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## TESTING REQUIREMENTS FOR SMOKE CONTROL SYSTEMS IN NEW BUILDINGS

### I. INTRODUCTION

This Information Bulletin outlines the new streamlined process for inspection of smoke control systems by the City of Los Angeles and is intended to reduce the inspection time, enhance communication among all parties involved, and expedite the occupancy of the buildings.

### II. GENERAL

#### 1) Scope of Testing

Smoke control systems subject to the provisions of Section 909 of Los Angeles Building Code (LABC) shall undergo special inspections and tests sufficient to verify that the smoke control system functions as intended in its final installed condition. Continuous inspections conducted by a City of Los Angeles certified Deputy Inspector is required during the installation of ductwork and prior to concealment so that duct leakage testing can be performed and reviewed.

#### 2) Smoke Control Design and Testing Declaration Form (SC-1)

To insure that all parties involved are aware of the impact of the smoke control system design on their scope of work, form SC-1 (attached) shall be completed and filed with the Los Angeles Department of Building and Safety (LADBS) Mechanical Plan Check before the mechanical plans are approved.

#### 3) Smoke Control testing and Approval Acknowledgement Form (SC-2)

Form SC-2 (attached) shall be completed, signed and submitted by the building owner or the owner's representative to LADBS Mechanical Plan Check before the mechanical plans are approved. A copy of the signed declaration shall be provided to the LADBS Electrical inspector at the time of power release.

#### 4) Testing Plan (SC-3)

A detailed testing schedule shall be submitted to the LADBS Mechanical Inspection and the Los Angeles Fire Department (LAFD) Development Services Inspection for approval prior to final acceptance of the testing procedure. The testing schedule shall include all applicable smoke control sequences. (See form SC-3 for a sample test schedule)

#### 5) Testing Procedure and Initial Test Report

The smoke control testing procedure and the initial test report shall be submitted to LADBS mechanical inspection and LAFD Development Services Inspection for review before smoke control inspections are performed. Any deviation must be approved by both departments.

### III. PASSIVE BARRIERS VERIFICATION

#### 1) Inspections. All passive barriers shall be inspected at various times during the building construction.

The passive barriers shall be identified per section 703.7 of LABC and inspections shall include ductwork, floor/exterior wall joints, passive dampers, penetration fire stopping assemblies, and door assemblies (rating, closer device, "S"-rating, etc.)

#### 2) Ductwork. Ducts shall be leak tested to 1.5 times the maximum design pressure in accordance with nationally accepted practices such as those established by the Association of Air Balance Council. The measured leakage shall not exceed 5% of the design flow. Long runs of ductwork that exceeds the capability of available leakage

testing apparatus may be tested in shorter segments. Allowable leakage shall be based on the maximum airflow in the section of ductwork being tested.

- 3) **Dampers.** Dampers shall be listed and installed in accordance with the approved building and mechanical plans. Full range of movement and installation of the dampers shall comply with the requirements of the Los Angeles Mechanical Code.
- 4) **Passive Zone Testing.** A minimum of 10% of all spaces passively protected shall be tested. A representative distribution of spaces and locations within the building shall be selected by LADBS Mechanical Inspection and LAFD Development Services Inspection in order to verify that the passive barriers were constructed properly. The results shall be documented in the final Deputy Inspection report and shall be compared to the leakage values that were used in the modeling for the rational analysis.

#### IV. SYSTEM VERIFICATION

##### 1) SMOKE CONTROL EQUIPMENT

- a) Smoke control equipment including, but not limited to, fans, ducts, automatic dampers and balance dampers shall be suitable for their intended use and probable exposure temperatures. (LABC section 909.10).
- b) All devices used shall be identified and marked in accordance with the requirements of LABC section 909.18.9. The identification and marking shall include the date of the last successful testing.
- c) Belt-driven fans shall have at least 1.5 times the number of belts required for the design duty with the minimum number of belts being two. Data sheets shall be provided to specify the number of fan belts required by LABC.
- d) Fan motors shall not operate beyond their nameplate horsepower as determined from the measurement of the actual current draw or KW meter. Motor driven fans shall have a minimum service factor of 1.15 (LABC section 909.10.5)
- e) Fans shall be examined for correct rotation. Measurements of voltage, current (amperage), rotational speed in RPM, and belt tension shall be made.
- f) The airflow sensors (current or pressure differential) shall be installed properly.
- g) The fans are monitored downstream of all disconnects. If the fan has a Hand-Auto-Off switch at the fan, the switch shall either be removed or locked with a chain and padlock.
- h) Hand-Auto-Off switches or controls provided for smoke control fans shall be removed, programmed, wired or locked in order for the switches or controls not to override the operation of the smoke control system. Only the OFF condition shall de-energize the smoke control equipment while providing a fault status as required by LABC Section 909.
- i) When fan belts are removed, the fire fighter's smoke control panel shall indicate a fault light (Yellow) for the fan and the zone when the fan is set into smoke control mode.
- j) Verify the presence of power downstream of all disconnects, the fire fighter's control panel shall show a (yellow) fault light when the power is not present for equipment that is required to be OPEN or ON.
- k) Verify that the Combination Smoke and Fire Damper (CSFD) has two end switches, one switch providing positive status when open and one switch showing positive status when closed. The fire fighter's control panel shall show a (yellow) fault light when the CSFD is not in its required position.
- l) Permanent installation of tubing to check pressures shall be required. This tubing shall be used for acceptance testing and is needed each year for LAFD required Chief's Regulation #4 testing.

- 2) **Inlets and Outlets.** The airflow from the inlet/outlet points for the smoke control system shall be measured using generally accepted practices. Inlets and outlets shall be permanently fixed in place if within the air stream of the smoke control system to prevent tampering of the required airflows.



**3) Pressures and Door Opening Forces**

- a) A minimum pressure differential of 0.05 inch water gage shall be verified between the active zone of alarm and all adjacent zones including from the active zone to adjacent smoke proof enclosures and from the smoke proof enclosures to the stairwell.
- b) All design pressure differentials shall be verified and the stairwell relief shall be verified to exhaust a minimum of 2500 CFM.
- c) The maximum allowable door opening force shall be verified for all doors in the exit path of travel.
- d) All adjustable louvers and balancing dampers shall be permanently secured in place.
- e) Pressure differentials and maximum opening force shall be measured for all scenarios. All potential smoke control scenarios shall be tested and documented such as simultaneous activation of the smoke proof enclosures and atrium exhaust, smoke proof enclosure and pressure differential between adjacent floors, smoke proof enclosure and corridor exhaust.
- f) The smoke control system shall be tested under normal power and emergency power for no less than 20 minutes.
- g) The standby power source and its transfer switches shall be in a room separate from the normal power transformers and switch gears and the room shall be directly ventilated to and from the building exterior (LABC 909.11).
- h) When power assist doors are used, they shall be on emergency power. Any manual control that may override the Firefighter Smoke Control Panel shall be removed.

**4) Control Verification.**

All fire alarm initiating devices shall be tested for all scenarios including the following:

- a) All detection devices that are specified by the Sequence of Operations to activate a smoke control system shall be tested by the Deputy Inspector. Proper configuration of the smoke control system shall be confirmed for all detection devices.
- b) Verify that there is positive confirmation of actuation, testing and manual override at the Fire-fighter's smoke control panel for all monitored fans, dampers, doors, etc.
- c) Verify that there is presence of power downstream of all disconnects.
- d) Verify that all panels that rely on volatile memories have uninterruptible power supplies (UPS) that will span up to 20 minutes of primary power interruption. UPS shall be listed for life/safety systems.
- e) Smoke control programming shall be verified to ensure override functions of building automation systems such as garage fans activated by CO detectors.

**V. FINAL SMOKE CONTROL DEPUTY INSPECTION REPORT**

A copy of the final Smoke Control Deputy Inspection report shall be provided to LADBS Mechanical Inspection and an identical copy shall be provided to the LAFD Development Services Section and Mechanical Plan Check upon the completion of testing. The final Smoke Control Deputy Inspection report shall contain the following:

- 1) A copy of the approved smoke control and rational analysis report.
- 2) Documentation of each specific item inspected and tested including dampers, doors, detection devices, etc.
- 3) Final Air Balance reports documenting all fans tested and each inlet/outlet.



- 4) Duct leakage testing reports.
- 5) Narrative detailing any modifications to the original smoke control design made during testing.
- 6) The entire report shall be reviewed by the responsible registered design professional. Once the report is acceptable, the responsible registered design professional shall seal, sign and date the report.

**VI. LADBS AND LOS ANGELES FIRE DEPARTMENT TESTING**

The following table shows the percentage of testing that shall be witnessed by LADBS and LAFD inspectors.

TEST TYPE	LADBS	LAFD
Duct Leakage	0 %	0 %
Combination Smoke & Fire Dampers (CSFD)	25 %	25 %
Firefighter Smoke Control Panel & Mechanical Test Panel Programming	100 %	100 %
Fire Alarm Testing	0 %	100 %
Door Fan Testing	10 % of passive zones	10 % of passive zones
E-Power Verification & Fans	All Devices	All Devices
Pressure and Door Forces	All Doors	All Doors
Exhaust Method Verification	All Systems	All Systems
Air Flow Method Verification	All Systems	All Systems

NOTES

- 1) Re-programing the Smoke Control System will void previous testing and may trigger additional testing.
- 2) Five additional combination smoke & fire dampers shall be tested for every test failure.
- 3) Additional testing shall be required for each door fan test failure



**[FORM SC-1]**  
**SMOKE CONTROL DESIGN AND TESTING DECLARATION FORM**  
 (To be submitted to Mechanical Plan Check)

Project Address: \_\_\_\_\_ Permit Application Number: \_\_\_\_\_  
 Plan Check Number: \_\_\_\_\_ Ref. Rational Analysis Developed By : \_\_\_\_\_  
 Rational Analysis Revision Date: \_\_\_\_\_

By signing this document, I declare that I have reviewed the smoke control plans showing the smoke control zones. I also declare that I have read the Rational Analysis and I am fully aware how the design and testing of the smoke control system affect my scope of work on this project.

<b>Responsibility</b>	<b>Name (type or print)</b>	<b>Company Name</b>	<b>Telephone No.</b>	<b>Signature</b>	<b>Date Signed</b>
Architect of Record	-----	-----	-----	-----	-----
Mechanical Engineer of Record	-----	-----	-----	-----	-----
Smoke Control Designer	-----	-----	-----	-----	-----
Fire Sprinkler Designer	-----	-----	-----	-----	-----
Smoke Control Testing Agent	-----	-----	-----	-----	-----
Fire Protection Contractor	-----	-----	-----	-----	-----
Mechanical Contractor (if selected)	-----	-----	-----	-----	-----
Fire alarm Designer/Contractor	-----	-----	-----	-----	-----
Building Automation Contractor (if selected)	-----	-----	-----	-----	-----
Electrical Engineer of Record	-----	-----	-----	-----	-----



[FORM SC-2]



**Smoke Control Testing and Approval Acknowledgement**

(To be submitted during plan check and with power release request)

Date: \_\_\_\_\_

Project Address: \_\_\_\_\_

Permit Application Number: \_\_\_\_\_

Smoke Control Deputy Inspector Name: \_\_\_\_\_ License # \_\_\_\_\_

The undersigned hereby certify that I am the owner or the owner representative of the property located at the address listed above and I acknowledge that the smoke control system shall be tested and approved by LADBS and Fire Department prior to issuing the Temporary Certificate of Occupancy (TCO).

\_\_\_\_\_  
Name

\_\_\_\_\_  
Signature

- Owner
- Owner's Representative

# SMOKE CONTROL TESTING CHECKLIST

## [FORM SC-3]

(To be submitted by an LADBS Certified Deputy Inspector to LAFD and LADBS Mechanical Inspection)

Project Address: \_\_\_\_\_

Permit Application number: \_\_\_\_\_

Item #	Task	Description	Due Date	Completion Date	Comments
1	Duct Leakage Testing	Verify duct work and conduct leakage and pressure tests.			
2	Meeting with AHJ	Meet with Fire Dept. and Mechanical Inspection to review the Fire Control Panel and Mechanical Test Panel and all other issues related to the smoke control system.			
3	Construct the fire control and test panels.	Fabricate the panels (3-5 weeks).			
4	Damper inspections	Inspect all dampers that are part of the smoke control system			
5	Programming Test	Verify the programming of all dampers and smoke control equipment.			
6	Verification of fault of monitored equipment	Check if the correct status is displayed for all dampers and smoke control equipment annunciated on the fire control and test panels.			
7	Alarm Sequencing Test	Test the initiating devices and verify that the panels are receiving the correct signals.			
8	Door Testing	Verify the pressure on the doors, fan CFM and emergency power			
9	Reports	Generate the smoke control test report and the air balance report and submit to the mechanical engineer of record for review and approval.			
10	Submit Report to AHJ	Submit the final test and air balance report to the Fire Dept. and to Mechanical Inspection			