Canadian Fire Alarm Association (CFAA)
D. GOODYEAR FIRE CONSULTING
STANDARD FOR THE INSTALLATION OF FIRE ALARM SYSTEMS
Installation of Fire Alarm Systems

• Why is the 2006 Edition Important?
  • Clarifies some items in the 2001 Edition
  • Corrects some errors
  • Offers some options
  • States items that were good practice
  • More clearly defines the intent of the 2001 Edition with respect to Data Communication Links and system survivability
Installation of Fire Alarm Systems

- CAN/ULC-S524-01 & CAN/ULC-S524-06
- Review current changes from old standard to new standard
2006 Glossary Update

- Air Sampling Type Detector
Air Sampling Type Detector
2006 Glossary Update

- Air Sampling Type Detector
- DCLC Data Communications Link Style C
- Manual Station
2006 Glossary Update

- Status Change Confirmation
  
  *(Smoke Detector Alarm Verification)*

- Temporary or Intermittent Sound Sources
2006 Glossary Update

- Data Communication Link Style C

2001 DCLR → 2006 DCLC
• Data Communication Link Style C

Installation of Fire Alarm Systems

DCL - C Primary Wiring Circuit

DCL - C Alternate Wiring Circuit

70 STOREY OFFICE TOWER

TRANSPONDER

TRANSPONDER

TRANSPONDER

TRANSPONDER

TRANSPONDER

TRANSPONDER

DCC

60th Floor

50th Floor

40th Floor

30th Floor

20th Floor

10th Floor
2006 Glossary Update

DELETED TERMS

- Output Circuit
- Redundant Wiring Circuit
- Spacing
2006 Requirements Update

– Requirements of Fire Alarm Systems

2006

C  ULC-S527, Control Units for Fire Alarm Systems;

D  CAN/ULC-S528, Manual Stations for Fire Alarm Systems, Including Accessories;

E  CAN/ULC-S529, Smoke Detectors for Fire Alarm Systems;

F  ULC-S530, Heat Actuated Fire detectors for Fire Alarm Systems;

G  ULC-S533, Standard for Egress Door Securing and Releasing Devices;

H  CAN/ULC-S541, Speakers for Fire Alarm Systems, Including Accessories;

I  ULC-S548, Standard for Alarm Initiating and Supervisory Devices for Water Type Extinguishing Systems; and

J  CAN/ULC-S561, Installation and Services for Fire Signal Receiving Centres and Systems.
2006 Power Supply Update

3.2.1.1 Two independent power supplies shall be provided; one primary and one emergency, in accordance with the National Building Code of Canada.
2006 Plans and Specifications Update

– Fire alarm plans and specifications shall include a complete and detailed description of the following:

2006

A Sequence of operation;
B Installation instructions;
C Description of each type of field device;
D Details of input to programmed output functions for programmed systems, and
E Connection to a fire signal receiving centre, if required by the National Building Code of Canada.
3.5.4 Documentation for the fire alarm system shall include the following description of the fire alarm system:

A Instructions for resetting the system and silencing alarm signals;
B Instructions for silencing the trouble signal and action to be taken when the trouble signal sounds;
C Description of the function of each operating control and indicator on the fire alarm unit;
D Description of the area of fire zone protected by each alarm detection circuit (this may be in the form of a list or plan drawing);
E Description of the sequence of operation;
F Description of ancillary devices controlled by the fire alarm system;
G Equipment operating instructions or manuals; and
H Equipment maintenance or testing instructions.
Installation of Fire Alarm Systems

2006 Electrical Supervision Update

2006 Items G, H & J

3.3.1.1

Electrical supervision of the wiring shall be provided to the following:

A Manual stations;
B Fire detectors;
C Water flow devices for water based fire protection systems;
D National Building Code of Canada required supervisory devices for water based fire protection systems;
E Audible signal devices;
F Visible signal devices;
G Voice communication equipment;
H Emergency telephone handsets;
I Primary power supplies and emergency power supplies;
J Power supplied to field devices;
K Annunciators;
L Display and control centre at the central alarm and control facility; and
M Common fault indication from the engine driven generator, as required by Clause 3.2.4.2.
2006 Electrical Supervision Update

– Conventional Two Stage Systems
  
  • Input circuits for first stage and second stage shall not share conductors

3.3.1.5 Except as noted in Clause 3.3.1.6, each circuit of a fire alarm system shall be installed such that open circuit faults or ground faults shall not interfere with the operation of other circuits of the fire alarm system, and such faults shall initiate a trouble signal.

Note: In conventional two-stage systems, input circuits for first stage and second stage shall not share conductors.
2006 Separation of Wiring Update

– Class A Wiring Circuit, DCL Style A, DCL Style C
  
  • Defines the distance between the primary and alternate wiring circuit paths

3.3.1.3 In Class A circuit wiring, data communication link Style A and data communication link Style C wiring, the primary wiring circuit and the alternate wiring circuit shall be installed in separate raceways or cable assemblies having a minimum separation of 300 mm where the cables are installed vertically and 1200 mm where the cables are installed horizontally, except under the following conditions (Refer to Figure 1-1):

A For a distance not to exceed 3000 mm where the primary and return conductors enter or exit the field devices, control unit or transponder enclosures (Refer to Figure 1-2);

B Single conduit/raceway drops to individual field devices (Refer to Figure 1-3); or

C Single conduit/raceway drops to multiple field devices installed within a single room not exceeding 100 m² (Refer to Figure 1-4).
2006 Separation of Wiring Update
– Class A Wiring Circuit, DCL Style A, DCL Style C

- Defines the distance between the primary and alternate wiring circuit paths

**FIGURE 1-1**
SEPARATION OF WIRING CIRCUITS

(Reference: Clause 3.3.1.3)

Note: For class A circuit, data communication link Style A and data communication link Style C circuits, primary and alternate wiring circuits to be separated by a minimum 300 mm when installed vertically and 1200 mm when installed horizontally. Refer to Figures 1-2 through 1-4 for exceptions.
2006 Separation of Wiring Update
– Class A Wiring Circuit, DCL Style A, DCL Style C

• Defines the distance between the primary and alternate wiring circuit paths

**FIGURE 1-2**
SEPARATION OF WIRING CIRCUITS: EXCEPTION A

(Reference: Clause 3.3.1.3-A, Figure 1-1)

Exception A (refer also to Figure 1-1): For a distance not to exceed 3 m where the primary and return conductors enter or exit the field devices, or control unit and transponder enclosure.
2006 Separation of Wiring Update
– Class A Wiring Circuit, DCL Style A, DCL Style C

FIGURE 1-3
SEPARATION OF WIRING CIRCUITS: EXCEPTION B

(Reference: Clause 3.3.1.3-B, Figure 1-1)

EXAMPLE 1

CLASS A CIRCUIT,
DATA COMMUNICATION LINK STYLE A OR
DATA COMMUNICATION LINK STYLE C CIRCUIT

PRIMARY AND ALTERNATE
WIRING CIRCUITS

INDIVIDUAL FIELD DEVICE

Exception B (refer also to Figure 1-1): Single conduit/raceway drops to individual field devices.
2006 Separation of Wiring Update
– Class A Wiring Circuit, DCL Style A, DCL Style C

Exception B (refer also to Figure 1-1): Single conduit/raceway drops to individual field devices.
Exception C (refer also to Figure 1-1): Single conduit/raceway drops to multiple field devices installed within a single room not exceeding 100 m².
4.1.2 The top of control units and transponders shall be not more than 2400 mm above the finished floor level.

4.1.3 Legend or operating controls shall be not more than 1800 mm above the finished floor level.
Manual Stations

- Manual stations shall be installed on both sides of a series of doors exceeding 12 m in total width, and within 1500 mm of each side of the opening.
2006 Installation Of Fire Alarm
Fire Detection

SMOKE DETECTION
Irregular shaped rooms
Maximum Distance 6.4 m

6.4 m
= 0.7 x 9.1 m
2006 Installation Of Fire Alarm
Fire Detection

2006

HEAT DETECTION
HIGH CEILINGS

Installation of Fire Alarm Systems
2006 Installation Of Fire Alarm Duct Smoke Detection

Installation of Fire Alarm Systems
2006 Installation Of Fire Alarm
Duct Smoke Detection
5.4.1.1 Where ceiling heights allow, audible signal devices shall be installed so that the top of the device will not be less than 2300 mm above the finished floor level.
Audible Signal Devices for Use in Suites of Residential Occupancy

Where silencing means are separately installed or incorporated in the audible signal device, the silencing means shall be clearly identified and located not less than 1200 mm and not more than 1400 mm above the finished floor level measured from the centre of the silencing means.
2006 Audible and Visible Signal Devices

• Visible signal devices that are used to advise occupants that a fire emergency exists

• Two or more visible signal devices in corridors or rooms located in the same field of view shall flash in synchronization
Audible and Visible Signal Devices

- Wall-mounted visible signal devices shall be installed such that the entire lens is not less than 2000 mm and not more than 2400 mm above the finished floor.
5.4.5.4 Wall-mounted *visible signal devices* shall be installed in accordance with Table 5 using one of the following:

A. A single *visible signal device*; or

B. Two *visible signal devices* located on opposite walls; or

C. Two or more *visible signal devices* in the same room or adjacent space within the field of view that flash in synchronization.
Room Spacing Allocation - Incorrect

- Four 15 cd strobes in 12.2m x 12.2m room
Room Spacing Allocation - Correct

- CAN/ULC-S524-06 clause 5.4.5.8
  - Subdivide the room into multiple squares
  - Install four 15 candela appliances

5.4.5.8 Where multiple wall-mounted visible signal devices are used within a room, the room shall be subdivided into multiple squares and the selection of the device output and location shall be in accordance with Table 5 and Figure 3.

Installation of Fire Alarm Systems
System Survivability

- There is an expectation that life safety systems should continue to provide some level of performance in a fire or a disaster.
- Survivability of the fire alarm system during a fire is the new concern.
- Data Communications Links (DCLs) in new fire alarm systems are at the heart of the issue of the reliability and survivability.
2 Forest Laneway
North York

Installation of Fire Alarm Systems
System survivability what is it?

Fatal fire in a Toronto high-rise fire
six people died, the issue of the early failure of life safety systems during the fire was examined.

- Failure of the exit lighting
- Failure of the emergency lighting
- Failure of the fire alarm annunciation
- Failure of the fire alarm signalling
- Failure of the voice communication system
What is a DCL?

DATA COMMUNICATIONS LINK

• The data channel between control units and/or transponders and annunciators

The fire alarm network

• Active field devices

Addressable fire alarm devices
### Data Communication Link Table 3

**Addressable fire alarm devices**

<table>
<thead>
<tr>
<th>APPLICATION OF DATA COMMUNICATION LINKS (DCL)</th>
<th>MAXIMUM NUMBER OF ACTIVE FIELD DEVICES AND SUPPORTING FIELD DEVICES</th>
</tr>
</thead>
<tbody>
<tr>
<td>PART I</td>
<td>DCLA*</td>
</tr>
<tr>
<td>EACH ADDRESSABLE DEVICE DATA COMMUNICATION LINK ORIGINATING IN A CONTROL UNIT OR TRANSPONDER.</td>
<td>300**</td>
</tr>
</tbody>
</table>

**This includes all addressable devices on the CIRCUIT**

See Notes 1, 3, and 4
Data Communication Link Table 3
Addressable Devices

Capacity of addressable devices
DCLA
300 Device Limit per loop
2 loops shown

Zone 1

ADDRESSABLE MANUAL STATION
ADDRESSABLE SMOKE DETECTOR
ADDRESSABLE HEAT DETECTOR
Capacity of addressable devices
DCLB
200 Device Limit per loop
2 loops shown
Data Communication Link Table 3
Addressable Devices

Capacity of addressable devices
DCLC
300 Device Limit per loop
Isolators used
2 loops shown

Addressable Devices

2006

Multiple Zones

Output Circuit

Conventional field devices are not to be included in determining the maximum capacity of the DCL.

Display And Control Centre OR Transponder

ADDRESSABLE MANUAL STATION
ADDRESSABLE SMOKE DETECTOR
ADDRESSABLE HEAT DETECTOR
Addressable Devices DCLs

4.2.7

When a data loop serves more than one floor area, a fault within one floor area cannot affect normal operation of devices in another floor area.
Data Communication Link Table 3
Addressable Devices

Addressable devices
300 Device Limit

Fault isolation module pairs

Addressable Manual Station
Addressable Smoke Detector
Addressable Heat Detector
Fault Isolation Module
Data Communication Link

Installation of Fire Alarm Systems
How to install fault isolation modules

5.14.6

Do not install the fault isolation modules back to back
How to install fault isolation modules

5.14.6

400mm

Offset the fault isolation modules
How to install fault isolation modules

5.14.8

Fault isolation modules serving a single device in an exit

Installation of Fire Alarm Systems
Data Communication Link Table 3

**Network** Data Communications Link

- Only DCLC permitted
- 1000 Addressable device limit for entire system
- One fault does not disable the system

Diagram:
- Fire Alarm Control Unit
- Fire Alarm Control Unit
- Fire Alarm Control Unit
- Fire Alarm Control Unit
- Fire Alarm Control Unit
- Fire Alarm Annunciator

**Notes:**
- 2006
- DCLA or DLCB Data communication Permitted here

**Installation of Fire Alarm Systems**
Data Communication Link Table 3

Network Data Communications Link

More than 1000 Addressable device limit for entire system
Must meet Large Scale Network and only DCLC permitted

Fire Alarm Control Unit

Data communications

Fire Alarm Control Unit

Fire Alarm Control Unit

Fire Alarm Annunciator

DCLA or DLCB
Data communication permitted here

Installation of Fire Alarm Systems
Data Communication Link Table 3

Network Data Communications Link

- More than 1000 Addressable device limit for entire system
- Must meet Large Scale Network
- Only DCLC permitted
Data Communication Link Network Data Communications Link Large Scale Network

- Each transponder has STAND ALONE capability
- Degraded mode capability
- Each transponder must have
  - Signal silence
  - Reset
  - Trouble silence
  - Stand alone indicator
- In high buildings per NBC
- At least one ADDITIONAL transponder with
  - Full annunciation per NBC
  - Means to transmit voice communication with “ALL CALL” capability
- Transponders must be in an electrical room with a 1 hour fire separation
INTERCONNECTION TO THE FIRE SIGNAL RECEIVING CENTRE

• The interconnection wiring from the fire alarm control unit or transponder to the fire signal receiving centre shall comply with CAN/ULC-S561, Installation and Services for Fire Signal Receiving Centres and Systems.
INTERCONNECTION TO THE FIRE SIGNAL RECEIVING CENTRE

Conductors in raceway for mechanical protection

Independent Terminal Cabinet

End of Line Device for supervision
Get the book
Installation of Fire Alarm Systems

Dave Goodyear
D. GOODYEAR FIRE CONSULTING
CFAA TECHNICAL SEMINAR

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