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APPEAL SUMMARY

Status: Decision Rendered - Held over from ID 20190 (4/3/19) for additional information

Appeal ID: 20252	**Project Address:** 3600 N Interstate Ave
Hearing Date: 4/17/19	**Appellant Name:** Jon Anderson
Case No.: B-013	**Appellant Phone:** 5032397377
Appeal Type: Building	**Plans Examiner/Inspector:** Corey Stanley
Project Type: commercial	**Stories:** 4 **Occupancy:** B **Construction Type:** 1-A
Building/Business Name: Kaiser Interstate, CIN	**Fire Sprinklers:** Yes -
Appeal Involves: Reconsideration of appeal	**LUR or Permit Application No.:**
Plan Submitted Option: pdf [File 1]	**Proposed use:**

APPEAL INFORMATION SHEET

Appeal item 1

Code Section	909
Requires	Item #1: OSSC 404.6 Atrium spaces shall be separated from adjacent spaces by a I-hour fire barrier. Exception (3): A fire barrier is not required between the atrium and the adjoining spaces of any three floors of the atrium provided the such spaces are accounted for in the design of the smoke control system. Item #2: OSSC 713.4 Fire-Resistance Rating. Shaft enclosures shall have a fire-resistance rating of not less than 2 hours where connecting four stories or more, and not less than 1 hour when connecting less than four floors. OSSC 713.10 Duct and Air Transfer Openings. Penetrations of a shaft enclosure by ducts and air transfer openings shall comply with section 717. OSSC 717.2.1 Smoke Control Systems. Where the installation of a fire damper will interfere with the operation of a required smoke control system in accordance with Section 909, approved alternative protection shall be utilized.
Proposed Design	Item #1: The proposed design would allow all four floors of the adjoining spaces be open to the atrium. This was the way the building was originally designed and built in 1981. However, documentation that would allow this condition cannot be located. Item #2: The proposed design would remove the existing fire-smoke dampers at the mechanical shafts and allow the mechanical shafts to be unrated. The stair shafts would remain as two hours at the north stair tower (4 floors) and one hour at the south stair tower (3 floors).

Reason for alternative General

The building is a four story building (lower level, first, second, third floors) with a four story atrium in the center of the building (See building section Sketch 1).
The building is fully sprinklered and has an active smoke control system. Upon activation of any smoke detector, pull station, sprinkler water flow or any other activating device in the building, the smoke evacuation system is activated. Upon activation the following occurs:

Both stair towers are pressurized with 3,000 CFM of 100% outside air
Exterior doors in the lower level of the atrium open to provide make-up air for the air removed in Item 3.
Roof mounted smoke evacuation exhaust fans start and remove 74,000 CFM from the atrium All HVAC supply fans switch to 100% outside air and supply 70,000 CFM to the tenant spaces

All HVAC return fans switch to 100% exhaust air and remove 70,000 CFM from the tenant spaces. Smoke from the tenant spaces is exhausted via the plenum return system. The plenums are exhausted through the shaft space (no ducts).
In normal operations, all of the existing fire-smoke dampers are open to allow the flow of supply and return air. Return air in the tenant spaces is via the plenum. Return air in the atrium is via the ceiling return ducts. (See Sketch 2E for the existing condition and Sketch 2R for the proposed condition)
In a smoke event, all of the fire-smoke dampers must be open to allow the flow of 100% outside air supply and the 100% exhaust of air. In a smoke event, there is no return air. (See Sketch 3E for the existing condition and Sketch 3R for the proposed condition).

Reason for alternative Item #1.
It appears that when the building was originally permitted (1981) that it was allowed to have all four floors open to the atrium. The original fire-life safety (FLS) drawings indicated:
Smoke Evacuation Systems:
(2) Atrium and tenant exhaust fans are sized to provide 9.7 air changes per hour averaged over the whole building. All four floors may_ be open to the atrium.
This same text also appears in the 1992 FLS drawings. The 1992 drawings indicate three appeals, Appeal #4 (2/5/81); Appeal #9 (1/8/81) and Appeal #12 (4/4/90). An appeal to allow all four floors to be open to the atrium does not appear in Appeals 4 or 12 and Appeal 9 cannot be located. However, Appeal 4 does reference the 1/8/81 appeal for the smoke detectors at the atrium ceiling.
Per Appeal #4, the building is equipped with the following:
Type I Construction Fully sprinklered Sidewall sprinklers at second floor of atrium Total building smoke evacuation system
Ionizing smoke detectors at exiting circulation system Infra-red type scanner at the top of the atrium
Appeal #4 also indicates that the smoke evacuation system is on emergency power.
Appeal #12 allows unrated corridors. As this is a plenum return smoke evacuation system, a rated wall to the structure above would compromise the smoke evacuation system.
The building has exits at the lower level and the first floor. Only the second and third floors require the use of stairs to exit the building.
Per the previous appeals, the tenants of this building are well protected by a smoke and fire alarm system, sprinklers and a smoke evacuation system. Code allows three of the four floor to be open to the atrium as long as the smoke control system takes this into account. The original design of the building was designed around an active smoke evacuation system with all four floors open to the atrium. Closing the tenant spaces off from the atrium on one floor only may actually hinder the design of the system. In general, in a smoke event, the whole building goes to 100% outside supply air and 100% exhaust air. Smoke is exhausted from the plenum of the tenant space and the top of the atrium at the same time. As noted above, the fire-smoke dampers never close. This means that it is impossible to isolate one floor from the other three floors. Closing off one floor

from the atrium serves no purpose.

Item #2:

Because the existing fire-smoke dampers located at the mechanical shafts are open in normal operations and must be open during a smoke evacuation event, the dampers never close. The existing dampers are unnecessary and actually pose a hazard to the building's occupants. If a damper were to fail and close during a smoke evacuation event, the smoke evacuation system would not function as designed. The existing dampers should be removed to prevent a failure of the smoke evacuation system. This is addressed in OSSC 717.2.1.

With a plenum return system that returns air within the shafts without ducts, and the dampers being removed, the rating of the mechanical shaft walls serves no purpose. The mechanical shafts are virtually the same as the atrium space connecting all four floors. To eliminate any confusion for future remodeling work (and plan review), we are proposing to eliminate the rating of the mechanical shaft walls.

Pending this appeal, updated FLS drawings will be submitted to the City for review.

APPEAL DECISION

Four story atrium open to adjoining spaces: Granted provided all conditions noted in the submitted letter are met.
Appellant may contact Corey Stanley (971 291-8919) with questions.

The Administrative Appeal Board finds with the conditions noted, that the information submitted by the appellant demonstrates that the approved modifications or alternate methods are consistent with the intent of the code; do not lessen health, safety, accessibility, life, fire safety or structural requirements; and that special conditions unique to this project make strict application of those code sections impractical.

Pursuant to City Code Chapter 24.10, you may appeal this decision to the Building Code Board of Appeal within 180 calendar days of the date this decision is published. For information on the appeals process and costs, including forms, appeal fee, payment methods and fee waivers, go to www.portlandoregon.gov/bds/appealsinfo, call (503) 823-7300 or come in to the Development Services Center.

Addendum to Appeal 20190
Hearing Date: 4/3/19
Applicant Name: Jon Anderson, Principle, AD Architects

2014 OSSC Section 909, Smoke Control Systems

909.2 General Design Requirements. Smoke control systems shall be designed in accordance with Section 909 and well-established engineering principles. The construction documents shall adequately describe the elements of the system. These documents shall be accompanied by sufficient information and analysis to demonstrate compliance with these provisions.

It is assumed that this building was designed and constructed with the 1978 UBC. We do not have a copy of this code. The closest version of the code we have is from 1985. In Section 1715 (b) the code talks about mechanically operated air-handling systems to evacuate smoke from the atrium.

- Exhaust shall be located at the ceiling. Supply air openings sized to provide a minimum of 50% of the exhaust volume shall be located at the lowest level.
- The smoke control system shall exhaust not less than the following quantities of air:
    - Atriums of not more than 600,000 cubic feet of air, not less than 6 air changes per hour or less than 40,000 cfm
    - Atriums of over 600,000 cubic feet of air, not less than 4 air changes per hour.
- Smoke detectors shall be located at the ceiling of the atrium and at each floor level.

The volume of the atrium is approximately 237,000 cubic feet. Per the 1985 UBC this would require 6 air changes per hour and not less than 40,000cfm. The current design of the mechanical system for the smoke evacuation provides 74,000 cfm or 20 air changes per hour. All of the make-up air for the atrium is provided at the lowest level of the atrium.

Smoke detectors are located at the ceiling of the atrium and at each level.

909.3 Special Inspections and Test Requirements. In addition to the ordinary inspection and test requirements which buildings are required to undergo, smoke control systems shall undergo special inspections and tests to verify the proper commissioning of the smoke control system.

As part of the fire-life safety summary for this building, there will be a requirement for annual testing of the system by a third party inspection agency. This inspection will cover the proper operation of the smoke evacuation equipment and air volumes to meet the requirement stated in 909.2 above.

909.4 Analysis. A rational analysis supporting the types of smoke control systems to be employed, their methods of operation, the systems supporting them and the methods of construction to be utilized shall accompany the submitted construction documents. Including the following:

909.4.1 Stack Effect. The system shall be designed such that the maximum probable normal or reverse stack effect will not adversely interfere with the system's capabilities.

Typically, stack effect is not an issue with low rise buildings. The stair shafts are pressurized with 3,000 cfm which would eliminate normal stack effect in the stair towers. The elevator is within a shaft that serves four floor. The elevator shaft is not pressurized and has smoke detectors at the top. There are elevator lobbies at each floor which negate the stack effect. \ The major entrances to the building are protected by a vestibule or a revolving door. Stack effect is mitigated by controlling air into the building at the major entry points.

909.4.2 Temperature Effects of Fire. Buoyancy and expansion caused by the design fire shall be analyzed. The system shall be designed such that these effects do not adversely interfere with the system' capabilities.

When this building was constructed, the requirement for analyzing a design fire did not exist (nor did the computer modeling capabilities exist). This is a Type I building – noncombustible. The fuel load for a fire is minimal. The lower level of the atrium space is tables and chairs. The café that had been located at the lower level (separated from the atrium) has been removed.

The system is capable of 20 air changes per hour, which far exceeds the 4 air changes required. This would remove any excess heat in the atrium and keep the temperatures from rising.

909.4.3 Wind Effect. The design shall consider the adverse effects of wind.

This is a low rise building. The wind effect are much less than that of a high rise building. The exhaust fans for the atrium are located within the penthouse and are protected from the wind.

909.4.4 HVAC Systems. The design shall consider the effects of the HVAC systems on both smoke and fire transport. The design shall consider the effects of the fire on the HVAC systems.

As originally designed, the HVAC system works with the smoke evacuation system simultaneously. When the system is activated, all of the HVAC equipment changes to provide 100% outside supply air and 100% exhaust. At the same time, the atrium smoke evacuation fans provide 100% exhaust and 100% outside air is provided through the lower level doors (which open automatically).

The building is 100% sprinklered. The HVAC equipment is located on the roof or in the rooftop penthouse. As required by code, the roof has a 2 hour rating.

909.4.5 Climate. The design shall consider the effects of low temperatures on the system, property and occupants. Air inlets and exhausts shall be located as to prevent snow or ice blockage.

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Portland Oregon is a relatively moderate climate. The air intake (lower level doors) for the atrium is located 30 feet inside the face of the building off of an entrance plaza. There is no snow or ice collection at this point. Air handler intakes and exhausts are located several feet above the roof. Portland never has enough snow to block the intakes/exhausts.

909.4.6 Duration of Operation. All portions of the smoke control system shall be capable of continued operation after detection of a fire event for a period of not less than 20 minutes or 1.5 times the calculated egress time, whichever is less.

The smoke evacuation system and the HVAC systems are connected to an emergency generator. The generator is located in the P1 level of South Interstate (directly south of this building). This generator has a 3,150 gallon fuel tank and can run for nearly 48 hours at full load.

909.5 Smoke Barrier Construction. Smoke barriers shall comply with Section 709 and shall be constructed and sealed to limit leakage areas exclusive of protected openings.

This building was designed to be a total smoke evacuation system – not just the atrium. Section 404.6 allows three of the four floors to be open to the atrium as long as the smoke control system takes this into account. The fourth floor is required to have a separation between the atrium and the tenant spaces with a smoke barrier. Part of this appeal is to remove this requirement as the smoke control system for this building was designed to have all four floor to the atrium.

The tenant spaces are plenum returned. There are no return air ducts. The shafts are the return. There are no return air ducts in the shafts. Thus all the floors are virtually connected. Adding a smoke barrier at one floor will not separate that floor from the atrium.

909.6 Pressurization Method. The primary mechanical means of controlling smoke shall be by pressure differences across smoke barriers.

As noted above, since all the floors are interconnected with the plenum return, it is not possible to control the smoke with a smoke barrier using pressure differences.

909.7 Airflow Design Method. When approved by the building official, smoke migration through openings fixed in a permanently open position, which are located between smoke control zones by the use of the airflow method, shall be permitted.

This building behaves like it only has one smoke zone. All of the floors are interconnected to each other and the atrium. The entire HVAC system goes into smoke evacuation mode at the same time. The tenant spaces and the atrium are all exhausted at the same time and interconnected – so they really are just a single smoke zone. A separation is not required.

909.8 Exhaust Method. When permitted by the building official, mechanical smoke control for large enclosed volumes, such as atriums, shall be permitted to utilize the exhaust method.

This is how the building was originally designed. 100% exhaust for the entire building.

909.9 Design Fire. The design fire shall be based on a rational analysis performed by the registered design professional and approved by the building official.

See the discussion above in 909.4. Design Fire doesn't appear to be a requirement at the time when this building was constructed.

909.10 Equipment. Equipment, including but not limited to, fans, ducts, dampers, shall be suitable for its intended use.

The building's HVAC system was designed around a total smoke evacuation system. The exhaust fans for the atrium are specifically for evacuation of the atrium. The HVAC system for the building is specifically designed to switch to 100% outside air in and 100% exhaust. Over the years the building automation system has been added and upgraded to maintain the proper operation of the system.

909.11 Power Systems. The smoke control system shall be supplied with two sources of power.

As noted above in 909.4.6 the HVAC system is on normal and emergency power.

909.12 Detection and Control Systems. Fire detection systems providing control input or output signals to mechanical smoke control systems shall comply with 907.

The building is controlled by a building automation system.

909.13 Control Air Tubing. Control air tubing shall be of sufficient size to meet the required response times.

The building complies.

909.14 Marking and Identification. The detection and control systems shall be clearly marked at all junctions, accesses, and terminations.

The building complies.

909.15 Control Diagrams. Identical control diagrams showing all devices in the system and identifying their location and function shall be maintained current and kept on file with the building official, the fire department and in the fire command center.

The building complies.

909.16 Fire-Fighter's Smoke Control Panel. A fire-fighter's smoke control panel for fire department emergency response purposes only shall be provided and shall include manual control or override of automatic control for mechanical smoke control systems.

This building complies.

909.17 System 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 in the sequence necessary to prevent physical damage to the equipment.

The sequence of operations is shown in the original appeal submission and is indicated on the fire-life safety plans.

909.18 Acceptance Testing. Devices, equipment, components and sequences shall be individually tested. These tests shall consist of determination of functions, sequence, and where applicable, capacity of the installed condition.

As indicated in 909.3, all components and operations shall be tested annually by a third party.

909.19 System Acceptance. Not applicable. The building is already occupied.

909.20 Smokeproof Enclosures. Where required by 1022.10, a smokeproof enclosure shall be constructed in accordance with this section. A smokeproof enclosure shall consist of an enclosed interior exit stairway that conforms to Section 1022.20.

Interior stairs and exit passageways are rated as required by the code.

909.21 Elevator Hoistway Pressurization Alternative. Not applicable