BCxA® Building Commissioning Association

Integrated Life Safety Testing

Lessons from North of the Border

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Course Description

Fire protection and life safety systems may operate correctly on their own yet fail when required to respond together. Using Canadian project experience and CAN/ULC-S1001 as a framework, this webinar examines integrated testing in new and existing buildings and its relationship to NFPA 3 and NFPA 4.

Participants will explore incomplete system readiness, unclear sequences of operation, failed interfaces, and coordination challenges. Practical examples involving elevator recall, emergency power, door release, and stairwell pressurization will illustrate how to plan effective test scenarios, verify actual responses, document deficiencies, and confirm successful retesting.

Learning Objectives

At the end of this webinar, participants will be able to:

- Explain the purpose of integrated life safety testing and the relationship between CAN/ULC-S1001, NFPA 3, and NFPA 4.
- Identify readiness gaps, unclear sequences of operation, and failed interfaces that can compromise coordinated system response.
- Describe the roles of owners, designers, commissioning providers, integrated testing coordinators, and contractors.
- Develop test scenarios that verify expected responses, document deficiencies, and confirm successful retesting and restoration.

Agenda



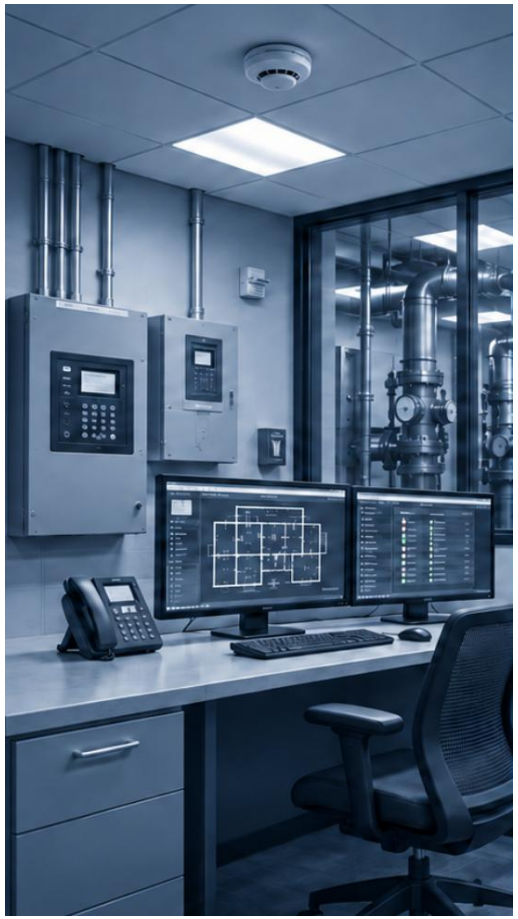
- Why Integrated Testing Matters to CxPs
- CAN/ULC-S1001 and the NFPA Connection
- New Construction: Coordination and Design Intent
- Procuring and Coordinating CxP and ITC Services
- Existing Buildings: Lessons from Actual Failures
- Applying the Lessons on Your Next Project
- Questions and Discussion

The CxP Opportunity



- More commissioning RFPs include life safety testing.
- Understanding of integrated testing remains uneven.
- Owners need clarity on scope and responsibility.
- CxPs bring knowledge of the building and its sequences.

BCxA Best Practices Connection



- Verify that systems perform together against the project documents.
- Coordinate controls, fire alarm, and emergency power sequences.
- Confirm readiness and use repeatable tests with clear acceptance criteria.
- Record actual responses, resolve deficiencies, and retest.
- IST applies this intent to a defined fire protection and life safety scope.

Source: BCxA NCCx Best Practices, 3.4.G.

NFPA 3, NFPA 4 and S1001



- CAN/ULC-S1001 (2011): Canada's method for verifying and documenting system interconnections.
- NFPA 3 (2012): broader fire protection and life safety commissioning process.
- NFPA 4 (2015): integrated testing became a dedicated standard, separated from NFPA 3.
- Closest comparison: NFPA 4 and S1001 both test coordinated system response against the design.
- Shared approach: qualified lead, test plan, defined scenarios, documented results and retesting.
- Application: similar purpose, different requirements. Follow the adopted code and edition.

Sources: ULC Bulletin 2011-17; NFPA 3/4.

Canadian Code



- 2015: Canadian national model codes referenced S1001.
- Adoption: provincial and territorial requirements determine application.
- Ontario: Fire Code section 6.10 addresses certain systems installed on or after January 1, 2020.
- Applicability: those systems must also have required S1001 verification under the Building Code.

The Historical Testing Gap



- Historical gap: in many projects we have encountered, fire alarm testing stopped at a relay.
- A successful output proved the signal changed, but did not prove the connected equipment responded.
- End-to-end testing verifies downstream wiring, controls, power availability and the final physical result.
- Example: initiate the alarm and witness the elevator arrive at the correct recall floor.
- The question: did the complete interconnected system perform its required life safety function?

Potential System Interfaces

- Fire alarm, initiating devices, voice evacuation and annunciation
- Sprinkler / standpipe flow, valve supervision and fire pump signals
- Fire pumps, controllers, transfer switches and power availability
- Pre-action / deluge, releasing panels and VESDA interfaces
- Clean-agent and special suppression with shutdown interlocks
- Kitchen suppression with fuel / electrical shutdown and ventilation
- Smoke control, stair / hoistway pressurization, fans and dampers
- HVAC shutdown, smoke exhaust, make-up air and BAS interlocks
- Elevators: recall, emergency power and shunt trip, where required
- Generators, ATSs, UPSs and emergency life safety loads
- Emergency lighting, exit signs and central lighting inverters
- Maglocks, access control, delayed egress and door hold-opens
- Fire / smoke doors, dampers, shutters, curtains and closures
- CO / combustible-gas detection with ventilation or shutdown
- Emergency voice / mass notification and communication interfaces
- Monitoring stations, fire command centres and supervisory signals

New Construction



- Stronger support: designers, contractors and vendors are usually engaged and available.
- Fewer occupancy limits: pre-occupancy testing allows more freedom for alarms, recall and shutdowns.
- Power testing: plan normal-power failures, emergency transfer and combined alarm scenarios.
- Better information: current drawings, submittals and sequences support the test plan.
- Faster corrections: trades can investigate, adjust and retest while still mobilized.
- Coordination still matters: complete individual tests and resolve interface gaps before IST.

Design Inputs



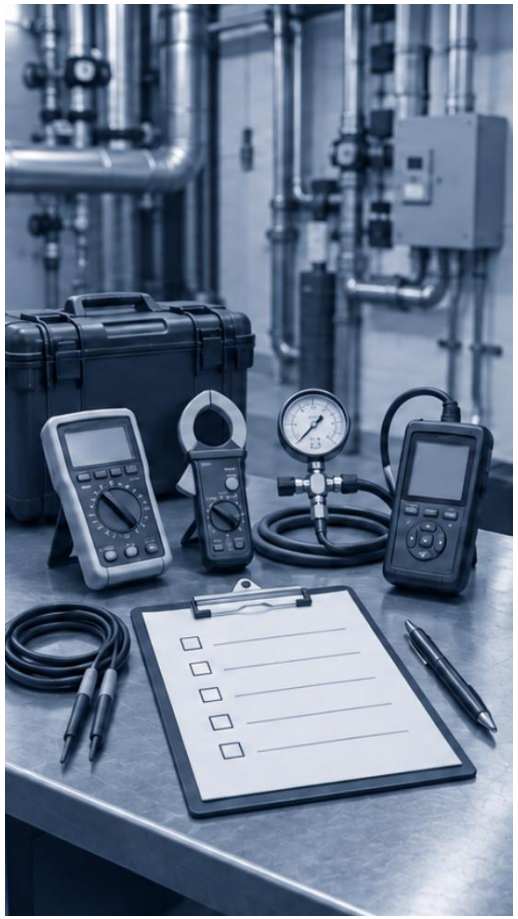
- Design professionals define intended integration.
- Provide coordinated drawings, specifications and sequences.
- Identify relevant instructions, alternative solutions and deviations.
- The ITC develops the test plan from that information.

Cause And Effect



- Initiating condition: what starts this scenario?
- Expected response: what should each connected system do?
- Acceptance criteria: what demonstrates a pass?
- Responsibility: who observes and records each result?
- Design review: resolve unclear or conflicting expectations.

System Readiness



- Canada: review the fire alarm verification (VI) report to CAN/ULC-S537 for the installed or modified scope.
- U.S. counterpart: NFPA 72 acceptance / reacceptance test records and System Record of Completion.
- Check the details: scope, results, deficiencies and documented emergency-control interfaces.
- Other systems: obtain applicable sprinkler, elevator, generator and controls test records.
- Ready to test: approved sequences, assigned trades, outage approvals and occupant notifications.
- Restoration: agree on impairment measures, reset procedures and return to normal operation.

CAN/ULC-S537; NFPA 72, Chs. 7 and 14.

Owner Procurement



- Some owners ask the electrical contractor to procure the ITC.
- Others combine CxP and ITC services in one company.
- Confirm who appoints, coordinates and receives reports.
- Define the ITC's access to designers, trades and the owner.

Combined Appointment



- Stronger understanding of the building systems.
- Better continuity in sequences of operation.
- Less opportunity for mistakes during IST.
- Reduced duplication and potential owner cost savings.

Role Clarity



- Design professionals establish the intended response.
- The ITC coordinates the integrated testing process.
- Contractors operate, adjust and correct their systems.
- The owner retains overall accountability and supports access, participation and decisions.

Existing Buildings: Harder to Test



- Occupancy limits: alarm tests, door releases and elevator recall disrupt occupants and operations.
- Restricted power tests: normal-power outages and emergency-power transfers need approved windows.
- More invasive: protect critical loads, maintain egress, coordinate impairments and plan restoration.
- Legacy conditions: missing sequences, altered wiring and mixed equipment complicate testing.
- Our experience: significant interface failures remain after fire alarm upgrades when IST is an afterthought.
- Unverified risk: untested interfaces may conceal further failures. Allow more investigation and retesting.

Elevator Recall



- Observed: elevators did not recall.
- Observed: some recalled to the wrong floor.
- Verify: compare the response with the approved recall sequence.
- Lesson: witness the elevator's actual response.

Emergency Power and Elevator Recall



- Observed: elevators failed to operate on emergency power.
- Test during an outage: verify fire alarm elevator recall while normal power is unavailable.
- Verify the sequence: correct recall floor, car selection, load sequencing and transfer delays, where required.
- Combined conditions: test the approved alarm / power-loss order and witness the actual car response.
- Restoration: confirm safe return to normal power and normal elevator service.

Maglock Release



- Observed: maglocks did not release on fire alarm.
- Verify: establish the required release conditions.
- Witness: confirm physical release at the door.
- Lesson: check the full path from signal to response.

Stairwell Pressure and Door Force



- Observed: stairwell pressurization made exit doors difficult to open.
- Measure: use a calibrated force gauge at the release hardware, with the latch released.
- OBC general exit-door limit: 90 N maximum, approximately 20.2 lbf (pounds-force).
- Our case: door-opening force was approximately twice the applicable limit.
- Verify and retest: check the required pressurization / door conditions and the complete egress function.

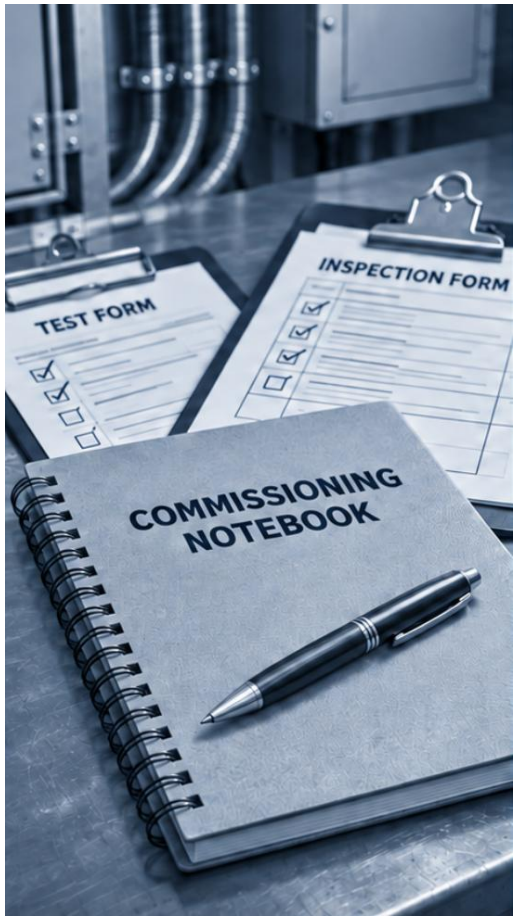
OBC 2024, Div. B 3.4.6.16, SB-4.

Test Scenarios: Sequences Matter



- EOR input: the engineer of record must provide and clarify the intended integrated sequence of operation.
- Define the scenario: initiating event, system states, expected actions, timing and acceptance criteria.
- Resolve gaps early: reconcile fire alarm, mechanical, electrical and elevator sequences with the EOR.
- Test real conditions: alarm, power failure and combined events in the required order.
- Assign observers: witness each endpoint and record the result against the approved sequence.
- Close the test: document deficiencies, retest corrections and verify full restoration.

Deficiencies And Retesting



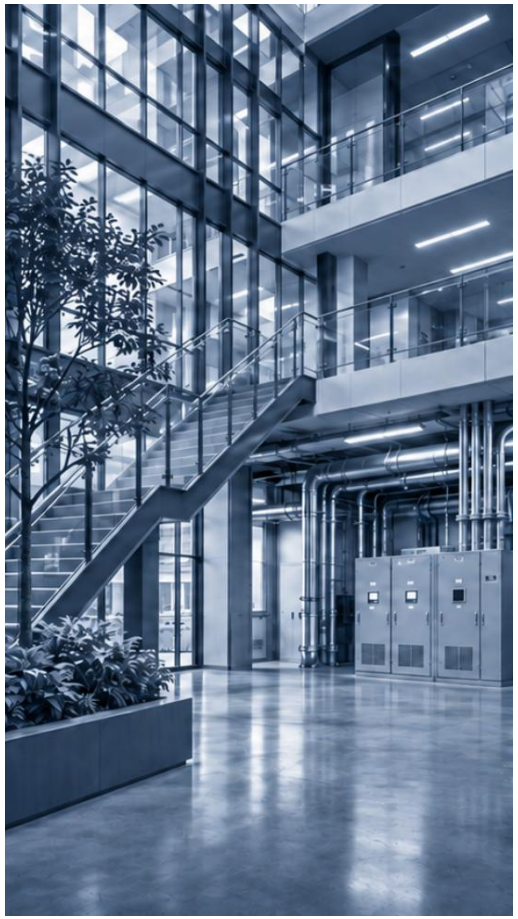
- Record expected and observed responses.
- Assign the issue for review and correction.
- Identify affected interfaces and the retest scope.
- Document the retest result and confirm restoration.

Practical Takeaways



- Appoint the integrated testing lead early.
- Confirm complete design information.
- Coordinate scope, trades and system readiness.
- Witness the actual response at every required interface.
- Close the loop with documented correction and retesting.

Questions And Discussion



- Where do you see the biggest interface gaps?
- How do your owners/clients procure the CxP and testing roles?
- What Life Safety IST do you see in your area?
- What would you change on your next project?

Reference Points



- CAN/ULC-S1001: integrated systems testing. First edition: September 2011.
- NFPA 3 and NFPA 4: commissioning and integrated testing, respectively.
- CAN/ULC-S537 and NFPA 72: fire alarm verification / acceptance documentation.
- Ontario Building Code: door-opening force, Div. B 3.4.6.16.(4), and high-building guidance in SB-4.
- Ontario Fire Code: integrated testing, section 6.10.
- BCxA NCCx Best Practices: section 3.4.G, I, P–Q, pages 20–23.
- Apply the adopted editions, approved project criteria and local requirements.