



Chesterfield Fire and EMS

Fire and Life Safety Division

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FIRE ALARM SYSTEM

NFPA-72, National Fire Alarm and Signaling Code, 2010 Edition; Virginia Construction Code (VCC) and Virginia Statewide Fire Prevention Code (VSFPC) 2012 Editions

Project Name : _____
Project Address : _____
File Number: _____ Date : _____
Code Edition: _____

All supporting documentation showing items listed below are required for review. The checklist is based upon NFPA 72, The National Fire Alarm Code (2010 Edition).

General (All submissions shall include the following):

- Applications for permit shall be made to the Chesterfield Building Inspection Department prior to commencement of any installation or alteration involving fire protection systems regulated by the Virginia Construction Code. A minimum of three copies of shop drawings and manufacturer's installation instructions shall be provided with the application prior to installation. The application shall clearly indicate the system is required or elective at the discretion of the owner. Virginia Construction Code, Section 108.1.

All fire alarm permit applications shall include the following information:

- Three sets of plans and catalog cut sheets for all equipment installed in the system.
- Name of the protected premises, owner and occupant.
- Location of protected premises.
- A device legend in accordance with NFPA 170, Standard for Fire Safety and Emergency Symbols
- Date of plans and any revision dates
- An input / output programming matrix. (see figure A.14.6.2.4(9))
- Floor identification
- Graphic scale used on the drawing
- All walls and doors and indicate where fire rated assemblies are located
- All partitions extending to within 10 percent of the ceiling height
- Room descriptions or occupancy
- Location of all fire alarm system devices and components
- Location of fire alarm system primary power connection

- Location of monitor / control interfaces to other systems
- Riser locations
- Routing for Class “A” circuits for compliance with NFPA 72, where applicable
- Indicate method(s) of compliance with Chapter 12 and Chapter 24 for survivability of Emergency Communication Systems where applicable
- Indicate ceiling height and ceiling construction details
- Placard data information shown in attached sheet (last sheet of this document) shall be completed and posted adjacent to fire alarm control panel.

Fire alarm system diagrams shall include the following:

- General arrangement of system shown in a building cross section
- Number of risers
- Type and number of circuits in each riser
- Type and number of fire alarm system components and devices on each circuit, on each floor or level

Control unit wiring diagrams shall be provided for all control equipment (power supplies, battery chargers, annunciators) and shall include the following information:

- Identification of control equipment depicted
 - Location(s) of control equipment
 - Field wiring terminals and terminal identification
 - Circuits connected to field wiring terminals and circuit identification
 - Indicators and manual controls, including the full text of all labels
 - Field connections to supervising station signaling equipment, releasing equipment or fire safety control interfaces
- Typical wiring diagrams shall be provided for all initiating devices, notification appliances, remote alarm light emitting diodes (LED’s), remote test stations and end-of-line and power supply supervisory devices.
- Floor plans shall be drawn to a recognized scale or dimensioned showing the layout of the building including walls and/or partitions for verification of device spacing.
- Submitted plans shall include location of all fire rated assemblies and indicate how the rated assemblies will be maintained when penetrated by equipment and/or wiring.
VCC Section 712
- Indicate what each room or space is used for by occupants.
- Provide a device to device wiring arrangement, in plan-view, from fire alarm panel to all devices, inclusive of last device, indicating location of end of line resistor. Indicate style of wiring used for verification of system performance under different conditions associated with functionality. Indicate size of wiring, number of conductors, and protection methods required by NEC 2011, Chapter 2.

- All exterior fire alarm cable circuits shall be protected with surge suppressors where entering or exiting a building in accordance with NEC (NFPA 70) Article 800 Parts 1, 2, and 4. Provide a wiring arrangement, size of wiring, location and mounting detail of surge suppressor and how the wire is grounded. Maximum length of #14 gauge grounding wire shall not exceed 20 feet; grounding cable in excess of 20 feet shall be a minimum of #6 gauge bare copper wire. Wiring shall be protected when located within seven feet or less of the floor.
- Floor plan drawings shall indicate location and number of all alarm-initiating devices and alarm-notification appliances, with dBA rating, in plan-view. The plans shall indicate mounting height of all devices, and where initiating devices are ceiling mounted, the plan shall indicate type of ceiling layout (flat, cathedral, sloped, peaked, solid joist construction) and device mounting detail. (Chapter 17).
- The submitted plan shall indicate how each fire alarm zone is designed and laid out in the building to meet provisions of the manufacturer's accepted practices (number of devices permitted on a zone) and/or as required by the Virginia Construction Code (per floor, maximum of 22,500 square feet, and /or maximum of 300 feet in any direction). VCC Section 907.6.3.
- Provide a scaled cross-section of detector mounting locations for door closure operation in accordance with NFPA 72 – 17.7.5.6, Figures 17.7.5.6.5.1 A, B, C, D.

RISER DIAGRAM

Provide a single line riser diagram for devices on fire alarm system for:

- All initiating devices
- All indicating devices
- Elevator capture function
- Door hold open functions
- Special locking devices
- HVAC controls

STAND ALONE INFORMATION

- The HVAC system shall be appropriately balanced prior to testing of the duct mounted smoke detectors. A note to this effect shall be placed on plans. Contractors shall be capable of performing air pressure differential testing of duct mounted smoke detectors to verify proper placement of devices (NFPA 72 – Section 17.7.5.5.6).
- If duct mounted smoke detectors or area smoke detectors are used to control smoke dampers, plans shall indicate if the HVAC system is dynamic or static.
 - Dynamic – HVAC systems designed to operate with fans on during a fire.
 - Static – HVAC systems designed to operate with fans off during a fire.

- Submitted plans shall indicate location of circuit breaker for primary power source and shall have a red marking (red circuit breaker switch). The circuit shall be identified in the circuit breaker panel as “FIRE ALARM CIRCUIT”. The circuit breaker shall also be equipped with breaker lock. NFPA 72 – Section 10.5.5.2.
- Submitted plans shall indicate location of and identification of circuit breaker panel and circuit number dedicated to the fire alarm system. The location of and identification of circuit breaker panel and dedicated fire alarm circuit shall be permanently identified at the fire alarm control panel. NFPA 72- Section 10.5.5.2.
- Submitted plans shall include calculations for all secondary power sources based on type and amount of equipment and devices to be installed. NFPA 72 – Section 10.18.1.2.
- Submitted plans shall include system voltage drop calculations. NFPA 72 – Section 10.18.1.2.
- Submitted plans shall show method of communications with monitoring agencies and number of telephone lines used for the transmission. NFPA 72 – Section 26.6.3.
- Provide information indicating method to be used to comply with NFPA 72, Section 26.6.3.2.1.5 (7). If a DACT is programmed to call a telephone line (number) that is call forwarded to a line (number) of the DACR, a means shall be implemented to verify integrity of the call forwarding feature every four hours. NFPA 72 – A- 26.6.3.2.1.5(7).
- Submitted plans shall show the name, address and telephone number of central station(s) monitoring the fire alarm system. Indicate if the company is UL Listed Central Station or Remote Station. Indicate if the signal transmission is directly to central station or if the signal is forwarded from a local central station to an alternate central station (i.e. – local central station is not a 24-hour manned location).
- Manufacturer’s catalog cut sheets shall be submitted for all equipment used or attached to the system, regardless of who the equipment is provided by or installed by. Where manufacture’s data sheets cover multiple devices, the submitted data sheet shall indicate those devices used in the system. Specifically provide information for Digital Alarm Communicator Transmitter (DACT) programming options.
 - DACT
 - Smoke detectors
 - Heat detectors
 - Pull stations
 - Duct detectors
 - Sprinkler attachments (water flow, tampers and pressure switches)
 - Any other initiating devices attached to the FACP
 - Control functions initiated through the FACP
 - Control relays
 - Special locking devices
 - Notification devices
 - Audio/visual appliances
 - Etc.

- In R-1 and R-2 occupancies equipped with Type “A” accessible units, the requirements for sleeping areas using a combination smoke detector and visible notification appliance(s) or a combination smoke detector and visible notification appliances(s), the location of devices and effective intensity of visible notification appliances(s) shall comply with NFPA 72 – Section 18.5.4.6 and Table 18.5.4.6.2.
- In R-2 occupancies all units shall be wired to support visible alarm notification appliances. This includes all sleeping and dwelling units, not just Type “A” or “B” accessible units. Building fire alarm wiring must be extended to all of the unit smoke detectors, single-station or system smoke detectors, so that audible/visible alarm notification appliances may be connected to the building fire alarm system in accordance with VCC, Section 907.5.2.3.4. Refer to 2012 IBC commentary for additional information. Submitted plans shall indicate the circuit wiring extension, location of the junction boxes and termination point.
- Plans shall include an operational input/output matrix for fire alarm systems that interface with and control operation of other fire protection devices or peripherals. Use format indicated in NFPA 72 – Figure A-14.6.2.9(9) as a guide.

System Inputs	System Outputs																																				
	Control Unit Annunciation							Notification							Required Fire Safety Control							Supplementary															
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG				
1 Manual fire alarm boxes – 1st floor	●	●					●			●																									●	1	
2 Manual fire alarm boxes – 2nd floor	●	●																																	●	2	
3 Manual fire alarm boxes – 3rd floor	●	●																																	●	3	
4 Smoke detectors – 1st floor	●	●																																	●	4	
5 Smoke detectors – 3rd floor	●	●																																	●	5	
6 Smoke detectors – 1st floor	●	●																																	●	6	
7 Smoke detectors – 1st floor elev lobby	●	●																																	●	7	
8 2nd floor computer rm. smoke det-zone 1	●	●																																	●	8	
9 2nd floor computer rm. smoke det-zone 2	●	●																																	●	9	
10 In-duct smoke detector – supply fan 1	●	●																																	●	10	
11 In-duct smoke detector – supply fan 2	●	●																																	●	11	
12 In-duct smoke detector – 1st floor return	●	●																																	●	12	
13 In-duct smoke detector – 2nd floor return	●	●																																	●	13	
14 In-duct smoke detector – 3rd floor return	●	●																																	●	14	
15 Heat detectors – 1st floor mech. rm	●	●																																	●	15	
16 Heat detectors – 2nd floor storage room	●	●																																	●	16	
17 Heat detectors – 3rd floor janitor's closet	●	●																																	●	17	
18 Waterflow – 1st floor	●	●																																	●	18	
19 Waterflow – 2nd floor	●	●																																	●	19	
20 Waterflow – 3rd floor	●	●																																	●	20	
21 Sprinkler control valve – 1st floor			●	●																															●	21	
22 Sprinkler control valve – 2nd floor			●	●																															●	22	
23 Sprinkler control valve – 3rd floor			●	●																															●	23	
24 Fire pump running	●	●																																	●	24	
25 Fire pump power failure/phase reversal			●	●																															●	25	
26 Fire alarm ac power failure					●	●																														●	26
27 Fire alarm system low battery					●	●																														●	27
28 Open circuit					●	●																														●	28
29 Ground fault					●	●																														●	29
30 Notification appliance circuit short					●	●																														●	30

Figure A-14.6.2.4(9)

HVAC SMOKE DETECTOR INTERCONNECTION WITH REQUIRED BUILDING FIRE ALARM SYSTEM

- 2012 Edition of the International Mechanical Code requires HVAC smoke detectors to be connected to *required* fire alarm systems found in the 2012 Edition of the Virginia Construction Code. When connected to these systems, the standard requires supervision in accordance with Section 606.4.1. The intent of connection will activate a visible and audible supervisory signal at a constantly attended location to alert building supervisory personnel that a smoke detector has activated, and also to provide electronic supervision of the duct detectors, thereby indicating any problems that may develop in the detector *system circuitry or power supply*.
- Duct smoke detectors installed in ducts shall be listed for the air velocity, temperature and humidity present in the duct. VCC Section 907.3.
- Duct detectors shall be installed in the *return* side of the HVAC system in accordance with the 2012 Edition of the International Mechanical Code. NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, is not referenced by the VCC for installation of equipment smoke detectors.
- If HVAC smoke detectors are connected to the fire alarm system serving the protected premises, all detection devices used to cause the operation of HVAC systems smoke dampers, fire dampers, fan control, smoke doors, and fire doors shall be monitored for integrity in accordance with Section 10.17. Section 21.7.2.

Where devices are connected to the fire alarm system, the wiring to these devices must be monitored for integrity the same as any other system detector. Stand-alone detectors, including 120 VAC-powered, single-station smoke detectors used to control HVAC equipment, that are not connected to the fire alarm system, cannot be monitored for integrity.

- Primary and secondary power supplies are to be monitored.
- Where smoke detectors are installed in concealed locations more than 10 ft. above finished floor or in arrangements where the detector's alarm or supervisory indicator is not visible to responding personnel, the detectors shall be provided with remote alarm or supervisory indication in a location acceptable to the authority having jurisdiction. Section 17.4.8
- The following options are permitted by code:
 1. Fire alarm system is elective - HVAC smoke detectors are not required to be interfaced with the fire alarm system.
 2. Off-site monitoring of sprinkler water flow – HVAC smoke detectors are not required to be interfaced with fire alarm system. However, if tied to the off-site monitoring system, smoke detectors are required to meet provisions listed above (power and supervision).
 3. Fire alarm system is required – HVAC smoke detectors are required to meet provisions listed above (power and supervision).

ELECTRONIC DOOR LOCKING DEVICES – 2012 Edition of Virginia Construction Code (VCC)

- In addition to standard provisions in NFPA 72, various code provisions are applicable for door locking requirements through the VCC. These provisions are more restrictive and take precedence.
- Section 1008.1.9.7 **Delayed egress locks** – not permitted in Groups A (Assembly), E (Educational) and H (High Hazard).
- Section 1008.1.9.8 **Sensor release of electronically locked egress doors** – permitted in several occupancy classifications.
- Section 1008.1.9.9 **Electromagnetically locked egress doors** – permitted in several occupancy classifications. Requires listed hardware that incorporates a built-in switch and meet the requirements below:
 1. The listed hardware that is affixed to the door leaf has an obvious method of operation that is readily operated under all lighting conditions.
 2. The listed hardware is capable of being operated with one hand.
 3. Operation of listed hardware directly interrupts the power to the electromagnetic lock and unlocks the door immediately.
 4. Loss of power to the listed hardware automatically unlocks the door.
 5. Where panic or fire exit hardware is required by Section 1008.1.10, operation of the listed panic or fire exit hardware also release the electromagnetic lock.
- Section 1008.1.9.10 **Locking arrangements in correctional facilities** – special provisions apply for occupancies within these facilities.
- Section 407.4.1.1 **Special locking arrangement for Group I-2**. Means of egress doors shall be permitted to contain locking devices restricting the means of egress in areas in which the clinical needs of the patients require restraint of movement, where all of the following conditions are met:
 1. The locks release upon activation of the fire alarm system or the loss of power.
 2. The building is equipped with an approved automatic sprinkler system in accordance with Section 903.3.1.1.
 3. A manual release device is provided at a nursing station responsible for the area.
 4. A key-operated switch or other manual device is provided adjacent to each door equipped with the locking device. Such switch or other device, when operated, shall result in direct interruption of power to the lock-independent of the control system electronics.
 5. All staff shall have keys or other means to unlock the switch or other device or each door provided with the locking device.

ELEVATOR CONTROLS

- Chesterfield County Building Inspection Office has a memorandum of understanding for installation of fire protection controls for elevators. Documentation is found in their Elevator Memorandum dated May 10, 2016.

FIRE DEPARTMENT WILL RESPOND

**TO ALARM SIGNALS TRANSMITTED UNLESS
TELEPHONE NUMBER TO
MONITORING STATION IS CALLED**

INSTALLING CONTRACTOR:

TELEPHONE NUMBER:

MONITORING STATION:

TELEPHONE NUMBER:

SYSTEM DESCRIPTION:

AUTHORITY HAVING JURISDICTION

CHESTERFIELD COUNTY

FIRE AND LIFE SAFETY DIVISION: (804)-748-1426

EMERGENCY COMMUNICATION CENTER: (804)-748-1251