

Welcome!

 **Simplex**

FIRE DETECTION

Online Continuous Learning

Day 3, Session 2:

Simplification – Multiplex Fan/Smoke
Extraction Fans Controls according to
NFPA72 2019

15:00 hrs till 15:45 hrs

*Updating your Fire Detection
Knowledge and Beyond*

By: Alan Ang



JOHNSON CONTROLS



The JCI Story

- 1885 JCI Started with Warren Johnson
- 1940 Johnson Service Goes Public
- 1978 Acquired Globe Union - Battery
- 2005 Acquires York International
- 2005 Acquires Delph Battery Business
- 2014 Shanghai HQ – Growth Global
- 2014 Focus on Multi Industry Strategy
- 2016 Spin off Automatic Seatgan

130+ YEARS OF INNOVATION

117,000 EMPLOYEES

316,000+ VOLUNTEER HOURS
Recorded in 2015

4+ MILLION CUSTOMERS GLOBALLY

\$30 BILLION ANNUAL REVENUE

MORE THAN 8,700 ACTIVE PATENTS

LEADER

- Building Products, Technologies & Integrated Solutions
- Energy Storage

\$78 MILLION IN CHARITABLE CONTRIBUTIONS in the Past 5 Years

PAID CONSECUTIVE DIVIDENDS SINCE 1887

HEADQUARTERS:
Cork, Ireland
Milwaukee, WI, USA
Shanghai, China



NEARLY 2,000 LOCATIONS WORLDWIDE



SERVING CUSTOMERS IN 150+ COUNTRIES

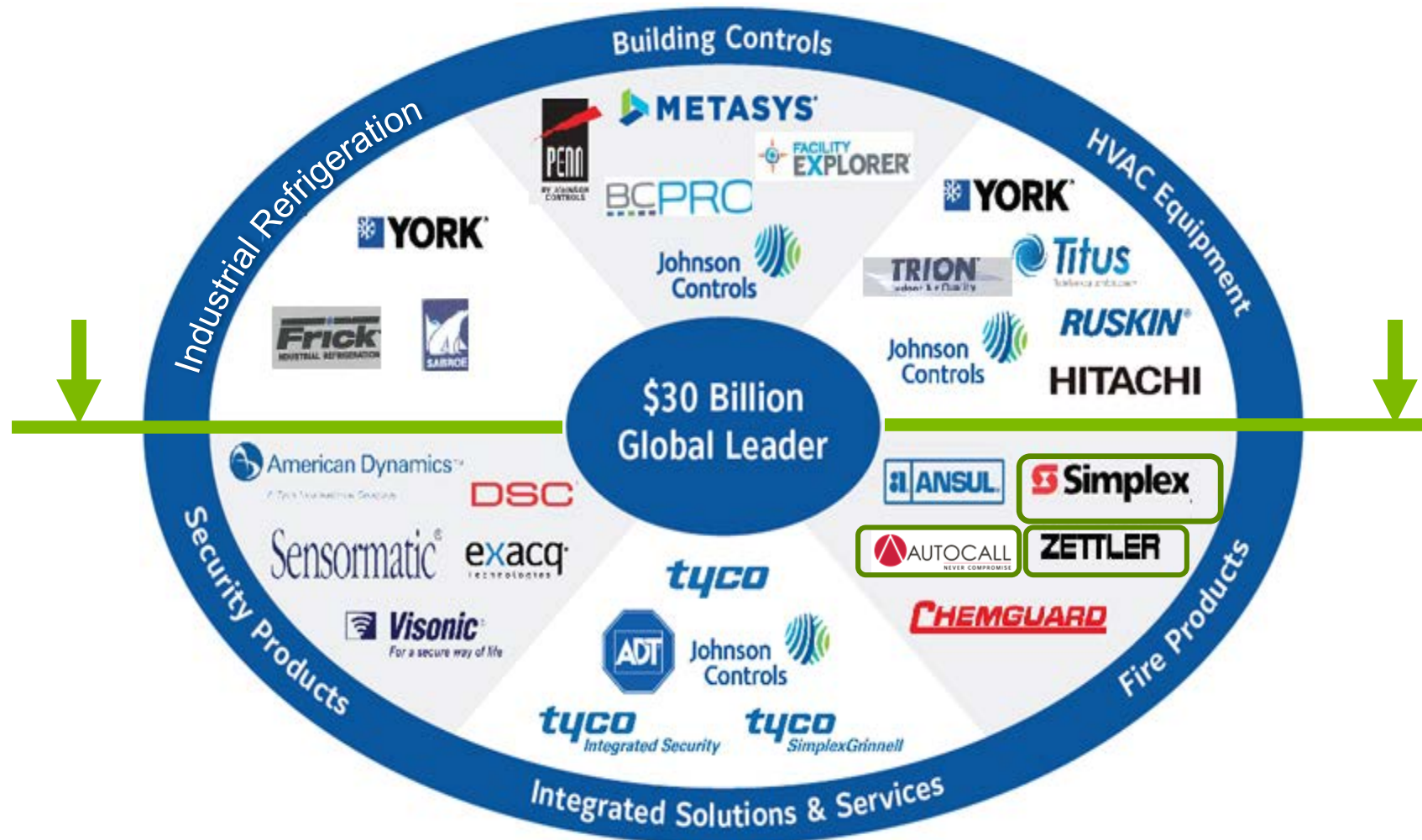
The Tyco Story

- 1892 Grinnell Fire Protection Started
- 1960 Tyco founded as Research lab
- 1975 Tyco Acquires Grinnell Fire
- 1997 Tyco and ADT Merge
- 2001 Tyco Acquires Simplex
- 2002 Corporate Governance started
- 2007 Spin off Healthcare & Electronics
- 2012 Split 03 Group, Dedicated fire & Security

2016 Merger of Johnson Controls & Tyco 2016



Leading Brands Across a Comprehensive Portfolio of Products and Services

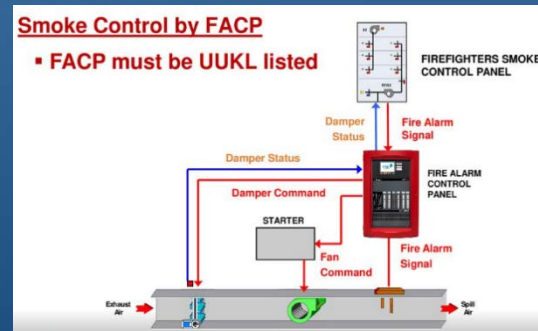


#1 in HVAC, Controls, Fire Detection and Protection, Security and Power Solutions



This is all about Adoption of Digitization for Fan or Smoke Control for Buildings for and reference to NFPA72 2019 Codes which requires Fire Alarm as the Primary Controller.

Fire Fighters' Smoke Control Station(FSCS).



- ✓ Simplified Design
- ✓ Installation
- ✓ Operation
- ✓ Cost Reduction



Let us have a fast understanding of Smoke Control thru the next video to hyper speed everyone to the same level of understanding





INTRODUCTION TO UL 864 UUKL 10TH EDITION

Smoke Control

Smoke Control related equipment – General Hardware and their Operating principles

In order to get a better grip of the other side of the mechanical world, let us get to understand what are the equipment and what are their functions.

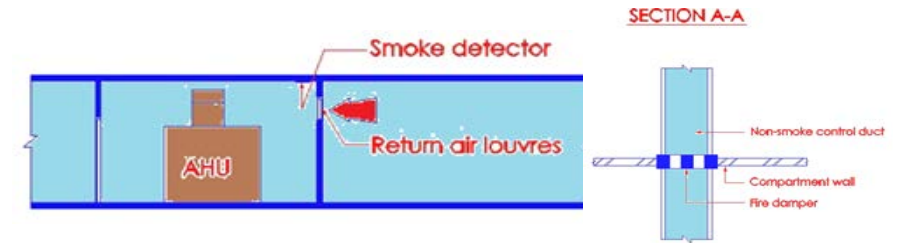
Guide on Smoke Control Equipment applications

1. When the **supply and return Air Duct** are interconnected as part of a normal operation.
 - ✓ Air Duct are equivalent to electrical conduct where Air conditioned cold air is supply thru supply duct and return typically is for the used air. However as per above there will be instance where supply and return air duct are interconnect and that is where It is crucial when smoke get transmitted thru the return to the supply and re populate the room environment and the detector at the return would not detect to shut the damper.

2. Pressurization fan needs to be connected to outside air.

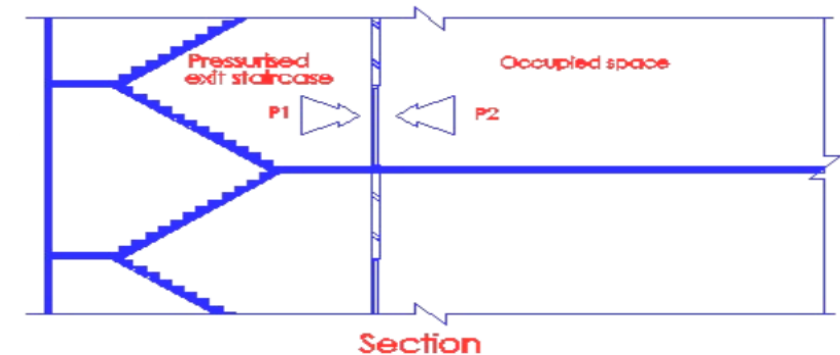
This is typically needed as part of the staircase exit requirement to keep out the smoke by pressurizing the stairwell and with the exit door with auto closer.

- ✓ In any building of which the habitable height exceeds 24m, any internal exit staircases without provision for natural ventilation shall be pressurised
- **Note:** Fire Detection can provide the signal to the control systems to managed the variable speed drive fan to keep the staircase pressurized to the expectations of the Fire Authorities. This is outside our ability to perform such controls with the Fire Alarm Panel.



- To prevent the spread of smoke and flame from one fire compartment to another served by a single AHU, smoke detector shall be incorporated in the return air stream adjacent to air handling unit.
- The smoke detector is to initiate action to shut down the AHU automatically when smoke is drawn into return air system.

(a) Maintaining pressure differential



P1 = Pressurisation system pressure
P2 = occupied area pressure
 $P1 - P2 \geq 50 \text{ pa}$
Pressure P1 is greater than P2 in occupied space

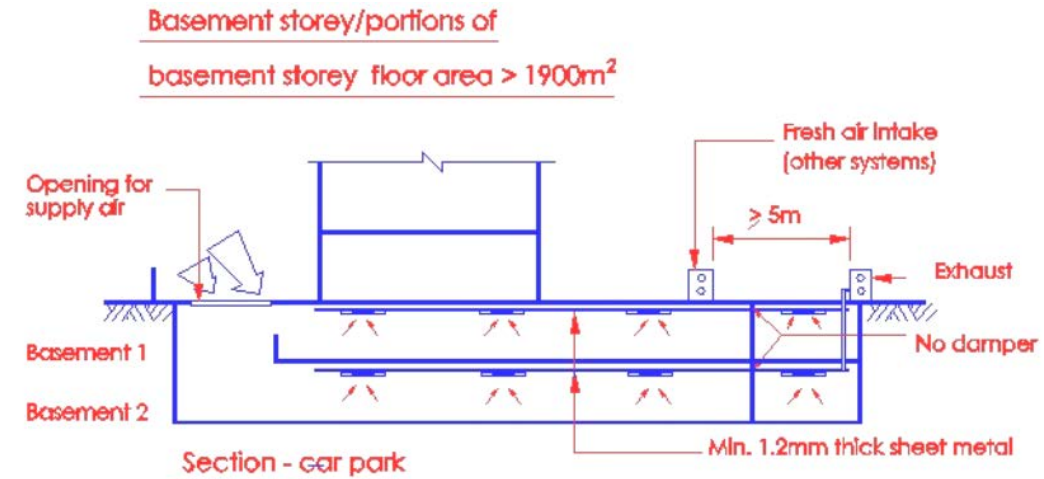
Smoke Control related equipment – General Hardware and their Operating principles

3. Supply & Exhaust Fans for Car Park

- ✓ Where a smoke purging system consists of a supply and exhaust, both of which shall be designed such that each can operate in two sections.
- ✓ The capacity of each section shall be sufficient to provide half the air changes required.
- ✓ The exhaust and supply parts shall be electrically interlocked so that failure of any section of the exhaust part shall automatically shut down the corresponding section of the supply part, which can prevent

4. Smoke Dampers used to protect Smoke Barrier.

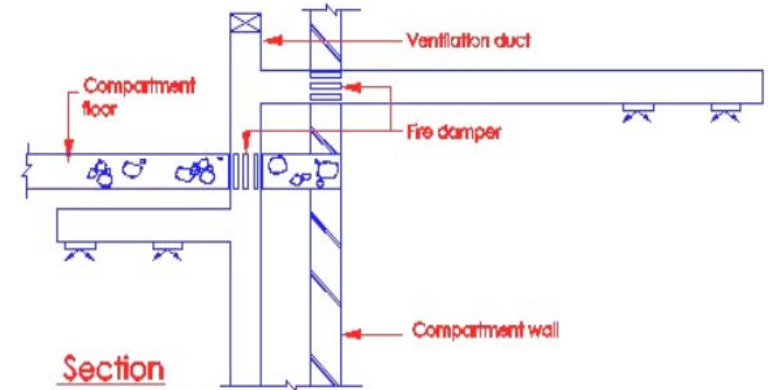
- ✓ Smoke dampers are specifically designed and installed in the ductwork and air transfer openings to prevent the passage of smoke between sections.
- ✓ Smoke dampers will work once smoke is detected by a smoke detector, which is typically located in the ductwork as well.



Smoke Control related equipment – General Hardware and their Operating principles

5. Fire Damper shall be listed to ANSI/UL555

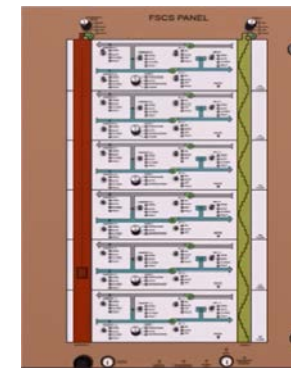
- ✓ Static fire dampers are designed to cut off airflow when a fire strikes. They are usually triggered by a building's fire system. When this particular style of fire dampers closes, no air can pass through the ducts or any part of the building following them.
- ✓ Dynamic fire dampers are approved for locations where the HVAC system's blower remains on during an alarm. This unique type of damper has to be powerful enough to close against moving air in order to perform its function and protect against the spread of fire.



6. Smoke Control Systems (Fire Alarm Panel) must be listed according to both **UL864** and **UUKL**.

- UL 864, Fire Detection and Control (UOJZ), Smoke Control Service (UUKL), Releasing Device Service (SYZV),

7. A **Single Control System** shall co ordinate the functions provided by **Fire Alarm System**, **FSCS** (Fire Fighter Smoke Control Station) and **Any other related System** with the operation of **3rd party System HVAC** and **Dedicated Smoke Control equipment**.



**Note: There is a inexhaustible list of equipment depending on Building requirements.

NFPA 92 Related Extracts

6.4.4 Activation and Deactivation

6.4.4.1 Automatic Activation.

6.4.4.1.1* Smoke Control systems shall be **automatically activated** in response to Signals received from **Specific fire detection device** or a **combination of Fire detection devices**

6.4.4.1.2* In the event that signals are received from **more than one smoke zone**, the system shall continue automatic operation in the mode **determined by the first signal received** except as provided for in 64.4.1.3

6.4.4.1.3* For systems designed for Operation of Multiple zones using **only heat activated detection devices**, it shall be permitted to expand the control strategy to **accommodate additional zones**, up to the limits of the mechanical system design.

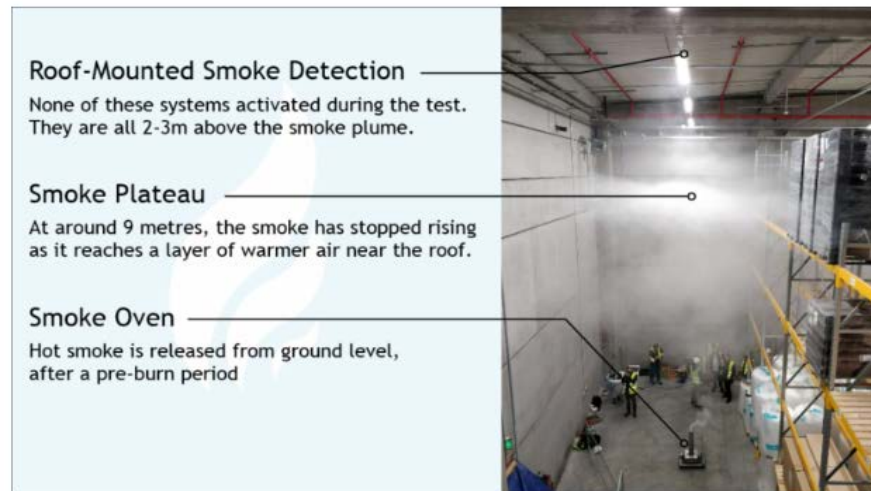
6.4.4.1.4* **Schedule.** The equipment to be operated for each automatically activated smoke control configuration shall be **fully defined in the project documents.**

6.4.4.1.5* **Stratifications of Smoke.** For large spaces where smoke stratification can occur, one of the following detection schemes shall be used

1. An upward beam to detect the smoke layer.
2. Detection of the smoke layer at various levels.
3. Horizontal beams to detect the smoke plume.

Smoke Stratification

Smoke Stratification occurs when a layer of warm air (a Stratus) collects at roof level. As smoke from a fire low-energy fire rises, it reaches this thermal barrier and lacks the energy to rise further. This causes the smoke to build up below the level of the stratus, creating a smoke plateau (see diagram below).



Stratification generally effects high-level buildings such as Atriums, Aircraft Hangers, Warehouses and Waste Management Facilities.

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NFPA 92 Related Extracts

6.4.4.2 Manual Activation

6.4.4.2.1* **Manual Fire Alarm pull Stations shall not be used** to activate smoke control systems that require information on the location of the fire.

6.4.4.2.3* **Stairwell pressurization systems or other smoke management systems** where the response of the system is identical for all zone alarms **shall be permitted to be activated from a manual fire alarm pull station.**

6.4.4.2.4 **Fire Alarm pull station** shall be permitted to cause doors in **smoke barrier walls to close.**

6.4.4.2.5* Manual activation and deactivation **shall be permitted** to be a controlled device, at a local control panel, at the building's main control center, or at the fire command station.

6.4.4.2.6 **Key operated manual switches** that are clearly marked to identify their function shall be permitted to manually activate the smoke control system.

6.4.FSCS Activation.

6.4.5.1 **Smoke control systems** shall be capable of being activated from the **FSCS by switches** clearly marked to identify the location and function.

6.4.5.2 **Sequence of Control Priorities.** Smoke Control system shall be subject to the sequences of control priorities given in 6.4.5.2.1, 6.4.5.2.2. and 6.4.5.2.2.2

For Fire Detection please note this when interfacing with Smoke Control Systems, pull station not allowed if Smoke Detection is assigned.

As per above, please note the difference for Stairwell pressurization System that allows Pull Station to be use for activation

Note for Door Closer that is permitted and signage required.

Note the scope of work for Main Control Centre of Main Fire Alarm Panel.

Note the clear requirements for clear labelling of FCSC switches and LEDs

This must be communicated clearly whether as a primary or secondary systems for Fire detection.

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6.4.5.3 Response Time

6.4.5.3.1 The **smoke control mode** shall be initiated within **10 seconds** after an automatic, manual or FSCS activation command is received at the smoke control system.

6.4.5.3.2* **Smoke Control Systems** shall activate **individual components**(e.g. dampers, fans) in the **sequence necessary** to **prevent physical damage** to the **fans, dampers, ducts and other equipment**

6.4.5.3.3* **Smoke Containment Systems.** The time necessary for individual smoke containment components to achieve their desired state or operational mode from when the components receives the signal shall not exceed the following time periods:

1. Fan operation at the desired state: **60 seconds**
2. Completion of damper travel: **75 seconds.**

6.4.5.5.3.4* **Smoke management systems.**

The **total response time**, including that necessary for detection, shutdown of smoke management operating equipment and smoke control systems startup, shall allow for **full operational mode to be achieved** before the condition in the space exceed the design smoke condition.

Please take note should Fire Detection be assigned as the FCSC as well if there is any feedback Status managed by Fire Detection System.

Rational is for mechanical systems if not handle in sequence might result in air pressure built up due to fire or smoke damper restriction and might damage the HVAC equipment.

Note for Smoke containment time to achieve fan cooperation is 60 seconds and completion of damper travel within 75 seconds. Need to ensure otherwise if wrong HVAC devices type selected or wrong Fire detection delay timer included will not be able to achieve the target timing required.

Note Smoke management System response time requirement to achieved design smoke condition.

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NFPA 92 Related Extracts – Relating to Smoke Control Requirement and FSCS Role

6.4.5.4* Fire Fighters' Smoke Control Station(FSCS).

6.4.5.4.1 An **FSCS** shall be provided for **all smoke control Systems**

6.4.5.4.2 The FSCS shall be installed at a location acceptable to the authority having jurisdiction.

6.4.5.4.3* The FSCS shall provide **status indication, fault condition indication and manual control** of all smoke control system components.

6.4.5.4.4 Status indicators and controls shall be **arranged and labeled** to convey the intended system objectives

6.4.5.4.5 **Operator controls, status indication and fault indication** shall be provided for **each smoke control zone**, each piece of equipment capable of activation for smoke control, or a combination of these approaches.

6.4.5.4.6 **Positive status indication (ON and OFF)** shall be provided **individually** or by **zone** in accordance with 6.4.5.4.5 for the following:

1. Dedicated **smoke control system fans**
2. **Nondedicated fans** used for smoke control having a capacity in excess of 2000 ft³/min (57m³/min)

6.4.5.4.7* **ON status** shall be sensed by a **pressure difference an airflow switch** or some other **positive proof of airflow**.

6.4.5.4.8 **Positive status indication** (fully open and fully closed) of **damper** are provided on the FSCS.

6.4.5.4.9 Provision shall be included for testing the pilot lamps on the FSCS control panel(s) by means of one or more **"Lamp Test"** momentary push buttons or other self restoring means.

6.4.5.4.10 **Diagram and graphic representations of the system** shall be used.

6.4.5.4.11 The FSCS shall have the **highest priority control** over all smoke control systems and equipment.

As per clause indicate for FSCS expected coverage.

Important to note as most supplier tends to miss out the Fault indication of the controlled devices.

Positive feedback needs to be clear if Fire detection is the primary System.

Note the requirement for airflow switch and not just electrical dry contacts for both fans and damper.

Note the lamp test requirements

This needs to be clarified right from the start as interfacing with multiple 3rd party Equipment and supplier.

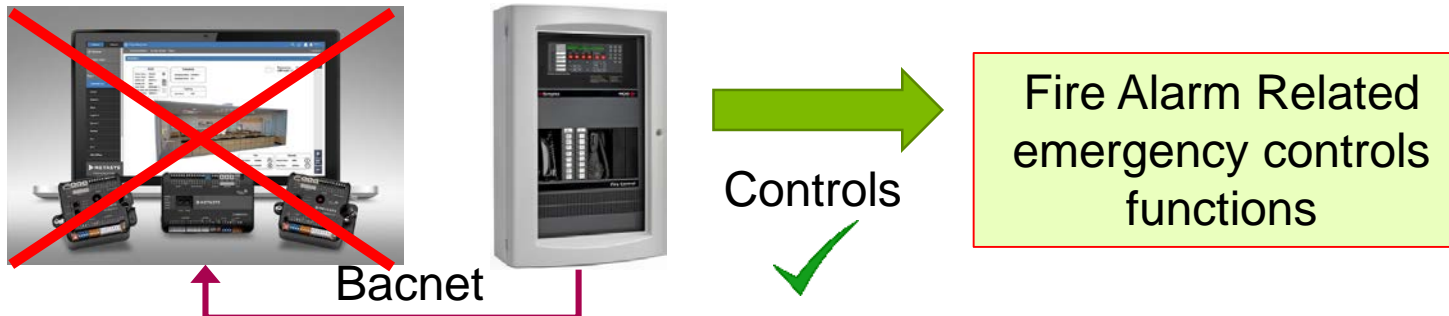


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NFPA72 2019 : Chapter 23.3.34 – BSIU & Fire Alarm Panel Role Definition

- **N3.3.34 A Building System Information Unit (BSIU).** computer-based electronic device that is intended to display building information and execute system control functions, including fire system information display and control.
- 23.8.4.2.2.1 A fire alarm control unit (FACU) controlling the fire alarm system shall be located within the **same room** as the BSIU.
- 23.8.4.2.2.2* The BSIU **shall not be permitted** to perform fire alarm system **control features** that cannot be accomplished by the FACU within the room.
- A.23.8.4.2.2.2 **When the BSIU is not available** to control the fire alarm system, the FACU within the room must be able to perform all the necessary controls of the fire alarm system without relying on the BSIU.

Failure of BSIU does not affect Fire Alarm Panel Control function



BSIU/BMS/BAS/PLC/Security Systems- Fire Alarm Annunciation and Control functions. All communication control signal issued thru Fire Alarm Panel.

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Chapter 23.8.4.2.2.3 – Listing Requirement for Interconnections

- **23.8.4.2.2.3** The communication path from the FACU and the BSIU shall meet the requirements of 23.8.4.4.1 through 23.8.4.4.3
- **23.8.4.2.2.4** The application software for the BSIU shall be listed to **ANSI/UL 864**, *Control Units and Accessories for Fire Alarm System*



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UUKL & UL864 Listing for Fire Alarm Systems as FSCS



UL/ULC, CSFM Listed,
FM Approved, OTCR/NYC
Acceptance*

Features



Figure 1: 4100ES Cabinets are available with one, two or three bays (two bay cabinet shown)

Master Controller (top) bay:

- 32-Bit Master Controller with color-coded operator interface including raised switches for high confidence feedback
- Dual configuration program CPU, convenient service port access, and capacity for up to 3000 addressable points
- CPU assembly includes 2 GB dedicated compact flash memory for on-site system programming and information storage
- ES Power Supply (ES-PS) and charger with onboard alarm relay, programmable auxiliary power output and provisions for one 4 in.

4100ES Fire Control Units

4100ES Addressable Fire Detection and Control Basic Panel Modules and Accessories

- Electrically isolated output IDNet 2 (two loop) and IDNet 2+2 (four loop) modules with short circuit isolation output loops allowing use with either shielded or unshielded, twisted or untwisted single pair wiring
- Fire Alarm Network Interfaces, DACTs, city connections, and up to five RS-232 ports for printers and terminals
- IP communicator compatibility. Use IP Communicator Cards (IPC) for central station reporting, refer to data sheet **S2080-0090**
- MAPNET II addressable device modules and MAPNET II quad isolator modules
- IDNAC signalling line circuits (SLCs) for addressable appliance control
- Alarm relays, auxiliary relays, additional power supplies, IDC modules, NAC expansion modules
- Service modems, VESDA Air Aspiration Systems interface, ASHRAE BACnet Interface, TCP/IP Bridges
- LED/switch modules and panel mount printers
- Emergency communications systems (ECS) equipment; 8 channel digital audio or 2 channel analog audio
- 8-point zone/relay module, each point is selectable as an IDC input or relay output. Class A IDCs require two points (one out and one return). Relays rated for 2 A @ 30 VDC (resistive) and configurable as either normally open or normally closed.
- Compatible with Simplex remotely located 4009 IDNet NAC Extenders, up to ten per IDNet SLC

Listings information

- UL 864, Fire Detection and Control (UQJZ), Smoke Control Service (UUKL), Releasing Device Service (SYZV), Emergency Communication and Relocation Equipment (UOQY)
- UL 1076, Proprietary Alarm Units - Burglar (APOU)
- UL 2017, Process Management Equipment (QVAX), Emergency Alarm System Control Units (FSZI)
- UL 1730, Smoke Detector Monitor (UULH)
- UL 2572, Mass Notification Systems (PGWM)
- CAN/ULC-S527 Control Units for Fire Alarm Systems (UQJZ7), Releasing Device Service (SYZV7)
- CAN/ULC-S559 Central Station Fire Alarm System Units (DAYR7)
- ULC/ORD-C1076 Proprietary Burglar Alarm Units and Systems (APOU7)
- ULC/ORD-C100 Smoke Control System Equipment (UUKL7)

Listings information

- UL 864, Fire Detection and Control (UQJZ), Smoke Control Service (UUKL), Releasing Device Service (SYZV), Emergency Communication and Relocation Equipment (UOQY)



Fire Detection Smoke/Fans Control Solution

Cost Cutting

Simplified Proven Solution:

Multiplex Fan Controls Solutions

The power behind **your mission**



Alternate Solution: Multiplex Fan Control Solutions from Simplex

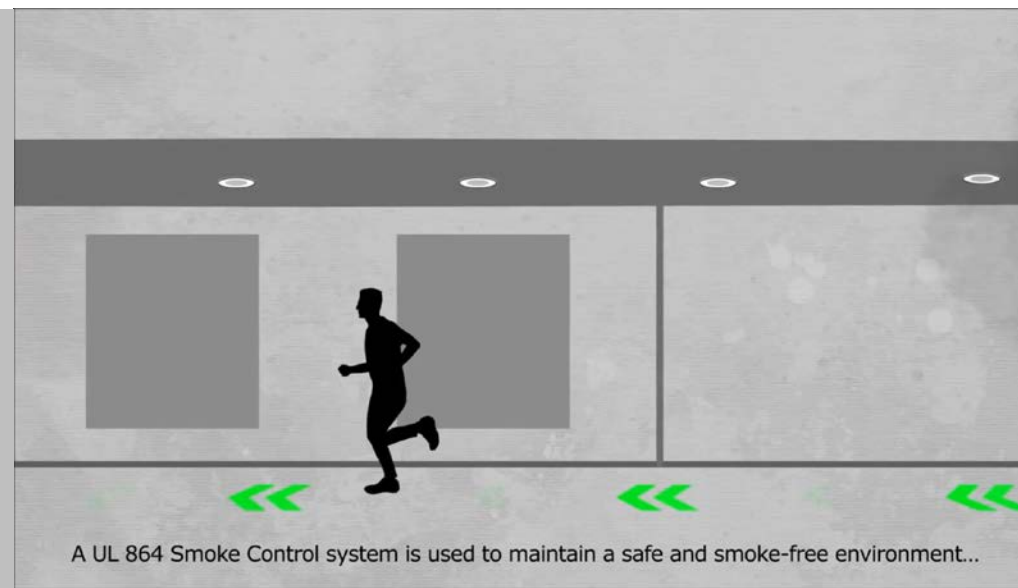
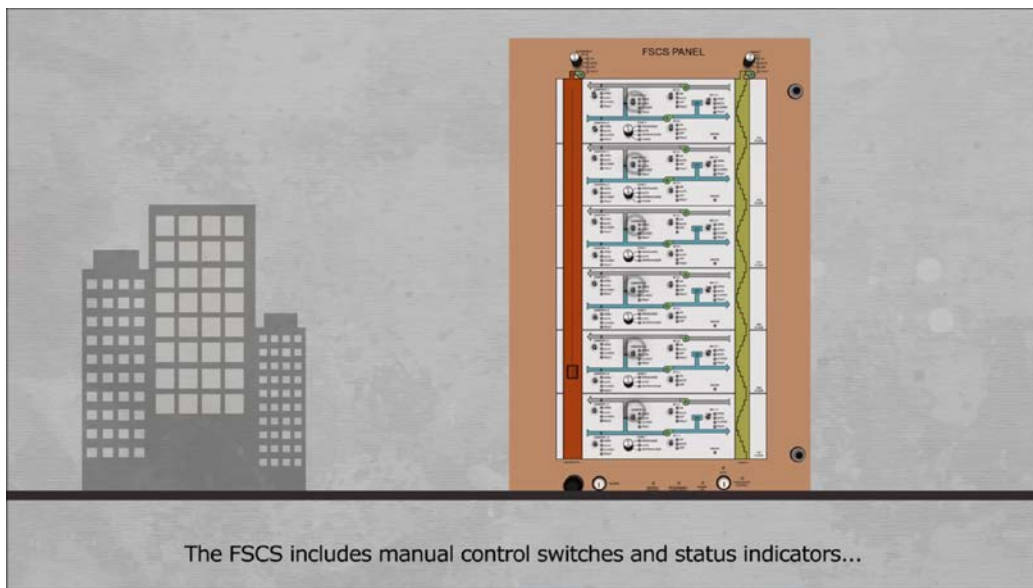
Fire Fighters' Smoke Control Station(FSCS)

Hardwired Solutions



Versus

Multiplex Solutions



Typical Fans Control Solution – Fire Fighters’ Smoke Control Station(FSCS). Direct connection from starter to Fan Control Panel

** Cost Implications

Cost of Hardwired Fan Control P = \$\$\$?

Cost of Engineering Hours = \$\$\$?

Wall Space – Lost of Rental Space = \$\$\$?

Cost of Fire Rated Cables = \$\$\$?

Cost of Conduit, Trunking and space = \$\$\$?

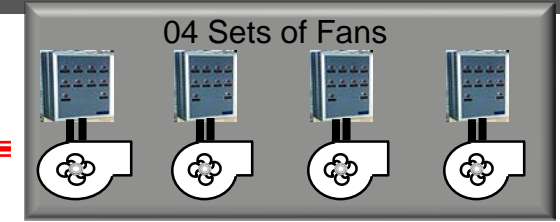
Equipment: Car Park/Pressurisation Fan Controls			
Function	Fire Alarm	Equipment	Fan Control Panel
Start	Output Signal	Relay Module	Input Signal
Status	Input Signal	Input Module	Dry Contacts Signal

4 x 4 = 16 Core of **Fire Rated Cables**

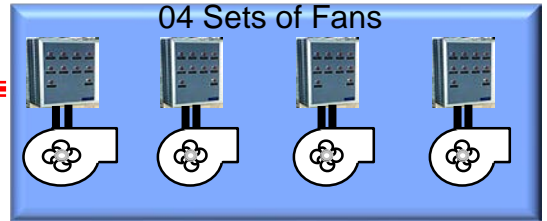
4 x 4 = 16 Core of **Fire Rated Cables**

4 x 4 = **Core of Fire Rated Cables**

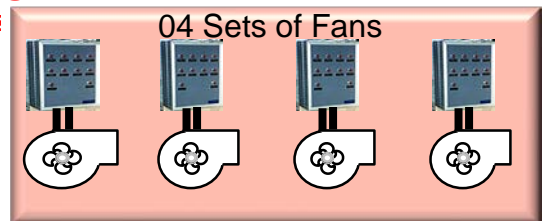
Total: 48 Core of Fire Rated Cables



Location One



Location Two



Location Three

Control Room



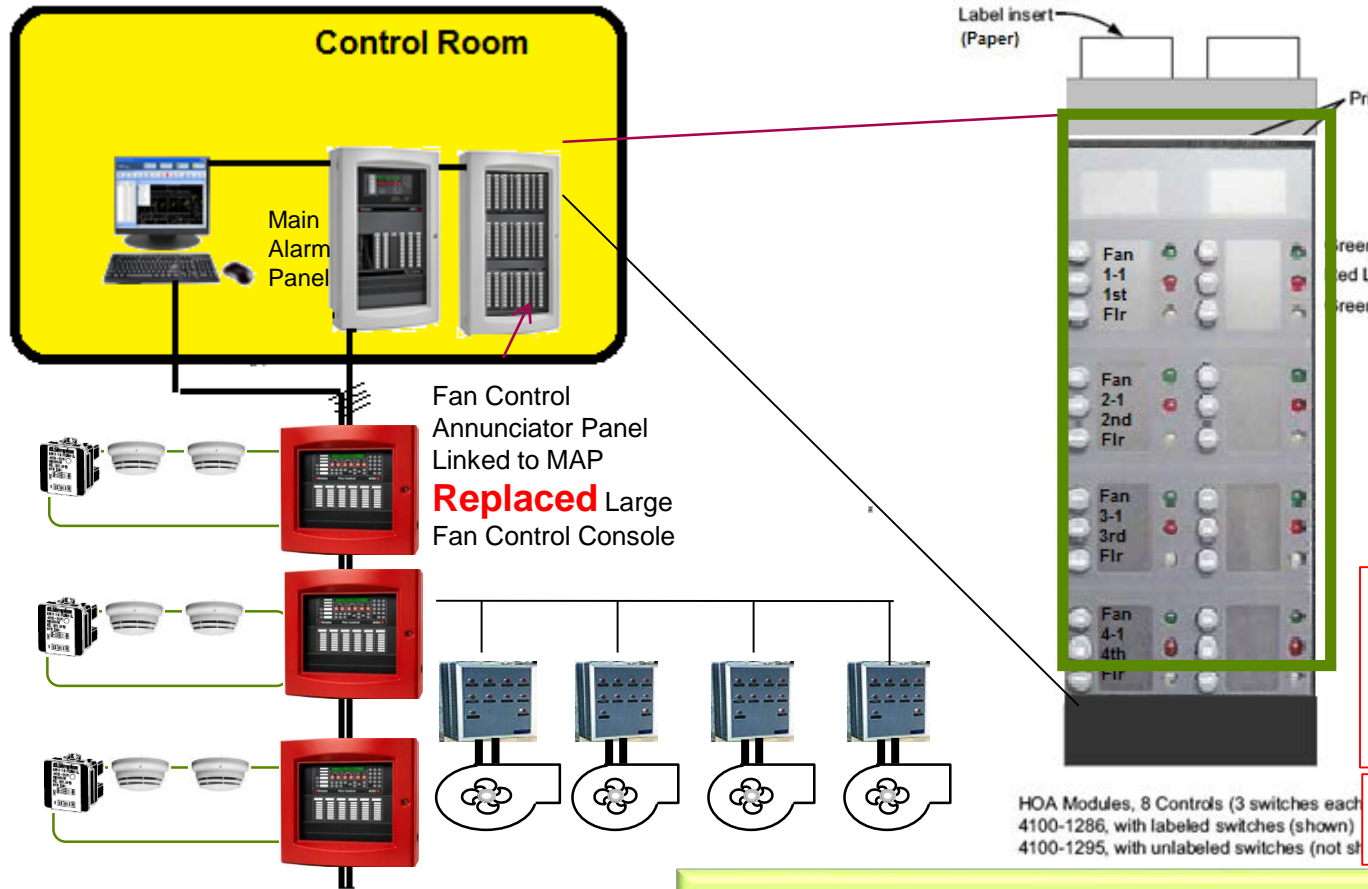
Main Fire Alarm Panel



Hard Wired Fan Control Panel Need Large Wall Space/Console



Fans Control and Annunciation thru **Remote Addressable Modules** and Control by Main Panel **LED and Switch Option**



**** Note:**

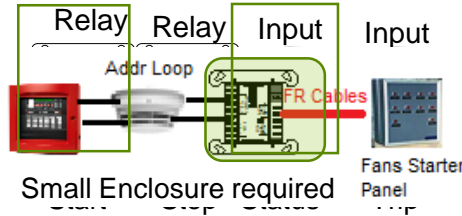
- With Fan Control function managed by FA Panel.
- FA Panel **can Monitor**.
- Fan Feedback Status
- Fan Operation Control Status
- **All Related historical fire detection information recorded.**
- Fireman or qualified person **is able to run fans to help control Fire Situation.**

****Note:** Not every country fire authorities can or have accepted multiplex Fans Controls approached. This needs to be verified and confirm acceptance with Fire Authorities and related authorized parties before proceeding.

****Note:** Multiplex Fan Controls had been around for more than 20 years and is a alternate practice in USA for AHJ accepts digital solution.

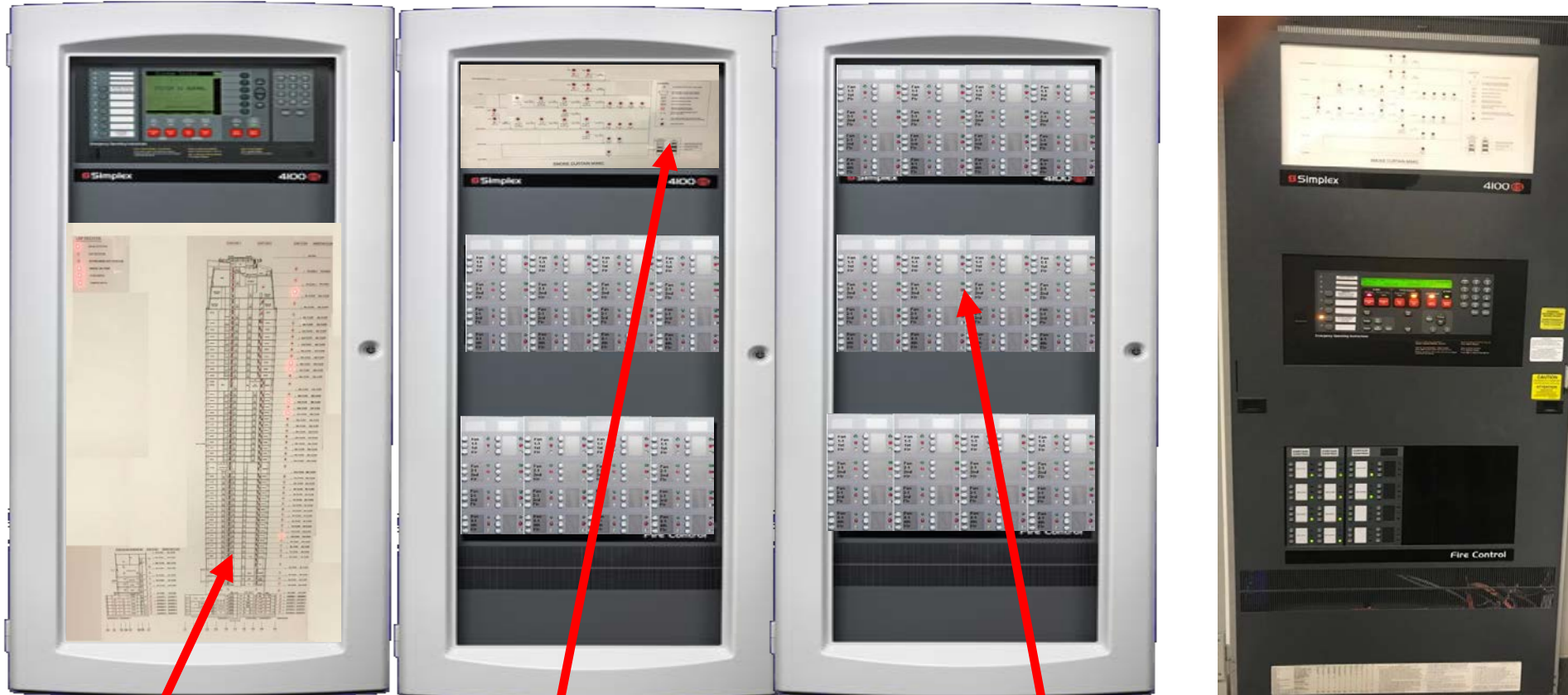
**** Cost Savings**

1. Replace Hardwired Control Panel with Fire Detection Control Switch using existing Fire Alarm Panel = \$\$\$
2. Reduced Fire Rated Cables = \$\$\$
3. Reduction of Engineering Hours = \$\$\$
4. Wall Space Recovery = \$\$\$



Using Mimic combine with Fan Controls minimum Wall Space on actual Site

Multiplex Fire Fighters' Smoke Control Station(FSCS).



Pressurisation Fan
Mimic Building
Display

Smoke Extraction and Car Park Fan
Overview Operation
Mimic Interface

On/Off Auto
Controls

Another Choice Of Layout

Actual Control Room in APAC with Multiplex Fan Controls

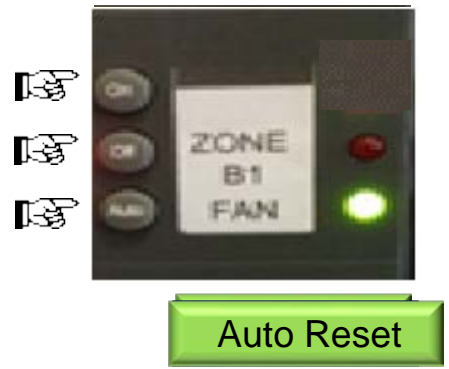




Switch and LED Operation Simulation

LED Operations

Buttons Operations



Mode: **Normal**

Zone	B1	Remarks
On LED		Off
Off LED		On
Auto LED		On

Mode: **Alarm**

Zone	B1	Remarks
On LED		On
Off LED		Off
Auto LED		On



Zone	Scenario 1		Mode (LED)	Scenario 2		Mode (LED)	Scenario 3		Mode (LED)
	Switch	LED		Switch	LED		Switch	LED	
On Sw			Off			On			Off
Off Sw			On			Off			On
Auto Sw			Off			Off			Off
Off Switch Press				On Switch Press			If Fan Trip While On		



Questions and Answers?



 **Simplex**

 **AUTOCALL**
NEVER COMPROMISE

ZETTLER



Pertanyaan

問題

질문

សំណួរ

Асуултууд

čŹňčĚ ĚĚĚ

Mga Tanong

Câu hỏi

Termina Kasih!

謝謝!

Salamat!

Баярлалаа!



Sales Region: All Except in grey colors



ආචාර්ය ජනරණ!

សូមអរគុណ!

Cảm ơn bạn!

감사합니다!

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