

Zonal and Sequential Extraction Design for Large Flat Space to Achieve Perpetual Tenability

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Abstract : This study proposed an effective smoke control strategy for the large flat space with a low ceiling to achieve the requirement of perpetual tenability. For the large flat space with a low ceiling, the depth of the smoke reservoir is very shallow, and it is difficult to perpetually constrain the smoke within a limited space. A series of numerical tests were conducted to determine the smoke strategy. A zonal design i.e., the fire zone and two adjacent zones was proposed and validated to be effective in controlling smoke. Once a fire happens in a compartment space, the Engineered Smoke Control (ESC) system will be activated in three zones i.e., the fire zone, in which the fire happened, and two adjacent zones. The smoke can be perpetually constrained within the three smoke zones. To further improve the extraction efficiency, sequential activation of the ESC system within the 3 zones turned out to be more efficient than simultaneous activation. Additionally, the proposed zonal and sequential extraction design can reduce the mechanical extraction flow rate by up to 40.7 % as compared to the conventional method, which is much more economical than that of the conventional method.

Keywords : performance-based design, perpetual tenability, smoke control, fire plume

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