STANDARD TITLE		STANDARD NUMBER
SMOKE CONTROL PERIODIC TESTING		**C-2**
EFFECTIVE DATE: **01/01/2025**	REVISION DATE:	

I. PURPOSE

The purpose of this standard is to provide clarification of requirements for a periodic testing and maintenance program to ensure that smoke control and mechanical smoke removal systems are operating in accordance with the applicable codes, standards, and design under which they were commissioned. Refer to City of San Diego Technical Bulletin BLDG-9-1 for design and testing requirements of new smoke control systems.

II. SCOPE

All existing buildings or structures with smoke control or mechanical smoke removal systems (collectively referred to as systems) under the jurisdiction of the San Diego Fire-Rescue Department.

III. DEFINITIONS

Smoke Control: The containment and/or management of smoke and heat produced by a fire within a building or structure. Smoke Control systems will utilize Active and/or Passive methods to maintain a smokefree environment within a given building space, or to prevent smoke and heat from migrating from the area of fire origin, or to exhaust smoke from the building.

Smoke Control, Dedicated Systems: Dedicated smoke control systems and components that are installed for the sole purpose of providing smoke control and that upon activation of the systems operate specifically to perform the smoke control function.

Smoke Control, Non-Dedicated Systems: Non-dedicated systems share system components with some other building system(s) such as the building HVAC system. Activation causes the system to change its mode of operation to achieve the smoke control objectives.

Mechanical Smoke Removal: The removal of smoke and heat produced by a fire within a building or structure to the exterior of the building or structure utilizing mechanical exhaust methods. Referred to simply as smoke removal throughout the remainder of this Standard.

Special Inspector (SI): A qualified person employed or retained by an approved agency and approved by the building official as having the competence necessary to inspect a particular type of construction requiring special inspection.

Special Inspection Agency (SIA): A combination of persons, agencies, or firms meeting the qualifications for smoke control testing including expertise in fire protection engineering, mechanical engineering, and certification as air balancers.

Recertification Testing: Testing required when original design documentation is not available or established testing of the smoke control or smoke removal system has exceeded the time duration between inspection, testing, and maintenance intervals required by the applicable codes. Recertification testing typically requires 100% testing of the system equipment and components and requires that a test plan be prepared and approved.

IV. RECORDS AND REPORTS

A. Written Maintenance and Testing Program: As required during original commissioning of a building, a building shall not be issued a certificate of occupancy until the San Diego Fire-Rescue Department has received satisfactory instruction on the operation, both automatic and manual, of the system, and a written maintenance and operational testing program complying with the requirements of CFC Sections 909.22.1 or 910.5.2 has been submitted and approved by the San Diego Fire-Rescue Department. If a current maintenance program for the system has not been provided, one will be required to be submitted to the San Diego Fire-Rescue Department as part of the smoke control periodic testing.

B. Operations Manual: An approved operations manual describing the complete operations of the system and functioning of the firefighter's smoke control panel (when provided) shall be maintained at the Fire Command Center or other approved location.

C. Test Records: Records of system testing and maintenance shall be maintained on site in the fire command center or in an approved location. The record shall include the date of the maintenance, identification of the servicing personnel and notification of any unsatisfactory condition and the corrective action taken, including parts replaced.

D. Record Submission: Results of all required testing must be submitted via The Compliance Engine (AKA TCE) to ensure maintenance and testing is being completed at the established frequencies. A copy of the test plan must be submitted with the report documenting the testing.

E. Deficiencies: Any deficiencies noted during the testing that are not corrected prior to the end of testing are required to be documented in a smoke control testing report and shall be submitted to the owner in writing and corrected as soon as possible. A copy of the document is required to be kept on site and uploaded to TCE within 10 business days.

F. Impairments: In accordance with CFC Section 901.7, impairments to the system that pose a risk for life safety must be reported to the San Diego Fire-Rescue Department immediately, following the procedures outlined within FPB Policy D-15-4.

G. Basis of Design: When a smoke control rational analysis report, smoke control special inspection report, manual for the smoke control or smoke removal system, or the records of the smoke control design is not available, a smoke control basis of design shall be prepared. The smoke control basis of design shall include the following information:

1. System description.
2. Summary of applicable codes of record, applicable standards, and local AHJ requirements.
3. System performance requirements.
4. System sequence of operations.
5. System periodic testing requirements.
6. System periodic test plan in accordance with Section V. D. of this Standard.

H. Qualifications: A smoke control basis of design is required to be prepared by a qualified licensed professional with expertise in smoke control design and installation. The smoke control basis of design shall be submitted to the San Diego Fire-Rescue Department for approval.

V. ROUTINE MAINTENANCE AND PERIODIC TESTING

A. Maintenance: Systems shall be maintained to ensure to a reasonable degree that the system is capable of controlling and/or removing smoke for the duration required. The system must be maintained in accordance with the manufacturer's instructions and CFC Sections 909.22 and 910.5.2.

B. Periodic Testing Program: A routine maintenance and periodic testing program shall be initiated immediately after the system has passed the acceptance tests. A written schedule for routine maintenance and periodic testing shall be established.
Periodic testing of the smoke control or smoke removal system shall include all equipment such as initiating devices, fans, dampers, controls, doors and windows.

C. Frequency: Systems shall be tested at the following frequencies:

1. Dedicated systems shall be operated for each control sequence semiannually (CFC Section 909.22.4). The system is required to be tested under standby power conditions at each testing cycle.

2. Non-dedicated systems shall be operated for each control annually (CFC Section 909.22.5). The system is required to be tested under standby power conditions at each testing cycle.
3. Periodic testing may also be based on a frequency documented in a smoke control periodic test plan that has been approved by the City of San Diego Fire Department.

D. Periodic Test Plan: When a smoke control test plan or a written maintenance program for the smoke control or smoke removal system is not available, a smoke control or smoke removal periodic test plan shall be prepared.

1. The test plan for new and existing systems shall include the following information:

   a. System performance requirements that outline the following, as applicable:
      i. Active Smoke Control Zones.
      ii. Passive Floor Zones.
      iii. Smokeproof Enclosures.
      iv. Stair Pressurization.
      v. Atrium, mall, and other large volume smoke control systems.
      vi. Mechanical Smoke Removal.
   b. Inspection requirements including:
      i. Visual inspections.
      ii. Function Inspections.
      iii. Testing Scenarios and sequences.
   c. Equipment testing, as applicable:
      i. Fans and control equipment.
      ii. Equipment associated with make-up air: louvers, doors, windows, etc.
      iii. Firefighter's Smoke Control Panel.
      iv. Conditions and frequency of equipment on normal and standby power.
      v. Fire smoke dampers.
      vi. Powered door operators.
   d. Testing frequency.
   e. If recertification of the system is required.

2. The test plan may be used to propose a cumulative testing approach that requires a portion of the system to be tested at the frequencies prescribed for dedicated and non-dedicated systems resulting in the entire system being tested every 1-4 years based on approval of the test cycle.

   a. Before cumulative testing can occur, recertification testing (100% testing) of the smoke control or smoke removal system will be required for systems that have not been tested at the established frequencies.
   b. The cumulative testing approach is required to include base line testing which must be completed at least annually and at a minimum include the following:

i. Manual control and status indication on the firefighter's smoke control panel.
ii. 25% of the smoke control initiation devices.
iii. 25% of the performance data points.
iv. Visual inspection of the smoke control equipment during operation
v. Confirmation of no troubles, faults, or supervisory alarms on the fire alarm system controlling the smoke control system.

c. **Example cumulative testing approach – Smoke Control System:** shall test at least 25% of the smoke control system components annually. Cumulative testing shall result in a 100% of the system being tested every 4 years. Testing of the system on standby power testing will occur at least once every four years.
d. **Example cumulative testing approach – Mechanical Smoke Removal System:** Shall test at least 50% of the smoke removal system annually. Cumulative testing shall result in a 100% of the system being tested every 2 years. Testing of the system on standby power testing will occur at least once every two years.

Note: Approval of a test cycle (time required for 100% testing) will be determined based on the size of the building and complexity of the system. Highrise buildings with stairwell and floor pressurization systems may be approved for a maximum 4 -year test cycle. Mechanical smoke removal systems will generally need to complete 100% testing annually or every two years where approved.

E. Qualifications: Smoke control periodic test plans are required to be prepared by a qualified licensed professional with expertise in smoke control design and installation. The smoke control periodic test plan shall be submitted to the San Diego Fire-Rescue Department for approval.

F. Performance Testing

1. Periodic testing shall determine the airflow quantities and the pressure differences at the following locations (NFPA 92 Section 8.6.3):

   a. Across smoke barrier openings.
   b. At the air makeup supplies.
   c. At smoke exhaust equipment.
   d. At locations required by the approved smoke control periodic test plan.

2. All data points shall coincide with the acceptance test location to facilitate comparison measurements (NFPA 92 Section 8.6.4).
3. The smoke control system shall be operated for each sequence in the current design criteria (NFPA 92 Section 8.6.5.3).

4. Testing requirements for the floor passive smoke control zones. As part of the periodic test plan, the proposed frequency and approach for inspecting and testing a building with passive smoke control zones must be included. The periodic test plan will need to include the following for passive smoke control zones at the minimum frequency:

    a. Visual inspections of at least 25% of the smoke barriers with 100% of the smoke barriers visually inspected every 4 years.
    b. Functional testing of smoke barrier opening protection and HVAC Sequencing:
        i. Doors on magnetic hold opens – annually.
        ii. Fire smoke dampers and smoke dampers – visually confirm at least 25% of the fire smoke dampers and smoke dampers properly actuate with 100% of the fire smoke dampers and smoke dampers confirmed to properly actuate every 4 years.
        iii. HVAC required to shut down during smoke control activation. Verify shutdown of at least 50% of the HVAC units properly shutdown annually with verification of all of the units shutdown every 2 years.
    c. Smoke barrier leakage testing.
        i. Group R occupancies – test 20% of the corridors within a four-year period. Same corridors cannot be retested until 100% of corridors have been tested.
        ii. Group B occupancies - test 40% of the floors within a four-year period. Same floors cannot be retested until 100% of floors have been tested. Floors that have undergone recent tenant improvements may be prioritized.
        iii. Other occupancies – approved on a case-by-case basis.
5. Where testing of initiating or other devices would result in the repeated start and stop of large fans, such systems 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. Any disabled equipment shall be restored to normal operation and demonstrated at the conclusion of the testing period.
6. Forces to unlatch and open doors shall meet the requirements of CFC Section 1010.1.3, CBC Section 1133B.2.5, or if otherwise dictated by the approved smoke control test plan.

G. Weekly Self-Test

1. As part of the periodic testing, the weekly self-test, if required, shall be verified to function as required.
2. Automatic weekly self-tests must be conducted and documented for smoke control systems (CBC Section 909.12.1). A preprogrammed weekly test sequence shall report abnormal conditions audibly, visually, or by printed report. Copies of this report shall be kept in a binder and available for review by the fire code official.
3. Weekly tests must include end-to-end verification. The fire alarm or smoke control panel shall exercise system components once per week and receive positive confirmation

that the component operated properly. The duration of the self-test shall be adequate to allow the system to detect a fault condition in the event an affected system component did not function properly.

4. For fans, the self-test typically involves turning on the fan just long enough to bring them up to speed and receive positive confirmation of airflow within the intent of the design.
5. For dampers, the self- test typically involves cycling the damper into both the open and closed positions and receiving positive confirmation of each position via limit or proximity switches.
6. Other automatic openings with required position monitoring not otherwise bypassed for weekly self-test.

H. Periodic Testing Qualifications

1. Shall be performed by a qualified SI.

VI. SYSTEM RECERTIFICATION

A. When Required: Smoke control systems shall comply with the design under which the system was commissioned. Where sufficient documentation is lacking, the owner shall contract with a licensed competent design professional to provide a basis of design detailing the system design and recertify the system in accordance with the following: Smoke control or smoke removal systems that do not have an established periodic testing program may require a recertification of the smoke control or smoke removal system. Recertification testing will be at the discretion of the fire official and required when:

1. The periodic testing has lapsed and exceeds the required test frequency duration as required by CFC Section 909.22, 910.5.2 or approved test plan.
2. The original commissioning documentation is not available.
3. A smoke control or smoke removal system is replaced or changed (i.e. active to passive conversion), or a substantial remodel of the structure warrants recertification of the smoke control or smoke removal system.
4. Control of the smoke control or smoke removal system is moved from a building management system to the fire alarm system.
5. Fire alarm control panel is upgraded or replaced, or programming is substantially changed.

B. Recertification Requirements: Smoke control or smoke removal system recertification requires the following:

1. Testing shall be completed within a timeframe approved by the fire code official.
2. Testing shall be performed by a qualified SI.
3. Shall test 100% of the system.
4. Smoke control basis of design in accordance with Section IV. G. of this Standard.

VII. SPECIAL INSPECTOR QUALIFICATIONS

A. Qualified SI or SIA: Each building's smoke control system functions differently. Therefore, the testing plans must be implemented by a qualified SI or SIA who is familiar with the proper operation of the smoke control system and equipment for the building.

1. Experience or training shall be considered to be relevant where the documented experience or training is related in complexity to the same type of special inspection or testing activities for projects of similar complexity and material qualities.
2. The registered design professional in responsible charge and engineers of record involved in the design of the project are permitted to act as the approved agency and their personnel are permitted to act as special inspectors for the work designed by them, provided they qualify as special inspectors.
3. An SI that is qualified to recertify or test any smoke control or smoke removal system shall be a person meeting one of the following requirements and providing the required documentation:

    a. Copy of California Registration as a Professional Engineer with demonstrated expertise in the fire protection, mechanical, and electrical aspects of smoke control and removal systems.
    b. Detailed explanation of experience with an engineered smoke control system utilizing a "UBC Section 905 or CBC Section 909" smoke control system and is actively overseen by a person that meets the requirements in Item a. Testing documentation provided will be required to be reviewed and signed by a person meeting Item a.
    c. Detailed explanation of experience with an engineered smoke removal system utilizing a "CBC Section 910" smoke removal system. Testing documentation provided will be required to be reviewed and signed by a person knowledgeable in the operation, testing, and maintenance of the systems.

Proper documents verifying that a qualified SI is implementing the smoke control periodic test plan may be requested by the San Diego Fire-Rescue Department.