules S-B and S-C) (Engineers and Geoscientists BC and the AIBC 2020) for more information.

The supporting registered professional selected by the CRP to act as the integrated testing coordinator should be someone appropriately qualified and may be one of the discipline RPRs, the certified professional (CP), where applicable, or a third-party, such as a code consultant, commissioning agent, or contractor, as long as they are a registered professional and appropriately qualified to take on the work in accordance with their regulatory body's code of ethics.

Regardless of whether the CRP is also the integrated testing coordinator or if the CRP utilizes a supporting registered professional to be the integrated testing coordinator, the CRP is responsible for completing and submitting Schedule A, Confirmation of Commitment by Owner and Coordinating Registered Professional, and Schedule C-A, Assurance of Coordination of Professional Field Review, to the applicable AHJ. See the *Guide to the Letters of Assurance in the BC Building Code and Vancouver Building By-law 2019* (Province of BC 2022) for more information.

The integrated testing coordinator should confirm any submission requirements and expectations for the integrated testing with the applicable AHJ. Upon request, the integrated testing coordinator can provide the AHJ with the integrated testing plan and/or integrated testing report.

APPLICABILITY

The building code applies to all new buildings or alterations to existing buildings and the fire code applies to all buildings for ongoing operation and maintenance. Both codes reference the integrated testing requirements of CAN/ULC-S1001. CAN/ULC-S1001 requires that integrated testing be done:

- before occupancy;
- one year after the initial test (i.e., one year after occupancy); and
- every five years post occupancy.

NEW BUILDINGS

For new buildings permitted under 2018 BCBC or 2019 VBBL and later, the integrated testing as per CAN/ULC-S1001 is required. The CRP should advise the client of this requirement as early as possible in the design process, well in advance of occupancy.

For new buildings permitted under previous building codes that have not yet finished construction and/or been granted occupancy, the formal integrated testing requirements of CAN/ULC-S1001 were not in place at the time of building permit award. However, as mentioned previously, the building code and fire code requirements for commissioning of the integrated systems were in place, just without the formal standard by which to do so. The CRP and any registered professionals involved in the coordination and integration of fire protection and life safety systems should consider proactively applying the formal CAN/ULC-S1001 requirements where they exceed the integrated testing requirements of the applicable building code (likely the 2012 BCBC or 2014 VBBL).

EXISTING BUILDINGS

The local fire service is the authority having jurisdiction for enforcing the fire code. They are responsible for interpreting whether the requirements for integrated testing apply to existing buildings, and how to enforce these requirements.

Existing buildings that undergo renovations (including tenant improvements) that affect the integration of fire protection and life safety systems will be subject to both the current building code and fire code requirements, which require initial and routine integrated testing in accordance with CAN/ULC S1001.

Initial and routine integrated testing in existing buildings must be coordinated by a qualified person (i.e., the integrated testing coordinator) and conducted by a qualified person, as outlined in CAN/ULC S1001. The guidance provided above for integrated testing in new buildings, including professional responsibility and the submission of letters of assurance, also applies to existing buildings as much as is reasonable and practicable. The registered professional responsible for the initial integrated testing in a building (new or existing) should consider including stipulations in the integrated testing plan regarding professional involvement and reuse of the plan for future integrated testing.

SCOPE OF WORK

GENERAL

The building code requires integrated testing per CAN/ULC-S1001 “where fire protection and life safety systems and systems with fire protection and life safety functions are integrated with each other.” It follows that any building with two or more integrated fire protection and life safety systems requires integrated testing of those systems. The following sections outline expectations for the initial integrated

testing for new buildings, and where appropriate, should be applied to routine testing of new and existing buildings.

PLANNING

The integrated testing coordinator is responsible for collecting documentation from the appropriate RPRs detailing each interconnection between fire protection and life safety systems and preparing the integrated testing plan. Such documentation includes but is not limited to:

- floor plans;
- fire and life safety system design documentation;
- manufacturer's operating and testing instructions; and
- documentation of alternative solutions or other building code deviations.

The integrated testing plan should include the above-collected documentation and contain the following:

- the functional objectives of system integrations;
- the sequence of operations, including:
 - operation under normal operating conditions, and
 - operation under fire conditions;
- test protocol and procedures;
- where applicable, a procedure for notifying building occupants; and
- where applicable, alternative measures, such as notifications and safety protocols, for ensuring occupant safety during testing.

The integrated testing coordinator is required to provide the integrated testing plan to the RPRs (and the CRP, if the CRP is not the integrated testing coordinator), for review and acceptance. After acceptance by the RPRs, the integrated testing plan may be submitted to the AHJ, where required, for their records. Note that it is the responsibility of the RPRs, not the AHJ, to accept the integrated testing plan.

Before the integrated testing begins, the integrated testing coordinator must obtain:

- Written confirmation (e.g., Schedule C-B) from the RPRs that they have conducted acceptance testing, and that the fire protection and life safety systems have been installed in accordance with the design and are ready for integrated testing.
- Written confirmation from the installing contractor(s) that the fire protection and life safety systems have been installed in accordance with the design and are ready for integrated testing.
- Documentation from the verifying party(s) (e.g., qualified person who does the CAN/ULC S537 verification) that the fire protection and life safety systems are operating acceptably (note that confirmation that the fire protection and life safety systems are in accordance with the design remains the RPR's responsibility).
- Confirmation of completion of electrical inspections, by the AHJ.
- Confirmation of completion of inspections in accordance with CSA B44 "Safety Code for Elevators and Escalators", by Technical Safety BC.
- Where required, confirmation of implementation of occupant notification procedures.
- Where required, confirmation of implementation of alternate measures for ensuring occupant safety.

The integrated testing coordinator (and/or the CRP) should communicate these pre-integrated testing documentation requirements to all affected parties (e.g., the client, RPRs, AHJ) to minimize the likelihood of unexpected project and occupancy delays. The integrated testing coordinator should note that this

documentation is not typically available until late in a project, which may affect the estimated occupancy date.

The integrated testing coordinator should organize the schedule for testing and, with sufficient notice, notify the AHJ, the RPRs (and the CRP, if the CRP is not the integrated testing coordinator), the contractors, and/or verifying parties of the intended schedule for integrated testing so that they can witness or participate, as required by the integrated testing plan.

Where a building will have phased occupancies, the integrated testing plan must be developed for the entire building, with consideration for the integrated testing required within each occupancy phase. The areas that have been tested are not required to be re-tested at subsequent occupancies, provided ongoing construction does not affect previously tested systems.

TESTING

While the integrated testing coordinator is responsible for coordinating the integrated testing, each RPR is responsible for ensuring that the functional testing of the systems they are responsible for is done.

Retesting is not required for systems that are required to be tested by other standards, such as CAN/ULC S537 or NFPA 25. The integrated testing coordinator should confirm that the functional testing of systems and their components was done by collecting verification reports, where applicable, before commencing the integrated testing. Functional and integrated testing of systems include but are not limited to:

- fire alarm systems, including interconnection with a fire signal receiving centre (monitoring company)
- mass notification systems
- elevators
- emergency generators
- audiovisual and/or lighting control systems (e.g., movies may stop and lighting may come on in cinemas, upon fire alarm activation)
- sprinkler and standpipe systems
- signals to fire department
- fire pumps
- water supply control valves, and water supplies with respect to supervisory devices for water level, water pressure, and temperature, as applicable
- freeze protection systems
- fixed fire suppression systems
- fire suppression systems for cooking equipment
- hold-open devices and electromagnetic locks
- smoke control systems
- protection of electrical conductors against exposure to fire
- hazardous protection monitoring
- smoke alarms, where they are interconnected with other fire protection and life safety systems, or systems with fire protection and life safety functions

Failure during testing of the interconnection between two or more fire protection or life safety systems in an integrated test requires correction and retesting of the affected integrated systems. However, failure during testing of a component in one system (e.g., a smoke detector) requires correction and review by the RPR, but not integrated system retesting.

The integrated testing coordinator is required to receive written confirmation from the RPRs that they have conducted their own acceptance testing prior to the commencement of CAN/ULC-S1001 testing, and the CAN/ULC-S1001 testing is required to be completed prior to the demonstration test by the AHJ. Therefore, the integrated testing will typically not align with the coordinated final field reviews or functional testing by the RPRs or with the final inspection by the AHJ. The required sequence of testing and reviews by CAN/ULC-S1001 may be different than previously accepted practice, and all involved parties should be aware of the sequential requirements and plan their testing accordingly to minimize the chance of project or occupancy delays.

The integrated testing coordinator should determine with their client and the RPRs whether they are expected to participate in any preliminary testing of systems or systems integration or the demonstration test by the AHJ.

REPORTING

CAN/ULC-S1001 requires that the integrated testing report include, but not be limited to, the following:

- the integrated testing plan;
- initial integrated testing forms (from Appendix C of CAN/ULC-S1001 or similar) which are:
 - developed prior to the testing, then used to document the testing, and
 - required to be signed by the test participants, for the areas related to their systems;
- where applicable, integrated testing forms from any re-testing; and
- documentation provided prior to the testing.

The completed integrated testing report must be:

- authenticated by the integrated testing coordinator;
- provided to the owner;
- maintained on site; and
- where required, submitted to the AHJ.

REFERENCES AND RELATED DOCUMENTS

CODES AND STANDARDS

[British Columbia Building Code 2018](#)

[British Columbia Fire Code 2018](#)

[CAN/ULC S1001-Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems](#)

[CAN/ULC S537: The Canadian Standard for Verification of Fire Alarm Systems](#)

[City of Vancouver Building By-law 2019](#)

[City of Vancouver Fire By-law 12472](#)

[City of Vancouver 2022-005-AD/BU/FI Integrated Testing of Fire and Life Safety Systems](#)

[National Building Code of Canada 2015](#)

[National Fire Code of Canada 2010](#)

National Fire Code of Canada 2015

Technical Safety BC CSA B44 Safety Code for Elevators and Escalators

REFERENCES

Architectural Institute of BC and Engineers and Geoscientists BC. 2020. Joint Professional Practice Guidelines—Professional Design and Field Review By Supporting Registered Professionals (including Model Schedules S-B and S-C). Version 1.0. Burnaby, BC: Engineers and Geoscientists BC. [accessed: 2024 January 25]. <https://tools.egbc.ca/Practice-Resources/Individual-Practice/Guidelines-Advisories>

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VERSION HISTORY

VERSION NUMBER	PUBLISHED DATE	DESCRIPTION OF CHANGES
1.0	January 31, 2024	Initial version.

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