ICC - CTC - Elevator Lobby Study Group

Summary of Options: Pressurization of Lobbies and Hoistways

January 16, 2011 - Initial draft issued - Clawson
January 20, 2011 - Option D added - Clawson (input from Siu)
January 21, 2011 - Edits and Option H added - Siu
February 27 2011 - Edits and Options Options J and K added - Clawson

Option	Description of Option	Pressurization for Lobby	Pressurization for Hoistway	Pressurization for Remainder of the Floor	Advantages	Disadvantages	Comments
A.	**Basic System:** Open lobby with no pressurization to lobby or to hoistway	None	None	None	1) Research indicates that it can be adequate for hoistways up to seven stories in height. [confirm by inserting citation].	1) Height Limit: About seven stories	***1) Not appropriate for use as Fire Service Elevator or as Occupant Evacuation Elevator.***
					2) Simple and inexpensive.	2) Not effective for all conditions [need to identify essential ones]	***2) Appropriate for consideration as traditional occupant elevator.***

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B.	**Basic System with Enclosed Lobby:** Enclosed lobby; no pressurization to lobby or to hoistway	None	None	None	1) Simple	1) Height Limit: [to be identifed]. 2) Physical separation from lobby and tenant area exists: Circulation and egress conflicts and space inefficiencies with lobby doors can occur; and some tenants prefer open plan to separated lobby.. *3) Maintenance issue to keep doors from being blocked open*	***1) Appropriate for consideration for use for all three types of elevators.***

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C.	**Pressurized Hoistway: Open Lobby**	None	Positive	None	*1) Allows circulation and egress without intervening doors, more open floor plan*	1) Height Limit: [to be identifed].	***1) Not appropriate for use as Fire Service Elevator or as Occupant Evacuation Elevator. Appropriate for consideration as traditional occupant elevator.***
						2) Difficulties occur in maintaining hoistway air pressure within the code required limits. This is due to stack effect, and is impacted by taller hoistways, and extreme differences in air temperature.	*2) Note that as the building is inflated, the neutral plane is lowered (reducing stack effect), and slows down smoke from spreading through other openings between floors (if building is leaky).*
						3) Elevator door closing problems can occur at some floors due to extreme air pressure required.	*3) Code not clear if HVAC system used for exhaust needs to be "hardened"*
						4) HVAC system used for shaft pressurization might not be dependable: Some components of the system might not be operated except during an emergency. Successful operation would depend on constant inspection and maintenance.	*4) Depending on size of floor & configuration, can result in entire floor being pressurized, unless relief for air is provided.*
						5) Inefficient use of floor area: Large shaft system required to pressurize and maintain pressure within hoistway usually has only single purpose (which is to pressurize shaft).	

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D.	**Pressurized Hoistway: Closed Lobby**	None	Positive	None	1) Same as Option C	1) Height Limit: [to be identifed].	*1) Appropriate for consideration for use for all types of elevators*
					2) Lobby ~~*could*~~ *is likely to* become passively pressurized due to air leakage from pressurized elevator *unless another avenue is provided for air to escape*.	2) Same as Option C above.	*2) Makes the lobby part of the hoistway as far as smoke zone is concerned*
					3) Passive pressurization might reduce extent of door closing problems, and might reduce stack effect problems.	*3) Is redundant (belt-and-suspenders), if the object is to keep smoke from spreading via the hoistway.*	

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E.	**Pressurized Lobby:** (Closed Lobby)	Positive	None	None	1) Increased dependability: Same HVAC system components are used for non-emergency mode as are used for emergency mode.	1) Height Limit: [to be identifed].	*1) Appropriate for consideration for use for all types of elevators*
					2) Efficient use of floor area: Shaft system required to pressurize and maintain pressure within lobby has dual purposes. Operates at a higher output during emergency events that require lobby pressurization.	2) Physical separation from lobby and tenant area exists: Circulation and egress conflicts and space inefficiencies with lobby doors can occur; and some tenants prefer open plan to separated lobby..	*2) Assumes use of same HVAC components. Are they hardened?*
					3) Elevator door closing problems substantially reduced: extreme air pressure required at some floors can cause problems with door closing at some floors.	*3) Maintenance to keep doors clear (esp. if on hold-opens)*	*3) What's the delta P across the elevator door?*
					4) Easier to maintain hoistway air pressure at the elevator doors within the required limits, especially for taller hoistways.		
					5) Flexible Concept: Can be designed to work efficiently for system with return air at perimeter of building; or system with supply air at perimeter of building		
					6) Fresh Air Provided to Occupants Waiting in Lobby to Use Elevators for Evacuation:HVAC System: Under IBC-2009, lobbies used for Occupant Evacuation Elevators accommodate 25% of occupants of the floor, plus some disabled in wheelchairs. Increased volumes of fresh air to waiting occupants would be very beneficial, both with regards to breathing and to maintaining a cool environment.		*4) But this pushes air into the hoistways(?) If smoke gets into the lobby (via open door by occupants egressing through lobby), doesn't it get pushed into the hoistway?*
					7) Decreases the amount of smoke entering elevator lobby from corridor: Without pressurization of the lobby, smoke from the corridors can seep into the lobby at gaps at the doors.		*4) The problem can be resovled by the use of smoke rated doors.*

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F.	**"Push-Pull":** Positive plus Negative Pressurization (Open Lobby)	Positive	None	Negative (pull smoke away from elevators and stairs)	1) Increased dependability: Same HVAC system components are used for non-emergency mode as are used for emergency mode. 2) Appropriate for newer approach for efficient HVAC systems design of supplying air from middle of the building, and extracting air from interior space at the perimeter (exterior wall) of the building. 3) Physical separation from lobby and tenant area does not exist: Circulation and egress conflicts and space inefficiencies with lobby doors does does not exist; and some tenants prefer open plan.	1) Height Limit: [to be identifed]. 2) No secondary system of protection from smoke (such as an enclosed vestibule).If HVAC system needs to be shut down. (This could be corrected with careful HVAC design). 3) System might be complicated if intent is to use a conventional 20th century HVAC system design with return air at the middle of the building and supply at the perimeter. 4) Limited use of elevator lobby for occupant evacuation by elevators.	***1) Not appropriate for use as Fire Service Elevator or as Occupant Evacuation Elevator. Appropriate for consideration as traditional occupant elevator.*** 2) As a variation on this option, floor above and floor below could receive positive pressurization.

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G.	**Zoned Smoke Control ("Pressure Sandwich")**	Negative at fire floor; positive at one floor immediately above and one or two floors immediately below the fire floor.	*Negative at fire floor; positive at one floor immediately above and one or two floors immediately below the fire floor. None*	*Negative*	1) Increased dependability: Same HVAC system components are used for non-emergency mode as are used for emergency mode.	1) Height Limit: [to be identifed].	***1) Not appropriate for use as Fire Service Elevator or as Occupant Evacuation Elevator. Appropriate for consideration as traditional occupant elevator.***
					2) Elevator door closing problems substantially reduced: extreme air pressure required at some floors can cause problems with door closing at some floors.	*2) Very sensitive to location of alarm*	*2) This system substitues for hoistway pressurization--it is a method to handle smoke control in the building.*
					3) Easier to maintain hoistway air pressure at the elevator doors within the required limits, especially for taller hoistways.		*3) This is not the system that's in the Seattle Building Code, but is one that was used as a code alternate in one building. It's my understanding the City of Bellevue, WA requires a system like this.*
					4) Physical separation from lobby and tenant area does not exist: Circulation and egress conflicts and space inefficiencies with lobby doors does does not exist; and some tenants prefer open plan.		

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H	*Zoned pressurization (Seattle code)*	*None (except by leakage)*	*Positive. Meet code-required ΔP across elevator door on fire floor, 1 above, and 2 below. Meet ΔP between hoistway and atmospheric for remainder of floors.*	*None*	*1) Achieves pressure where needed, reduces pressure on elevator doors in rest of hoistway.*	*1) Height Limit: to be determined.*	***1) Not appropriate for use as Fire Service Elevator or as Occupant Evacuation Elevator. Appropriate for consideration as traditional occupant elevator.***
			Allows measuring ΔP from hoistway to dwelling or sleeping units in residential occupancies		*2) Lowers neutral plane in building, reducing stack effect => prevents smoke migration via other openings between floors.*	*2) Complex system. Generally requires exhaust from 4 floor "sandwich" to achieve ΔP. Requires correct posturing of dampers, etc., depending on how exhaust is handled.* *3) For residential buildings, may still require dedicated exhaust shaft.*	*2) Seattle code does not require hardened HVAC components used for relief exhaust.*

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J	*Additional Door at Hoistway Entrance (nothing pressurized)*	*None (optional)*	*None*	*None (optional)*	*1) Provides additional hoistway protection without the use of a fully lobby; and without the use of pressurization.* *2) May have cost advantage.*	*1) Height Limit: to be determined.* *2) Coordination of door with elevator construction: Location of doors in the open position must be coordinated with other adjacent building elements, including elevator call buttons.* *3) Coordination of Door with corridor width: Door cannot encroach on more than 50% of the minimum door width.* *4) Must contain a vision panel that will allow fire fighters to observe the elevator lobby when the hoistway doors are no more than one-quarter open, and the additional door is in the closed position. [ASME A17.1].* *5) May not be considered visually acceptable for some building types or higher end uses.*	*1) Not appropriate for use as Fire Service Elevator or as Occupant Evacuation Elevator. Appropriate for consideration as traditional occupant elevator.* *2) Door frame is attached to the cooridor wall in such a way that the hoistway door frame fire rating is not compromised. Typically the additional doors are restrained (open) by magnetic hold opens and released upon some type of alarm signal.* *3) The "S" rating must be achieved without taping the undercut of the door during testing in accordance with UL 1784.[IBC section -insert-]* *4) Such doors must be readily operable from the inside, without special knowledge and without the use of a key. [IBC Chapter 30]*

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K	*Additional Door at Hoistway Entrance (hoistway pressurized)*	*None (optional)*	*Yes*	*None (optional)*	*1) Provides additional hoistway protection without the use of a fully lobby; and without the use of pressurization.* *2) May have cost advantage.*	*1) Height Limit: to be determined.* *2) Coordination of door with elevator construction: Location of doors in the open position must be coordinated with other adjacent building elements, including elevator call buttons.* *3) Coordination of Door with corridor width: Door cannot encroach on more than 50% of the minimum door width.* *4) Must contain a vision panel that will allow fire fighters to observe the elevator lobby when the hoistway doors are no more than one-quarter open, and the additional door is in the closed position. [ASME A17.1].* *5) May not be considered visually acceptable for some building types or higher end uses.*	*1) Not appropriate for use as Fire Service Elevator or as Occupant Evacuation Elevator. Appropriate for consideration as traditional occupant elevator.* *2) Door frame is attached to the cooridor wall in such a way that the hoistway door frame fire rating is not compromised. Typically the additional doors are restrained (open) by magnetic hold opens and released upon some type of alarm signal.* *3) The "S" rating must be achieved without taping the undercut of the door during testing in accordance with UL 1784.[IBC section -insert-]* *4) Such doors must be readily operable from the inside, without special knowledge and without the use of a key. [IBC Chapter 30]*