



TOPIC: Pressurized Stairway Enclosures & Elevator Hoistways - OSSC/9/#4

CODE: Oregon Structural Specialty Code - 2014 Edition

APPROVED: February 16, 2018 [Rebecca Esau], Director

REFERENCE: Oregon Structural Specialty Code 909.20 & 909.21

SUBJECT: Pressurization Systems for Smokeproof Exit Enclosures & Elevator Hoistways

QUESTION 1: Where a smokeproof exit enclosure is required, are there prescriptive standards that will be accepted to satisfy the requirements for pressurization of the stair enclosure and elevator hoistway as an alternate to providing a vestibule or lobby?

RESPONSE 1: The following pressurization methods will be accepted as systems that are capable of providing the required pressure differential across stair enclosure doors while still providing required egress capability. Proposed pressurization methods not complying with the provisions of this Code Guide must be approved on a case-by-case basis through the administrative appeals process.

A. General. Each of the following methods for providing the required exit enclosure pressurization is accepted as being able to provide the required pressure differential across stair enclosure doors. Each method must include all of the components listed below as part of their design in order to qualify for acceptance. Each method is required to provide engineered air flow calculations for fan and duct sizing and to demonstrate that the design will provide the required pressure differential.

B. Acceptable Pressurization Methods.

1. Supply only at the top and the bottom of the enclosure with controlled relief at the top;

2. Supply at the top, the bottom and at approximately every 50 feet of vertical run of the enclosure with controlled relief at the top; or
3. Supply only at the top of the enclosure with controlled relief at approximately every 50 feet of vertical run of the enclosure.

C. Required Components. If any of the above listed prescriptive methods are selected for use in providing exit enclosure pressurization, then all of the following components must be provided as part of the design of the chosen method.

1. Maximum anticipated stack effect shall be calculated using 2003 ASHRAE Applications Handbook, 52.2, equation 1;
2. Wind effect shall be considered and accounted for in the design of the pressurization system to insure proper operation of system components. The system design summary shall contain specific information on how wind effect is being mitigated;
3. Operation of Counter Weighted Backdraft Dampers (CWBDDs) shall consider and account for turbulent air flow conditions. The system design summary shall contain specific information on how turbulent air flow conditions are to be mitigated;
4. All fans, both supply and exhaust, shall be provided with a Variable Frequency Drive (VFD) for balancing;
5. Fan motors are to be Class B, or shall have a 1.25 service factor rating;
6. Each stair enclosure shall be provided with one louver for every 10 stories, equipped with CWBDDs and MODs. The first CWBDD shall be set to open at 0.15" of pressure at 2500 cfm with all doors closed. The second CWBDD shall be set to activate at 0.25" of pressure at 2500 cfm with all doors closed. The third CWBDD set to activate at 0.35" of pressure at 2500 cfm with all doors closed. This is to allow for the dynamics associated with door opening and stack effect.

The Balancer will use the VFD on the pressurization fan(s) to make these adjustments. Then, set the VFD to provide a differential pressure across doors of 0.10" minimum. Pressures in the stair shaft shall be measured relative to the corridor.

All louvers require Motor Operated Dampers (MODs) as required by the energy code. All MODs shall be set to power close during normal operation and to fail open upon building fire alarm;

7. If deemed necessary by the design professional responsible for the smoke control system, a method of relieving pressure buildup in the corridors due to air leakage from pressurization systems shall be provided. The system design summary shall specify how this is to be accomplished. Suggested approach is to provide a relief fan from the corridor with a controlled exhaust rate set by the Balancer on each floor. Note the exception under 710.8 where smoke dampers are not allowed when it can interfere with the operation of a required smoke control systems;
8. Fans and other electrically powered components of the pressurization system shall be provided with emergency power as part of the building smoke control system;
9. The system shall be balanced to provide approximately equal door back pressures on the doors at each level, including garage levels. Door latches shall release when subject to a force not to exceed 15 pounds and the opening force required to set the door in motion shall not exceed 30 pounds. Once in motion the door shall require not more than 15 pounds of force to swing to the full open position. The system design summary shall contain specific information on how this is to be accomplished;
10. Doors at stair enclosures shall be provided with dual speed closers. Closers shall be set to insure that stair enclosure doors will return to the fully closed position under all pressure conditions;
11. Doors at stair enclosures shall be provided with automatic, drop down door sweeps along their bottom edge. Sweeps shall be installed to insure a tight seal between the stair enclosure and the corridor. Code compliant thresholds may be used as part of the door assembly if required to provide the necessary seal;
12. Stair enclosure and associated corridor pressurization systems shall activate upon signal from any corridor, machine room or lobby smoke detector or upon sprinkler water flow;

13. The building life safety summary shall define the components of the smoke control systems and the sequence of operation of these components;
14. The system shall be tested at time of commissioning through a Special Inspection; and
15. The system shall be tested annually and inspected by the Fire Marshal's Office.

QUESTION 2: Where elevator hoistway pressurization is provided in lieu of required elevator lobbies, are there prescriptive standards that will be accepted as satisfying the requirements for pressurization of the elevator hoistways?

RESPONSE 2: The following pressurization methods will be accepted as systems that are capable of providing the required pressure differential across elevator hoistway openings in order to prevent smoke migration into the hoistway. Proposed pressurization methods not complying with the provisions of this Code Guide must be approved on a case-by-case basis through the administrative appeals process.

A. General. Elevator hoistway pressurization may be used in lieu of providing required elevator lobbies or other similar hoistway separation requirements as described in OSSC 713.14. Each of the following methods for providing the required elevator hoistway pressurization is accepted as being able to provide the required pressure differential across openings into the elevator hoistway. Each method must include all of the components listed below as part of their design in order to qualify for acceptance. Each method is required to provide engineered air flow calculations for fan and duct sizing and to demonstrate that the design will provide the required pressure differential.

B. Acceptable Pressurization Methods.

1. Supply only at the top and the bottom of the hoistway with controlled relief at the top;
2. Supply at the top, the bottom and at approximately every 50 feet of vertical run of the hoistway with controlled relief at the top; or
3. Supply only at the top of the hoistway with controlled relief at approximately every 50 feet of vertical run of the hoistway.

- C. Required Components.** If any of the above listed prescriptive methods are selected for use in providing elevator hoistway pressurization, then all of the following components must be provided as part of the design of the chosen method.
1. Maximum anticipated stack effect shall be calculated using 2003 ASHRAE Applications Handbook, 52.2, equation 1;
 2. Wind effect shall be considered and accounted for in the design of the pressurization system to insure proper operation of system components. The system design summary shall contain specific information on how wind effect is being mitigated;
 3. Operation of Counter Weighted Backdraft Dampers (CWBDDs) shall consider and account for turbulent air flow conditions. The system design summary shall contain specific information on how turbulent air flow conditions are to be mitigated;
 4. All fans, both supply and exhaust, shall be provided with a Variable Frequency Drive (VFD) for balancing;
 5. Fan motors are to be Class B, or shall have a 1.25 service factor rating;
 6. Each elevator hoistway shall be provided with one louver for every 10 stories, equipped with CWBDDs and MODs. The first CWBDD shall be set to open at 0.15" of pressure at 2500 cfm with all doors closed. The second CWBDD shall be set to activate at 0.25" of pressure at 2500 cfm with all doors closed. The third CWBDD set to activate at 0.35" of pressure at 2500 cfm with all doors closed. This is to allow for the dynamics associated with door opening and stack effect.

The Balancer will use the VFD on the pressurization fan(s) to make these adjustments. Then, set the VFD to provide a differential pressure across doors of 0.10" minimum. Pressures in the stair shaft shall be measured relative to the corridor.

All louvers require Motor Operated Dampers (MODs) as required by the energy code. All MODs shall be set to power close during normal operation and to fail open upon building fire alarm;

7. Each elevator hoistway shall also be provided with one louver for the event of fan failure. The louver required per IBC 3004 shall have a MOD that is to:
 - a. Power closed under normal operation;
 - b. Power closed during a fire if the pressurization fan is working; and
 - c. Fail open upon failure of pressurization fan(s);
8. If deemed necessary by the design professional responsible for the smoke control system, a method of relieving pressure buildup in the corridors due to air leakage from pressurization systems shall be provided. The system design summary shall specify how this is to be accomplished. Suggested approach is to provide a relief system from the corridors with a controlled exhaust rate set by the Balancer on each floor. Of primary consideration is the Primary Recall Floor where significant pressure relief is necessary;
9. Fans and other electrically powered components of the pressurization system shall be provided with emergency power as part of the building smoke control system;
10. Pressure differentials, relative to the corridor, are to be measured with the hoistway doors open on the designated recall floor and all other hoistway doors closed or with the door at the recall floor closed and all other doors open. When it has been verified that hoistway pressurization is at the required level, the elevator and hoistway doors at other levels shall be checked to verify that they operate freely;
11. The system shall be balanced to provide approximately equal door back pressures on the hoistway doors at each level, including garage levels and shall allow for free operation of the elevator cab and hoistway doors under Fire Department operation of the elevator. The system design summary shall contain specific information on how this is to be accomplished;
12. Doors at hoistways shall be provided with gaskets to limit leakage of air onto floors with corridors;
13. Hoistway pressurization systems shall activate upon signal from any corridor, machine room or lobby smoke detector or upon sprinkler water flow;

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14. The building life safety summary shall define the components of the smoke control systems and the sequence of operation of these components;
15. The system shall be tested at time of commissioning through a Special Inspection; and
16. The system shall be tested annually and inspected by the Fire Marshal's Office.

Updated May 13, 2016 edition, previously OSSC/10/#10

New May 13, 2016