
Presentation To:
Canadian Fire Alarm Association (CFAA)
- National Capital Region Technical Seminar

Ottawa, Ontario
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PRESENTATION OVERVIEW

- BACKGROUND
- SCOPE
- CAN/ULC S1001 HIGHLIGHTS
- CAN/ULC S1001 QUALIFICATIONS
- CAN/ULC S1001 PROCESS
- CAN/ULC S1001 TESTING REQUIREMENTS
- CAN/ULC S1001 DOCUMENTATION
- CAN/ULC S1001 BUILDING LIFE-CYCLE TESTING
- NEXT PROJECTS FOR ULC COMMISSIONING SUBCOMMITTEE
WHY COMMISSIONING?

- Requirement included as a Technical Change to the 2010 NBCC & NFCC
  - 2010 NBCC Article 3.2.4.6
  - 2010 NFCC Article 2.1.3.8

Where life safety and fire protection systems are installed to comply with the provisions of the NBC or the NFC, the commissioning of these integrated systems must be performed as a whole to ensure the proper operation and inter-relationship between the systems.
WHAT IS COMMISSIONING?

- Subcommittee discussions as to what “commissioning” is
- Two different processes identified:
  - Commissioning - Owners Process
  - Integrated Systems Testing - Code Requirement

Intent of the NBCC / NFCC reviewed with NRC to ensure Standard in-line with Codes
COMMISSIONING VS INTEGRATED SYSTEMS TESTING

• Commissioning

A process of documentation, adjustment, testing, verification and training, performed specifically to ensure that the finished facility operates in accordance with the Owner’s documented project requirements and the construction documents.

• Integrated Systems Testing

A methodology for verifying and documenting that all interconnections between systems provided for fire protection and life safety are installed and operating in conformance with their design criteria.
COMMISSIONING

- Highlights
  - Owner Driven and Quality Focused
    - Ensures Owners get what they paid for
  - Process from Pre-Design to Turn-Over
    - Develop Owner’s Project Requirements
    - Develop Commissioning Scope and Plan
    - Review of Design Documents
    - Construction Checklists and Submittals
    - Review Construction and Testing
    - Training and Closeout Documents and Activities
COMMISSIONING

- Highlights
  - Documentation of Design Changes and Resolutions, Verifications, and Acceptance Testing
  - Owner gets more out of their investment
    - Better Operating Systems
    - Properly Maintained Systems
    - Properly Training Building Staff
  - Fire Commissioning is the fire protection and life safety component of Building Commissioning
INTEGRATED SYSTEMS TESTING

- Highlights
  - Code Driven Process
  - Minimum testing required to prove integrations
    - System A works with System B
  - Testing of the integrations between systems in situ
  - One input device per integration activated to confirm corresponding outputs
  - Documentation of the testing
INTEGRATED SYSTEMS TESTING

- Address “gaps” in existing Standards
  - Systems typically tested and verified independently
  - No requirements to test systems together
    - Example - Door Hold-Open Devices
      - Fire alarm relays tested and doors confirmed as operating
      - Testing by separate contractors
      - Integrated Systems Testing requires a coordinated test
    - Example - Fire Pumps
      - Fire pump installed and tested to confirm relays work
      - Fire alarm verification to confirm inputs
      - Integrated Systems Testing requires a coordinated test
INTEGRATED SYSTEMS TESTING

- Integrated Systems Testing is not:
  - Replacement of Design Professionals review and acceptance of systems
  - Review of system designs or installations, only system integrations
  - Duplication of existing inspection, testing, and verification requirements
COMPARISON OF THE INTEGRATED SYSTEMS TESTING PROCESS VS. A SAMPLE COMMISSIONING PROCESS

INTEGRATED SYSTEMS TESTING PROCESS

Owner Requests Building

System Design by Design Professionals

Construction by Installing Contractors

General Review by Design Professionals

Verification by Verifying Parties

Acceptance Testing by Design Professionals

Integrated Systems Testing

Occupancy

SAMPLE COMMISSIONING PROCESS

Owner Requests Building

System Design by Design Professionals

Commissioning Agent Defines Owners Requirements

Construction by Installing Contractors

General Review by Design Professionals

Verification by Verifying Parties

Acceptance Testing by Design Professionals

Integrated Systems Testing

Building Documentation and Staff Training

Occupancy

LEGEND

Project Start

Construction Process

Commissioning

Project End

Integrated Systems Testing
CAN/ULC S1001-11
Integrated Systems Testing of Fire Protection and Life Safety Systems
ULC-S1001 CODE ADOPTION

- Reference Standard Status
  - Code Changes submitted to the NRC
  - Inclusion in the 2015 National Building and Fire Codes of Canada
  - Reviewed by Reference Standards Working Group
  - Recommendations to the Standing Committees
NATIONAL BUILDING CODE

- 2015 Edition Tentative Changes
  - New Subsection 3.2.9
  - Removes 2010 NBC Article 3.2.4.6
  - New Sentence 3.2.9.1.(1) Requirements
    - Testing of integrations between fire protection and life safety systems, and systems with fire protection and life safety functions
    - Systems and integrations to be tested as a whole
    - ULC-S1001 Reference Standard for Integrated Testing
NATIONAL BUILDING CODE

- Appendix Note A-3.2.9.1.(1)

  - Testing of Integrated Systems
    - Owners must ensure fire protection and life safety systems are functioning in accordance with their design, including interconnections with other building systems
    - CAN/ULC-S1001 provides the methodology for verifying and documenting that interconnections between building systems satisfy the intent of their design
NATIONAL FIRE CODE

- 2015 Edition Tentative Changes
  - Construction requirements in Article 2.1.3.8
  - New Section 6.8 on testing of integrations
  - Article 2.1.3.8
    - References the NBC for installation of system integrations
  - Section 6.8
    - Integrations between fire protection and life safety systems to be tested and maintained in confirmation with ULC-S1001
ULC-S1001 CODE ADOPTION

- Standing Committees
  - Proposed Change reviewed by Standing Committees
    - Use and Egress
    - Fire Protection
    - Housing and Small Buildings
  - Proposed changes accepted by all three standing committees
  - Changes will be circulated for public comment during next review phase
INTEGRATED SYSTEMS TESTING OF FIRE PROTECTION AND LIFE SAFETY SYSTEMS

ULC Standards

Canada
ULC S1001 MAJOR SECTIONS

- Integrated Systems Testing Requirements
  - Qualifications
  - Process
  - Testing Requirements
  - Documentation
  - Periodic Integrated Systems Testing
  - Retro Integrated Systems Testing
  - Integrated Systems Testing for Modifications
QUALIFICATIONS

- Participants in the Integrated Testing Plan
  - Design Professionals, Installing Contractors, Verifying Parties
  - Knowledge and experience in the design, installation, and operation of their relevant systems
  - Regulations may exist for licensing and/or certification of these individuals
QUALIFICATIONS

- Integrated Testing Coordinator
  - Maybe a person, firm, or corporation
  - Knowledge and experience of integrated systems, operation under normal and fire conditions, and methods of validation
  - Licenses and Certifications?
    - Standard can’t dictate professional qualifications
    - To be part of the adoption in Regulations
    - Could also be in Owner’s contractual requirements
PROCESS

- Planning Phase

  Information gathering from Design Professionals
  - Building Floor Plans
  - Fire Protection / Life Safety System Design Documents
  - Sequencing descriptions and coordination of systems
  - M&E Riser Diagrams
  - Operating and Testing Instructions
  - Alternative Solutions
  - Miscellaneous
PROCESS

- Planning Phase
  - Preparation of the Integrated Testing Plan
    - Functional Objectives of System Integrations
    - Sequences of Operation
    - Integrated Testing Protocols and Procedures
    - Occupant Notification Procedures
    - Alternative Measures
  - Appendix B Guidelines
PROCESS

- Planning Phase
  - *Integrated Testing Plan*
    - Consider safety of personnel
    - Consider safe operation of systems
    - Consider Phased Occupancy, where applicable
    - Approved by the Design Professionals
    - Reviewed by the AHJs, where required
    - Revised when changes to systems are made
PROCESS

- Implementation Phase
  - Prior to implementing the Integrated Testing Plan
    - Confirmation from Design Professionals and Installing Contractors that systems are ready for testing
    - Verification documentation from Verifying Parties
    - Inspection Certificates from Local Authorities
    - Occupant notification procedures implemented
    - Alternate measures implemented
    - Notify AHJs, where required
PROCESS

- Implementation Phase
  - Implementation of Test Protocols
    - As per the Integrated Testing Plan
    - Design Professionals, Installing Contractor, and Verifying Party participation required
  - Retesting of Failed Tests
  - Documentation of Tests
TESTING REQUIREMENTS

- Project Specific Testing
  - Procedures to demonstrate proper operation of integrated systems based on design criteria
  - Functional operation of input devices
    - Simulated operation permitted for non-restorable devices or where tests could harm persons or damage systems
  - Acceptance of other documented testing at the discretion of the Integrated Testing Coordinator
  - Performance Based Testing Requirements
TESTING REQUIREMENTS

- Systems Considered
  - Fire Alarm System
  - Mass Notification Systems
  - Elevators
  - Emergency Generators
  - A/V and Lighting Control Systems
  - Notification Systems
  - Sprinkler Systems
  - Standpipe Systems
  - Fire Pumps
  - Water Supplies
  - Water Supply Control Valve
  - Freeze Protection Systems
  - Fixed Fire Suppression Systems
  - Cooking Suppression Systems
  - Hold-Open Devices
  - Electromagnetic Locks
  - Smoke Control Systems
  - Hazardous Protection Monitoring
  - Smoke Alarms
TESTING REQUIREMENTS

- Testing effort is related to the complexity of the system
  
  - For example a smoke exhaust system
  - Various input/output correlation tests
    - Fan and damper control and status monitoring
    - Control interfaces (Firefighter’s Smoke Control Station, BMS)
  - For simple analog interconnections,
    - one input activated to initiate sequence
    - operation of fans, dampers, etc. confirmed to test integrations
  - Complicated digital interfaces
    - each software command string considered an integration
SAMPLE TEST REQUIREMENTS - FIRE PUMPS

- Fire Pumps
  - Testing of each interconnection, as provided
    - Fire Pump Running,
    - Trouble,
    - Phase Reversal,
    - Loss of Phase,
    - Connected to an Alternate Source,
    - Controller Main Switch in Off or Manual Position,
    - etc.
SAMPLE TEST REQUIREMENTS - FIRE PUMPS

- Fire Pumps
  - Each monitored connection is created on the Fire Pump to show that the correct integration is provided
    - Fire Pump manually started and “Fire Pump Running” annunciation confirmed at the Fire Alarm System
    - Fire Pump trouble condition created and ‘Fire Pump Trouble” annunciation confirmed at the Fire Alarm System
SAMPLE TEST REQUIREMENTS - EMERGENCY GENERATORS

- Emergency Generators
  - Similar to Fire Pumps
    - Testing of each interconnection, as provided
    - Generator Running, Trouble, etc.
    - Each monitored condition is created on the Emergency Generator to show the correct integration is provided
Emergency Generators

- Additional required Generator Start-Up Test
  - Full load test
  - All systems running at full design capacity
  - Simulated loss of normal power
  - All running systems confirmed as operating under emergency power
Sprinkler Systems

- Testing of Each Interconnection
  - Typically alarm and supervisory device monitoring
  - Test method appropriate for the integration
    - Flow water to test an integration to a flow switch
    - Turn valve to test an integration to a supervised valve
  - CAN/ULC-S537 Verification acceptable, at Integrated Testing Coordinators discretion
  - Process to not duplicate existing test and verification requirements
DOCUMENTATION

- Integrated Systems Testing Report
  - Final Integrated Testing Report consists of the
    - Integrated Testing Plan
    - Documentation collected during Implementation Phase
    - Integrated Testing Forms for Initial Test
    - Integrated Testing Forms for Re-Tests
  - Future use throughout the building’s life cycle
    - Life Cycle Testing
    - Modifications
LIFE CYCLE TESTING

- On-Going Integrated Systems Testing
  - On-Going Testing or Testing of Existing Systems
  - Re-Testing after system modifications
  - Implementation to be by Governing Bodies
    - Building and Fire Codes
    - Other Legislation
    - Contract Requirements
LIFE CYCLE TESTING

- Periodic Integrated Systems Testing
  - Routine Integrated Systems Testing throughout the building’s life cycle
  - Ensure system integrations are maintained
  - 1 Year Confirmation Test
  - 5 Year Periodic Testing
LIFE CYCLE TESTING

- Retro Integrated Systems Testing
  - Integrated Systems Testing for Existing Buildings
  - Confirmation that systems are properly integrated
  - Similar process as new construction
  - Lack of system Design requires detailed review

- Integrated Systems Testing for Modifications
  - Amended Integrated Systems Testing
  - Implement testing for effected systems
APPENDIX A - GENERAL INFORMATION

- Informative Information
  - Aligned with the Standard Numbering (e.g., A1.1)
  - Provides background from the Working Group on the intent of requirements
  - Examples of procedures and approaches that can be considered
  - Examples of existing tests and reports
  - Examples of Fire Protection and Life Safety Systems
APPENDIX B - GUIDELINES FOR INTEGRATED TESTING PLANS

- Introduction
- Sequence of Operation
- Test Protocols and Procedures
- Notifications
- Personnel Safety
- Phased Occupancies
- Pre-Testing Documentation
- Testing Forms
- Ongoing Integrated Systems Testing
ULC SUBCOMMITTEE ON COMMISSIONING

Current Projects
STANDARDS UPDATE

- **Published**

- **In Development**
  - ULC-S1002, Guideline on the Fire Commissioning Process
  - ULC-S1003, Acceptance Testing for Active Fire Protection and Life Safety Systems
ULC S1002

- Fire Commissioning Process
  - All aspects of the construction process
    - Pre-design, design, installation, acceptance testing, closeout, training, etc.
  - New Construction, Retro, and Modifications
  - Review existing processes
    - CSA Z320, NFPA, NIBS, ISO, Public Works, etc.
  - Align with ULC-S1001, ULC-S1003, and ULC-S1004
ULC-S1002 PRELIMINARY ITEMS

- Commissioning Process
  - Project Inception
  - Planning & Pre-Design
  - Detailed Design
  - Construction
  - Verification
  - Acceptance Testing
  - Occupancy and Close-Out
ULC-S1002 PRELIMINARY ITEMS

• Documentation Requirements
  ➢ Owners Project Requirements
  ➢ Commissioning Plans and Schedules
  ➢ Commissioning Documents and Forms
    • Design Phase
    • Construction Rough-In Phase
    • Construction Finishing Phase
    • Acceptance Testing Phase
    • Closeout Phase
ULC-S1002 PRELIMINARY ITEMS

- Fire Commissioning Team
  - Owner & Facility Personnel
  - Fire Commissioning Team
  - Design Professionals / Contractors / Verifying Parties
  - Authorities Having Jurisdiction

- Fire Commissioning Phases
  - New Construction
  - Re-Commissioning
  - Retro-Commissioning
ULC-S1003 & ULC-S1004

- Technical aspects of acceptance testing
- Recommended practices for design professionals
- Reasonable steps to ensure systems are properly installed and functioning
- All aspects of the construction process
- To align with ULC-S1001 & ULC-S1002
ULC-S1003 & ULC-S1004 - PRELIMINARY ITEMS

- Acceptance Testing requirements in development
- Active and Passive Systems
- Extent of testing requirements being developed
  - Based on system components
  - Percentage of component to be tested
  - Permitted failure rates
Questions or Comments?

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