SFPE

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Smoke Control System Inspection and Testing

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LOHBERG

Smoke Control System

(simple definition)

Smoke control systems and components that are installed for the purpose of providing smoke control, and that upon activation of the system, operates specifically to perform the smoke control function.

Smoke Control System Types

- Dedicated
- Non Dedicated
- Smoke Exhaust System
  - Natural/Gravity
  - Mechanical
- Smoke Control System
  - Zoned
  - Stair Pressurization
  - Elevator Shafts

Smoke Control System Testing

- IBC Requirements
- NFPA Requirements
  - NFPA 4 Standard for Integrated Fire Protection and Life Safety System Testing
  - NFPA 92 Standard for Smoke Control Systems
- ASHRAE Requirements

Smoke Control System Testing

IBC Requirements

Smoke control systems subject to Section 909 shall undergo special inspections and tests sufficient to verify the proper commissioning of the smoke control design in its final installed condition.

Section 909
Smoke Control Systems

- 909.1 Scope and purpose. This section applies to mechanical or passive smoke control systems where they are required by other provisions of this code. The purpose of this section is to establish minimum requirements for the design, installation and acceptance testing of smoke control systems that are intended to provide a tenable environment for the evacuation or relocation of occupants. These provisions are not intended for the preservation of contents, the timely restoration of operations of for assistance in fire suppression or overhaul activities.

Section 909.3

- **Special inspection and test requirements.** In addition to the ordinary inspection and test requirements that building, structures and parts thereof are required to undergo, smoke control systems subject to the provisions of Section 909 shall undergo special inspections and tests sufficient to verify the proper commissioning of the smoke control design in its final installed condition. The design submission accompanying the construction documents shall clearly detail procedures and methods to be used and the items subject to such inspections and tests. Such commissioning shall be in accordance with generally accepted engineering practice and where possible, based on published standards for the particular testing involved.

Smoke Control System Testing

NFPA 92 Requirements

Each smoke control system shall be tested against its specific design criteria.

Testing shall confirm that the design objectives described are achieved.

Design documents shall include all acceptance testing procedures and pass/fail criteria.

Responsibility for each phase of the testing shall be defined clearly prior to commencing inspection and testing.

Smoke Control System Testing

ASHRAE Requirements

The intent of the smoke control system testing is to determine that the system meets the owner's project requirements, including code requirements and inspections by the AHJ throughout the delivery of the project.

Smoke Control System

Responsibilities

- Electrical Contractor
- Mechanical Contractor
- Fire Alarm System Contractor
- Fire Sprinkler Contractor
- HVAC Control Contractor
- Smoke Control Contractor
- General Contractor

- **Inspection**
  - **All components**
    - **Ductwork**
    - **Dampers**
    - **Louvers**
    - **Fans**
    - **Fire alarm System, SCP**
    - **Fire Sprinkler System**
    - **Electrical**
- **Testing**
  - **All Functions**

Smoke Control System

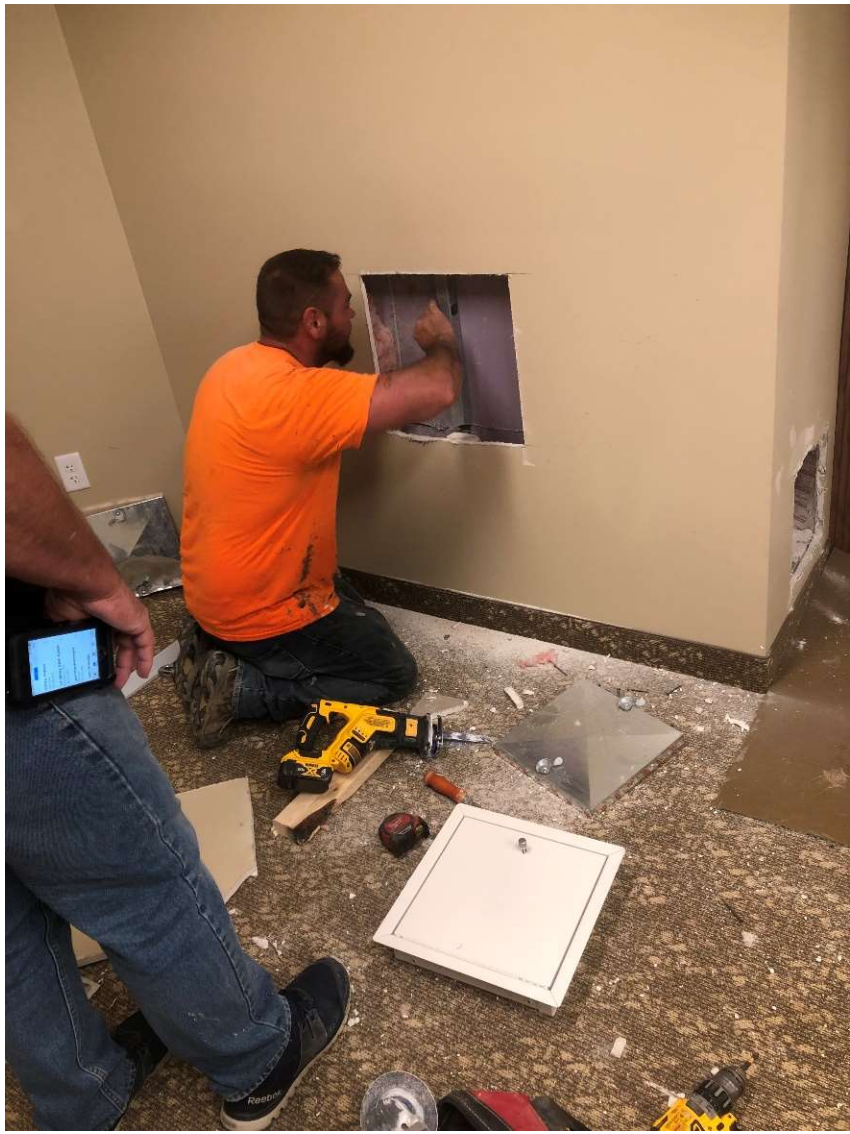
Ductwork

- Visual Inspection
- IBC 909.10.2
  - Withstand probable temperatures and pressures
  - Leak tested to 1.5 times the maximum design pressure
  - Leakage shall not exceed 5% of design flow
  - Documentation

Smoke Control System

Dampers

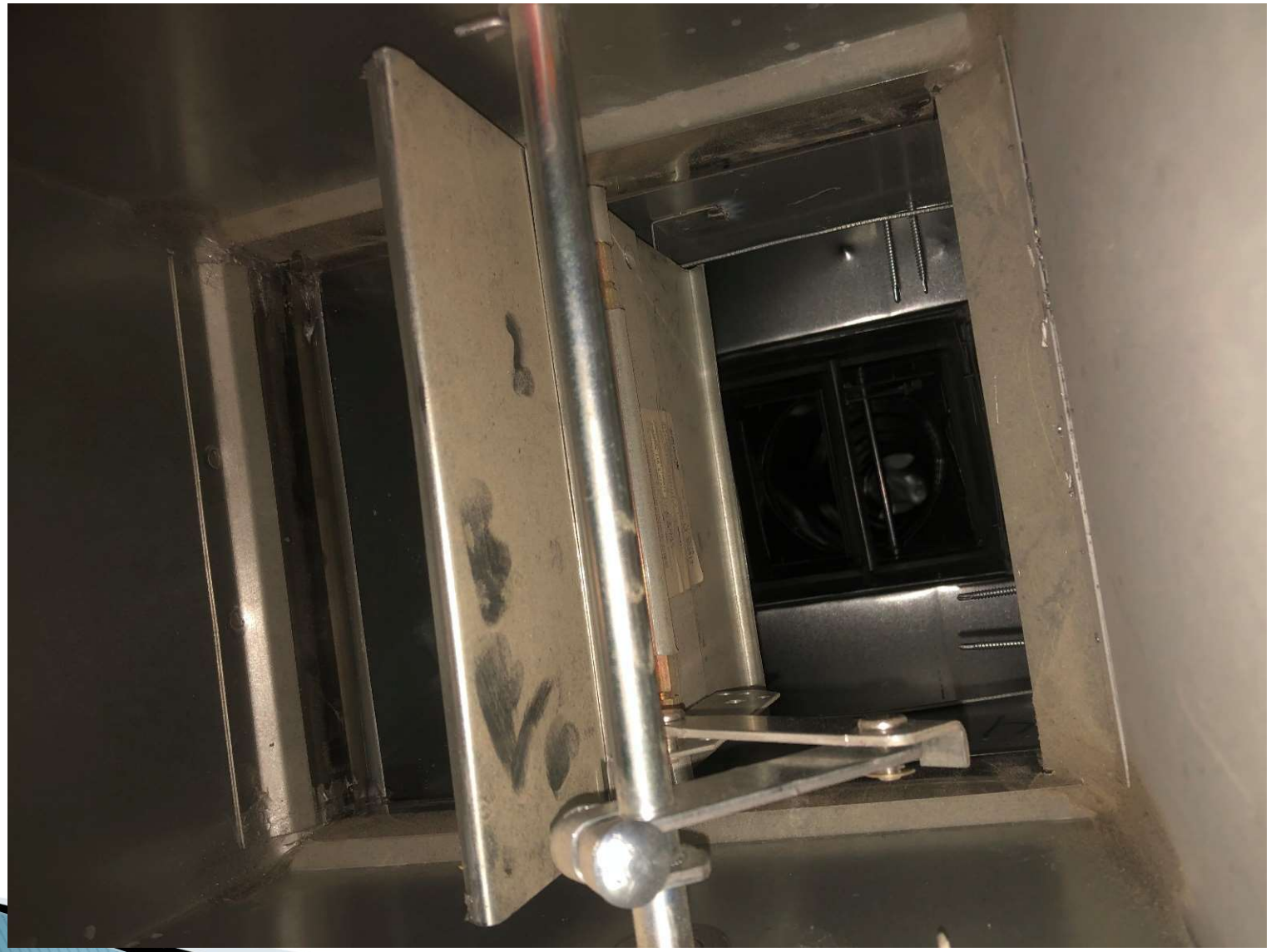
- Visual Inspection
  - Duct access doors
- IBC 909
  - Fail open
  - Fail closed
  - Presence of power
  - Documentation



Smoke Control System

Smoke Control System

Smoke Control System



Smoke Control System

Louvers

- Visual Inspection
  - Access doors
- IBC 909
  - Fail open
  - Fail closed
  - Presence of power
  - Documentation

Smoke Control System

Fans

- Visual Inspection
  - Review shop drawings
- IBC 909
  - 1.5 times the number of belts
  - Approved for smoke control
  - 1.15 service factor
  - Rotation
  - Air flow
  - Presence of power
  - Documentation

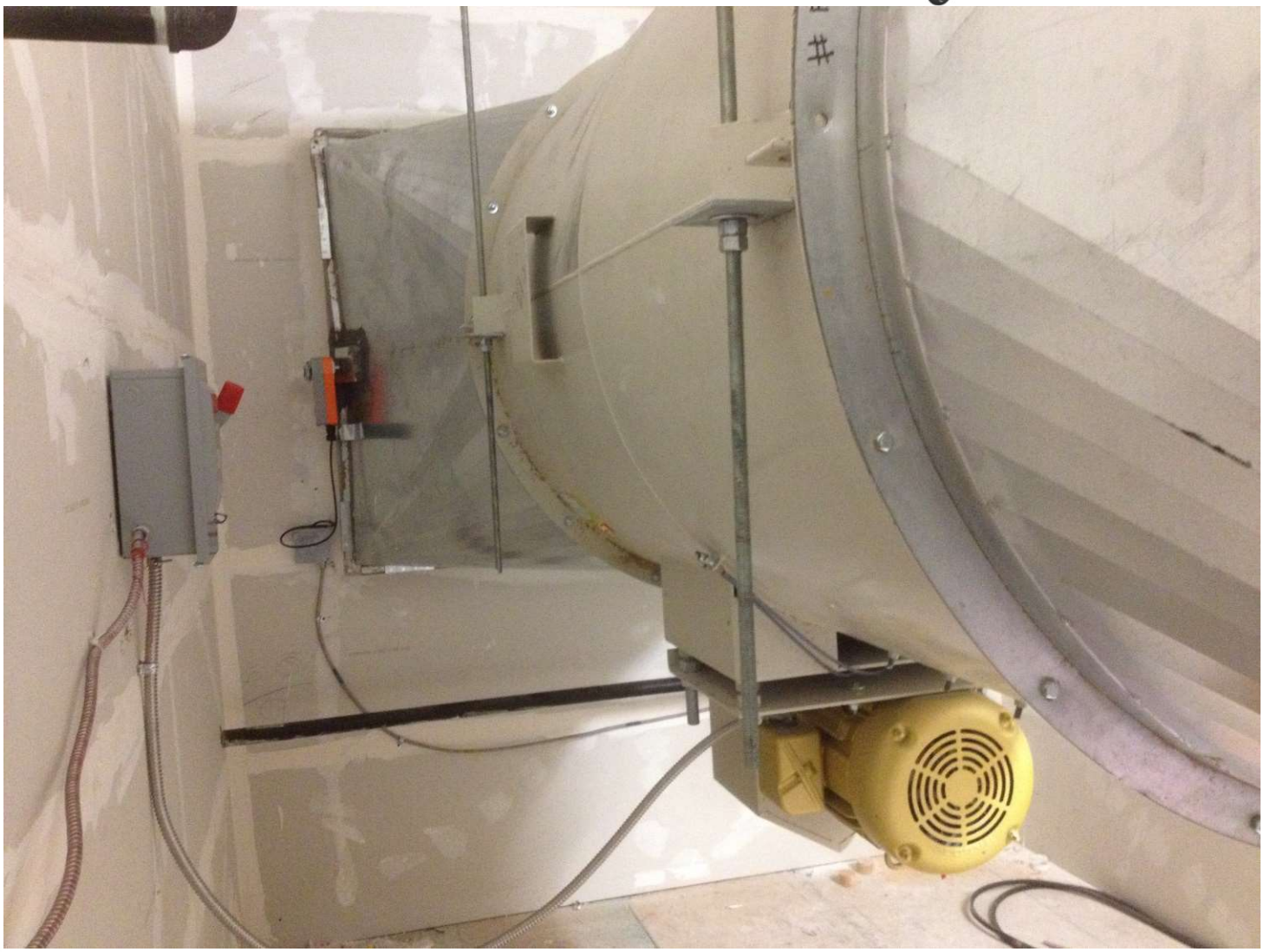
Smoke Control System

Smoke Control System

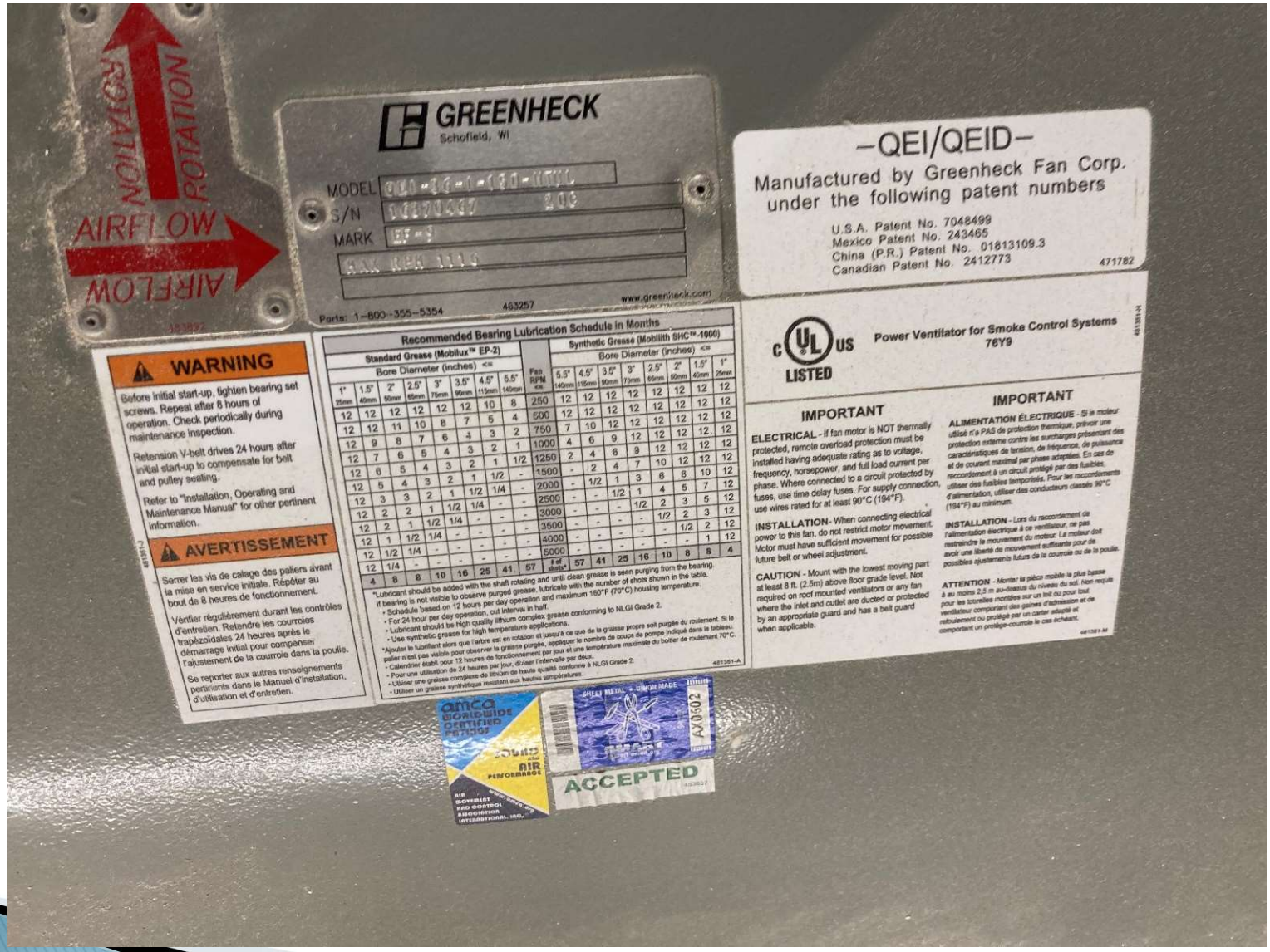
Fans

VFDs

Smoke Control System



Smoke Control System



Smoke Control System

Fire Alarm System

- Visual Inspection
  - Fire alarm panel
  - Smoke control panel
  - Wiring in raceways

Smoke Control System

Fire Sprinkler System

- Visual Inspection
  - Review shop drawings
- IBC 909.12.4 Automatic Control
  - Initiated from an appropriately zoned automatic sprinkler system
  - Documentation

Smoke Control System

Electrical

- Visual Inspection
  - Review shop drawings
- IBC 909.11 Standby Power
  - Emergency generator and transfer switches
  - Dedicated 1 hour power room with transfer switches
- IBC 909.12.1 Verification
  - Presence of power downstream of all disconnects
- IBC 909.12.2 Wiring
  - All wiring shall be fully enclosed within continuous raceways
  - Documentation

Inspection

All components

- Ductwork
- Dampers
- Louvers
- Fans
- Fire alarm System, SCP
- Fire Sprinkler System
- Electrical

Testing

All Functions

Testing

IBC 909.3

The design submission accompanying the construction documents shall clearly detail procedures and methods to be used and the items subject to such inspections and tests.

INTEGRATED FIRE ALARM AND SMOKE CONTROL SYSTEM TESTING PROCEDURE

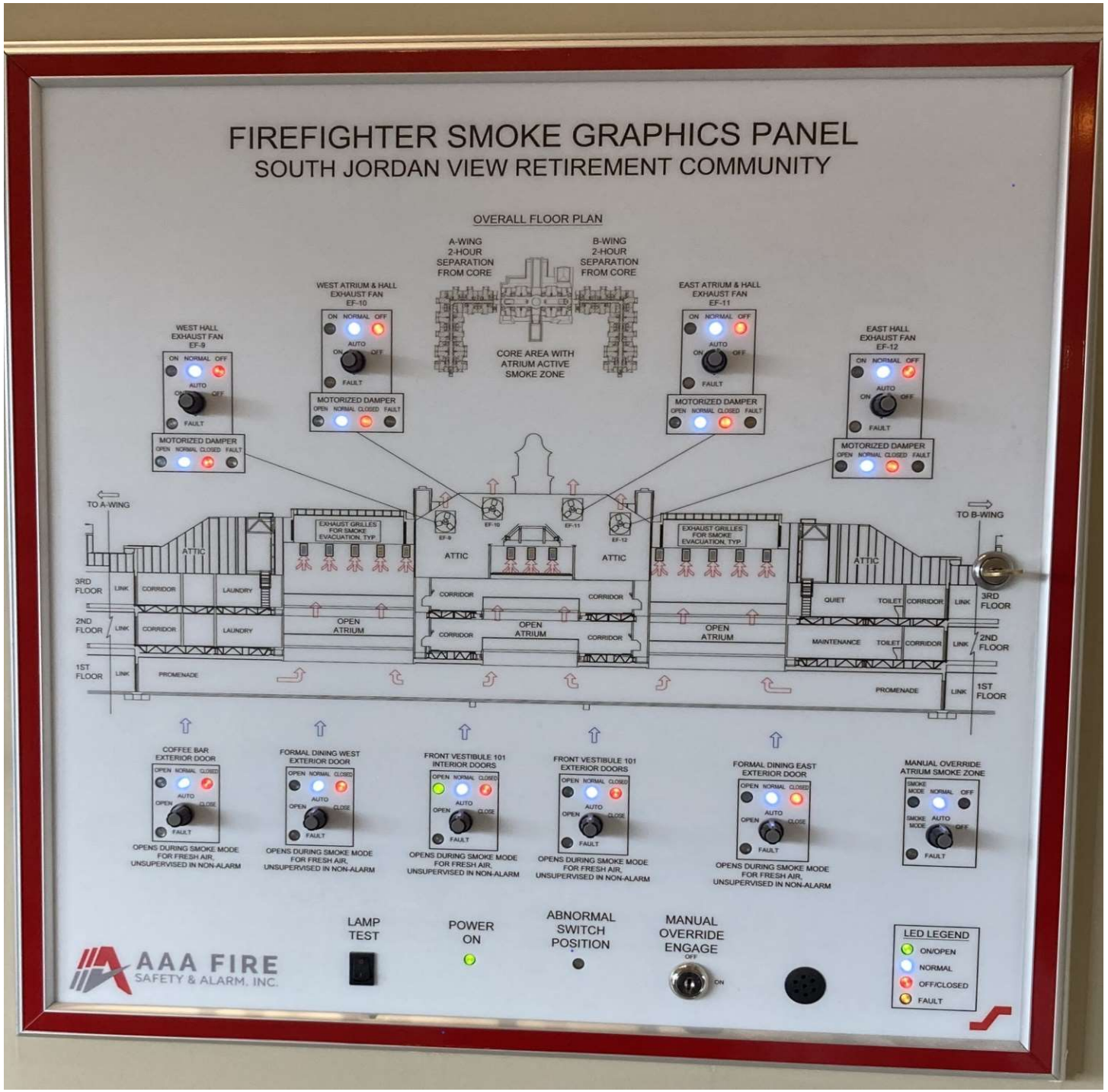
BEFORE TESTING BEGINS, VERIFY FROM TAB DATA THAT SMOKE EVACUATION MAKE-UP AND EXHAUST AIR CFM'S MEET DESIGN AIR FLOW QUANTI

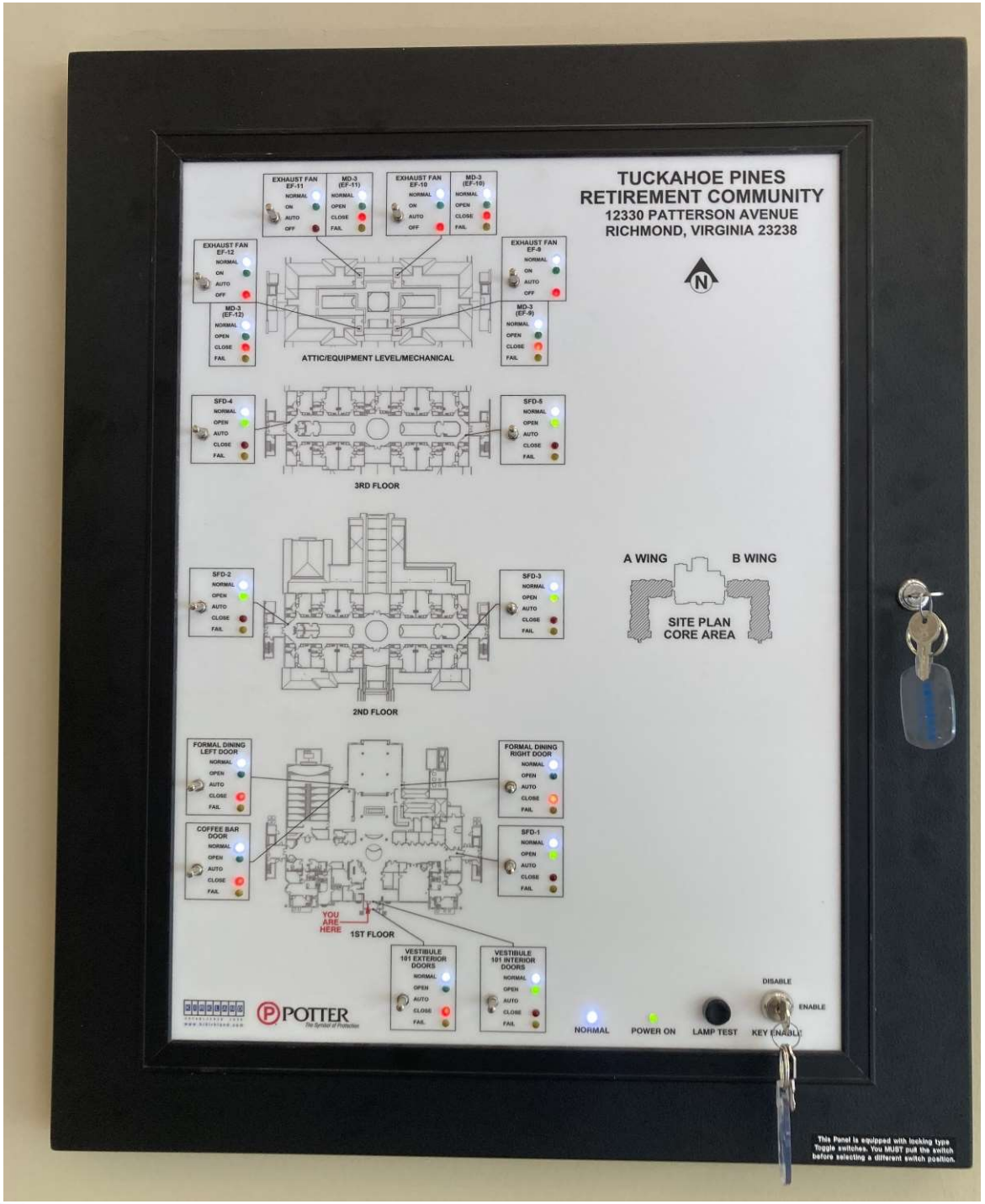
1.0 TEST SEQUENCE INITIATED BY SMOKE DETECTORS		
ITEM	TASK	YES or NO
1	ACTIVATE SMOKE EVACUATION SYSTEM BY APPLICATION OF SMOKE TEST SPRAY AT A FIRST FLOOR SMOKE DETECTOR	
2	VERIFY THAT EXHAUST FAN EF-1, EF-10, EF-11, AND EF-12 STARTS	
3	VERIFY DOORS FOR SMOKE EXHAUST OPEN	
4	VERIFY THAT C123A ATRIUM 1ST FLOOR MAGNETIC SMOKE DOORS CLOSE AND LATCH	
5	MEASURE FORCE REQUIRED TO OPEN C123A ATRIUM 1ST FLOOR SMOKE DOORS	
6	VERIFY THAT C220 ATRIUM 2ND FLOOR MAGNETIC SMOKE DOORS CLOSE AND LATCH	
7	MEASURE FORCE REQUIRED TO OPEN C220 ATRIUM 2ND FLOOR SMOKE DOORS	
8	VERIFY THAT C320A ATRIUM 3RD FLOOR MAGNETIC SMOKE DOORS CLOSE AND LATCH	
9	MEASURE FORCE REQUIRED TO OPEN C320A ATRIUM 3RD FLOOR SMOKE DOORS	
10	VERIFY THAT C123 ATRIUM 1ST FLOOR MAGNETIC SMOKE DOORS CLOSE AND LATCH	
11	MEASURE FORCE REQUIRED TO OPEN C123 ATRIUM 1ST FLOOR SMOKE DOORS	
12	VERIFY THAT C220A ATRIUM 2ND FLOOR MAGNETIC SMOKE DOORS CLOSE AND LATCH	
13	MEASURE FORCE REQUIRED TO OPEN C220A ATRIUM 2ND FLOOR SMOKE DOORS	
14	VERIFY THAT C320 ATRIUM 3RD FLOOR MAGNETIC SMOKE DOORS CLOSE AND LATCH	
15	MEASURE FORCE REQUIRED TO OPEN C320 ATRIUM 3RD FLOOR SMOKE DOORS	
16	VERIFY THAT C122, C122A, & C122B 1ST FLOOR THEATER MAGNETIC SMOKE DOORS CLOSE AND LATCH	
17	MEASURE FORCE REQUIRED TO OPEN C122, C122A, & C122B 1ST FLOOR THEATER SMOKE DOORS	

Testing

Does it work?????

Time allotment for system to operate
Initiation from the smoke control panel
Initiation by smoke detector
Did fans start?
Did dampers close and open
Did makeup air systems start
Did doors close and latch
Door opening pressures less than 30 lbs.
Initiation by fire sprinkler flow
Transfer from normal to emergency power
Operation under emergency power
Transfer from emergency power back to normal power
Weekly testing


FIREFIGHTER SMOKE GRAPHICS PANEL
SOUTH JORDAN VIEW RETIREMENT COMMUNITY
OVERALL FLOOR PLAN
A-WING 2-HOUR SEPARATION FROM CORE
B-WING 2-HOUR SEPARATION FROM CORE
CORE AREA WITH ATRIUM ACTIVE SMOKE ZONE
WEST HALL EXHAUST FAN EF-9
WEST ATRIUM & HALL EXHAUST FAN EF-10
EAST ATRIUM & HALL EXHAUST FAN EF-11
EAST HALL EXHAUST FAN EF-12
MOTORIZED DAMPER
TO A-WING
TO B-WING
EXHAUST GRILLES FOR SMOKE EVACUATION, TYP.
ATTIC
3RD FLOOR
2ND FLOOR
1ST FLOOR
LINK
CORRIDOR
LAUNDRY
OPEN ATRIUM
PROMENADE
QUIET
TOILET
MAINTENANCE
COFFEE BAR EXTERIOR DOOR
FORMAL DINING WEST EXTERIOR DOOR
FRONT VESTIBULE 101 INTERIOR DOORS
FRONT VESTIBULE 101 EXTERIOR DOORS
FORMAL DINING EAST EXTERIOR DOOR
MANUAL OVERRIDE ATRIUM SMOKE ZONE
OPENS DURING SMOKE MODE FOR FRESH AIR, UNSUPERVISED IN NON-ALARM
LAMP TEST
POWER ON
ABNORMAL SWITCH POSITION
MANUAL OVERRIDE ENGAGE
LED LEGEND
ON/OPEN
NORMAL
OFF/CLOSED
FAULT
AAA FIRE
SAFETY & ALARM, INC.


TUCKAHOE PINES
RETIREMENT COMMUNITY
12330 PATTERSON AVENUE
RICHMOND, VIRGINIA 23238
EXHAUST FAN EF-11
MD-3 (EF-11)
EXHAUST FAN EF-10
MD-3 (EF-10)
EXHAUST FAN EF-12
MD-3 (EF-12)
EXHAUST FAN EF-9
MD-3 (EF-9)
ATTIC/EQUIPMENT LEVEL/MECHANICAL
SFD-4
SFD-5
3RD FLOOR
A WING
B WING
SITE PLAN
CORE AREA
SFD-2
SFD-3
2ND FLOOR
FORMAL DINING LEFT DOOR
FORMAL DINING RIGHT DOOR
COFFEE BAR DOOR
SFD-1
YOU ARE HERE
1ST FLOOR
VESTIBULE 101 EXTERIOR DOORS
VESTIBULE 101 INTERIOR DOORS
POTTER
NORMAL
POWER ON
LAMP TEST
DISABLE
ENABLE
KEY ENABLE
This Panel is equipped with locking type Toggle switches. You MUST pull the switch before selecting a different switch position.

Discussion

Q&A