SMOKE CONTROL TECHNICAL STANDARD
Vancouver Fire Department, Washington

Effective May 10, 2021
Added illustrative content October 06, 2022

TABLE OF CONTENTS

1. INTRODUCTION

A. This document outlines and clarifies minimum requirements for the design, installation, and acceptance testing of smoke control systems. The information within this technical standard is based upon the adoption of the latest published edition of the International Fire Code (IFC) and International Building Code (IBC) as amended by the State of Washington (WSFC, WSBC).

B. This Smoke Control Standard has an effective date of October 6, 2021.

C. Special inspection(s) of smoke control systems is addressed in Appendix A.

D. Smoke control diagrams are addressed in Appendix B.

E. Firefighter's Smoke Control Panels are addressed in Appendix C.

F. Tenant improvement submittal requirements are addressed in Appendix D.

G. Sample special inspection and testing documents are provided in Appendix E.

2. SCOPE AND PURPOSE

A. Smoke control systems in the City of Vancouver shall be designed, installed, and tested in accordance with this document. This information is not intended to provide an exhaustive list of smoke control system requirements but will supplement existing Code requirements. It is the responsibility of the Owner/Developer to retain qualified design professionals, contractors, and an approved agency for smoke control system testing (also referred to as the Special Inspection Agency) with expertise in the inspections of smoke control systems. This standard applies to both active and passive smoke control systems.

B. Design approaches may include the Pressurization Method, Airflow Design Method, Exhaust Method, Passive Method, and Smoke Control Systems incorporating Performance Based Designs. These approaches are discussed in the International Code Council (ICC) standards, including Section 909 of the WSBC and WSFC. The intent of a smoke control system meeting the requirements of WSFC/WSBC Section 909 is to provide a tenable environment to occupants during evacuation and relocation or limit the migration of smoke from the area of fire origin. Thus, a smoke control system is intended to:

   1. Contribute to the protection of occupants.
   2. Limit the migration of smoke from the smoke control zone of fire origin.
   3. Maintain conditions outside the smoke control zone of fire origin such that emergency response personnel are provided access for rescue and firefighting operations.
   4. Maintain a tenable environment in and limit smoke migration to smoke refuge areas and exit enclosures, and within the smoke control zone of fire origin when utilizing the Exhaust Method, for the required duration.

C. The International Building Code does not intend to require smoke control systems to protect building contents, enable timely restoration of firefighting operations, or facilitate fire suppression and overhaul activities. However, the design team may opt to incorporate one or more of these goals when designing the smoke control system.

D. Smoke control systems may be required in the following:

   1. High-rise buildings
   2. Smokeproof enclosures

3. Underground buildings
4. Building atriums
5. Windowless buildings
6. Stages
7. Elevator hoistways without enclosed lobbies or additional smoke and draft control doors that are required to be provided with hoistway opening protection in accordance with WSBC Section 3006.2.
    a. For clarification, elevator hoistway openings must be protected under the following conditions as defined in WSBC Section 3006.2.
        1) The hoistway connects more than 3 stories.
        2) The building is not equipped throughout with an automatic sprinkler system.
        3) The building contains a Group I-1 Condition 2, Group I-2, or Group I-3 occupancy.
        4) To maintain continuity of a corridor requiring smoke partitions or smoke barriers.
    b. Exceptions
        1) Opening protection is not required where the elevator serves only open parking garage in accordance with WSBC Section 406.5.
        2) Opening protection is not required on the level(s) of exit discharge, provided the level(s) of exit discharge is protected throughout with an automatic sprinkler system.
        3) Opening protection is not required when the hoistway opens to the exterior.
8. Assembly seating
9. Washington State Building Code Amendment to Section 504.4.1 permitting an increase of the maximum number of stories by one for Group R occupancies of Type VA construction.

E. Smoke control systems shall comply with WSBC/WSFC Section 909 and generally accepted and well-established principles of engineering as required by WSBC/WSFC Section 909.2. This shall include NFPA 92, A Guide to Smoke Control in the 2006 IBC, and the ASHRAE Handbook of Smoke Control Engineering by Klote et. al.

3. DEFINITIONS

The following words and terms shall, for the purposes of this chapter and as used elsewhere, have the meanings shown herein:

A. Smoke Control. A comprehensive approach to fire safety in a building, established by the integration of various building characteristics, features, or systems. Effective smoke control often includes the provision of automatic sprinkler protection. Properly designed, installed, and maintained automatic sprinkler systems will assist in accomplishing any smoke control, limiting fire growth and therefore the quantity of smoke produced. Smoke control systems are a means of accomplishing smoke control.

B. Smoke Control System. An engineered system that utilizes mechanical equipment, compartmentation, automatic detection, and suppression (or a combination thereof) to modify smoke movement.

C. Zoned Smoke Control System. A smoke control system that configures differently based on the zone of fire origin. This may include a combination of exhausting smoke in the smoke control zone of fire origin and/or pressurizing and/or compartmentalizing other smoke control zones.

D. Smoke Barrier. A continuous membrane, either vertical or horizontal, such as a wall, floor, or ceiling assembly that is designed and constructed to restrict the movement of smoke, meeting the requirements of WSBC Sections 709 and 909.5.

E. Smoke Partition. A wall assembly that extends from the top of the foundation or floor below to the underside of the floor or roof sheathing, deck, or slab above, or to the underside of the ceiling above where the ceiling membrane is constructed to limit the transfer of smoke, meeting the requirements of WSBC Section 710. In cases where smoke partitions are approved as part of the construction of a smoke control zone boundary, these partitions must meet the requirements of WSBC Section 909.5.

F. Smoke Control Zone. A space within a building separated from other spaces of the building by smoke barriers, including the top and bottom, that is part of a smoke control system.

1. Active Smoke Control Zone. Also referred to as "Active Zone." A smoke control zone that utilizes mechanical ventilation for smoke control during smoke control mode to achieve design objectives.

2. Passive Smoke Control Zone. Also referred to as "Passive Zone." A smoke control zone that employs the passive method, which is a smoke control method that does not incorporate the use of mechanical ventilation, but instead generally relies on compartmentation to contain the smoke to the zone of fire origin.

3. Passive Sub-Zone. A space within an active smoke control zone that is not provided with mechanical ventilation for smoke control. The passive sub-zone is not required to be separated by smoke barrier construction, but at a minimum must meet the construction requirements of a smoke partition.

4. Smoke Control Zone of Fire Origin. The smoke control zone where the fire event is considered to originate. May also be referred to as "Fire Zone," or "Event Zone."

G. Smoke Control Mode. A predefined operational configuration of a system or device for the purpose of smoke control.

H. Shaft Pressurization. A type of smoke control approach in which stair shafts, ramps, exit passageways, and/or elevator hoistways are considered a distinct smoke control zone and are mechanically pressurized to establish prescribed pressure differentials with respect to the adjacent smoke control zone(s). These systems are provided with outside air to limit the migration of smoke into the associated smoke control zone.

I. Smokeproof Enclosure. An exit stairway, ramp, or exit passageway designed and constructed to limit the introduction of smoke into the enclosure produced by a fire occurring in any part of the building.

J. Raceways. Where referenced in accordance with WSBC Section 909.12.1, raceways shall be limited to rigid metal, IMC, and EMT. The City of Vancouver will permit the use of MC Cable as a raceway.

K. End-to-End Verification. A self-testing method that provides positive confirmation that the desired result (e.g., airflow or damper position) has been achieved when a controlled device has been activated, such as during smoke control mode, testing, or manual override operations. The intent of end-to-end verification goes beyond determining whether a circuit fault exists, but instead ascertains whether the desired end result is achieved. True end-to-end verification, therefore, requires a comparison of the desired operation to the actual end result.

L. Fire Command Center. The principal attended or unattended location where the status of detection, alarm communications, and control systems is displayed, and from which the systems can be manually controlled. This room contains the Firefighter's Smoke Control Panel (FSCP), the Fire Alarm Control Unit (FACU), and other life safety equipment. Fire Command Centers are required in certain buildings prescribed by the WSBC/WSFC and must comply with WSBC Section 911 and WSFC Section 508, and as described below. The architectural drawings shall include a layout of the components prescribed in Section 911 of the WSBC.

1. The Fire Command Center shall be separated from the remainder of the building by not less than a 2-hour fire barrier constructed in accordance with Section 707 of the WSBC or a horizontal assembly in accordance with Section 711, or both.

2. The Fire Command Center shall be separated from the remainder of the building by a smoke barrier in accordance with Sections 709 and 909.5 of the WSBC.

3. The location of the Fire Command Center shall be coordinated with the City of Vancouver Fire Department.

4. Unless the Fire Command Center is attended 24/7, the door serving the Fire Command Center shall be locked. A key labeled as "*Fire Command Center"* shall be located in the Fire Department approved Knox Box installed adjacent to the Fire Command Center. Unless specifically approved, this is in addition to a separate Knox Box at the exterior of building in a location approved by the Vancouver Fire Department.
   a. Keys to access equipment located in the Fire Command Center that are provided with locks shall be stored in the Knox Box and labeled accordingly.
   b. A laminated sign "*Fire Command Center*" shall be affixed to the door.

5. A plan rack for storage of the approved record documents and shelving for storage of inspections shall be provided for the documents identified below.

   The Special Inspection Agency shall be responsible for ensuring all design documents are properly stored.
   a. Record Design and Construction Documents:
      1) Architectural Drawings
      2) Mechanical Drawings
      3) Electrical Drawings
      4) Fire Sprinkler Drawings
      5) Fire Alarm Drawings,
      6) Smoke Control Drawings
      7) City of Vancouver Approved Detailed Smoke Control Report
      8) Approved Smoke Control Special Inspection Agency Final Report
   b. Inspection Reports:
      1) Annual Fire Alarm Inspection
      2) Annual Fire Sprinkler Inspection Reports
      3) Annual Smoke Control Inspection Reports
      4) Other Life Safety Inspection Reports

M. Fire Control Room. When a Fire Command Center is not required or provided, but a building is equipped with a smoke control system, the term Fire Command Center shall not be utilized so as to avoid confusion. The term "Fire Control Room" shall be utilized instead.

1. The Fire Control Room will serve as the principal unattended location where the status of detection, alarm communications, and control systems is displayed, and from which the systems can be manually controlled. This room will contain the FSCP and FACU.

2. The location of the Fire Control Room shall be coordinated with the City of Vancouver Fire Department. The location shall not be located in the path of egress or impede firefighting operations.

3. To maintain continuity of the required 2-hour protection of the power and control circuits for stair and elevator pressurization systems, The Fire Control Room shall be separated from the remainder of the building by not less than a 2-hour fire barrier constructed in accordance with Section 707 of the WSBC, or a horizontal assembly in accordance with Section 711, or both.

4. The Fire Control Room shall be separated from the remainder of the building by a smoke barrier in accordance with Sections 709 and 909.5 of the WSBC.

5. The provisions prescribed in Section 911 of the WSBC do not apply to the Fire Control Room.

N. Smoke Control Report. A narrative describing the smoke control system's purpose, design objectives, code requirements, design assumptions, system operation logic, rational analysis including system calculations, and commissioning procedure summary. This report is part of a Smoke Control Submittal. The documents that together compose of the Smoke Control Submittals (both Preliminary and Detailed) are included in Section 6.

1. Preliminary Smoke Control Report. Smoke control systems are inherently complex and require an extensive amount of coordination effort between multiple engineering disciplines. The Preliminary Report includes a narrative describing the type of smoke control systems required and general code requirements based upon the occupancy type, use, and configuration of the building, which is generally prepared during the Schematic Design phase. This report is intended to ensure all engineering disciplines coordinate their respective designs to comply with the applicable codes.

2. Detailed Smoke Control Report. As the design of the building progresses into the Construction Document phase, the Detailed Report expounds upon the content of the Preliminary Report. The report includes additional code and design requirements specifically related to the project, as applicable. The report includes the results of smoke control modeling analyses performed by applicable software (e.g., CONTAM, CFAST, FDS) to determine the type, location and size of fans and related smoke control equipment required to meet the smoke control design objective. This report, and charts, drawings, and a sequence of operations matrix is included the Detailed Smoke Control Submittal to facilitate the advancement of the design from other engineering disciplines and elaborate upon the construction and inspection requirements.

O. Smoke Zone Diagram. A construction document that is part of the Architectural set which identifies each smoke control zone as passive or active, provides a zone designation for each zone, shows the occupancies of each zone, identifies the location of smoke barrier and smoke partition construction, and shows all openings required for smoke control (e.g., doors required to open for make-up air). A legend is provided to indicate the various features on the diagram, and the zones are identified generally through color-coding or cross-hatching. The proposed method of smoke control (exhaust, pressurization, modified airflow, passive) for each smoke control zone is identified in this document. The smoke control zones utilizing the passive method will not include shading or hatching. This document is required to be submitted as part of the Preliminary Smoke Control Submittal.

P. Smoke Control Diagram. A construction document that depicts device locations and function, equipment performance, systems integration, and sequencing of smoke control measures necessary to verify compliance to the design approach for smoke control outlined in the

approved Smoke Control Report. These diagrams shall include, at a minimum, an equipment/device input/output matrix, smoke control zone layouts consistent with the smoke zone diagrams, control wiring details, and activation zone layouts (reference Appendix B. Smoke Control Diagram Checklist). This document is required to be submitted as part of the Detailed Smoke Control Submittal.

Q. Smoke Control Matrix. A document that identifies the input/output configuration of smoke control devices/equipment based upon their functionality in the smoke control system. The matrix shall be developed using a X-Y Axis format with the fire alarm input (smoke detectors, sprinkler waterflow switches, heat detectors, etc.) on the Y axis and the outputs (smoke control fans, dampers, doors for opening protection, etc.) on the X axis.

R. Peer Review. The evaluation of analysis, design, specifications, recommendations and/or as-built conditions by individuals qualified by their education, training, and experience as appropriate to the situation.

S. Special Inspector. A qualified person employed or retained by an approved Special Inspection Agency and approved by the Vancouver Fire Department (VFD) as having the competence necessary to conduct special inspections of smoke control systems.

T. Approved Agency for Smoke Control System Testing. An established and recognized agency that is regularly engaged in conducting tests or furnishing inspection services for smoke control systems and approved by the VFD. This agency is also referred to as the Special Inspection Agency. Approved agencies for smoke control system testing shall have expertise in fire protection engineering, mechanical engineering, and certification as air balancers. Refer to Appendix A for a detailed description of the approved agencies for smoke control system testing requirements.

U. Smoke Control System Special Inspection and Testing Program. Proposed detailed procedures and methods provided by the approved Special Inspection Agency that are used for the commissioning of the smoke control system including all the items/equipment subject to such inspections and tests. Refer to Appendix A for detailed requirements of the Special Inspection and Testing Program.

4. QUALIFICATIONS AND RESPONSIBILITIES

A. Design Team. The building owner shall engage a fire protection engineer or other qualified engineer to establish the Smoke Control System Basis of Design and prepare the associated Smoke Control Report. The Smoke Control Report author shall have documented experience in the design of smoke control systems, and the report shall be stamped by a licensed engineer (also with documented experience in the design of smoke control systems) in the state of Washington.

The building owner shall engage an architect, mechanical engineer, fire protection engineer, and electrical engineer as Architect and Engineers-of-Record (AOR / EOR), to prepare the Smoke Control System design documents. These individuals shall also be designated as the registered design professionals in responsible charge who are responsible for reviewing and coordinating submittal documents, including reports and deferred submittals prepared by others, as they pertain to the smoke control system design. The AOR and EORs are considered the design professional in responsible charge for their respective components of the smoke control system for compliance with the basis of design described in the Smoke Control Report. All design professionals must be registered or licensed by the State of Washington in their respective disciplines. Fire alarm system and fire sprinkler system designers must have the appropriate NICET Certification as required by the Washington State Administrative Code.

It is imperative that all parties responsible for the design of the smoke control systems are retained throughout the project from the Conceptual/Schematic Design phase through the issuance of the Certificate of Occupancy.

B. Coordination of Effort. Coordinated effort among all parties involved in designing, installing, and testing smoke control systems is essential to meet applicable code requirements. It cannot be overemphasized that the design professionals, including the AOR / EORs, City reviewers, as well as all applicable trades including the fire alarm/electrical contractor(s), automatic sprinkler contractor, mechanical contractor, and those responsible for construction of fire barriers, smoke barriers, fire partitions and smoke partitions, must work together to accomplish a fully functional and Code-compliant smoke control system.

C. Coordination Letters. A signed statement must be provided from each of the individual designers (Electrical, Mechanical, Fire Alarm, Fire Sprinkler and Building Architectural) stating that the designer has read the Detailed Design Smoke Control Report and has incorporated it into their design. A signed statement is not required for the design professional who authored the report.

D. Special Inspection Agency. The owner must identify a Special Inspection Agency approved by VFD whose duties are further outlined in Appendix A.

E. Special Inspector Qualifications. The City of Vancouver does not certify or list special inspection agencies (SIA) or Special Inspectors (SI). The qualifications for Special Inspector are described in Appendix A. An interview with the VFD shall be required to prove competence; submittal of documented qualifications and experience accompanied by a letter of request shall be submitted for review.

5. DESIGN CONSIDERATIONS

A. Phased Occupancy. Projects using a phased occupancy approach must be considered as part of the detailed Smoke Control Report. If phased occupancy is determined at a later date, then a revised submittal is required. Some potential issues related to phased occupancy include:

1. Rating of electrical wiring reliant on sprinkler protection
2. Elevator lobbies
3. Completeness of corridors
4. Completeness of shafts
5. Stair enclosure completeness or use
6. Sprinkler and fire alarm coverage
7. Firefighter’s Smoke Control Panel
8. Emergency power

B. Generator and Transfer Switch. The emergency generator and transfer switches shall be in a separate room from the normal power transformers and switch gear and ventilated directly to and from the exterior. The rooms must be enclosed in minimum 2-hour fire-resistance-rated (FRR) construction in high-rise and underground buildings, and minimum 1-hour FRR in all other buildings. (Ref. WSBC Section 403, WSBC Section 2702, WSBC Section 909.11). Circuit breakers and shut-off switches associated with the secondary power system upstream of the automatic transfer switch shall be monitored by the fire alarm system and will transmit a supervisory signal to the Fire Alarm Control Unit and the Central Station when such switches / breakers are open as required by WSBC Section 909.12. Articles 700.6(A) and 701.6(A).

C. Fire Command Center. When Fire Command Centers are required to be provided, they shall meet the requirements specified in Section 3.L. of this document. Fire Command Centers are required in high-rise buildings, in buildings with smoke-protected assembly seating, and elsewhere as required by the Code and VFD.

D. Loading Docks. Loading docks and similar facilities located interior of a building provided with a smoke control system shall be fully separated from the remainder of the building by smoke barriers with a FRR of not less than 2 hours. This shall not apply to walls separating a loading dock from a parking garage. Openings in the barriers shall be protected in accordance with Section 716 of the WSBC. Roll-down or accordion doors between the loading dock and interior spaces shall be monitored for status and annunciated at the FSCP.

E. Continuously Operating Fans. Fans that are required to continuously operate in accordance with the WSBC for opening protection such as sub-ducts shall be provided with secondary power.

F. Smoke Removal. WSBC Section 403.4.7 requires smoke removal in high-rise buildings. The VFD will consider alternate designs that rely on manipulating pressurized stair enclosures.

G. System Activation. Smoke control system activation shall be initiated immediately after receipt of an appropriate automatic or manual activation command.

1. Stair Pressurization. Any fire alarm initiating device, including but not limited to manual fire alarm stations, smoke detectors, heat detectors, sprinkler waterflow detectors, etc. shall activate the stair pressurization fans.
    a. A smoke detector shall be installed within 5 feet of each ventilated smokeproof enclosure on every floor level. Where the conditions outside the smokeproof enclosure preclude the installation of a smoke detector, a smoke detector shall be located within 5-feet inside the enclosure.

2. Elevator Hoistway Pressurization. Although the WSBC recognizes elevator hoistway pressurization as a means of hoistway opening protection, experience has demonstrated that elevator hoistway pressurization systems and the associated measures to mitigate the impact on other smoke control systems tend to be expensive, complicated, and difficult to maintain. Therefore, the other Code-permitted means of hoistway opening protection are recommended. However, where hoistway pressurization is chosen as the option for compliance with the hoistway opening protection requirements, the design must consider other systems that need to operate at the same time without adversely impacting the performance of those systems as prescribed in WSBC Section 909.4.7. Openings in fire service access elevator hoistways are not permitted to be protected through pressurization and must be provided with a lobby, as prescribed in WSBC Section 3007.6.
    a. When elevator hoistway pressurization systems are utilized, they shall be initiated upon activation of area smoke detectors utilized for primary or alternate recall only. The elevator hoistway pressurization system shall be designed and tested with the elevators open on the relevant floor of recall.

3. Shut-Down of Pressurization Fans. A duct-mounted smoke detector shall be installed at each stair and elevator pressurization fan. Duct-mounted smoke detectors shall be of the same manufacturer as the Fire Alarm Control Panel to allow reset from the Fire Alarm Control Panel. 110VAC or 24VAC detectors shall not be installed. The fire alarm contractor shall coordinate with the mechanical engineer of record for anticipated velocities at the duct-mounted smoke detector. If the velocities exceed the listing of the detector, an alternate approach to de-energize the fan shall be submitted to the VFD for approval.

4. Residential High-Rise Corridor Systems. When the design team opts to utilize the Pressurization Method for residential high-rise buildings to create a pressure differential from the corridor on the floor of alarm to the adjacent floors, the typical tower floors should sequence as follows: upon activation of a waterflow detection device, the notification sequence and shaft pressurization systems shall be initiated. Subsequent corridor smoke detector activation shall activate the corridor exhaust system. If a corridor smoke detector activation occurs before waterflow detection, then the shaft pressurization systems will energize the corridor exhaust system will activate. A subsequent waterflow detector activation on a typical residential floor will not affect the configuration of the active smoke control system.

5. Sprinkler Zoning. Waterflow detection devices serving multiple smoke control zones and manual fire alarm stations may not be used to initiate zoned active smoke control systems, since the smoke control zone of fire origin may not be identified. These devices may be used to active the stair pressurization systems. Subsequent activation of an automatic fire alarm initiating device (i.e., an addressable smoke detector) within an active smoke control zone shall automatically configure the smoke control system accordingly.

H. Equipment. All equipment utilized for smoke control must comply with WSBC Section 909, the National Electrical Code (NEC), and associated NFPA standards.

1. Listed and Labeled. All smoke control system equipment shall be listed and labeled by Underwriters' Laboratories. Interconnecting equipment that has not been listed for interconnection or the creation of components or system into a nonstandard unit that is not normally available from the manufacturer is not acceptable.

2. Installation. All smoke control system equipment shall be installed in accordance with its listing and manufacturer’s recommendations.

3. Identification. Smoke control system equipment and devices shall have a unique equipment identification label affixed to them that matches their designation as shown on the approved smoke control drawings.

4. Ducts. Ducts utilized for smoke control systems shall meet the requirements of WSBC Section 909.10.2. Duct liner may need to be considered in order to meet the leakage and pressure requirements specified.

5. Wiring. All wiring associated with the smoke control system shall be fully enclosed within continuous raceways (WSBC Section 909.12.2). This includes all fire alarm component wiring utilized for activation and/or control. (Note: see Raceway in definitions)
   a. Auxiliary Equipment. The requirements for the primary power supply shall apply to all auxiliary panels and equipment. These shall include a dedicated circuit marked at the electric panels’ locations and the smoke control system panel or auxiliary panels’ locations.
   b. Data Circuits. Signaling line circuits or other data control circuits shall be arranged so that a short, ground, or open fault within a smoke control zone will not cause the loss of function of initiating devices, monitoring devices, or building control devices in any *other* smoke control zone of the protected premises.
   c. Marking and Identification. All portions of the control system must be identified in the field in accordance with NEC Article 700.9. This includes all applicable junction boxes, control tubing, temperature control modules, relays, damper sensors, automatic door sensors and air movement sensors. All junction boxes and covers associated with the smoke control system (including all portions of the fire detection system which activate smoke control) shall be externally identifiable.

1) Emergency Systems. All boxes and enclosures larger than 6 inches by 6 inches (including transfer switches, generators, and power panels) for emergency circuits shall be permanently marked with an identification plate that is orange in color in order to be readily identified as a component of the emergency circuit or system. All other device and junction boxes for emergency systems and circuits shall be orange in color, both internally and externally.
2) Smoke Control Systems. All boxes and enclosures larger than 6 inches by 6 inches (including transfer switches, generators and power panels) for smoke control system power and control circuits shall be permanently marked with an identification plate that is orange in color with a yellow diagonal stripe in order to be readily identified as a component of the smoke control system. All other device and junction boxes for smoke control systems and circuits shall be orange in color both internally and externally. Cover plates shall be orange in color with a yellow diagonal stripe. Raceways for stair and elevator pressurization system wiring shall be identified by labels or color coding and shall be visible at the time of inspection.

6. Protection of Exit Stairway Pressurization Equipment. Stairway pressurization equipment is required to be protected in accordance with WSBC Section 909.20.6.1. This protection includes all equipment, power, and control wiring associated with the stairway pressurization systems. Protection of wiring and control systems located inside the building must extend from the secondary power source to the protected devices or equipment.
   a. VFD deems the following designs (or combination thereof) compliant with the integrity and survivability requirements for stairway pressurization equipment power and control wiring intended in WSBC Section 909.20.6.1:
      1) Concrete Cover. Wiring shall be located within concrete slabs and walls when covered with a minimum of 2 inches of concrete.
      2) 2-hour Wiring Systems. The use of 2-hour FRR wiring systems protected against vandalism and other adverse effects including falling equipment or debris. This can typically be achieved by securing conduit tight to building structural elements.
      3) Interior Exit Stairway. Wiring may be located within the 2-hour FRR stairway it is serving, when routed such that it is adequately protected against vandalism and other adverse effects including falling equipment or debris and in accordance with WSBC Chapter 7. This can typically be achieved by securing raceways tight to building structural elements.
      4) Dedicated Enclosure Method. Wiring shall be located in a dedicated 2-hour FRR shaft enclosure. Only wiring for emergency systems, fire service access and occupant evacuation elevators, fire alarm and pressurization systems may be located in this enclosure. Panels, cabinets, etc. are not allowed to be placed in the enclosure, only conductors installed in approved electrical raceways. All shaft enclosure penetrations must be protected in accordance with the WSBC and by UL-listed methods.
         a) When stairway pressurization power and control wiring, panels, or equipment is located within a 2-hour FRR electrical room, such equipment must be separated by a 2-hour FRR fire barrier from all other equipment and systems within the room.
         b) Exception: Fire alarm panels and cabinets are permitted within the 2-hour FRR enclosure as long as all other circuits are in continuous approved electrical raceways without panels or splices.

5) Alternate Methods and Materials. Design proposals that do not conform to one or a combination of the above methods will require submittal of an alternate materials, design and methods proposal, demonstrating compliance with the provisions of NEC Article 700.10(C) and WSBC Section 909.1.

b. Drawings. The chosen method of protection shall be depicted and described on the associated electrical drawings submitted as part of the smoke control permit.

6. SUBMITTAL REQUIREMENTS

A. Preliminary Smoke Control Submittal (PSCS). The preliminary report is the initial submittal of the Smoke Control Permit. The PSCS must be prepared by a Professional Engineer competent in the design of smoke control systems. This submittal contains the Smoke Control Report, Conceptual Smoke Control Sequence of Operations Matrix, and Smoke Zone Diagrams in accordance with this document. Once the PSCS has been approved, then the Detailed Smoke Control Submittal is required to be submitted. Calculations and computer modeling analysis are not required until the detailed design stage.

1. Smoke Control Report

a. Code References. List all applicable codes and standards (with relevant editions) and approved equivalencies for the project.

b. Building Description. Include a general project description of the building and its uses. Include the building height, number of stories, basement levels, gross floor area, type of occupancies and type(s) of construction, and any special architectural features of the project that may impact smoke control design and life-safety.

c. Smoke Control Systems. Provide a conceptual narrative overview of the smoke control systems, including concepts, approaches, design assumptions, design objectives, types of systems, zoning (active or passive), major equipment (including variable frequency drives), analysis methods, and basic operation and activation sequences. Address the probable temperatures to which fans, dampers, and ducts may be exposed to in a fire. Address smoke control equipment requirements as specified in WSBC Section 909.10. Identify smoke control zone openings which must be open or closed for proper operation, such as doors, windows, dampers, and louvers. Identify smoke control zone openings that are supervised in the open and/or closed positions.

d. Fire Suppression Systems. Provide a concise narrative overview of the fire suppression system(s). Identify the types of systems and areas served (zoning), major equipment, design criteria and basic operation. Identify the type, location, and quantity of flammable or combustible fuel, and hazardous/toxic materials, if any.

e. HVAC and Ventilation Systems. Provide a concise narrative overview of the HVAC systems whether or not used for smoke control. Identify the major equipment, fire and smoke dampers type and class including link temperatures, design objectives and basic operation. Identify where fire dampers have actuating devices with increased operating temperatures (not more than 350 °F) due to smoke control and specify the actuating temperatures for each type of fire damper. Identify where fire/smoke dampers are not provided due to smoke control. Identify where fire/smoke dampers are not provided at shafts due to 22-inch sub-ducts and continuously operating exhaust fans connected to the standby power system.

f. Power Supply Systems. Provide a concise narrative overview of the primary and standby power sources for the smoke control systems. Include the locations of the standby power source, transfer switches, normal power transformers and switchgear, and describe the independent routing of the normal and standby power distribution systems (WSBC Section 909.11). Address the need for uninterruptible power

supplies and power surge protectors. Identify all equipment required to be connected to secondary power. Specify the required duration the secondary power supply is required to operate the smoke control system.

g. Raceways and Wiring. Identify requirements for continuous raceways as prescribed in WSBC Section 909.12.2 and 2-hour protection for power and control as prescribed in WSBC Section 909.20.6.1.

h. Fire Alarm, Detection and Control Systems. Provide a concise narrative overview of the fire alarm, detection, and control systems as they relate to the smoke control system. Identify the smoke control system components that must be monitored for proper operation (supervised end-to-end) and the method of supervision. Describe what components will be included in the weekly self-test of the smoke control system. Include the building management system (BMS) where used for or interconnected to the smoke control system. BMS systems shall be listed for smoke control use. Address the listing of fire detection and control systems (UL category UUKL) including the BMS where used for smoke control (WSBC Section 909.12).

   1) Damper supervision and control at the FSCP are required for all active-active and active-passive smoke control zone boundaries (e.g., corridor to residential units). Damper supervision and control are required for dampers required for the proper function of the smoke control system (e.g., motorized isolation dampers at smoke control fans and motorized relief dampers at exterior boundaries). Group control and interlocking on fans with dampers is permitted. The minimum acceptable supervision and control required will indicate proper damper operation and fault condition for smoke control system operation (i.e., open and closed). These dampers shall be included in the weekly self-test. Consideration shall be given to damper power-loss position.

      a) The status of dampers shall be determined using limit or proximity switches installed at the damper; it shall not be permitted to determine status at the actuator. Where multiple dampers are grouped together in an assembly requiring one or more actuators, each damper shall be independently controlled by a separate actuator and provided with an individual limit or proximity switch, or the dampers shall be linked together by a reliable and durable mechanical or otherwise permanent means into one or more group, with each group provided with a common limit or proximity switch.

   2) Fan supervision and control at the FSCP is required for all fans used in the smoke control system (WSBC Section 909.16). Each fan and damper shall have a separate annunciator lights and controls, unless otherwise approved. Power shall be supervised at the downstream side of the electrical disconnects. A positive means of verifying the design airflow shall be provided at each fan and indicated on the FSCP as a fault condition if failure occurs. Positive confirmation of fan off status shall be provided for major mechanical equipment required to de-energize in a smoke control event. Fan off status may not need to be included on the FSCP but must be included in the weekly self-test.

i. Firefighter's Smoke Control Panel. Include a narrative description of the FSCP.

j. Other Life Safety Features. Identify any other life safety features of the project (fire water storage, Fire Command Center requirements, in-building radio system, etc.) and how the life safety systems will interface with one another.

2. Conceptual Smoke Control Sequence of Operations Matrix. A sequence of operations for the smoke control system shall be provided with the Conceptual Smoke Control Submittal.

3. Smoke Zone Diagrams. Include the Smoke Zone Diagrams as defined in Section 3 of this document. This shall be prepared by the Architect (with guidance and review provided by the Smoke Control Report author) and included in both the PSCS and in the Architectural Set.
   a. Designations of smoke control zones and smoke barriers is a coordinated effort between the architect and the mechanical engineer. Smoke control zones must also be coordinated with fire alarm initiating devices (including those associated with automatic sprinkler systems) which activate mechanical smoke control systems and occupant notification systems.
   b. The following are generally considered independent smoke control zones: floors, entrance vestibules to pressurized enclosures, stair enclosures, exit passageways, elevator hoistways, shafts, FRR corridors, and horizontal exits.

B. Detailed Smoke Control Submittal (DSCS). The DSCS shall be prepared as described in this document, after approval of the PSCS has been granted. The Detailed Smoke Control Report associated with this submittal shall progress and update the information contained in the previously submitted Preliminary Report and shall include the required smoke control system rational analysis. Supporting documents (calculations, zone drawings, Special Inspector test sheets, etc.) shall be provided as a bound document, independent of design plans, addressing each requirement of WSBC Section 909.

1. Rational Analysis. A rational analysis of the smoke control system is required in accordance with WSBC Section 909.4 and will be incorporated as part of the Detailed Smoke Control Report. Such analysis must be prepared by a Professional Engineer competent in the design of smoke control systems. This analysis must include support for the types of smoke control systems to be employed, smoke control fan capacities, their methods of operation, the systems supporting them and the methods of construction to be utilized.
   a. The rational analysis shall include the expected time constraints and time to operation for the smoke control system components. The time constraints and time to operation will be utilized by the Special Inspection Agency and VFD during the acceptance testing of the smoke control system(s).

2. Computer Modeling. WSBC Section 909.4 requires designs to incorporate the effect of temperature, climate, stack effect, HVAC system interaction, wind, and minimum duration of operation. The detailed design report shall address the anticipated performance of the smoke control system under extreme climatic conditions and the presence of operable windows or doors. It is acceptable to utilize a computer models, such as those validated or distributed by National Institute of Standards and Technology – Building and Fire Research Laboratory.
   a. Required. Residential high-rise buildings with operable windows, accessible balconies, shaft pressurization, and zoned smoke control will be required to computer model the smoke control systems or provide an engineering justification as to why such modeling is not necessary.

3. Updated Smoke Zone Diagrams. The Architect shall update the Smoke Zone Diagrams (with guidance and review provided by the Smoke Control Report author) to incorporate design changes for an accurate representation of zones, smoke barrier locations, and relevant features.

4. Smoke Control Diagrams. A layered, comprehensive submittal limited to items relevant to Smoke Control shall be prepared. These plans shall incorporate smoke control zones, and electrical, mechanical, fire alarm, architectural (and when applicable, sprinkler) information pertaining to the smoke control system and approach. Please see Appendix B for information required to be shown on these diagrams.

5. Special Inspection and Testing Program Summary. The author of the Smoke Control Report shall prepare a Special Inspection and Testing Program Summary as part of the Detailed Smoke Control Report. This program summary briefly describes the testing approach for the smoke control system. The summary is distinct from the complete Special Inspection and Testing Program described below, which can be submitted at a later date.
    a. The Special Inspection and Testing Program shall be prepared by the Engineer of Record, the author of the Smoke Control Report, or the Special Inspection Agency and meet the requirements of Appendix A of this document. This program must be submitted to VFD for review prior to the issuance of the building permit. Approval of this document is required prior to commencement of any smoke control system special inspection activities. This program will document the method(s) to test the complete smoke control system to demonstrate compliance with the applicable codes, standards, manufacturer's instructions, and this document. The program shall also cover passive smoke control zone leakage testing (quantity and location) in addition to any other unique testing situations. Where an existing smoke control system is present, remodels to existing smoke control systems shall also be addressed. Testing and acceptance of all system test scenarios submitted as part of the program shall be the method used by the Special Inspector to verify correct operation of the smoke control system.

6. Detailed Smoke Control Matrix. A detailed sequence of operations matrix shall be prepared by that includes:
    a. Each type of fire alarm initiating that will activate the smoke control system (sprinkler waterflow, smoke detector heat detector) shall be depicted in a column on the left. Include operation of FSCP manual control switches for fans and dampers where the switch controls multiple outputs.
    b. Show every fire alarm/smoke control system output in a row across the top, including fans and dampers (or group of dampers) by identifier, and every other event that must occur in order for proper operation of the smoke control system across the top. Outputs may be combined with prior approval.
    c. Show automatic fan shutoffs where required or provided.
    d. Show supervised conditions for required smoke control components such as fan power disconnect, pressure differentials, switches, fans not full speed, and doors/windows/dampers open or closed.

7. Firefighter's Smoke Control Panel. A full-scale colored drawing of the proposed FSCP must be included with the Detailed Smoke Control Submittal, prepared by the fire alarm contractor and reviewed by the author of the Smoke Control Report. See Appendix C of this document for more information.

7. PERMIT TIMING

Permit application and approval timing is as follow:

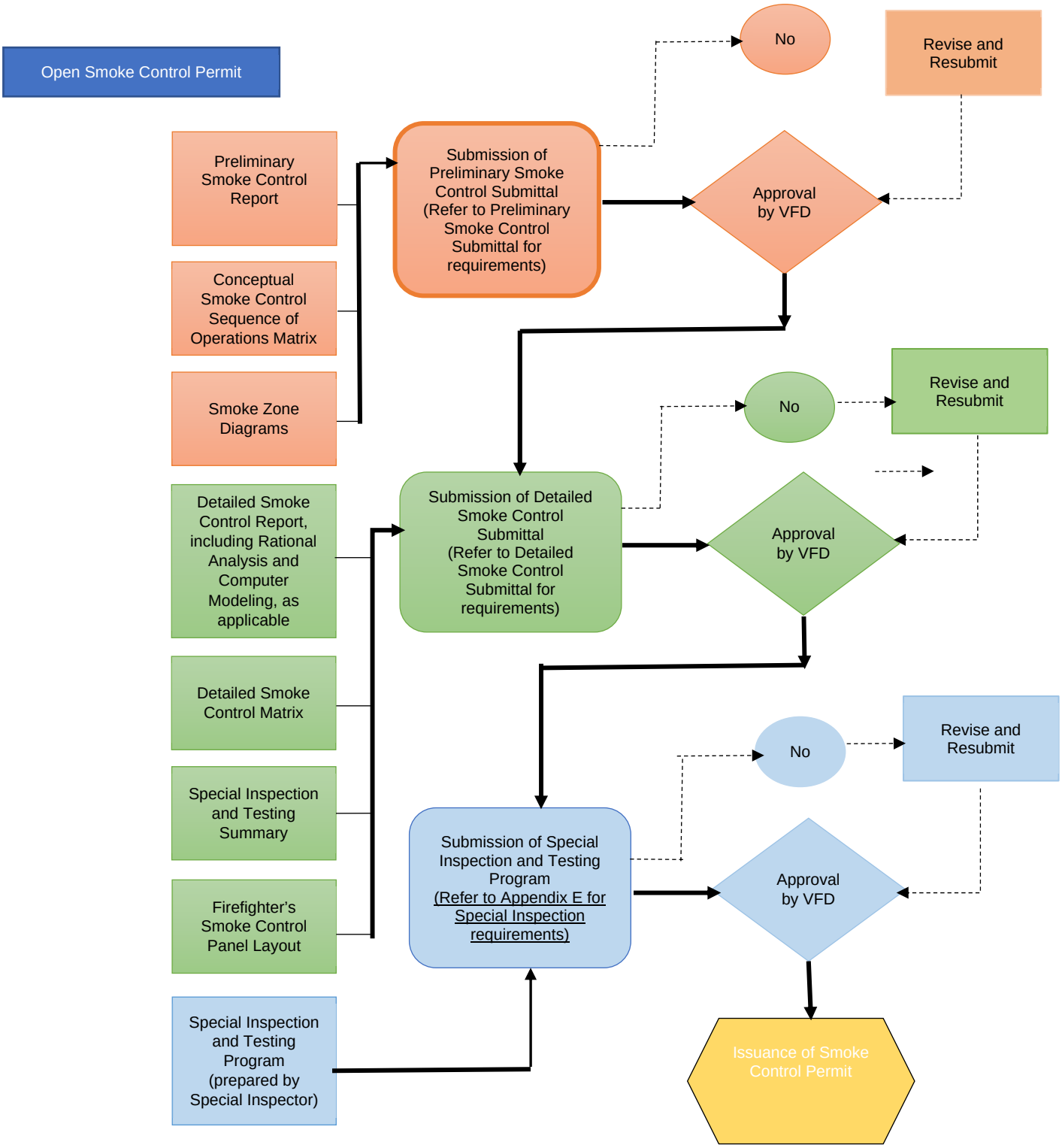
A. The Preliminary Smoke Control Submittal is the first required submittal. This document is intended to serve as a basis of design of the fire protection features and smoke control systems for all other engineering disciplines to develop their respective design. The architectural,

mechanical, electrical, and fire alarm and other design drawings referenced in Section 8, *Other Submittal Requirements,* will not be reviewed until approval of the Preliminary Smoke Control Submittal.

B. The Detailed Smoke Control Submittal must be submitted after approval of the Preliminary Submittal.

[*Remaining page intentionally left blank*]

Figure 1. Smoke Control Permit Submittal Flowchart



8. OTHER SUBMITTAL REQUIREMENTS

In addition to the information that is typically provided, the following details must be included in the Architectural, Mechanical, Electrical, Fire Alarm, and Sprinkler plan submittals:

A. A letter prepared by each discipline stating that they have reviewed the Smoke Control Report and that their design satisfies the requirements of the smoke control system. A single letter signed by all disciplines is acceptable.

B. Architectural Plan Submittal

1. As part of the Architectural drawings, prepare and provide the Smoke Zone Diagrams.
2. Provide clear identification of fire and smoke-resistive construction.
3. Provide sufficient detail in the drawings to support engineering calculations, e.g., leakage values for walls, ceilings, and doors; locations and heights of surrounding buildings; sizes and locations of make-up air openings; and smoke barrier wall construction details.
4. Plans must provide the location of the Fire Command Center and emergency generator and transfer switch rooms. In addition, when applicable, they must detail 2-hour FRR separation of power/control wiring to equipment serving the pressurized stairways.
5. Provide door schedule for all doors in fire- and smoke-resistive construction, which shall include the fire protection rating and smoke rating, exit hardware, locations of magnetic door holding mechanisms, and door sweeps as applicable. Locations of heavy-duty door closing mechanisms and power-operated door opening or closing mechanisms utilized as part of the smoke control approach shall be identified in the schedule. Where applicable, doors monitored for position as part of the smoke control approach shall also be identified in the schedule.
    a. When stair pressurization systems are utilized, the use of automatic door sweeps for associated stair doors is recommended.

C. Mechanical Plan Submittal

1. Clear identification of the fire- and smoke-resistive construction, in coordination with the architectural plans.
2. Provide a schematic riser diagram of the smoke control systems.
    a. Identify the ducts and shafts used for smoke control in the schematic riser diagrams. Indicate the maximum design static pressure for all ducts require pressure testing as prescribed in WSBC Section 909.10.2. Liner for shafts utilized for smoke control should be considered in order to meet the requirements of Section 909.10.2.
3. Coordinate with the Smoke Control Report author and the fire alarm contractor as part of the development of the Detailed Smoke Control Matrix.
4. Identify the major components used for smoke control in appropriate schedules. Include fans, variable frequency drives and their locations, fire/smoke dampers, motorized dampers and louver and damper operators. Each smoke control system component shall have a unique identifier. Every fire/smoke damper and motorized damper shall be provided with phenolic label at the access panel or other approved location that corresponds with the damper schedule and approved drawings.
5. Identify the anticipated velocities at each duct-mounted smoke detector for every stair and elevator pressurization fan.

6. Indicate the minimum service factor for fan motors (1.15), secondary power, the minimum number of belts for belt-driven fans, and temperature ratings for fans and ducts. Include activation temperatures for combination fire/smoke dampers. Identify which air-moving systems greater than 2,000 cfm will not be provided with automatic shut-off.
7. Identify equipment locations with inlet and outlets clearly shown and separated in accordance with WSBC Section 909.10.3.
8. For smoke control systems with variable frequency drives, locate the variable frequency drives outside the smoke control zone they serve (unless located in the pressurized stairway that they serve per WSBC Section 909.20.6.1). Alternatively, protect the variable frequency drives within the smoke zone they serve from smoke and heat so that they are capable of continued operation after detection of a fire for at least 20 minutes or the time set by the required safe egress time (1.5 times RSET), whichever is greater. Variable frequency drives shall not serve more than one end device unless listed for smoke control service.

D. Electrical Plan Submittal

1. Clear identification of the fire- and smoke-resistive construction, in coordination with the architectural plans.
2. Identify the major electrical components used for smoke control, including secondary power source, transfer switches, and control system(s).
3. Provide load calculations for the secondary power source.
4. Show the layout of the room containing the secondary power source. The secondary power source and its transfer switches shall be in a room separate from the normal power transformers and switchgear.
5. Show the routing and fire rating of the normal and secondary power distribution systems. The normal and secondary power systems shall be routed independently.
6. Show the locations of the Fire Alarm Control Unit, the Firefighter's Smoke Control Panel, and Fire Alarm Annunciator(s).
7. Where Fire Command Centers are required, show the layout. See WSBC Section 911 for required equipment and furnishings.
8. Coordinate with fire alarm contractor to confirm means of monitoring the presence of power downstream of the circuit breakers/disconnects for smoke control equipment (ref WSBC Section 909.12). This shall include secondary power disconnects at or upstream of the automatic transfer switches.
9. Identify means of providing 2-hour FRR protection for power and control circuits serving stair pressurization systems in accordance with WSBC Section 909.20.6.1. Drawings shall identify means of 2-hour FRR protection for both horizontal and vertical circuits. Wiring for control and power may be installed in an exit enclosure only if it serves the respective enclosure.

E. Fire Alarm Plan Submittal

1. Clear identification of the fire- and smoke-resistive construction, in coordination with the architectural plans.
2. Coordinate with the Smoke Control Report author and the Mechanical Engineer as part of the development of the Detailed Smoke Control Matrix.

3. The Fire Alarm Sequence of Operations Matrix (generally describing non-smoke control related activation sequences) shall include a single column referring to the Detailed Smoke Control Matrix, such that outputs pertaining to the smoke control system are routed to the Detailed Smoke Control Matrix.
4. Provide a full-scale colored drawing of the FSCP for review and approval. Refer to Appendix C for further information. Provide a legend or matrix mounted adjacent to the FSCP showing the configuration of fans, dampers, and doors in normal conditions and in smoke control mode.
5. Smoke control systems shall have an automatic weekly self-test feature. The self-test feature shall automatically command activation of each associated function(s). Any function that fails to operate within the required time period will report the abnormal conditions audibly and visually, will be annunciated on the FSCP, transmit a supervisory signal to a remote central station and documented by printed report or by means approved by VFD (WSBC Sections 909.12, 907, UL 864 Section 49). Devices that are not monitored for status, such as doors on magnetic hold-open devices are not required to be included in weekly self-test but must be tested as part of the annual fire alarm and smoke control inspections.

F. Identify all fire alarm initiating devices, including sprinkler waterflow detectors.

G. Fire Sprinkler Plan Submittal

1. Clear identification of the fire- and smoke-resistive construction, in coordination with the architectural plans.
2. Sprinkler zones shall be coordinated and match the Smoke Control Report, as applicable.
   a. For atriums, provide separate sprinkler zones for the atrium and spaces separated from the atrium (WSBC Section 909.12.3).
   b. For malls, provide separate sprinkler zones for mall and tenant spaces (WSBC Sections 402.5, 909.12.3).

APPENDIX A. SPECIAL INSPECTION AND TESTING

A.1 General Requirements

In accordance with Section 909.3 of the WSBC, the smoke control system shall undergo special inspections and tests sufficient to verify proper commissioning of the smoke control design in its final installed condition. The fundamental role of the Special Inspector is to inspect and test both the active and passive smoke control systems to confirm compliance with the applicable codes and the approved design documents. The following is intended clarify the requirements for smoke control system special inspection services as prescribed in the Code.

WSBC Sections 909.18.8.2 and 1705.18.2 requires the *approved* Special Inspection Agency to have expertise in fire protection engineering, mechanical engineering, and certification as air balancers. The International Code Council Smoke Control Provisions Interpretation and Application Guide discussing this requirement states as follows:

Obviously, very few individuals possess all three of the above skill sets. Special inspection activities usually consist of a team approach with a lead agency utilizing the resources of varying internal and external professional resources. A fire-protection engineering firm with expertise in the mechanical aspects of air-handling systems working in combination with a certified air balance company, a mechanical engineering firm with assistance from a fire-protection engineer and a certified air balance firm, or an air balance firm with device and controls testing and quality control provided by fire-protection or mechanical engineering firms are but a few examples of a teaming approach to special inspections. The combinations are numerous with anyone party acting as the coordinating lead agency supported by the professional and technical skills of the other parties. Final reports are often a coordinated consolidation of the three parties involved in the testing program. [1]

The smoke control special inspections shall be conducted under the same terms prescribed in WSBC Section 1704. Section 1704.2 requires the owner, or Owner's authorized agent, to retain the Special Inspection Agency. The architect may serve as the Owner's Representative. The contractor or any other person responsible for the work cannot retain the Special Inspection Agency.

Section 1704.2.1 states: In addition to qualifications specified in other sections of this Code, the Special Inspection Agency shall provide written documentation to the building official demonstrating the competence and relevant training experience required to perform the special inspections.

A.2 Agency Requirements

Agencies serving as the SIA must have a Washington State Registered Fire Protection or Mechanical Engineer, with the qualifications outlined in WSBC Section 909.18, overseeing the special inspection process. The P.E. is required to provide a certificate or letter of compliance in accordance with this document. The airflow and pressure testing must be performed by an approved AABC, NEBB, or TABB agency.

A. Individuals conducting the actual testing are not required to be a registered P.E., nor is the P.E. required to be present for all testing. However, the inspectors conducting the actual testing must demonstrate experience testing and inspecting smoke control systems as indicated below.

[1] Smoke Control Provision of the 2000 IBC an Interpretation and Application Guide, International Code Council Smoke 2003 Country Club Hill, IL Douglass Evans and Dr. John Klote. Page 73

B. The P.E. who prepared the Smoke Control Report may serve as the Special Inspector. The vendor, technician, installing contractor or air balancer cannot serve as the Special Inspector nor be a subcontractor or affiliate to any of the aforementioned entities.

C. Special Inspection Qualification Submittal. The proposed Special Inspection Agency shall be identified as part of the initial design submittal package. To demonstrate compliance with Sections 909.18.8.2 and 1705.18.2, the proposed Special Inspection Agency shall submit a qualification package containing the information below for review and approval by the VFD.

1. General information regarding agency, including years of experience.
2. Identify licensed professional engineer in charge. Include a brief narrative describing the experience performing or supervising special inspection activities.
3. Provide a minimum of three projects of similar size and scope where smoke control special inspection services were performed, including project name location, the date work was performed, client name and contact.
4. Submit sample inspection forms, including design review logs, functional test plans (test scenarios), daily reports, non-conformance reports, initiating device inspection sheets, damper inspection sheets, fan inspection sheets, etc.
5. Submit resumes of proposed inspectors who will be performing the special inspection services. Include relevant project experience for each inspector.
6. The VFD may request an interview with the professional engineer in charge and individual Special Inspectors.

D. After the Special Inspection Agency has been approved, the qualification package will be kept on file and will not need to be re-submitted for future projects. Resumes of new personnel must be submitted before they can perform special inspection services.

E. Failure to properly inspect the smoke control system in accordance with this standard and applicable codes may result in the rescinding of VFD approval of the Special Inspection Agency.

A.3 Special Inspection and Testing Program

Within 90 days after VFD approval of the Detailed Smoke Control Submittal, the Special Inspection Agency shall prepare and submit a Special Inspection and Testing Program for VFD review and approval.

A. Special Inspection and Testing Program. The Testing Program shall include a detailed narrative on the means and methods of inspecting and testing both the active and passive smoke control systems in accordance with requirements prescribed in the approved design documents, applicable codes, and this document. All relevant approved design documents and applicable codes shall be referenced in the Testing Program.

B. Inspection Forms. The following describes the minimum type of forms that will be utilized by the Special Inspection Agency to document the inspection of the smoke control system. These forms must be submitted with the Special Inspection and Testing Program. Appendix E includes examples of each form. The actual forms submitted by the Special Inspector may differ, provided the content is at least equivalent to the sample forms in Appendix E. The completed forms must be included in the Special Inspection Final Report discussed below.

1. Functional Test Plans (Test Scenarios). The Test Scenarios shall identify the fire alarm initiating devices that will activate the smoke control system and the expected output upon receipt of an alarm. Each device required to configure during a smoke control event shall be defined by the distinct by ID identified on the mechanical drawings.

   These scenarios are intended to be utilized as a guide for contractor pre-testing, during the final inspection by the VFD, and as record document for identify proper sequence of operation for periodic testing of the smoke control system.

2. Daily Report. This Report shall be completed at the end of each day that the Special Inspector is on site. The report shall include a brief narrative of the tasks performed, any deficiencies observed, previous deficiencies corrected and whether a Non-Conformance Report (NCR) was issued. The fire alarm program revision number shall be documented. Where deficiencies were noted, copies of this report shall be forwarded to the respective contractor(s).

3. Non-Conformance Report. This report is intended to document critical deficiencies. The NCR shall detail the existing condition(s), identify the applicable Code and/or referenced design document, and the required correction. The NCR shall be forwarded to the contractor and VFD. When applicable, a copy shall be forwarded to the respective EOR's.

   Once the deficiency is corrected, the Special Inspector shall re-inspect or re-test the condition as applicable. After confirming the condition has been resolved, the Special Inspector shall provide a brief description of the resolution and the means of verification, i.e., visual observation, re-testing, etc. The Special Inspector shall sign and date the NCR and forward the cleared NCR to the contractor, VFD and when applicable, to the respective EOR.

4. Passive Barrier Leakage Testing Forms. In accordance with WSBC Section 909.5.2, compliance with maximum leakage area of passive smoke control systems shall be verified through methods of door fan testing or other methods approved by VFD. Smoke barrier acceptance criteria shall be established by the Smoke Control Report author, but the maximum leakage shall not exceed that specified in WSBC Section 909.5. The test pressure shall be approximately 0.05 inches of water column or greater as determined by the design. A copy of the barrier leakage calculation form shall be prepared by a qualified engineer and submitted with the Special Inspection and Testing Program. When leakage testing of residential smoke barriers will be performed, the Special Inspection and Testing Program will identify the number or percentage of units to be tested, not to be less than 10% of the units or one (1) unit per floor, whichever is greater.

   If passive barrier leakage testing will be conducted as part of LEED Silver or Gold Certification, a separate passive barrier leakage testing for smoke control is not required. However, the Special Inspection and Testing Program shall reference if this is to occur, and the Final Report shall include the testing results performed by others.

5. Initiating Device Inspection Form. This report is intended to document every fire alarm initiating device tested and all pertinent information as applicable.

6. Opening Protection Inspection Form. This report documents every damper inspected and tested with all pertinent information.

C. The Special Inspection Agency shall obtain and include copies of the air balance contractor's proposed test and inspection forms utilized to document relevant smoke control system information described under the performance testing requirements in this document.

D. A written maintenance program complying with the requirements of WSFC Section 909.20.1 must be prepared with a written acknowledgement / signature of the owner regarding the contents of the plan and the requirements contained therein. This plan must be submitted,

reviewed and approved by the VFD prior to issuance of a certificate of occupancy. See Section A.10 for further detail.

A.4 Special Inspection and Testing Approach

Smoke control system special inspections consists of visual inspection and component identification, equipment installation verification, operational testing, performance testing and documentation for both the active and passive smoke control systems serving the building. All of the above shall be performed in accordance with the approved design documents and applicable codes. The following is intended to provide a summary of the expected task performed by Special Inspection Agency based upon best practice and industry standards.

A. Design Review. Prior to conducting special inspections, the Special Inspector shall review the Detailed Smoke Control Report to gain a thorough understanding of the basis of design. The City of Vancouver approved construction documents and submittals, including the architectural, mechanical, electrical, and fire alarm drawings, shall be reviewed, to confirm compliance with the WSBC as amended by the City of Vancouver.

Should the Special Inspector identify any discrepancies between the Smoke Control Report and approved construction documents, such discrepancies shall be brought to the attention of the VFD and the respective party. The intent of this review is to resolve deficiencies prior to construction when corrections can be more easily resolved.

B. Daily Reports. The Special Inspector shall prepare a Daily Report each day they are on site inspecting and testing the smoke control system.

The VFD may request copies of the Daily Report to determine the progress of special inspection process.

C. Component Submittals. The Special Inspector shall review contractor product submittals and installation manuals prior to the inspection of every smoke control component to confirm the installation complies with the manufacturers' installation instructions, applicable codes, approved design documents, and contractors' submittals. The Special Inspector shall document the results of each component inspected and tested on an applicable form prepared by the Special Inspection Agency.

D. Contractor Pre-Testing. Prior to each phase of the Special Inspection, the contractor shall provide documentation demonstrating that the relevant smoke control system inspection or test has been pre-tested and the components/systems function as required. This documentation must be provided to the Special Inspector a minimum of 7 days prior to the scheduled inspection by the Special Inspector to allow for adequate time for review.

E. Duct Leakage Testing. Duct leakage testing shall be performed prior to concealment of ductwork, but it is imperative that this occurs after dampers are installed. Duct leakage testing is required for all smoke control ductwork that crosses a smoke barrier. Ductwork shall be leak tested to 1.5-times the larger of the operating or design pressure (positive or negative, as applicable). Measured leakage shall not exceed 5% of the design airflow. Ductwork associated with the smoke control system that does not cross smoke barriers are required to be pressure tested to 1.5-times the larger of the operating or design pressure. Verification of allowable leakage rates shall be in accordance with stamped design calculations provided by the responsible registered design professional of record. Ductwork associated with the smoke control system shall be confirmed to be supported directly from fire-resistance rated building structural elements by substantial, noncombustible supports.

A.5 Component Installation Inspection

A. Component Installation. Components and sub-systems used as part of the smoke control system shall be identified by manufacturer, model number, and building specific mark number. Product data sheets for each component and the applicable design documents shall be provided to the Special Inspector and shall be utilized to verify that the installed equipment is consistent with the design, including the location of the equipment and devices, and complies with the applicable Codes and Standards.

1. All systems devices shall have a unique equipment identification label affixed to them that matches their designation as shown on the approved smoke control diagrams. Device identification on test sheets and manufacturer data sheets shall be traceable to the unique equipment identification listed on the approved smoke control diagrams.

B. Fire Alarm Control Unit. The Fire Alarm Control Unit associated with the smoke control systems and the FSCP shall be verified to comply with UL 864 and UUKL listed for smoke control. All revisions to the fire alarm program during the course of the special inspection shall be documented.

C. Smoke Barrier Construction. Smoke barriers shall be constructed of an assembly complying with the requirements of the WSBC and having a minimum l-hour fire-resistance rating. Construction of the smoke barrier and smoke partition assemblies and seals shall be visually inspected. Attention to penetrations through smoke barriers and partitions shall be given throughout the duration of the special inspection and testing program. It cannot be overemphasized that the various trades must properly seal penetrations through FRR construction with appropriate protection.

D. Opening Protection. The Special Inspection Agency shall refer to the Smoke Control Report and the door hardware schedule located on the Architectural submittal for the type and location of all doors located in a smoke control zone boundary. Verify doors have clearly visible and legible labels indicating the accurate fire protection rating. When applicable, confirm doors comply with NFPA 105. Such doors must be listed for smoke and draft control and bear the "S" marking and must be provided with smoke seals and self-closing mechanisms and associated coordinators. Verification will include reference to NFPA 80 and NFPA 105 for the maximum clearances permitted around doors and required smoke seals. Verify adjustable door sweeps at pressurized stairways, as applicable.

1. Doors on hold-open devices located in a smoke control zone boundary shall be verified to be provided with an appropriate automatic means of closing. Verification of hold-open doors and associated devices shall include location and identification pursuant to the approved drawings and installation in accordance with their listing.

2. Where provided, confirm coiling doors, large roll-down doors, and power-operated doors that must open to provide make-up air in a smoke control event are provided with means to monitor status, including power (when the equipment does not fail in the smoke control position) and position.

E. Dampers. Confirm all smoke and combination fire/smoke dampers are installed where shown on approved mechanical and smoke control drawings. Verify that the installed smoke or combination fire/smoke dampers are UL 555S listed. Verify fire rating and leakage class. Verify that dampers are installed in accordance with their listing and manufacturer's instructions (including angle and fastener installation). When applicable, verify presence of position switches and related design features. Verify that placement of such switches is adequate to monitor movement of damper blades when required. Verify that temperature switches for dampers are appropriate for smoke control in accordance with the approved Smoke Control Report. Verify that dampers and damper actuators have not been painted and that fire caulk has not been applied unless approved. Verify that dampers have access for inspection

and maintenance as required by WSBC Section 717.4. Verify that each fire/smoke damper is provided with a permanent identifying tag or mark on them consistent with the approved design documentation.

1. Confirm a smoke detector is provided to actuate each smoke or fire/smoke damper is provided in accordance WSBC Section 717.3.3.2. Where a smoke detector is installed within a duct as prescribed in Method 1 of Section 717.3.3.2, confirm the detector is listed for air velocity, temperature and humidity anticipated at the point where it is installed and upon fan shutdown, all dampers associated within the respective system close (other than in non-dedicated mechanical smoke control systems).

F. Wiring. Verify all smokeproof enclosure ventilation equipment power and control wiring inside the building meets the requirements of WSBC Section 909.20.6, as described in Section 5.H.5 of the VFD Smoke Control Technical Standard. Confirm all wiring associated with the smoke control system, including detection, power, and control wiring, is installed in continuous raceways in accordance with WSBC Section 909.12.2. MC Cable is an acceptable alternative.

G. Monitoring Devices. Identify manufacturer and model number. Verify proper device mounting location to monitor maintenance disconnects associated with smoke control equipment, power downstream of all disconnects (including circuit breakers associated with the secondary power system), position and/or status of dampers or automatic horizontal slide doors (or similar), and operating status of fans.

H. Fans. Identify all smoke control system fans and motors by manufacturer and permanent identifying tag consistent with the design documents. Belt-driven fans shall be verified to have 1.5-times the number of belts required for the design duty with the minimum number of belts being two. The mechanical engineer of record shall provide information to Special Inspector prior to inspection indicating how many belts are required and provided for each belt-driven smoke control system fan. Fan motors shall be verified to have a minimum 1.15 service factor. Fans shall be confirmed to be suitable for the anticipated conditions, including temperature exposure. Confirm smoke control system fans are supported and restrained by non-combustible devices. Confirm smoke control fans are provided with adequate means of minimizing wind impact.

1. Confirm smoke control fans are provided with means of monitoring status of the fans (e.g., pressure or current sensors). Pressure sensors must be located in the airstream. Current sensors must monitor power leads to the motor only. Such sensors must be adjusted to differentiate between the fan reaching its intended airflow flowrate and the fan not meeting the prescribed airflow (e.g., belt-slip, locked rotor, etc.). Confirm monitoring of power downstream of the last disconnect.

2. Verify a duct-mounted smoke detector are provided at each pressurization fan. Duct detectors shall not be installed in smoke exhaust fans. The Mechanical Engineer of Record shall be consulted to determine the anticipated velocity at the point where the duct detector will be installed. If the velocities will exceed the listing of the detector, the contractor shall submit an alternate method of de-energizing the fan to the VFD.

I. Equipment Inlets and Outlets. Equipment inlet and outlet locations will be reviewed to verify that uninvolved portions of the building are not exposed to an additional fire hazard. Outside air inlet and exhaust outlet locations associated with equipment must have a separation of no less than 20 feet to minimize reintroduction of smoke.

J. Motorized Dampers. Verify motorized dampers are located and identified with permanent tags as shown on the approved design documents. Confirm dampers are listed as required by WSBC Section 909.10.4. Where monitoring of such dampers is required in the Smoke Control Report, verify motorized dampers are provided with position switches. Verify that placement of such switches is adequate to monitor movement of damper blades. Where such dampers are used for

exterior relief, confirm the size of the dampers and that the associated grills provide the required free area prescribed in the Smoke Control Report. Confirm such relief is not obstructed by other building systems.

K. Other Dampers. Verify barometric relief dampers are provided where required by the Smoke Control Report (e.g., pressurized stair enclosures) and installed in accordance with their listing. Confirm these dampers fail open.

   1. Where prescribed in the Smoke Control Report, confirm a counter-balance pressure relief damper (and where applicable a motorized isolation damper) is provided at the top of each pressurized elevator hoistway. Verify an access panel is provided for adjustment.

L. Control and Monitor Modules. Where applicable, verify placement of control/monitor modules are installed within 3 feet of the associated component utilized for smoke control or appropriate supervision.

M. Secondary Power Systems. The secondary power system must comply with the requirements of WSBC Section 909.11. Verify that the secondary power source and transfer switches are in a room enclosed with not less than 1-hour FRR fire/smoke barriers (or 2-hour FRR fire/smoke barriers in high-rise buildings), ventilated directly to and from the exterior. Document the location of the automatic transfer switch. Verify that power distribution from the two sources to the automatic transfer switch is by two independent routes. Secondary power shall be confirmed to be provided to all smoke control equipment that require power to meet their smoke control configuration, included power-operated door opening mechanisms utilized as part of the smoke control system.

A.6 Equipment Functional Testing

To minimize the potential of programming errors that can impact the functionality of the smoke control system, cause delays in the schedule, and cause redundant special inspection activities, the functional testing of the smoke control system shall not begin until the installation of the fire alarm system is substantially complete and tested by VFD, and the entire system has been pretested by the construction team.

The construction team shall send written notice to the Special Inspection Agency that the system has been pretested based upon the Test Scenarios prepared by the Special Inspection Agency and ready for verification. An alternative to written notice is for the contractor overseeing the smoke control system installation and pre-testing to initial the Test Scenarios, confirming each function performs as prescribed.

The Special Inspection and Testing Program discussed above shall detail the functional testing that will be performed to confirm the smoke control system operates in accordance with the approved design documents and applicable codes.

A. Opening Protection

1. Doors. Verify doors located in smoke partitions and smoke barriers close and latch when operated in normal and smoke control modes. Verify doors provided with hold-open devices release, close and latch upon activation of the associated initiating device(s). Where applicable, confirm that exit doors provided with electric locks will be automatically unlocked in a fire alarm event.

2. Dampers. The following shall apply to automatic dampers and control dampers internal to air handling units that must reach a specific position for the smoke control system to properly function. Results of each test shall be documented in the Damper Inspection Sheets and submitted with the Special Inspection Final Report. Power-operated doors used for smoke control also shall be tested in a similar manner as such dampers.
   a. Verify automatic dampers respond appropriately to the associated initiating device(s) and manual controls from the FSCP, where applicable. Dampers shall be verified to be in the final position and indicate accurate status at the FSCP within the time specified in the Smoke Control Report. Dampers shall be confirmed to have monitoring devices to provide positive confirmation of at least the smoke control position, unless separating two passive smoke control zones and is exempted from monitoring as specified in the Smoke Control Report. If a damper has multiple smoke control configurations, the damper shall be monitored to provide positive confirmation of each position.
   b. Verify proper supervision by causing dampers to not fully open (when required to be open in smoke control mode) and/or causing dampers to not fully close (when required to be closed in smoke control mode). This can be achieved by the mechanical contractor disengaging the rod from the damper actuator in a non-destructive manner. Confirm these actions transmit the appropriate signal to the Fire Alarm Control Unit and cause the associated FAULT indicator to illuminate on the FSCP. At a minimum, a representative sample of monitored dampers utilized for smoke control (e.g., smoke exhaust damper, isolation damper, control damper, supply damper) must undergo this test. The proposed representative test shall be included in the Special Inspection and Testing Program. The Special Inspector is permitted to request the fire alarm program from the fire alarm contractor and request proof of consistent programming for the remaining monitored dampers. If the programming is deemed sufficient by the Special Inspector, the Special Inspector may opt to perform the “FAULT Test” on the remaining dampers or perform representative “FAULT Testing” for the remaining dampers.
   c. Confirm dampers required to be monitored for power downstream of the last disconnect are provided with appropriate supervision and illuminate the appropriate indicator on the FSCP and/or sends the appropriate signal to the fire alarm system when power is interrupted, as applicable. Verify that upon loss of power, the damper fails to the smoke control position. When dampers do not fail to their required smoke control position, verify power monitoring downstream of the last disconnect is provided. For power-operated doors utilized for smoke control, this test may not be possible to be performed since such doors generally do not fail to the required smoke control position.

3. Fans. Fans operating at design conditions shall be verified to the manufacturer's data and standard engineering practices for stable performance. Fans shall be verified for proper rotation when placed into a smoke control mode of operation. Airflow testing shall be witnessed by the Special Inspector and verified to be consistent with the design requirements (as discussed in the System Performance Testing portion of this document). Fans shall be verified to respond to automatic and manual commands and provide accurate status indication within the time specified in the Smoke Control Report.

a. Proper power disconnect supervision to smoke control equipment shall be verified. Upon power-loss to the fan, or upon opening the power disconnect switch, verify the appropriate signal is transmitted to the fire alarm system and central station, and the appropriate FAULT light is illuminated on the FSCP within the required time.

b. Verify automatic control of the fans by the fire alarm system, manual control of the smoke control fans from the FSCP, and that the panel correctly indicates the status of the fan. Manual controls from the FSCP shall be verified to override duct smoke detector shut-down of stair pressurization and smoke control supply fans. Verify positive confirmation of ON and OFF statuses via the pressure sensor and current transmitter used. Fans used for smoke control shall be provided with monitoring for positive confirmation of smoke control speed and for OFF status and shall be indicated on the FSCP. Fans with capacities greater than 2,000 cfm that are *not* used for smoke control shall be confirmed to be provided with monitoring of positive confirmation of OFF status; these fans do not need be indicated on the FSCP but shall be included in the weekly self-test.

c. Regardless of the use of the monitoring device for fan status (current or pressure sensors), verify that when the monitoring devices do not sense the prescribed airflow when the fan is commanded to run at the smoke control speed, a FAULT light is indicated on the FSCP. For example, where belt-drive fans are utilized for smoke control, verify that when belts are removed and the fan is commanded ON, a FAULT light is indicated at the FSCP.

d. When variable frequency drives are used, they shall be included in the weekly self-test. Variable frequency drives for both smoke control and non-smoke control fans that are required to de-energize in a smoke control event shall be verified to be overridden and locked out by the fire alarm system, including when utilizing the variable frequency drive's hand off auto (HOA) operation. Alternatively, verify the drive's control panels are permanently removed. If multiple fire alarm inputs are utilized for the variable frequency drive controlling a smoke control fan, each smoke control setpoint shall be monitored for positive confirmation of being attained. Except as permitted by WSBC Section 909.20.6 for smokeproof enclosure equipment, variable frequency drives shall be confirmed to be outside the smoke control zone they serve or protected from the zone they serve by minimum 20-minute fire-resistive construction. Verify variable frequency drives are not serving more than one end device unless listed for smoke control service.

4. Initiating Devices. All initiating devices and fire alarm system components required to initiate the smoke control system shall be tested and documented in the Initiating Device Inspection Sheets and shall be verified to be installed properly and operational during normal and secondary power conditions. These inspection sheets shall identify the type of detector and the location and address for each device. The Initiating Device Inspection Sheets shall be submitted with the Special Inspection Final Report.

   a. Smoke detection systems shall comply with NFPA 72, *National Fire Alarm and Signaling Code*. Smoke detectors shall be listed for the service for the purpose for which they are being used and shall be tested in their installed condition. Correct annunciation at the monitoring station after activation of such devices shall be verified. Detectors that are used to control or release equipment associated with a smoke barrier shall be tested by verification of airflow for both the minimum and maximum conditions, where applicable.

   b. As required by NFPA 72 (2016 Edition) Section 17.7.5.5.5, detectors mounted outside of a duct that employs sampling tubes for transporting smoke from inside the duct to the detector shall be designed and installed to allow verification of airflow from the duct to the detector. The air balance contractor shall measure and document velocities at such duct detectors.

A.7 Sequence of Operations Testing

A. Each individual fire alarm initiating device which activates any portion of the smoke control system must be verified to provide all applicable output functions defined in the Detailed Smoke Control Matrix. Each detection device must be tested in accordance with Section 909.18.1. Mechanical smoke control systems shall be verified to be provided with completely automatic control.

   1. A minimum of 30% of the initiating devices shall be tested to confirm correct sequence of operation, but not less than one of each type of initiating device per floor. To minimize the potential to damage fan motors, power may be removed from such fans, or such fans may be commanded OFF from the FSCP, after the minimum of 30% of the initiating devices have been tested. At the conclusion of each day of testing, the fans shall be restored to proper operation.

   2. Additionally, after 30% of the initiating devices have been tested, the remaining devices can be verified for consistent programming for the remaining detectors the fire alarm contractor shall provide the fire alarm program to the Special Inspector and demonstrate. If the programming is deemed sufficient by the Special Inspector, the Special Inspector may opt to test all the remaining devices or opt to perform representative sequence of operations testing for the rest of the devices.

   3. Fans and dampers shall be altered to a non-smoke control condition during a smoke control event to verify the appropriate signal is transmitted to the fire alarm system and central station, and the appropriate FAULT light is illuminated on the FSCP within the required time.

   4. Verify automatic fan shutdown upon activation of initiating devices installed for the purposes of fan shutdown.

B. Verify that when a smoke control initiating device activates in an active smoke control zone, activation of a second device in a different smoke control zone does not change the smoke control system sequence of operations.

C. Verify that the FSCP manual controls have the highest priority of all systems (unless otherwise specifically exempted by WSBC Section 909.16), including automatic control of the smoke control system. Verify that upon manipulation of any manual control switch at the FSCP, a supervisory signal is transmitted to the Fire Alarm Control Unit and the central station.

   1. Where applicable, verify that after the smoke control supply fan shuts down due to the activation of an associated duct detection device, the FSCP has manual control capability to override the re-energize the fan to the smoke control speed.

D. If any critical failures in the sequence of operation is observed, all testing shall stop until the fire alarm program is corrected or component(s) are repaired. The failed sequence shall be re-tested after the issues is corrected. If the failure is attributed to programming error, the Special Inspector may require a significant increase in representative sampling of confirmation of correct sequence of operation. At the conclusion of all functional testing, the Programming Revision Number shall be documented and identified in the Special Inspection Final Report.

E. Weekly Self-Test. All smoke control system devices and functions need to be included in the weekly self-test feature, unless specifically discussed with and approved by VFD. The weekly self-test shall be observed to verify the following:

   1. A written report is produced, clearly indicating a “start” of the test, and an “end.” Alternate methods of weekly-self test records may be approved on a case-by-case basis.

   2. When all components function properly, the self-test indicates a “pass.” The report must also clearly indicate a “fail” if components do not function properly and must identify the

failed component(s). The self-test shall verify abnormal conditions audibly, visibly, and by printed report.

3. A failure of any component shall transmit a trouble signal to the Fire Alarm Control Unit and the central station.

4. Any building alarm shall interrupt the self-test. If a smoke control initiating device is activated, it will be confirmed to configure based on the relevant alarm signal and confirmed to remain locked out past the duration allotted for the weekly self-test.

F. Response Time. Smoke control system activation shall be initiated immediately after receipt of an appropriate automatic or manual activation command. Smoke control systems shall activate individual components (i.e., dampers and fans) in the sequence necessary to prevent physical damage to the fans, dampers, ductwork, and other equipment. Upon receipt of an alarm condition at the fire alarm control unit, fans, dampers, and automatic doors shall have achieved their expected operating state and confirmation of proper operation shall be indicated at the FSCP within 60 seconds or otherwise specified in the Smoke Control Report. Verification shall be documented in the special inspection final report.

A.8 System Performance Testing

The following describes the task required for the performance testing of the smoke control system. Balancing of the smoke control system and measurements must be performed by an AABC, NEBB or TABB Agency/Technician. The Special Inspector shall witness all final results. All final readings shall be recorded and documented in a Smoke Control System Air Balance Report prepared by the air balance contractor and forwarded to the Special Inspection Agency to be included as an appendix to the Smoke Control System Special Inspection Final Report.

A. Fan Parameter Measurements. The certified air balance contractor shall document the following for each smoke control fan in the smoke control mode: fan airflow (cfm), proper rotation of fan blades, voltage and amperage, horsepower, and motor speed (rpm). The belt tension shall be measured, and the number of belts shall be verified to be 1.5 times the number of belts required (minimum of two). When variable frequency drives are used, the smoke control speed (Hz) shall be documented. The measurements and variable frequency drive setting for each smoke control fan after final balancing shall be documented in the Air Balance Report. These results shall be forwarded to the Mechanical Engineer of Record to re-plot the fan curves to confirm stable performance as prescribed in WSBC Section 909.10.5 of the WSBC. The re-plotted fan curves shall be included in the Special Inspection Final Report.

1. Ducts, Inlets and Outlets. Air quantities including capacities and velocities shall be reported in a manner that is consistent with generally accepted practices, from the AABC, NEBB, or TABB firm.

2. Smoke Barrier Leakage. Smoke barriers in passive smoke control zone boundaries shall be leakage tested in accordance with recognized standards to demonstrate compliance with established acceptance criteria, as required by WSBC Section 909.5. Smoke barrier acceptance criteria shall be tested based on what was established by the Smoke Control Report author. The location and scope of the smoke barrier leakage testing shall be documented in the Special Inspection and Testing Program.

3. Pressurization Method. Smoke control systems employing the Pressurization Method shall be tested with the system in the appropriate automatic smoke control mode. The design pressure differentials shall be verified across the relevant zone boundary smoke barriers to confirm the performance criteria is met.
   a. Pressurized stair enclosures shall be balanced and tested to maintain the minimum and maximum pressure differentials prescribed in WSBC Section 909.20.5.

b. Barometric Dampers. Where barometric relief dampers are prescribed in the Smoke Control Report for stair pressurization systems, confirm the barometric relief damper serving the stairway discharges a minimum 2,500 cfm during a smoke control event when all stair doors are closed.

c. Where elevator hoistway pressurization is utilized as the means of protecting the elevator hoistway openings, the elevator hoistway pressurization system shall be tested to maintain the minimum and maximum pressure differentials prescribed in the WSBC Section 909.21.1. This testing shall be conducted with elevator doors open on the floor of recall and when the elevator doors are in normal operation with all doors closed. The opening and closing of hoistway doors at each level must be demonstrated during this test.

4. Exhaust and Airflow Methods. Where smoke control systems employ either the Exhaust or Airflow Methods, the author of the Smoke Control Report shall identify locations where the airflow velocity toward a potential fire / smoke plume may be greater than 200 feet per minute, and the air balance agency shall measure airflows to confirm the velocities of the airflow remain below the limit, unless documentation in the detailed design submittal indicates higher velocities are permitted (NFPA 92 Section 4.4.4). The velocities shall be measured to comply with the detailed design submittal if varying from the 200 feet per minute criteria.

5. Door Forces. The maximum force required to open doors that are part of a required means of egress (e.g., vestibule, stair, corridor, exterior exit doors) in a smoke control mode shall be verified to comply with the Smoke Control Report and WSBC Section 1010.1.3.

6. Electrical Power Systems. Circuit breakers and switches associated with the secondary power system that, when open, may impair the provision of secondary power to smoke control equipment must be verified to send a supervisory signal to the fire alarm system. These circuit breakers and shut-off switches are generally located upstream of the automatic transfer switch.

   All smoke control system components that are required to operate on secondary power shall be tested on the secondary power system in a cold start condition as defined in NFPA 110, which requires the removal of normal power to the building and verifying the operation of the automatic transfer switch(es). This shall occur in the following manner:

   a. An automatic smoke control system event shall occur under primary building power. After confirmation that the smoke control system has configured correctly, the primary power serving the building shall be removed to automatically transfer to secondary power. The Special Inspector shall confirm that the system re-configures for the last alarm within 60 seconds. Transfer time shall be recorded. Under secondary power conditions, smoke control system equipment shall be verified to be capable of continuous operation during a fire event, for at least 20 minutes or the duration identified in the Smoke Control Report.

   b. In secondary power conditions, a smoke control event must be initiated in each smoke control zone and the Special Inspector shall verify that all fans, dampers, and other components required to operate in a smoke control event function as required. The system shall be reset after confirmation in each smoke zone.

B. Special Inspection Final Reports

1. The Special Inspection Final Report shall include a summary of the smoke control system design and a narrative detailing how the smoke control system was inspected and tested, including confirmation that the smoke control system was tested in accordance with Appendix A of this document and other relevant information. All completed inspection and test forms shall be attached to the Final Report, which shall include the Smoke Control

System Air Balance Report described in Section A.8 of this document and all completed forms described in Section A.3.B of this document.

a. The Special Inspection Final Report shall include the signature and professional engineer's seal of the Special Inspector (or the individual from the Special Inspection Agency providing special inspection oversight) certifying that the smoke control system is in substantial compliance with the approved design documents and applicable Codes. The Special Inspection Final Report shall be submitted electronically for approval prior to scheduling the integrated life-safety systems test (also known as the All Systems Test). Once approved by VFD, the Special Inspection Agency shall submit a bound and indexed hard copy of the Final Report to the owner for permanent retention in the Fire Command Center (or appropriate room when Fire Command Centers are not required). Additionally, the documents shall be submitted in electronic format.

2. A certificate or letter of compliance must be provided by the Special Inspector / Special Inspection Agency certifying that the referenced property is in substantial compliance. The certificate or letter shall identify the company and Special Inspector that performed the testing, and the name, date and address of the property being tested.

3. Additionally, the Special Inspector shall submit the report to the AOR/EORs in responsible charge to sign the following statement, which shall be included in the report:

I have reviewed the Special Inspection Final Report and based on the content of the report and our respective design, certify that the smoke control system is in substantial compliance with the approved respective design documents.

C. Documentation. The approved detailed smoke control submittal, the Special Inspection and Testing Program, smoke control diagrams, the Special Inspection Final Report, and an approved operations manual describing the functioning of the FSCP constitute the documentation required by this section. This information shall be retained in the Fire Command Center (or Fire Control Room / other appropriate area when Fire Command Centers are not required) and shall be provided in hard copy and digital format (PDF/CAD on a USB or similar).

A.9 System Commissioning by the Vancouver Fire Department

A. VFD verification to "final" the smoke control permit shall be completed in accordance with the Special Inspection and Test Program and this section. Operational and performance testing will be witnessed by VFD.

1. Prior Testing Required. The Special Inspector testing must be completed prior to system verification by the VFD.

2. Procedures. The SI/SIA will arrange for "final" acceptance testing of the smoke control system by VFD, to include witnessing contractor-executed operational and performance testing of the system. The Functional Test Scenarios shall be referenced with regard to methodology for testing selected system components and features. All testing shall be conducted in accordance with approved permit documents.

3. Operational Testing Witnessed by VFD. Operational testing shall be conducted in accordance with applicable sections of the Special Inspection and Testing Program by a qualified individual. Each control sequence of the smoke control systems must minimally include the following:

a. Manual control of smoke control system equipment serving select smoke control zones shall be demonstrated.

b. Manual activation of equipment via FSCP while the system is in normal status. Transmission of trouble signal to FACU.
c. Trouble signal, transmitted to FACU when FSCP manual control set to OFF or CLOSED position while system is in normal status.
d. Correct automatic system operation via a minimum of one of each type of initiating device (i.e., smoke detector, waterflow switch, manual station) and sequence of operation serving each smoke control zone.
e. Manual control via FSCP when system is active to activate inactive system components and disable active system components. Manipulation of the system to achieve each possible combination of switch configurations need not be demonstrated. Manually override the operation of a sampling of fans and/or dampers during each test, taking care not to damage system components.
f. For each sequence of operations, visual confirmation that controlled components in associated active zones have assumed the correct operating condition for the type of alarm initiating device and the location of initiating device. Proper status indication shall be confirmed also at the FSCP.
g. Self-test abort. The system must demonstrate that upon initiation of an alarm, it will properly abort the weekly self-test and initiate the programmed smoke control sequence of operation.
h. Return all override switches to their "Auto" position.

4. Performance Testing Witnessed by VFD. Performance testing shall be conducted in accordance with applicable sections of the Special Inspection and Test Program by a qualified individual, as follows:
   a. For each building, the testing must demonstrate proper system operation and performance tests, including observations and measurements of all aspects of the smoke control system, in no fewer than 3 smoke zones and a minimum of 10% of the building's smoke zones. Smoke zones will be selected at the Fire Prevention Officer's discretion and are generally intended to evaluate conditions at or near the bottom, middle and top of a building/tower. Every pressurized shaft shall be evaluated. Proper system performance is demonstrated by achieving stated performance criteria.
   b. Proper function of smoke control system in select smoke control zones, including a minimum of one of each initiating device serving the zone (i.e., smoke detector, waterflow switch, manual station) and sequence of operation, as discussed in the prior section. Required pressure differentials across smoke barriers and maximum door opening forces must be demonstrated where applicable.
   c. Proper function of any smoke control fan equipment via automatic initiation and manual control if not observed during evaluation of select smoke control zones.
   d. Return all override switches to their "Auto" position.

5. Airflow or Exhaust Method (WSBC Section 909.7 or 909.8). Atria or other spaces utilizing the exhaust and/or airflow method. The testing must demonstrate proper system operation and performance of 100% of the smoke control equipment. Smoke control system features to be evaluated during system commissioning include:
   a. Visual observation of elements described above.
   b. Visual inspection of associated smoke barriers for absence of obvious deficiencies.
   c. Proper function of smoke control system, including a minimum of one of each initiating device (i.e., smoke detector, waterflow switch, manual station) and sequence of operation. It shall be demonstrated that airflow velocities not exceed 200 feet per minute where the airflow could come in contact with a fire or smoke plume, per WSBC Sections 909.7.1 and NFPA 92 Section 4.4.4 unless documentation in the detailed design submittal indicates higher velocities are

permitted. The velocities shall be measured to comply with the detailed design submittal if varying from the 200 feet per minute criteria.

d. Manual control of smoke control system equipment shall be demonstrated.

6. Other Designs. For all other systems, conduct performance tests, observations, and measurements of all aspects of the smoke control system at a minimum number of locations to demonstrate proper performance as approved by the VFD. Each test shall attempt to involve as many different fan systems as practical. Other smoke control systems or features shall be evaluated as requested by the VFD's Fire Marshal's Office personnel based on the approved design and installed condition to demonstrate proper operation of the smoke control system and features.

7. Disabling Fans. Where Operational or Performance Testing would result in the repeated start and stop of large fans, such fans may be disabled or bypassed provided that verification that the proper system output to the fans is transmitted during testing while the FSCP is constantly attended. Proper operation of disabled equipment shall be restored and demonstrated upon receipt of an actual alarm event, or at the conclusion of the testing period, whichever occurs first.

8. Chemical Smoke. If necessary, testing involving chemical smoke or a tracer gas can be used for tracer test during acceptance testing to visually verify air movement.

9. System Failures. If any smoke control system deficiency is discovered during system commissioning, system commissioning may be ceased at the discretion of VFD personnel until such time as testing in accordance with this section can be repeated as necessary to resolve the deficiency, and a revised report is submitted in accordance with this Section.

A.10 Periodic Testing and Maintenance Requirements

A. Smoke control systems shall be maintained to ensure to a reasonable degree that the system is capable of controlling smoke for the duration required.

B. An inspection, testing and maintenance program shall be prepared by a qualified professional. The program shall be based on the building smoke control approach and comply with the requirements of WSFC Section 909.20 and NFPA 92 Section 8.6. The periodic testing shall be performed by a qualified individual/agency, as approved by VFD. The plan and the proposed individual/agency to perform the testing will be submitted to VFD for review and approval.

C. The routine maintenance and operational testing program shall be initiated immediately after the smoke control system has passed the acceptance tests.

1. A written schedule for routine maintenance and operational testing shall be established by the Owner.

[*Remaining page intentionally left blank*]

Special Inspection Final Report Checklist

OK	No.	Checklist Requirements
	1.	Special Inspection Final Report Checklist
	2.	Engineering Stamps (Washington) - Special Inspection Agency - Testing and Balancing Agency (on Air Balance Report -signature acceptable) - Responsible Registered Design Professional(s) – compliance statement
	3.	Documentation - Permit number. - Smoke Control Report (cover page only). - Special Inspection and Testing Program (cover page only). - Reference latest approved version of Smoke Control Diagrams.
	4.	Passive Smoke Control Zones - Room leakage calculations with door fan test result sheets or LEED testing documentation, as applicable.
	5.	Ductwork Leakage - Test sheets showing leakage testing results of ducts crossing smoke zone boundaries to l.5-times the maximum design pressure. Measured leakage shall not exceed 5% of design airflow. All other smoke control ductwork to be pressure tested at 1.5-times the maximum design pressure; leakage measurements unnecessary.
	6.	Smoke Control System Devices - Device data sheets documenting data for all devices performing any smoke control function. - Activation in accordance with the approved Smoke Control Report and smoke control diagrams. - Sprinkler system drawings match smoke zone boundaries as applicable. - Verify activation response times.
	7.	Equipment Data Sheets - Dampers. - Doors. - Other major smoke control equipment. - Unique permanent identifiers (tag) consistent with the smoke control diagrams.
	8.	Fans (Air Balance Agency to document this information in Final Air Balance Report) - Test sheets showing: □ Airflow velocity (for Airflow Design Method and Exhaust Method Systems), supply quantity, or exhaust quantity measurements as compared to the design values. □ Fan belts and drive components. □ Fan motors and associated components, including amperage, voltage, and horsepower in smoke control mode compared to rating. □ Variable frequency drive smoke control speeds (Hz). □ Noncombustible fan supports and restraints. □ Confirm temperature rating. □ Replotted fan curves after final smoke control system air balance.
	9.	Fire Alarm Program

OK	No.	Checklist Requirements
		- Firefighter's Smoke Control Panel: Confirm proper operation for manual override functions and status indication. - Confirm proper weekly self-test operation (with various scenarios). - Document fire alarm programming revision number.
	10.	Differential Pressures - Test sheets by Air Balance Agency.
	11.	Pressurized Stairways and Pressurized Elevator Hoistways - Test sheets by Air Balance Agency showing: □ Barometric relief damper discharge flowrate or other approved over-pressurization control function. □ Pressure differentials conforming to the requirements of WSBC and Smoke Control Report.
	12.	Door Opening Forces for Exit Doors - During smoke control mode: Test sheets documenting force to set door in motion, and force to fully open door.
	13.	Secondary Power Test - Document time to transfer and configure to smoke control mode.
	14.	Daily Inspection Reports - Non-Compliance Report(s) with written disposition(s).
	15.	Smoke Control System Functional Test Plans.

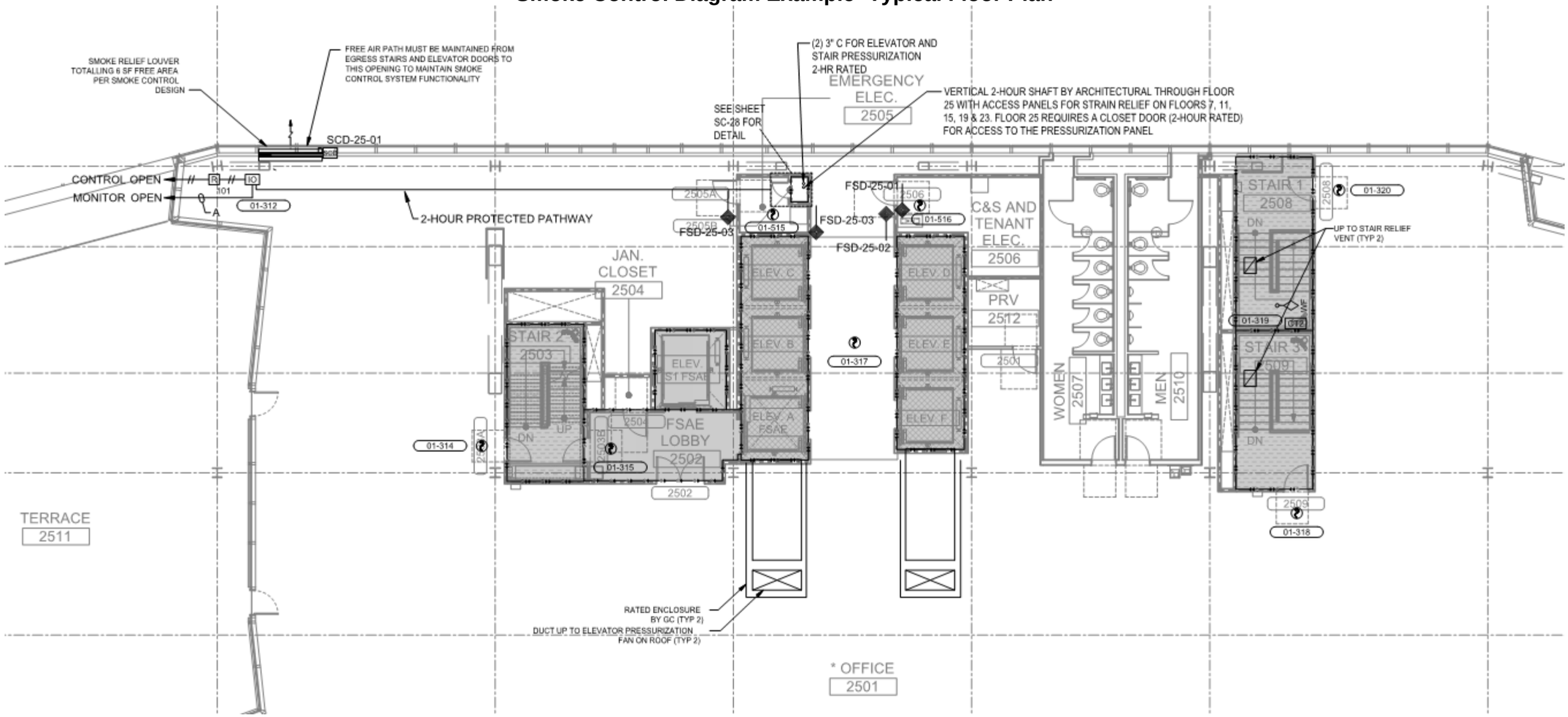
APPENDIX B. SMOKE CONTROL DIAGRAMS CHECKLIST

OK	No.	Smoke Control Diagram Requirements
	1.	Project name, address, and permit number
	2.	List of design team's contact information (owner's representative, architect, mechanical, electrical, and fire protection engineers): name, company firm's names/addresses, telephone numbers, etc.
	3.	Latest revision number and date (if applicable)
	4.	Scope of Work - Coordinate with the approved Smoke Control Report with amendment(s). - Reference smoke control zones and smoke control equipment/devices in existing construction, if applicable.
	5.	Professional Engineer (PE) stamp – Washington (on cover page)
	6.	Device/equipment legend on every page. Wall type legend on every page.
	7.	Location of the Fire Command Center or Fire Control Room.
	8.	Location of the emergency generator(s) and automatic transfer switch(es).
	9.	Location of the fire pump room(s).
	10.	Construction - Locate and identify fire- and smoke-resistive construction.
	11.	Smoke Control Zone Boundaries - Locate and identify smoke control zone boundaries on floor plans, consistent with zone diagrams produced by Architect: □ Active and passive zones □ Passive subzones □ Stair enclosures including vestibules □ Elevator hoistways and lobbies □ Pressurized enclosures □ Corridors, exit passageways, and horizontal exits □ Linen and trash chutes □ Shafts □ Atria □ Mall / tenant interface - Locate and identify sprinkler zone boundaries. - Specify design method on a zone-by-zone basis.
	12.	Major Components - Locate and identify input devices: □ Waterflow/pressure detectors required for smoke control □ Long-range beam, heat, flame, aspirating, or duct-mounted detectors □ Spot-type or full-coverage smoke detectors (depict extent of coverage) - Locate and identify smoke control system equipment: □ Stair, elevator hoistway, and elevator machine room pressurization fans □ Exhaust fans required for smoke control

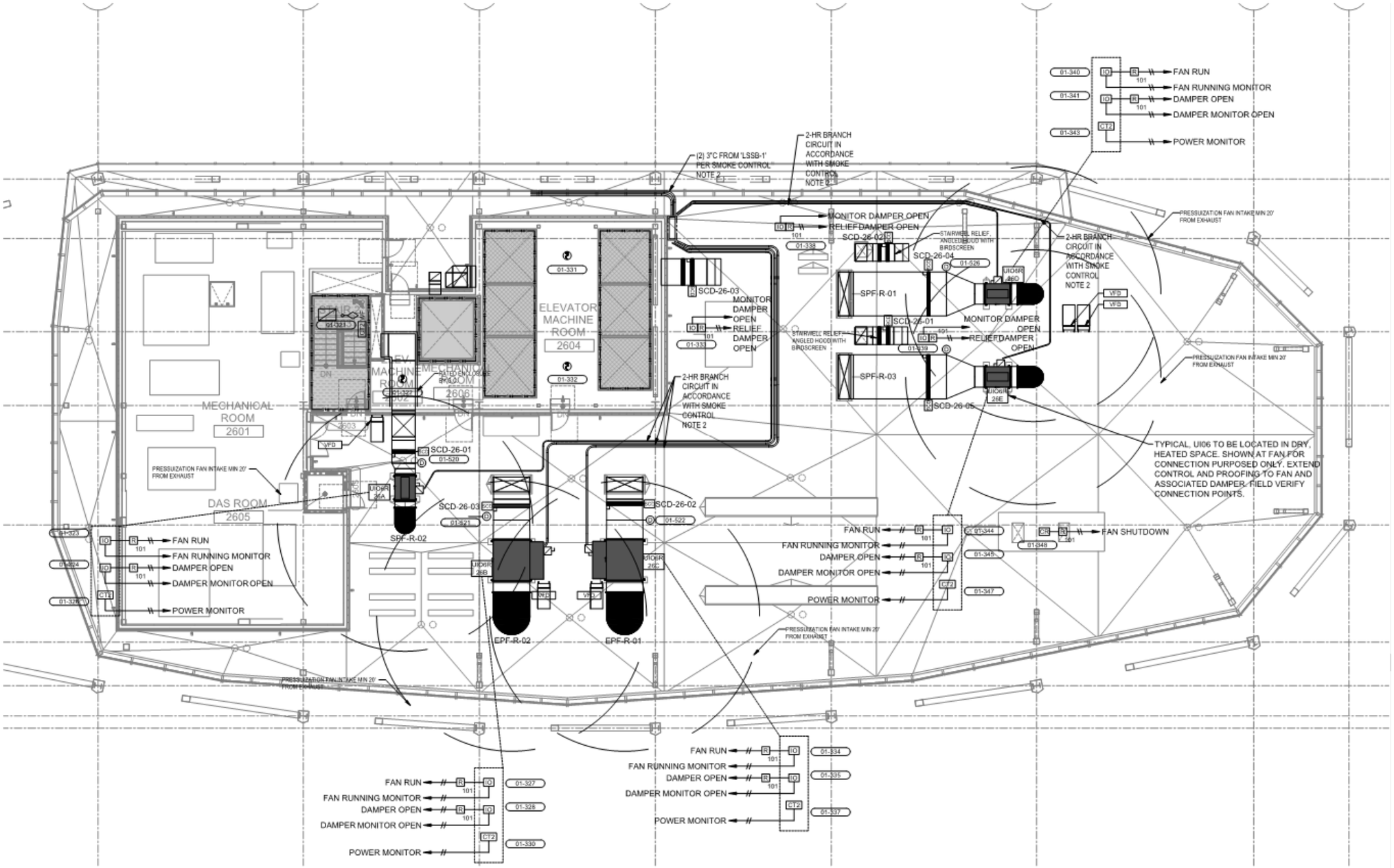
OK	No.	Smoke Control Diagram Requirements
		□ Other fans used for smoke control □ Air handling units > 2,000cfm □ Dampers required for smoke control (i.e., smoke, smoke/fire, fire, barometric, automatic, etc.) □ Doors on hold-open devices □ Doors provided with power-operated opening or closing mechanisms used for smoke control □ Openings used for make-up air (include net free area) □ Proscenium curtains □ Rolldown, drop, sliding, rolling or accordion doors at smoke barrier openings - Component unique identifiers (tags) on the project equipment/devices to match those shown on plan and sectional view drawings and the matrix.
	13.	Smoke Control System Operation - Input/Output Smoke Control Diagram Matrix: □ Include all device/equipment unique identifiers/tags □ Coordinate with the Smoke Control Report matrix □ Include loss of primary power □ Include relevant sheet notes as necessary
	14.	Ductwork - Locate and identify all ductwork that crosses smoke zone boundaries. - Indicate all ductwork that requires duct leakage testing.
	15.	Monitoring/Control - show the following: - Interconnection of input and output devices/equipment with the smoke control panel. - Connection of variable frequency drives and other intermediate fan controllers. - Monitor modules. - Control modules. - Current/airflow sensors. - Motor starters. - End switches. - Interlocks (electrical and mechanical) – add as sheet note where applicable. - Emergency power feed.

Include a copy of this checklist with the submitted set of smoke control diagrams.

Smoke Control Diagram Example -Typical Floor Plan

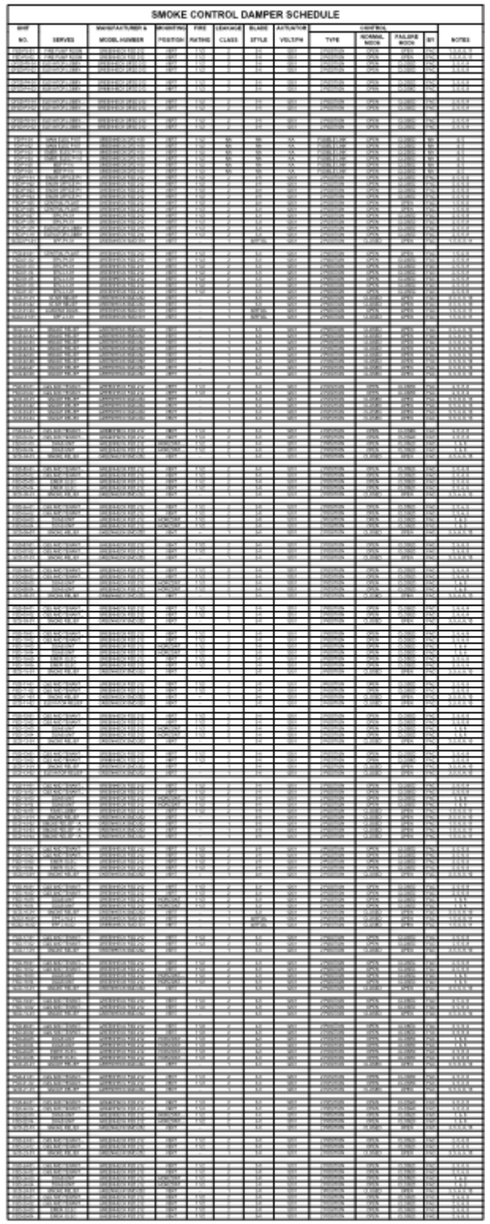


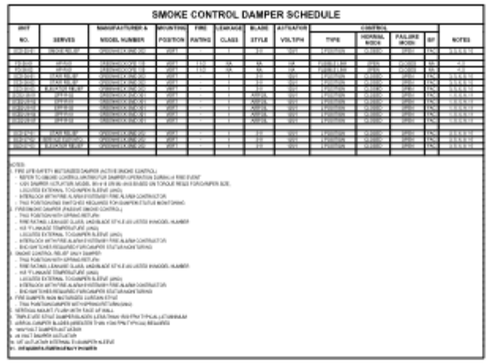
Smoke Control Diagram Example - Roof Plan



Smoke Control Diagrams Example

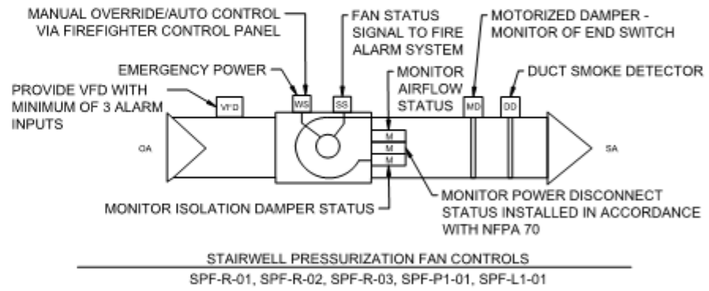
Smoke Control Fans Schedules, Damper Schedules, and Details


SMOKE CONTROL DAMPER SCHEDULE


SMOKE CONTROL DAMPER SCHEDULE

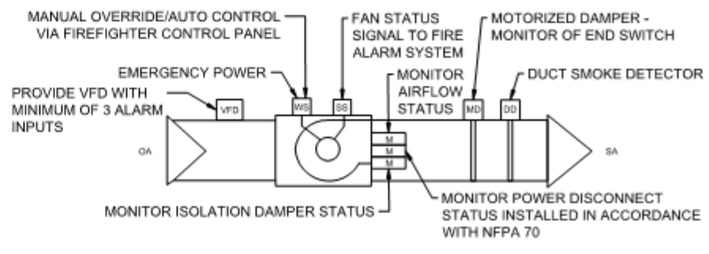

GARAGE FAN SCHEDULE


EMERGENCY FAN SCHEDULE



STAIRWELL PRESSURIZATION FAN CONTROLS

SPF-R-01, SPF-R-02, SPF-R-03, SPF-P1-01, SPF-L1-01



ELEVATOR PRESSURIZATION FAN CONTROLS

EPF-R-01, EPF-R-02, EPF-L16-01, EPF-L16-02

Smoke Control Diagram Example - Door Schedule

LL1																
P101A	STAIR 5	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW01	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	STAIRWAY DOOR. ADA ACCESSIBLE PANIC HARDWARE UL10C & UL305 PER IBC 1010.1.10. SELF-CLOSING PER IBC 716.5.9. S RATED UL 1784 PER IBC 710.5.2
P101B	STAIR 5 CORRIDOR	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW01	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBL SELF-CLOSING PER IBC 716.5.9
P101C	STAIR 5	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW01	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	STAIRWAY DOOR. ADA ACCESSIBLE PANIC HARDWARE UL10C & UL305 PER IBC 1010.1.10. SELF-CLOSING PER IBC 716.5.9. S RATED UL 1784 PER IBC 710.5.2
P102A	STAIR 6	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW01	90 MIN	HM	PT	1 & 4 / A9.56	6 / A9.56	4 / A9.57	STAIRWAY DOOR. ADA ACCESSIBL SELF-CLOSING PER IBC 716.5.9. S RATED UL 1784 PER IBC 710.5.2
P106A	CENTRAL PLANT	AA	6' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW10	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P106B	CENTRAL PLANT	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW06	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P107A	METER ELECTRICAL ROOM	AA	6' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW09	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P108	PSE XFORMER	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW11	180 MIN	HM	PT	2 / A9.56	3 / A9.56	4 / A9.57	SELF-CLOSING PER IBC 716.5.9
P109A	PSE XFORMER	AA	10' - 4"	10' - 4"	0' - 1 3/4"	HM	PT		HW12	180 MIN	HM	PT	2 / A9.56	3 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9. PROVIDE 1/2" MAX. UNDERCUT TO ALLOW WATER TO PASS THROUGH.
P109B	PSE XFORMER	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW13	180 MIN	HM	PT	2 / A9.56	3 / A9.56	4 / A9.57	SELF-CLOSING PER IBC 716.5.9.
P110A	EMERGENCY ELECTRICAL	AA	6' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW05	90 MIN	HM	PT	1 & 4 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P110B	PRESSURIZATION ELECTRICAL	AA	6' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW05	90 MIN	HM	PT	5/A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P111A	MPOE / MDF	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW02	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P112A	MPOE / MDF	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW02	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P113A	STORAGE	AA	6' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW03	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P115A	WATER SERVICE ENTRY	AA	5' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW10	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P116A	ELECT. CLOSET	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW02	90 MIN	HM	PT	1 & 4 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P118A	STORAGE	AA	5' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW10	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P118B	STORAGE	AA	5' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW10	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P124	FARS	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW03	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P126A	VESTIBULE	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW07	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P130A	ELEC. CLOSET	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW02	90 MIN	HM	PT	5/A9.56	6 / A9.56	4 / A9.57	
P130B	ELEC. CLOSET	AA	6' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW10	90 MIN	HM	PT	5/A9.56	6 / A9.56	4 / A9.57	
P137	LULA ELEV. MACHINE ROOM	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW03	90 MIN	HM	PT	5/A9.56	6/A9.56	4/A9.57	
LL2																
P201A	STAIR 5	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW01	90 MIN	HM	PT	1 & 4 / A9.56	6 / A9.56	4 / A9.57	STAIRWAY DOOR. SELF-CLOSING PER IBC 716.5.9. RATED UL 1784 PER IBC 710.5.2
P202A	STAIR 6	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW01	90 MIN	HM	PT	1 & 4 / A9.56	6 / A9.56	4 / A9.57	STAIRWAY DOOR. SELF-CLOSING PER IBC 716.5.9. RATED UL 1784 PER IBC 710.5.2
P205A	GENERATOR	AA	6' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW05	90 MIN	HM	PT	1 & 4 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBL SELF-CLOSING PER IBC 716.5.9
P205B	EMERGENCY GENERATOR	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW06	90 MIN	HM	PT	1 & 4 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBL SELF-CLOSING PER IBC 716.5.9
P206A	PSE CABLE VAULT	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW06	180 MIN	HM	PT	2 / A9.56	3 / A9.56	4 / A9.57	PANIC HARDWARE UL10C & UL305 PER IBC 1010.1.10. SELF-CLOSING PER IBC 716.5.9.
P207A	PSE CABLE VAULT	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW06	180 MIN	HM	PT	2 / A9.56	3 / A9.56	4 / A9.57	PANIC HARDWARE UL10C & UL305 PER IBC 1010.1.10. SELF-CLOSING PER IBC 716.5.9.
LL3																
P301A	STAIR 5	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW01	90 MIN	HM	PT	1 & 4 / A9.56	6 / A9.56	4 / A9.57	STAIRWAY DOOR. SELF-CLOSING PER IBC 716.5.9. RATED UL 1784 PER IBC 710.5.2
P302A	STAIR 6	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW01	90 MIN	HM	PT	1 & 4 / A9.56	6 / A9.56	4 / A9.57	STAIRWAY DOOR. SELF-CLOSING PER IBC 716.5.9. RATED UL 1784 PER IBC 710.5.2
LL4																
P401A	STAIR 5	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW01	90 MIN	HM	PT	1 & 4 / A9.56	6 / A9.56	4 / A9.57	STAIRWAY DOOR. SELF-CLOSING PER IBC 716.5.9. RATED UL 1784 PER IBC 710.5.2
P401B	STAIR 5	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW02	90 MIN	HM	PT	1 & 4 / A9.56	6 / A9.56	4 / A9.57	STAIRWAY DOOR. SELF-CLOSING PER IBC 716.5.9. RATED UL 1784 PER IBC 710.5.2
P402A	STAIR 6	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW01	90 MIN	HM	PT	1 & 4 / A9.56	6 / A9.56	4 / A9.57	STAIRWAY DOOR. SELF-CLOSING PER IBC 716.5.9. RATED UL 1784 PER IBC 710.5.2
P404A	ELEV. CONTROL ROOM	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW02	90 MIN	HM	PT	1 & 4 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P406A	CORRIDOR	A	3' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW03	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9
P406B	FIRE PUMP ROOM	A	4' - 0"	7' - 0"	0' - 1 3/4"	HM	PT		HW03	90 MIN	HM	PT	5 / A9.56	6 / A9.56	4 / A9.57	ADA ACCESSIBLE SELF-CLOSING PER IBC 716.5.9

NOTES:

NOTE 1: ALL STAIR AND ELEVATOR LOBBY DOORS WILL BE PROVIDED WITH ADJUSTABLE DOOR SWEEPS.

NOTE 2: MAGNETIC DOOR HOLD DEVICES SHALL BE PROVIDED FOR THE LOBBY DOORS SERVING THE FIRE SERVICE ACCESS ELEVATORS ON THE GROUND FLOOR. THESE DEVICES WILL NOT BE DE-ENERGIZED UP ACTIVATION OF A FIRE ALARM SIGNAL IN ACCORDANCE WITH SECTION 12.1 OF THE DETAILED SMOKE CONTROL REPORT.

Smoke Control Drawing Matrix Example

INPUT / OUTPUT	Annunciate Fire Alarm Signal at Fire Alarm Control Panel	Illuminate Applicable LED(s) on FSCP	Activate Fire Alarm Notification Appliances for phased evacuation in accordance with Bellevue Requirements .	Transmit Fire Alarm Signal to UL listed Central Station	Open Isolation Damper Associated with Stairway Barometric Relief Dampers: SCD-01-01, SCD-01-02, SCD-26-01, SCD-26-02, SCD-27-01 **(See Note 1)**	Start Garage Ventilation System to 100% of Capacity	Open Isolation Dampers and Start Loading Dock Exhaust Fan on Level 1: SCD-01-04 **(See Notes 1 and 3)**	Open Stair Pressurization Isolation Dampers and Start Stair Pressurization Fans: SPF-P1-01, SPF-L1-01, SPF-R-01, SPF-R-02, SPF-R-03, SCD2-P1-01, SCD2-01-01, SCD2-26-01, SCD2-26-04, SCD2-26-05 **(See Notes 1 and 3)**	Open Elevator Pressurization Isolation Dampers and Start Passenger Elevator Pressurization Fans: EPF-L16-01, EPF-L16-02, EPF-R-01, EPF-R-02, SCD2-16-01, SCD2-16-02, SCD2-26-02, SCD2-26-03 **(See Notes 1 and 3)**	Open Isolation Damper Associated with Elevator Barometric Relief Damper. SCD-11-02, SCD-13-02, SCD-26-03, SCD-27-03 **(See Note 1)**	Close FSD associated with FSAE Lobby on Level 14. FSD-14-05 **(See Note 10)**	De-energize DOAS Units on all floors and close associated Fire Smoke Dampers: FSD-04-03, FSD-04-04, FSD-06-03, FSD-06-04, FSD-08-03, FSD-08-04, FSD-10-03, FSD-10-04, FSD-12-03, FSD-12-04, FSD-14-03, FSD-14-04, FSD-16-03, FSD-16-04, FSD-18-03, FSD-18-04, FSD-20-03, FSD-20-04, FSD-22-03, FSD-22-04, FSD-24-03, FSD-24-04 **(See Note 9)**	Open Fire Service Elevator (FSAE S-1) Isolation Damper Associated with Holstway Relief Vent (See Note 1) SCD-27-02.	Open All Exterior Relief Motorized Dampers: SCD-02-01, SCD-02-02, SCD-02-03, SCD-02-04, SCD-02-05, SCD-02-06, SCD-02-07, SCD-02-08, SCD-03-01,SCD-03-02, SCD-03-03, SCD-03-04, SCD-04-01, SCD-05-01, SCD-06-01, SCD-07-01, SCD-08-01, SCD-09-01, SCD-10-01,SCD-11-01, SCD-12-01, SCD-13-01, SCD-14-01, SCD-14-02, SCD-14-03, SCD-14-04, SCD-15-01, SCD-16-01, SCD-17-01, SCD-18-01, SCD-19-01, SCD-20-01, SCD-21-01, SCD-22-01, SCD-23-01, SCD-24-01, SCD-25-01 **(See Notes 1 and 11)**	Close All Doors on Magnetic Hold Open Devices	De-energize Associated Fan	Annunciate Supervisory Condition on Fire Alarm Control Panel **(see Note 4)**	Close Associated Fire Smoke Damper(s)	Recall elevator to appropriate floor (primary or alternate floor of recall)	Annunciate Trouble Condition at Fire Alarm Control Panel	Annunciate Associated Fault LED Associated with Fan and/or Damper on Firefighters Smoke Control Panel	Transmit Supervisory Signal to UL listed Central Station	Release Door Locks (if proved)
Automatic Initiating Devices (See Note 8)																							
Activation of area spot-type smoke detector, heat detector, or sprinkler waterflow switch serving the Pavilion.	X	X	X	X	X			X															X
Activation of area spot-type smoke detector, heat detector, or sprinkler waterflow switch serving the parking garage.	X	X	X	X	X	X		X	X	X	X		X		X								X
Activation of area spot-type smoke detector, heat detector, or sprinkler waterflow switch serving Level 1, Level 1 Mezzanine, and Level 2 (aside from loading dock).	X	X	X	X				X	X	X	X		X		X								X
Activation of fire alarm initiating device serving the loading dock area.	X	X	X	X	X		X	X	X	X	X				X								X
Activation of area spot-type smoke detector, heat detector, or sprinkler waterflow switch serving Levels 3 through Level 25 and Roof.	X	X	X	X	X			X	X	X	X		X		X								X
Activation of elevator lobby smoke detector.	X	X	X	X	X			X	X	X	X[10]		X		X								X
Activation of duct-mounted smoke detector at stair pressurization fan, elevator pressurization fan or air handling unit **(See Notes 6 and 7).**		X														X	X				X	X	
Activation of smoke detectors at passive fire/smoke dampers.	X		X	X	X			X	X	X	X		X		X			X					X
Fire Fighters Graphic Control Panel																							
Motorized damper fails to open.																				X	X	X	
Loading Dock Exhaust Fans, Stair, and Elev. Pressurization fan airflow sensor does not sense airflow.																				X	X	X	
Activation of power disconnect required per NFPA 70 at pressurization and loading dock exhaust fans.																				X	X	X	
Fault signal received during weekly self test **(See Note 5)**.																		X			X	X	
Manual Controls at Firefighter's Smoke Control Panel **(see Note 4)**.		X			X	X	X	X	X	X	X		X		X	X	X					X	X

Note 1: All motorized dampers serving pressurization fans and loading dock exhaust fans, and all motorized dampers serving as relief dampers shall be monitored for status and fail in the open position.

Note 2: FACP shall be provided with printer to print all off normal statuses, including any faults during the weekly self-test.

Note 3: Fire alarm system shall be programmed with a maximum 20 second delay before starting fan to allow motorized damper to open.

Note 4: Fire Alarm Control Panel shall transmit a supervisory signal when Firefighter's Smoke Control Panel is disabled, manual switches for fans are used, or power downstream of the disconnect of the fans in the "OFF" position.

Note 5: Special Inspection agency shall initiate an alarm during the self-test and confirm self-test is aborted when an alarm is received.

Note 6: Activation of duct smoke detector associated with stair pressurization fan will de-energize the fan. Manual switch at FSCP shall override shutdown of fan.

Note 7: Activation of duct smoke detector associated with elevator pressurization fan will de-energize the fan. Manual switch at FSCP shall override shutdown of fan.

Note 8: See smoke control drawings for device identification numbers.

Note 9: All DOAS's (including associated FSDs) in the building shall be controlled by a single manual AUTO/OFF switch at the FSCP, and status indication shall be provided through a single set of LEDs showing AUTO and OFF status. FSDs associated with the DOAS must fail in the closed position.

Note 10: FSD-14-05 shall **open** upon activation of an initiating device causing an **alternate** elevator recall event. This FSD shall controlled by a manual OPEN/AUTO/CLOSED switch at the FSCP, and status indication through a single set of LEDs showing OPEN, AUTO, and OFF status.

APPENDIX C. FIREFIGHTER'S SMOKE CONTROL PANEL (FSCP)

The provided WSBC and WSFC section references within Appendix C reflect the 2015 Editions of the documents. It is the design professionals' responsibilities to ensure compliance with this document and any subsequent adopted editions of the WSBC or WSFC.

The FSCP provides visual status indication and manual overriding capability over smoke control systems and equipment. This is also referred to as the Firefighters' Smoke Control Station (FSCS) in NFPA 92. The purpose of the FSCP is for fire department use during an emergency. This panel shall be in accordance with WSBC Sections 909.12 and 909.16 and incorporate VFD requirements listed in this section.

A. Priority and Control. The FSCP shall have the highest priority control over all smoke control systems and equipment, whether or not the automatic fire alarm system has been activated. The panel shall be designed to enable Fire Department personnel who may be unfamiliar with the specific system the ability to reconfigure the status of each smoke zone as deemed necessary during an emergency.

B. Approval. The FSCP is not approved separately. Its features and functions are integral to the smoke control system and fire alarm system. Therefore, the panel layout must be included in the Fire Alarm Permit Submittal and Detailed Smoke Control Submittal. A full-scale color representation of the FSCP must be submitted to the Smoke Control Report author and subsequently to VFD for final approval prior to fabrication. Fire alarm submittals that add, alter or replace an existing FSCP must also include a full-size (1:1) color representation of the FSCP for review and approval.

C. Smoke Detector for Panel. As required by NFPA 72, when the FSCP is located in an area that is not continuously occupied, a smoke detector shall be provided within 15 feet of the panel (measured horizontally). This also applies to all remotely located panels.

D. Panel Colors. The FSCP shall consist of a white background and generally depict significant smoke barriers (i.e., floors, shaft walls, exterior walls) by single black lines, appearing as a general section view of the building. The image shall sufficiently illustrate all smoke zones in the building without providing the level of detail common to architectural elevation or section views.

   1. Air Flow. The indication and direction of air movement shall be shown with arrows of the following colors:
      a. Stair/elevator shaft pressurization supply air: BLUE
      b. Building zoned smoke control exhaust shafts: RED
      c. Building zoned smoke control supply air: GREEN

   2. Garage and Atria. Large smoke control zones, such as atria or interconnected garage levels, shall be color shaded. In general, garage zones shall be solid shaded in ORANGE, atria in PURPLE.

   3. Text. All text shall be on contrasting background with a minimum size and stroke equivalent to 12-point bold Sans Serif font (such as Helvetica). Marking pens and self-adhesive labels are not acceptable for identification.

E. Panel Indicators: Equipment and Status. The general location of each smoke control system component, including fans, ducts and dampers that is controlled by or indicated on the FSCP shall be depicted on the panel.

   1. Supply and Exhaust Equipment. Supply equipment shall be located on the right side and exhaust equipment located on the left side of the building image.

2. Fans, Ducts, Dampers, Stairs, Elevators. Fans, major ducts, dampers, stairwells, shafts, and zoning within the building that are portions of the smoke control system shall be shown connected to their respective ducts or dedicated fans with clear indication of direction of airflow.

3. Pressure Reducing Valves. Identification (Text "PRV") shall be provided to denote floors where standpipe hose connections are equipped with pressure-reducing valves (PRV's).

4. Door Unlocking Switch. A single switch shall be provided on the panel to unlock all locking stairway doors in accordance with WSBC Section 403.5.3, WSFC Section 508.1.5, and WSBC Section 1010.1.9.11 Exception 3. The switch shall be provided in the lower right corner of the panel and labeled AUTO/UNLOCKED.

5. Equipment Status Indicators. Indicators as required by WSBC Section 909.16.1 shall be provided for each individually monitored piece of equipment unless otherwise approved.
   a. Exception: Where specifically approved by VFD, such indicators may be combined to represent the cumulative condition of monitored components within a zone. For example, all fans that perform the same function (energize or de-energize) may be indicated with one set of lamps. All dampers and any monitored doors within a zone that perform the same function (open or close) may be indicated on an additional set of lamps.

6. Pump and Generator. The location and status (NORMAL/RUNNING/FAULT) of each fire pump and emergency generator shall be depicted on the panel. Lamps shall be WHITE/RED/YELLOW.

7. Dampers and Power-Operated Doors. Positive indication of OPEN/CLOSED/FAULT status is required for automatic control dampers, smoke dampers, combination fire/smoke dampers, and power-operated doors that are part of an active smoke control system. Fire/smoke dampers used for opening protection of passive smoke barriers or partitions are not required to be monitored or controlled by the FSCP.

8. Fans. Positive indication of ON/OFF/FAULT status is required for all fans that are part of a smoke control system.

9. Doors. Automatic-closing doors in smoke barriers which separate active/active or active/passive smoke control zones are required to be activated anytime the smoke control system is activated.

10. Smoke Detector and Waterflow Alarms. Each zone shall be provided with a red smoke detector alarm indicator labeled AREA SMOKE, CORRIDOR SMOKE, LOBBY SMOKE, etc. and will illuminate when the respective detector is in alarm. A red waterflow alarm indicator labeled WATERFLOW (initiated by automatic sprinkler protection waterflow). The appropriate indicator shall be illuminated upon initiation of the respective alarm in the zone. Where multiple zones exist on a floor, the zone of alarm shall be clearly depicted on the panel. If required for clarity, such alarm zones shall be shown in a plan view of the floor on the smoke control panel.

11. Duct Detectors. When duct detectors for pressurization or smoke control supply fans are provided, they shall have a single indication lamp near the fan/damper depiction. This shall be a yellow/amber lamp.

12. Additional Alarms. The panel shall be provided with a list in the upper right corner of the panel of all possible and potential initiating device categories as appropriate, including: AREA SMOKE, CORRIDOR SMOKE, LOBBY SMOKE, DUCT DETECTOR, WATERFLOW, SPECIAL SYSTEM, HEAT DETECTOR, MANUAL STATION, and POWER DISCONNECT. Each category shall be provided with a red indicator. The respective indicator is to be illuminated upon such an alarm event in the building.

13. System Normal Indicator. A single white indicator shall be provided and labeled "SYSTEM NORMAL." This indicator shall be illuminated at all times when monitored equipment is in normal (non-smoke control mode) status and all switches are in the Auto position. Illumination of this lamp shall be in addition to the indication of the status of each component.

14. Light Emitting Diodes (LED's). Where pilot type lamp indicators are required, LED's may be used.

F. Zone Controls. Switches utilized for floor zone control shall be located on the left side of the building image.

1. Control Functions. Control capability provided in accordance with WSBC Section 909.16.2 for each smoke zone shall be via a single three-position switch. When approved, superfluous positions may be eliminated if the smoke control system is not provided with such control in a zone.

2. Off. The OFF position shall automatically close/shut-down the components within a zone, isolating that zone from all adjacent smoke zones.

3. Auto. The AUTO position shall be configured in accordance with WSBC 909.16.3 (2).

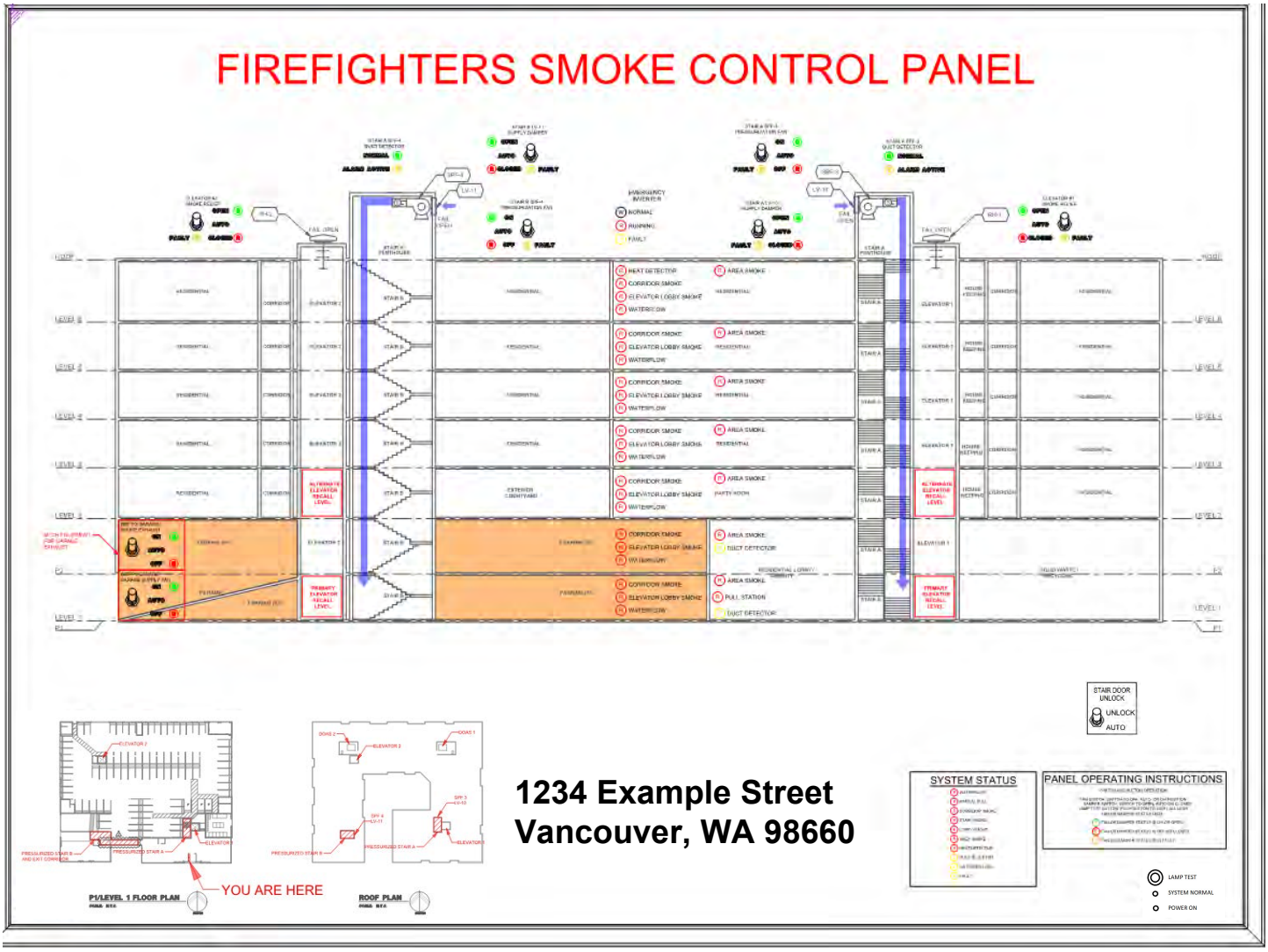
4. On. The ON position shall automatically posture the components within that zone to operate as required for that zone.

G. Garage Ventilation System. Where garage ventilation systems are provided, two three-position switches (ON / AUTO / OFF) shall be provided to operate the garage supply and exhaust fans for post-fire event mop-up operations (one switch for exhaust and one switch for supply). The garage ventilation system is not considered a smoke control system and need not comply with WSBC Section 909; the intent of the manual override operation is to provide smoke removal upon arrival of firefighting personnel.

H. Multiple Fans Operating in a Single Zone. Where multiple fans intended to operate simultaneously in smoke control mode serve a single smoke zone, a single switch shall be provided for simultaneous control of all associated fans. However, status indication of each individual fan unit is required.

I. Elevators. Every elevator hoistway that is designed as part of a fire service access elevator system shall be labeled "Fire Service Access Elevator" using vertical text. Every elevator hoistway that is designed as part of an occupancy evacuation elevator system shall be labeled "Occupant Evacuation Elevator" using vertical text.

Firefighter's Smoke Control Panel Example



APPENDIX D. TENANT IMPROVEMENTS

When the project work adds or modifies a space provided with a smoke control system, the modification could adversely impact the performance of the smoke control system. A Tenant Improvement Smoke Control Report must be submitted to VFD.

The Report must include the following for each tenant improvement:

A. Provide a floorplan of the tenant improvement areas showing existing conditions, including the following:

   1. Locations of existing smoke barriers/partitions
   2. Locations of fire walls/barriers/partitions
   3. Type and location of opening protection installed at each wall, barrier and partition.
   4. Location of existing fire alarm initiating devices to activate the smoke control system and actuate the opening protection at the walls/barriers/partitions.
   5. When the building has smoke control systems that may impact other smoke control systems serving the building, identify the means of mitigating the impact of such systems on other systems, especially as it pertains to the tenant improvement. This may be particularly relevant when elevator hoistway pressurization systems are utilized in the building.
   6. Identify locations of all existing smoke control fans and associated equipment.

B. Provide a separate floorplan for the new tenant improvement, identifying the following:

   1. Additions or removal of walls, barriers, or partitions and associated opening protection.
   2. Type and location of all new and relocated fire alarm initiating devices (distinguishing between the two).
   3. When the building utilizes elevator hoistway pressurization to protect the elevator opening and full-height walls are installed, identify the means of maintaining the original design intent of mitigating the impact of the other smoke control systems serving the building. If the existing design includes relieving the air by mechanical or exterior relief vents, identify the means of maintaining the relief airflow path. Include calculations as applicable.
   4. If new smoke control fans are provided, identify locations of all new smoke control fans and all other applicable components.
   5. Provide an updated detailed smoke control matrix for the entire building. The matrix should identify (by equipment-specific identification mark): all new smoke and motorized dampers associated with the smoke control system, and new smoke control fans that are required to operate during a smoke control event. All automatic dampers must be listed for their application in accordance with WSBC Section 909.10.4.
   6. Provide a Tenant Improvement Smoke Control Report, which incorporates a detailed narrative that references all applicable record documents describing the original smoke control system design. The proposed modification shall be detailed within the narrative, and when applicable, the narrative shall identify the potential impact the tenant improvement may have on the performance of the existing smoke control system, and the proposed means of mitigating the impact.
   7. Where the tenant improvement modifies or replaces smoke control zones, barriers, fire alarm initiating devices, or fan equipment, operational testing and performance testing of the affected zones is required. Performance tests shall demonstrate satisfactory performance of the elements of the affected smoke control zones. Operational tests of selected areas outside of the work zone will be required to confirm that programming

changes did not affect other zones. If variable frequency drive settings are modified, tests must be performed as required in the modified area and in adjacent areas served by previous fan speed to confirm proper pressure differentials.

Exception: Where the project work is limited to modifications within an existing smoke zone, operational testing only is required to demonstrate appropriate system responses based on alarm sequences initiated in affected zones, as well as system responses in the affected zones based on alarm sequences initiated in adjacent zones. Manual control of equipment in affected zones via the FSCP must also be verified.

In existing buildings with smoke control systems, documentation from a licensed Fire Protection Engineer will be required to accompany the permit documents identifying the smoke control system(s) within the building and any anticipated effects to those systems by the tenant improvement work.

APPENDIX E. SAMPLE SPECIAL INSPECTION AND TESTING DOCUMENTS

[Remaining page intentionally left blank]

Project Name - Smoke Control System Test Scenarios

Date: _____ **Revision #:** _____

System:		Referenced Design Document	
Test No:	Test Scenario # 1		
Title:	Activation of Smoke Detector or Waterflow Switch Level X		
Location:			
System Actions:	1. Initiation of Area Smoke Detector or Sprinkler Waterflow Switch Level X		

Event #	Device	DESCRIPTION OF TESTING EVENT									Action			Sign-off
											1			Contractor
		ANNUNCIATION												
1.	FACP and FSCP	Annunciate at the Fire Alarm Control Panel and Firefighters Smoke Control Panel												
		OUTPUT RESPONSE												
2.	Stair Press Fans	SPF-R-1	SPF-R-2								ENERGIZE			
3.	Elevator Press Fan	EPF-R-1									ENERGIZE			
4.	Exhaust Fan	SEF-R-1									ENERGIZE			
5.	Fan Isolation Damper	SD-R-1	SD-R-2	SD-R-3	SD-R-4						OPEN			
6.	Elevator Relief Damper	SD-R-5									OPEN			
7.	Smoke Damper	SD-3-5	SD-3-6	SD-3-18	SD-3-19	SD-3-20					OPEN			
8.	Smoke Damper	SD-3-1	SD-3-2	SD-3-3	SD-3-4	SD-3-7	SD-3-8	SD-3-9	SD-3-10	SD-3-XX	CLOSED			
9.	Fire/Smoke Damper	FSD-3-4									OPEN			
10.	Fire/Smoke Damper	FSD-3-1	FSD-3-2	FSD-3-3	FSD-3-5	FSD-3-6	FSD-3-7	FSD-3-8			CLOSED			
11.	All Other FSDs or SDs	FSD-PX-X	FSD-X-X	SD-PX-X	SD-X-X						CLOSED			
12.	Door Mag Hold-Open										RELEASE			

Notes / Comments:	1. The fire/smoke and smoke dampers will be force failed to the OPEN position and CLOSED position to verify the associated fault at the Firefighters Smoke Control Panel. The dampers shall be failed in a manner to prevent the damaging of the damper, ductwork, and/or fan(s). **THIS TEST SCENARIO DOCUMENT IS AN EXAMPLE DOCUMENT AND SHOULD BE REPRODUCED TO INCORPORATE EACH DISTINCT SMOKE CONTROL SYSTEM EVENT.**
TESTING ACCEPTANCE	**Date:**

Smoke Control System Daily Inspection Report

Project: _____

Inspector: _____

Date: _____

ITEMS/AREAS/SYSTEMS INSPECTED OR TESTED:	
Item	Description:
1	
2	

DEFICIENCIES NOTED:	
Item	Description:
1	
2	

CORRECTIONS MADE:	
Item	Description:
1	
2	

Inspector's Signature:

Non-Conformance Report # _____

To: _____ Date: _____

Author: _____ Permit # _____

Project: _____

Address: _____

CODE REFERENCE:

ISSUE DESCRIPTION:

Inspector: _____ Date: _____

Contractor: _____ Date: _____

CORRECTIONS MADE:

Inspector Name: _____

Reinspection Date: _____ Closure Date: _____

Inspector: _____ Date: _____

Contractor: _____ Date: _____

Smoke Control Initiating Device Inspection Summary

Project:	**Permit #:**	**Device Types**	PD- Projected Beam Detector DD –Duct Mounted Smoke Detector ID – Zero Velocity Smoke Detector AD – Area Smoke Detector WF – Automatic Fire Sprinkler Flow Switch AS – Air Sampling System (VESDA) PS – Pull Station
Address:	**Updated:**		
Inspector(s):	**Signature:**		

Device Type	FACP Device Description	Device Address	Smoke Zone	Manufacturer	Model #	UL Listing #	Correct Annunciation	System Functioned per Approved Documents	Inspector	Date of Inspection

Smoke and Combination Fire Smoke Damper Inspection Summary

Project	**Permit #**	**Damper Types**	FSD – Combination Fire/Smoke Damper SD – Smoke Damper CD – Control Damper MD– Motorized Isolation Damper
Address	**Updated**		
Inspector(s)	**Signature**		

Damper Identification	Physical Location	Associated System	Manufacturer	Model	Location on Approved Plans	UL 555S Listing #	Fusible Link Temp °F	Damper Type	Access Panel Installed	Damper Mounted in Direction of Arrow	Correct Automatic Operation	Correct Manual Open Operation from FSCP	Correct Open End Switch Status to FSCP	Correct Manual Close Operation from FSCP	Correct Closed End Switch Status to FSCP	Full Range of Motion	Failsafe on Power Loss	Configuration and Status Feedback within Approved Time	Permanent Label Installed