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Letter from D.D. Pearsall to J.G. Degenkolb

Duane Pearsall

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Mr. John G. Degenkolb  
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Dear Gus:

Using a copy of the "Report of the High Rise ADHOC Committee" on code change 18-72-1 (adopted as amended 9-21-72), we have the following suggestions or comments on Section 1807. Capitalized words are suggested changes.

Section 1807-(b),-1,-a, - change minimum compartmentation from 30,000 square feet to 10,000 square feet. (Reason, under smoke control paragraph (H), sub-paragraph 4, was referenced to 60 air changes per hour from the largest compartment. We think the maximum size fan for a mechanical ventilated smoke shaft would be somewhere in the neighborhood of 20,000 CFM or 20 air changes).

1807 (D) Fire Detectors

"An approved system which will provide for automatic detection of products of combustion other than heat shall be installed in every mechanical equipment room and in the return air portion of every air conditioning and mechanical ventilation AIR HANDLING system NOT INCLUDING TOILET OR KITCHEN EXHAUST SYSTEMS, that serves floors other than the floor on-which-the-equipment-is-located. Detectors set-to-operate-within-the limitations-of-UBC-Standard-Number-43-6-or-for-greater-sensitivity-shall be-located-at-each-opening-into-the-vertical-shaft. DETECTORS SHALL BE LOCATED AT EACH OPENING INTO A RETURN OR EXHAUST AIR SHAFT OR DUCT. UPON DETECTION OF SMOKE OR FIRE, THE SYSTEM SHALL CAUSE THE FOLLOWING:
1. ACTIVATE VOICE ALARM SYSTEM PER SECTION 1807 (e)
2. CAUSE ALL RETURN AIR TO BE EXHAUSTED.
3. CAUSE ALL SUPPLY FANS TO DELIVER 100 PERCENT OUTSIDE AIR
4. OPEN SMOKE SHAFT VENT AT THE FIRE FLOOR.
5. ACTIVATE SUPPLY FAN FOR STAIRWAY PRESSURIZATION, WHEN REQUIRED.
6. ACTIVATE EXHAUST FAN ON SMOKE SHAFT, WHEN REQUIRED.

Gus, I would personally like method IV of the Canadian Building Code "Fully Pressurized Building". This would require, on detection, closing all external vents from the building (exhaust, toilet exhaust, kitchen exhaust, elevator exhausts, etc.) and leave the supply fans ON. This would force an internal pressure in the building in all areas including elevator shafts and stair shafts, leaving the fire floor, which is open to the smoke shaft, the lowest pressure and force all air in that direction. However, it seems too much of a departure.

Our suggested changes (following UBC pattern) leaves the return fan and exhausts operating, diverting all return air to outside and leaving the supply fan ON. This has the hazard of transmitting fire through the return ducts to other floors when they are not designed for this heat.

This system requires that supply fans remain on even though they may be bringing smoke in from outside the building. To correct this, there should be inserted "a detector of products of combustion other than heat shall be installed in the supply air of every mechanical ventilation system. Upon detection of products of combustion, the affected supply system shall shut down".

1807 (H) SMOKE CONTROL

It seems that sub-paragraph 2 "tempered glass, etc." should be part of sub-paragraph 1.

Sub-paragraph 3 -- When fire sprinklers are installed in compliance with Section 1807 (M), the mechanical air handling equipment may be designed to assist smoke removal. Under-fire-conditions, UPON ACTIVATION OF THE FIRE ALARM SYSTEM, the return and exhaust air shall be moved directly to the outside without recirculation to other sections of the building. THE SUPPLY FAN SHALL PROVIDE 100 PERCENT OUTSIDE AIR.
Sub-paragraph 4 -- A shaft OR SHAFTS, SHALL BE PROVIDED through which smoke and heat can be mechanically vented to the outdoors. The size of the shaft shall be uniform throughout and of such dimensions as to provide 60 (20) air changes per hour in FROM the largest compartment served anywhere in the building. EACH openings into the shaft shall be protected with an automatic single piece shutter located as high in the room as possible and designed to vent the entire compartment.

TOTAL VENT OPENING (AREA) PER FLOOR SHALL BE BASED ON 1.5 Ft² PER 1000 SQUARE FOOT OF OUTSIDE WALL AREA PER FLOOR. THE SHAFT AREA SHALL BE BASED ON $2\frac{1}{2}$ TIMES THE AREA OF A FLOOR VENT OPENING.

Gus, this entire system is based on a mechanically vented smoke shaft. As you know, this is different from the Canadian Building Code Standard which is a ventilated shaft with the top vent opening equal to the free area of the shaft. The above sizing tables are simply condensed from the Canadian graphs. I confess, I do not believe the Canadian vent openings are sufficiently large, particularly without mechanical assisted ventilation. In addition, they are dependent on air-tight vent openings at each floor. Although leakage is important to a mechanically vented shaft, it becomes very critical in the Canadian Code where a fan is not required.

Enclosed is a proposed new 90A which leaves the designer with nothing but an objective. Since most mechanical engineers don't understand smoke control nor fire alarms, the resulting system could be worthless - and then must be approved by the local building inspector - who doesn't understand airflows in the first place.

Even with some admitted flaws, the present UBC approach should be much more effective.

After studying the Canadian approach (NRC 11413), I think they have opened so many possibilities as to make the code confusing and unenforceable.

Please call me if I can help.

Sincerely yours,

STATITROL

Duane D. Pearsall
President

Encl
DDP:mm
10. Controls

1001. Each installation shall be equipped with a manual emergency stop, located at a conveniently accessible point, for quick shutting down of the fan in case of fire. This location shall be submitted to the authority having jurisdiction for approval.

1002. A building having two or more stories or zones required to be separated by construction that will restrict the spread of smoke or fire and (a) in which it is determined that evacuation time is excessive, or
(b) in which evacuation is not practicable because occupants are incapable of self preservation because of age, physical or mental disability, or because of security measures not under occupant control, shall have the duct systems arranged so that in the event of a fire, flow of smoke from the fire zone will be inhibited from spreading to required exit routes and designated refuge areas. Such an arrangement may involve air conditioning systems alone or in combination with other systems such as emergency venting, pressurizing system and fire suppression system, taking into account possibly stack and wind effect of multi-story buildings. Smoke control systems are required to be engineered for the specific occupancy and building design. This shall not preclude the use of other engineered approaches to provide equivalent protection to life and property when acceptable to the authority having jurisdiction. Appendix B includes considerations and guidelines for smoke control systems.