CLARK COUNTY DEPARTMENT OF BUILDING & FIRE PREVENTION

4701 W. Russell Road • Las Vegas, NV 89118
(702) 455-3000 • Fax (702) 221-0630

Ronald L. Lynn, Director/Building & Fire Official
Samuel D. Palmer, P.E., Assistant Director • Girard W. Page, Fire Marshal

SUBJECT: TG-60-IBC-2006 edition: SMOKE-CONTROL and Related Topics

1.0 PURPOSE: This guideline establishes responsibilities for submittals, document review, and installation verification, testing and reporting.

2.0 SCOPE: This guideline is applicable to the 2006 International Building Code as amended. This document is intended to provide detail necessary for those submitting plans and reporting documents on what is expected to comply with various code provisions.

3.0 ABBREVIATIONS & ACRONYMS:

AABC: Associated Air Balance Council

CCBAC: Clark County Building Administrative Code

CCDB: Clark County Department of Building

CCFD: Clark County Fire Department

FPR: Fire Protection Report

IBC: International Building Code

MQAA: Mechanical Quality Assurance Agency **NEBB:**

National Environmental Balancing Bureau

NFPA: National Fire Protection Association

NRS: Nevada Revised Statutes

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Revised By:	Concurred By:	Approved By:
/s/	/s/	/s/
Nolan Baker, E.I.T, ET Associate Engineer	Jim Arnold Associate Engineer	Theodore L. Droessler, P.E. Manager of Engineering

QAA: Quality Assurance Agency

SNA-IBC: Southern Nevada Amendments to the International Building Code

TG: Technical Guideline

TRG: Technical Reporting Guideline

4.0 DEFINITIONS: For the purposes of this technical guideline certain terms, phrases, words and their derivatives shall be construed as specified in this section, the International Building Code (IBC) and the Clark County Building Administrative Code (CCBAC).

Activation Zone. The smoke-control zone that initiated a smoke-control mode.

Active Subzone. A mechanical smoke-control zone within a smoke-control zone.

Dedicated Systems. Smoke-control systems that are installed for the sole purpose of providing smoke-control. They are separate systems of air-moving and distribution equipment that do not function under normal building operating conditions. Upon activation, these systems operate specifically to perform the smoke-control function.

Fire Command Center. A room with emergency equipment capable of supporting fire department operations and containing the firefighter's smoke control panel, the fire alarm control panel, and other life-safety equipment.

Fire Protection Report. A document that describes the fire protection features of a facility.

Mechanical Quality Assurance Agency: An agency approved by the CCDB staff to conduct special inspections and/or testing on mechanical smoke-control systems as required by the Clark County BAC.

Non-dedicated Systems. Systems that share components with some other system(s) such as the building HVAC system. Activation causes the system to change its mode of operation in order to achieve the smoke-control objectives.

Passive Subzone. A passive smoke-control zone within a mechanical smoke-control zone in which smoke containment is achieved by a smoke barrier.

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. It is not an alternative or supplemental design.

Prime Agency. An approved agency that maintains employment of a qualified engineering manager.

Responsible Registered Design Professional. An architect registered pursuant to NRS Chapter 623 or a professional engineer licensed pursuant to NRS Chapter 625, who is responsible for the coordination of each aspect of the construction documents that are submitted to the CCDB for permit.

Slightly Positive/Negative. A pressure difference identified in the fire protection report or the smoke-control test plan to establish a boundary condition.

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 in conjunction with a smoke-control system.

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 fire protection report. These diagrams shall include at a minimum, an equipment/device input/output matrix, smoke-control zone layouts, control wiring details, and activation zone layouts (Reference Attachment A – Smoke-Control Diagram Checklist).

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.

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

Smoke-Control System, Mechanical. An engineered system that uses mechanical fans to produce pressure differences across smoke barriers or establish airflows to limit and direct smoke movement.

Smoke-Control System, Passive. A system of smoke barriers arranged to limit the migration of smoke.

Smoke-Control Zone. A space within a building enclosed by smoke barriers, including the top and bottom, that is part of a zoned smoke-control system.

Smoke-Control Test Plan. Proposed detailed procedures and methods provided by the prime agency that are used for the commissioning of the smoke-control system including all the items/equipment subject to such inspections and tests. The smoke-control test plan shall include at a minimum, test scenarios (listing all smoke-control equipment) and a detailed narrative explaining how the smoke-control system testing will be accomplished. It also addresses the frequency and location of passive smoke zone barrier leakage testing.

Subzone. A smoke-control zone that shares activation with the surrounding smoke- control zone(s).

Zoned Smoke-Control System. A smoke-control system that includes smoke exhaust for the smoke zone and pressurization for all contiguous smoke-control zones.

5.0 REFERENCES:

- Clark County Building Administrative Code – latest edition
- Fire Protection Report Design Guide – latest edition
- Southern Nevada Building Code Amendments – latest edition
- TG-15 Quality Systems Manual
- TG-16 Quality Assurance Agency Obligations
- TG-17 Minimum Approval Criteria for Special Inspectors and Other Personnel
- TG-50 QAA Final Report Requirements
- TRG-K Smoke Control System(s) Verification and Special Inspections Daily Activity Reporting Requirements
- National Fire Protection Association (NFPA)-72, 92A, and 92B (latest adopted editions)
- International Building Code (IBC)- 2006 edition
- Variable Frequency Drives used in Smoke-Control Systems – Published by CCDB.
- Mechanical Smoke-Control Systems – IBC 909 Systems; Firefighter Smoke-Control Panel – Published by Clark County Fire Department.

6.0 RESPONSIBILITIES:

6.1 Project Owner
- 6.1.1 Responsible Registered Design Professional designation
- 6.1.2 Authorize peer review
- 6.1.3 Contract smoke-control verification and development of the smoke- control test plan with the Prime Agency
- 6.1.4 Coordination of smoke-control diagram updates
- 6.1.5 Maintenance of smoke-control diagram as-built
- 6.1.6 Coordinate document submittals
  - 6.1.6.1 Fire protection report including amendment(s)
  - 6.1.6.2 Alternate materials and methods requests
  - 6.1.6.3 Smoke-control diagrams
  - 6.1.6.4 Smoke-control test plan
  - 6.1.6.5 MQAA final report

6.2 Designers
- 6.2.1 Architect
- 6.2.2 Responsible Registered Design Professional
- 6.2.3 Author of fire protection report (Architect, Fire Protection Engineer, Mechanical Engineer)
  - 6.2.3.1 Describe the fire protection approach for the entire project
  - 6.2.3.2 Establish the smoke-control design approach
  - 6.2.3.3 Outline smoke-control pass/fail criteria
  - 6.2.3.4 Remodels and additions – existing system operation
- 6.2.4 Electrical Engineer
  - 6.2.4.1 Electrical load considerations
  - 6.2.4.2 Emergency power response

6.2.5 Fire Protection Engineer
6.2.5.1 Alternate materials and methods submittal
6.2.5.2 Fire protection report submittal
6.2.6 Mechanical Engineer
6.2.6.1 HVAC system design
6.2.6.2 Smoke-control system design

6.3 Permit Holder
6.3.1 Inspection access
6.3.2 Marking and identification
6.3.3 Pretest of equipment and systems prior to Prime Agency verification

6.4 Building Division
6.4.1 Alternate materials and methods review-CCDB Plans Examination
6.4.2 Mandate peer review-CCDB Plans Examination
6.4.3 Fire protection report review- CCDB Plans Examination and/or Engineering Services
6.4.4 Smoke-control diagram review-CCDB Engineering Services
6.4.4.1 Smoke-control diagram checklist – Attachment A
6.4.5 Smoke-control test plan review-CCDB Engineering Services
6.4.6 Smoke-control MQAA final report review-CCDB Engineering Services
6.4.6.1 MQAA Final report checklist – Attachment B

6.5 Fire Department
6.5.1 Sprinkler system drawing review
6.5.2 Fire alarm system drawing review
6.5.3 Firefighter's smoke-control panel layout review
6.5.4 Fire protection report review (concurrent with CCDB)
6.5.5 Functional testing and sign-off of fire alarm and sprinkler systems
6.5.6 Inspection and testing of existing smoke-control systems
6.5.7 Participate in the Life-safety systems test (a.k.a., All systems test)

6.6 Prime Agency
6.6.1 Submit project start-up form
6.6.2 Develop the smoke-control test plan
6.6.3 Perform and coordinate testing and inspection required for the project
6.6.4 Assign CCDB approved personnel to the project
6.6.5 Coordinate inspection and testing with the air balance company
6.6.6 Execute smoke-control test plan a minimum of 10-days prior to final smoke-control system commissioning. See 6.1.3 above.
6.6.7 Test and signoff as being acceptable all system test scenarios submitted in the smoke-control test plan and include in the MQAA Final Report
6.6.8 Prepare and submit the MQAA Final Report

6.7 Special Inspector
6.7.1 Perform inspection and testing as required by the approved construction documents.
6.7.2 Document inspection and testing criteria as specified herein and in TRG- K.

7.0 PROCEDURE:

7.1 Project Owner

7.1.1 A special inspection agreement is required to be executed by the owner or the owner's agent. The special inspection agreement is issued with the mechanical permit for mechanical smoke-control and may be issued with a building permit for passive smoke-control systems.

7.1.2 The owner shall coordinate the submittal of the MQAA final report to allow report preparation, CCDB review, and life-safety systems testing, prior to final inspections and approval of a Certificate of Occupancy (temporary or permanent).

7.1.3 The following approved documents are required to be maintained in the fire command center upon completion of life-safety systems testing:

- 7.1.3.1 Fire protection report including amendment(s) and/or addendums
- 7.1.3.2 Smoke-control diagrams
- 7.1.3.2 MQAA Final Report
- 7.1.3.3 Approved copies of requests for alternate materials and methods of construction
- 7.1.3.4 Sprinkler System Drawings
- 7.1.3.5 Mechanical System Drawings
- 7.1.3.6 Fire Alarm System Drawings
- 7.1.3.7 Architectural Drawings
- 7.1.3.8 Electrical Drawings
- 7.1.3.9 Master Exit Plan

7.2 Designers

7.2.1 Smoke-control and related documents shall be prepared in accordance with the references listed in Section 5.0.

7.2.2 Requests for alternate materials and methods shall be submitted to and reviewed by the CCDB Plans Examination personnel and shall include the criteria to verify compliance during construction. Smoke-control diagrams shall be updated when changes are made to control wiring details, device locations and identification, zone layouts or the systems integration and sequencing.

7.2.3 Fire Protection Reports (FPRs) shall be submitted to and reviewed by the CCDB Plans Examination personnel and the Clark County Fire Department (CCFD). The FPR shall be approved prior to CCDB approval of the smoke- control diagrams.

7.2.4 Smoke-control diagrams shall be submitted to CCDB Engineering Services. Smoke-control diagram approval is required prior to scheduling a rough mechanical inspection. A minimum of five (5) copies of the smoke-control diagrams shall be submitted for review by CCDB Engineering Services personnel. The Smoke-Control Diagram Checklist (Attachment A) shall be included with the smoke-control diagram submission to CCDB Engineering Services.

7.2.5 Smoke-control diagrams that have been reviewed and were returned with comments shall require a written disposition to each specific comment. The written response and any revised drawings shall be re-submitted to the CCDDS- BD Inspections Division front counter for review by Engineering Services.

7.2.6 A facility floor numbering system shall be selected prior to submitting design documents for approval. This floor numbering system shall be adhered to throughout the period of time the building is under construction.

7.2.7 Smoke-control diagrams that are re-submitted for updates other than those listed in a correction letter, shall include a narrative denoting the specific changes made to the drawings with the associated justification for the updates and whether the approved FPR is impacted.

7.2.8 The responsible registered design professional shall sign-off on the MQAA final report as required by the IBC and SNA-IBC.

7.2.9 The designer of record that provides special inspection verification requires CCDB approval as a quality assurance agency in accordance with technical guidelines 15, 16 and 17.

7.3 Clark County Department of Development Services-Building Division (CCDDS- BD)

7.3.1 The CCDB Plans Examination reviews FPRs. The FPR shall be approved prior to approval of the smoke-control diagrams by CCDB Engineering Services.

7.3.2 The CCDB Engineering Services reviews smoke-control diagrams.

Smoke-control diagrams are reviewed for conformance to the approved fire protection report, IBC, SNA-IBC, and any approved alternate materials and methods submittals. Smoke-control diagrams shall include specific functions and sequences to verify code and FPR requirements are met. A detailed review utilizing the smoke-control diagram checklist (Attachment A) will be performed to determine if the drawings are inclusive enough for approval.

7.3.3 The CCDB Engineering Services reviews smoke-control test plans with emphasis on smoke-control operation in accordance with the FPR matrix and approved smoke-control diagrams.

7.3.4 The CCDB Engineering Services reviews MQAA final reports for compliance with the inspection & testing pass/fail criteria mandated by the following approved documents: fire protection report; smoke-control diagrams; smoke-control test plan; alternates; SNA-IBC; and IBC. A MQAA final report checklist is included as Attachment B.

7.4 Clark County Fire Department (CCFD)

7.4.1 Clark County Fire Department (CCFD) smoke-control system responsibilities are listed in Section 6.5. Additional review and inspection items may be required by the Clark County Fire Department which are beyond the scope of this document and shall be coordinated with them.

7.4.2 The CCFD utilizes the Mechanical Smoke-Control Systems – IBC 909 Systems Firefighter Smoke-Control Panel Guideline to ensure the panel is designed and operates in accordance with Section 909 of the IBC and SNA-IBC amendments.

7.5 Permit Holder

7.5.1 Smoke-control diagram approval is documented as a clearance point in the inspection process. Smoke-control diagrams shall be approved prior to scheduling a rough mechanical inspection.

7.5.2 A smoke-control test plan shall be submitted for approval after the project smoke-control diagrams have been approved by CCDB and 10-days prior to final smoke-control system commissioning.

7.5.3 Full access to the smoke-control system equipment and related documentation shall be provided to the MQAA inspection agency by the owner and/or general contractor. Inspection, testing and additional verification activities shall be coordinated with the MQAA inspection agency.

7.5.4 Device identification shall be traceable to the unique equipment identification depicted on the smoke-control diagrams.

7.5.5 Contractors/subcontractors' shall pretest all smoke-control equipment and systems prior to verification by the MQAA inspection agency.

7.6 Mechanical Quality Assurance Agency (MQAA)

7.6.1 Agencies and their personnel shall be listed and approved in accordance with Technical Guidelines 15, 16 and 17.

7.6.2 Inspection, testing, and system verification shall be as required by the approved documents. When conflicts are discovered between the approved documents, the approved FPR with amendment(s) shall be the first source of resolution. If the FPR does not provide sufficient detail, then the applicable code section(s), TG-60, and approved alternates shall be referenced, in that order.

7.6.3 MQAA Final Report Requirements

7.6.3.1 Shall be in accordance with Technical Guideline 50.

7.6.3.2 A MQAA final report checklist is enclosed as Attachment B.

7.6.3.3 MQAA final report cover letter shall be sealed and signed by a registered professional representing the Prime Agency. This person is responsible for the assembly and review of the final report.

7.6.3.4 The smoke-control system responsible registered design professional of record shall seal and sign a compliance statement as required by the IBC and the SNA-IBC.

7.6.3.5 Air balance firms shall submit a cover letter that describes their verification activities to the person responsible for assembly of the MQAA final report.

7.7 Inspection & Testing

7.7.1 Smoke Barrier Construction:

Smoke barriers shall be constructed of an assembly complying with the IBC and having a minimum 1-hour fire-resistance rating. Construction of the smoke barrier assembly and seal will be visually inspected by CCDB.

In addition to visual inspection, smoke barrier construction containing mechanical smoke-control zones shall be functionally tested. Smoke barrier performance must be demonstrated for all possible mechanical system configurations, including the various configurations of mechanical systems used for environmental comfort and exhaust and under both normal and standby power.

Passive zone smoke barrier construction shall be leakage tested in accordance with recognized standards, to demonstrate compliance with established acceptance criteria. Smoke barrier acceptance criteria shall be as established by the responsible registered design professional of record using the allowable leakage calculations in the IBC and SNA-IBC. Verification methodology shall be fully detailed in the smoke-control system test plan when a recognized testing standard is not directly referenced. The frequency and location of smoke barrier leakage testing shall also be documented in the approved smoke-control system test plan.

Mechanical smoke-control systems using the pressurization method shall be tested with the system in a smoke-control mode of operation. The design pressure differential shall be verified across the zone boundary smoke barrier at all openings that can be tested with conventional equipment.

7.7.2 Opening Protection:

The fire protection rating of doors in smoke barriers depends upon the fire- resistance rating of the smoke barrier in which it is placed, but shall be a minimum of 20-minutes. The fire protection rating of dampers in smoke barriers depends upon the fire-resistance rating of the smoke barrier in which it is placed, but shall be 1-1/2-hours at a minimum. Refer to NFPA 80 for the maximum clearances permitted around doors. Opening protection for mechanical smoke zones enclosed with smoke barriers requires activated automatic closing devices that shall be verified by the MQAA inspector. Verification shall include location and identification pursuant to the smoke-control diagrams and installation in accordance with their listing. MQAA testing shall verify control per the smoke-control diagram matrix and any monitoring that is required by the approved documents.

Typical examples of opening protection that may require automatic closing devices:
Doors; Dampers; Fire Shutters; Proscenium Curtains; Laundry or Trash Chutes

Rolldown, drop, sliding, rolling, accordion, proscenium curtains, swing doors with a single leaf larger than 5-ft wide and/or 10-ft high located at smoke barrier openings, shall be identified with a unique equipment number that matches the smoke-control diagrams; this equipment shall also have control and status indication at the firefighter's smoke-control panel.

7.7.3 Equipment (General):
Equipment shall be verified to meet the temperature ratings specified on the smoke-control diagrams and in the FPR. Substantiating assumptions such as mass flow rates shall be part of the specifications and equipment shall be verified to meet the limitation during system testing. Verification of both airflow and exhaust method airflow quantities shall be as required by the design and documented when the mechanical smoke-control system is placed in a smoke-control mode of operation.

7.7.4 Exhaust Fans:
Exhaust fan components temperature rise calculations shall be verified by the MQAA inspector and a statement shall be provided in the MQAA final report which states the fans are rated for the anticipated conditions.

7.7.5 Ductwork:
Duct leakage testing is required for all smoke-control ductwork that crosses a smoke barrier. Verification of allowable leakage rates shall be in accordance with stamped design calculations provided by the responsible registered design professional of record. Ductwork shall be leak tested to 1.5-times the larger of the operating or design pressure. Measured leakage shall not exceed 5-percent of the design airflow. Ductwork shall be supported directly from fire-resistance rated building structural elements.

7.7.6 Equipment Inlets and Outlets:
Exhaust outlets shall be located so as to not expose uninvolved portions of the building to an additional fire or smoke hazard.

7.7.7 Automatic Dampers:
Dampers at smoke barriers shall be verified to be, at a minimum, a Class II leakage, 250^0 F smoke damper having a UL 555S listing. Report documentation shall include general listing number, with applicable manufacturer's data, the device specific listing number (control number), and identification in accordance with the smoke-control diagrams. The damper shall be verified to be within the dynamic listing requirements when applicable.

7.7.8 Fans:
Fans operating at design conditions shall be verified to the manufacturer's data and standard engineering practices for stable performance. 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. Fan motors shall be verified to have a minimum 1.15 service factor. Fans shall be verified for proper rotation when placed into a smoke-control mode of operation. Smoke-control fans shall be shown on the firefighter’s smoke control panel with a clear indication of airflow direction. Actual field recorded fan curve data shall be provided at the time the MQAA final report is submitted for approval. Test results and manufacturer data sheets shall be traceable to the equipment identification depicted on the smoke- control diagrams.

7.7.9 Electrical Power Systems:

Normal and standby power systems shall be verified for all possible system permutations. Independent primary and secondary power distribution systems, including power conductors, shall be verified. Operation under standby power and its transfer time shall be verified and recorded. Existing smoke-control systems that are modified without additional (new) standby power loads are not required to demonstrate standby power operation and transfer time where documented in an approved FPR. Under standby power conditions, smoke- control system equipment shall be capable of at least 20-minutes continuous operation during the fire event. Verification of the presence of power downstream of all disconnects shall be through the implementation of 7-day diagnostic test for the smoke-control system.

7.7.10 Detection and Control Systems:

System activation shall be confirmed as described in the project specific approved FPR and as shown on the approved smoke-control diagrams.

7.7.11 Smoke-Control Diagrams:

A minimum of five (5) copies of the smoke-control diagrams shall be submitted for review by CCDB Engineering Services personnel. The Smoke-Control Diagram Checklist (Attachment A) shall be included with the smoke-control diagram submission to CCDB Engineering Services. Approved smoke- control diagrams shall be located at the project site prior to scheduling a rough mechanical inspection. Inspection shall include verification of device location and labeling in accordance with the smoke-control diagrams. One set of approved smoke-control diagrams shall be maintained at the Fire Command Center. Full area smoke detection shall be clearly shown or described on the smoke-control diagrams. Locations of spot-type smoke detectors used for releasing service shall be designated on the drawing(s) by listing the associated room designations and their unique identifiers. Area smoke detection may be used in lieu of spot-type smoke detectors when the listing and code allows for that specific use.

7.7.12 Firefighter's Smoke-Control Panel:

Verify that the firefighter's smoke control panel has priority over all possible control features of the smoke-control system for each possible permutation including standby power operation. Verify that each smoke zone and applicable equipment (fans, dampers, doors, etc.) is capable of manual operation from the firefighter's smoke control panel. Verify that the firefighter’s smoke-control panel operates in accordance with the approved design. The firefighter’s smoke control panel shall be located in the Fire Command Center.

Verify that each pressurized stair enclosure is monitored and controlled. Dampers and monitored doors (including doors for make-up air) require status indicators as required in the Mechanical Smoke-Control Systems – IBC 909 Systems; Firefighter Smoke-Control Panel publication. All fans shall be indicated and controlled separately from dampers and doors on a zone-by-zone basis. Verify that variable frequency drive controllers (VFD’s) operate in accordance with the approved FPR and the latest edition of VFD’s used in smoke-control systems letter to industry.

7.7.13 Response Time:
Response times shall be verified to meet the requirements of this section. 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 panel, fans, dampers, and automatic doors shall have achieved their expected operating state and confirmation of proper operation shall be indicated at the firefighter's smoke-control panel within 60-seconds. Verification shall be documented in the MQAA final report.

7.7.14 Acceptance Testing:
Verification testing shall be in accordance with the smoke-control test plan. The smoke-control test plan will document the method(s) to test the complete smoke- control system to demonstrate compliance with the applicable codes, standards, manufacturer's instructions, and Clark County technical guidelines. The smoke- control test plan shall also cover passive zone testing (quantity and location) in addition to any other unique testing situations. Special conditions such as remodels to existing systems shall also be addressed. Testing and acceptance of all system test scenarios submitted as part of the smoke-control test plan shall be the method used by the MQAA inspector to verify correct operation of the smoke- control system.

7.7.15 Detection Devices:
Smoke detection systems that supervise mechanical smoke-control systems shall comply with NFPA 72, the National Fire Alarm Code. Smoke detectors that are part of the smoke-control systems including those used for area detection and for spot-type releasing service shall be tested in their installed condition. Testing shall include verification that the installed condition corresponds to the type of service outlined in the device listing. 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.

7.7.16 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 Associated Air Balance Council (AABC), the National Environmental Balancing Bureau (NEBB) and the Total Air Balance (TAB) firm.

7.7.17 Dampers:
Damper testing and reporting shall include: listing number, individual listing reference number, type of damper (class), temperature rating, location per smoke- control diagrams, field label tag matching smoke-control diagram label, monitoring, report status for zone activation, standby power supply and response time, and fail-safe closed position, at a minimum.

7.7.18 Controls:
Mechanical smoke-control systems shall have complete automatic control. Every initiating device shall be tested and confirmed to place into operation each respective smoke zone pursuant to the approved documents. Testing documentation shall include confirmation of system activation and presence of power downstream of all disconnects. Testing shall include all control sequences and that the firefighter's smoke-control panel has priority for all permutations. Control sequence testing may be conducted under simulation of standby power conditions. The method of simulation shall be addressed in the smoke-control test plan. The control units of fire detection systems which supervise mechanical smoke-control systems shall comply with UL 864 and be listed as smoke-control equipment. The CCDB interprets that the verification required by Section
909.12 of the IBC need only be confirmed when the system is activated (configured) in a smoke-control mode (including the preprogrammed weekly test sequence). Fan supervision is typically provided by pressure or current sensors calibrated to distinguish proper operation from a fault condition. A pre- programmed 7-day test sequence shall verify abnormal conditions audibly, visibly, and by a printed report.

7.7.19 Special Inspections for Smoke Control:
Scope of testing and agency qualifications shall at a minimum comply with the IBC and the SNA-IBC amendments.

7.7.20 MQAA Final Reports:
Reports shall include manufacturer's data for all system initiation and output devices for both passive and active systems. MQAA Final Report review and acceptance shall include the signature and professional engineer seal of the MQAA special inspector (i.e., Prime Agency) and the responsible registered design professional. For active systems this may be the mechanical engineer of record and for passive systems either the architect and/or author of the written submittal describing the smoke-control system. A minimum of five (5) smoke- control MQAA Final Reports shall be submitted and approved prior to scheduling the life-safety systems test (a.k.a., All Systems Test). The report shall include compliance statements regarding the use of VFDs and the implementation of 7- day diagnostic test for the smoke-control system. Once accepted and stamped as approved, the MQAA agency shall forward a copy of the report to the owner for permanent retention in the Fire Command Center.

7.7.21 Identification:
All systems devices shall have an 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.

7.7.22 Documentation:
The approved FPR, smoke-control test plan, smoke-control diagrams, and the MQAA final report constitute the documentation required by this section. This information shall be retained in the Fire Command Center.

7.7.23 Acceptance:

An approved MQAA final report is required prior to issuance of the building's temporary certificate of occupancy (TCO) or certificate of occupancy (CO). A MQAA final report that is approved with exception may allow for temporary occupancy if the report exception(s) are documented and do not create an unsafe condition or diminish the integrity of the building or the safety of its occupants. Portions of a building may be granted a temporary certificate of occupancy (TCO) provided the specific portion of the building to be occupied meets the above conditions and it is documented in the partial MQAA final report submitted by the MQAA inspection firm. If the remaining portions of the building are determined not be a hazard to other areas scheduled to be occupied in the vicintiy; this partial MQAA final report may then be approved. Once the entire building is tested, a comprehensive MQAA Final Report may be required for the remaining portions with the contents of the previously accepted report(s) included within the body of the MQAA Final Report.

7.8 Special Equipment

Variable Frequency Drives (VFDs) that are intended to be used as part of the smoke-control system shall be identified in the MQAA final report with a compliance statement that the VFDs utilized for the project conform to the requirements listed in the Clark County letter titled "Variable Frequency Drives Used In Smoke-Control Systems" – latest edition.

7.9 Smokeproof Enclosures:

7.9.1 Access

Access construction shall be verified by CCDB personnel.

7.9.2 Construction

Rated construction shall be verified by CCDB personnel. Automatic closing doors shall be verified to confirm that their installation is in accordance with their listing and operation as required by the IBC.

7.9.3 Natural Ventilation Alternative

Natural ventilation construction shall be verified by CCDB personnel.

7.9.4 Mechanical Ventilation Alternative

At a minimum, the MQAA inspector shall verify pressure differentials, door opening forces, and proper operation of the relief damper.

7.9.5 Stair Pressurization Alternative

IBC Section 909.20.5 was deleted as specified in the SNA-IBC with no other modifications to this section.

8.0 RECORDS:

The following documents are official records and maintained as such by the CCDDS Records Office. An identical copy of the following approved documents shall be maintained at the Fire Command Center or other specifically approved location:

- Fire Protection Report including amendment(s)
- Smoke-Control Diagrams
- MQAA Final Report
- Smoke-Control System Test Plan
- Fire Alarm System Drawings
- Mechanical System Drawings
- Sprinkler System Drawings
- Architectural Drawings
- Electrical Drawings
- Master Exit Plan

9.0 ATTACHMENTS:

Annex – Supplemental Information
Smoke-Control Diagram Checklist -Attachment A MQAA
Final Report Checklist – Attachment B

10.0 REVISION HISTORY:

Title	Revision/Approved Date	Effective Date
TG-60-97	January 20, 1997	January 20, 1997
TG-60-IBC-2000	September 15, 2004	October 1, 2004
TG-60-IBC-2006	December 11, 2007	January 1, 2008

Annex – Supplemental Information

The following documents can be found at:
http://www.clarkcountynv.gov/depts/development_services/Pages/default.aspx
and your local library

Fire Protection Report Design Guide
Clark County Department of Building – latest edition

Guide to the 1997 UBC SMOKE-CONTROL PROVISIONS Douglas
H. Evans, P.E. copyright 1999
ISBN 1-58001-023-7

Smoke Control Provisions of the 2000 IBC: An Interpretation and Applications Guide
Douglas H. Evans, P.E. and Dr. John H. Klote, P.E. copyright 2003
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Mechanical Smoke-Control Systems – IBC 909 Systems
Firefighter Smoke-Control Panel – latest edition

Variable Frequency Drives Used In Smoke-Control Systems – latest edition

Smoke-Control Diagram Checklist - Attachment A
Page 1 of 3

OK - Acceptable
SNA-IBC – Southern NV Bldg Code Amendments
IBC – 2006 International Building Code
No. – Item Number

Reviewer's Initials _____
Date _____
PAC No. _____

OK	No.	Smoke-control diagram requirements
	1	Project name, physical address, and PAC/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 and fax numbers, etc.
	3	Latest revision number and date (if applicable)
	4	Scope of work - Coordinate with the approved Fire Protection Report with amendment(s) - Reference adjacent smoke zones and smoke-control equipment/devices in existing construction, if applicable
	5	Professional Engineer (PE) stamp – Nevada (all drawing sheets)
	6	Device/equipment legend
	7	Location of the Fire Command Center (FCC)
	8	Location of the Emergency Generator(s)
	9	Location of the Fire Pump Room(s)
	10	Smoke zone boundaries - Locate and identify smoke zone boundaries on floor plans and section view (i.e., riser diagram) ☐ Active and passive zones ☐ Active and passive subzones ☐ Pressurized stair enclosures including vestibules ☐ Elevator hoistways and lobbies ☐ Corridors, exit passageways, and horizontal exits ☐ Linen and trash chutes ☐ Fire rated walls ☐ Atria ☐ Mall / tenant interface - Locate and identify sprinkler zone boundaries - Specify design method on a zone-by-zone basis - Identify smoke compartment boundaries for E and I occupancies

Smoke-Control Diagram Checklist - Attachment A Page 2 of 3

	11	Major Components - Locate and identify input devices ☐ Waterflow switches required for smoke-control ☐ Long-range beam, flame, duct-mounted, and heat detectors ☐ Spot-type or full coverage smoke detectors (depict extent of coverage) - Locate and identify output devices ☐ Stair and elevator machine room pressurization fans ☐ Exhaust fans required 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 ☐ Proscenium curtains ☐ Rolldown, drop, sliding, rolling or accordion doors at smoke barrier openings ☐ Single leaf swinging doors ≥ 5'-0"W X 10'-0"H 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
	12	Smoke-Control System Operation - Input/Output Smoke-Control Diagram Matrix • Rows are system inputs • Columns are system outputs • Include all device/equipment unique identifiers/tags • Coordinate with the Fire Protection Report matrix • Include loss of primary power
	13	Ductwork - Locate and identify all ductwork that crosses smoke zone boundaries - Call out all ductwork that requires duct leakage testing

Smoke-Control Diagram Checklist - Attachment A Page 3 of 3

	14	Control wiring details; 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 - Manual override - Electrical control equipment - Current sensors - Motor starters - Relays - End switches - Pilot lamps or LED's - Interlocks (electrical and mechanical) - Emergency power feed - Duct-mounted smoke detectors for air handling units ≥ 2,000cfm - Status indicators – proscenium curtains, rolldown, and accordion doors

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

MQAA Final Report Checklist – Attachment B
Code references to the 2006 IBC
Page 1 of 3

OK - Acceptable
SNA-IBC – Southern NV Bldg Code Amendments
IBC – 2006 International Building Code
No. – Item Number

Reviewer's Initials _____
Date _____
PAC No. _____

OK	No.	MQAA Final Report Checklist requirements	Code Ref.
	1	MQAA Final Report requirements	Section 7.0 of TG-50
	2	Engineering Stamps - Special Inspection Agency - Testing and Balancing Agency (signature acceptable) - Responsible Registered Design Professional – compliance statement	909.18.8.3 SNA-IBC
	3	Scope of Report - Comprehensive Final Report - Partial Final Report	Section 7.0 of TG-50
	4	Documentation - MQAA Agreement - Project Start-up Form - Permit - Fire Protection Report (cover page only)	Section 7.0 of TG-50
	5	Passive Zones - Room leakage calculations (P.E. stamp required) - Door fan test sheets	909.5, 909.6.1, and 709
	6	Differential Pressures - Test Sheets	909.5, 909.6.1, and 909.18.6
	7	Stairway - Test sheets showing: o Barometric relief damper operation at 0.05-inch water gage and airflow ≥ 2,500 cfm o Minimum pressure differential of 0.05-inch water gage from vestibule to stair and from vestibule to floor area	909.18.6, 909.20.4.2, and 909.20.4.3
	8	Door Opening Forces - Maximum opening and door swing forces o Test and report applicable field conditions	909.6.2 and 1008.1.2
	9	Ductwork leakage - Test sheets showing leak testing to 1.5-times the maximum design pressure. Measured leakage shall not exceed 5-percent of design airflow	909.10.2

MQAA Final Report Checklist – Attachment B Code references to the 2006 IBC
Page 2 of 3

	10	Detectors - Test sheets showing smoke-control initiation for all applicable initiating devices - Device data sheets	909.12.2, 909.18.1, 907.10, and 907.11
	11	Smoke-Control Diagrams - Reference latest approved revision	909.15
	12	Smoke-Control Initiating Devices - Activation in accordance with the approved fire protection report and smoke-control diagram drawings - Sprinkler system drawings match smoke zone boundaries - Field devices/equipment and building zoning matches those depicted on the Firefighter's Smoke-Control Panel - Verify activation response times	909.12.2, 909.12.3, 909.16, 909.17 SNA-IBC, 909.18
	13	Fans - Test sheets showing: o Airflow velocity or exhaust quantity measurements as compared to the design values o Fan belts and drive components o Fan motors and associated components o VFD items o Verify response times (run and stop conditions) o Compare operating temperature ratings of the equipment with those calculated and ensure they are in compliance with those provided by the manufacturer	909.10.1, 909.10.5, 909.17 SNA-IBC, 909.18.4, 909.18.5 VFD Letter to Industry – latest edition
	14	Equipment Data Sheets - Fans - Dampers - Doors - Other major smoke-control equipment - Traceability by unique identifiers (tag) numbers per smoke-control diagrams	909.18.8.3 SNA-IBC, 909.18.9
	15	Equipment specifications: - Temperature rating (provide statement that fan operating temperatures are in compliance) - Minimum of 1.15 motor service factor - Nameplate voltage and horsepower not exceeded - Proper fan rotation - Proper belt tension - Fans supported and restrained by noncombustible devices - 1.5 times the number of belts with the minimum of belts being two - Manufacturer's fan curves that include actual field measured data	909.10.1 and 909.10.5

MQAA Final Report Checklist – Attachment B Code references to the 2006 IBC
Page 3 of 3

	16	Emergency Power Test	909.4.6 and 909.11
	17	Daily Inspection Report - Non-compliance Report with written disposition	TG-16, TG-17, TG-50, TRG-K
	18	Life-safety Systems Test (a.k.a., All Systems Test) - Scenarios	909.3, 22.02.465

Include a copy of this checklist with the submitted set of MQAA final reports.