

## **Sustainable Design on Semi-ducted Reversible Smoke Extraction System in Basement Parking Facilities**

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**Abstract:** Basement enclosed parking facilities require mechanical ventilation for emergency and normal operation. These two ventilation requirements are commonly combined into one hybrid system by many designers. This paper compares the smoke extraction system between the conventional ducted uni-directional ventilation system and the semi-ducted reversible ventilation system in a rectangular enclosed basement parking facility. In this reversible scheme, fans installed in fire zone are operated as extraction, whereas fans positioned in adjacent zones are running as make-up air to facilitate the extraction. The CFD simulation results show that both system performances are equivalent in maintaining the fire safety requirement. The installed ductwork for semi-ducted reversible system is significantly reduced. As such, the fans static can be reduced, resulting in lower power consumption during normal ventilation. It is estimated that energy savings of 41.4% can be achieved via semi-ducted reversible system.

**Keywords:** sustainable design; cost savings; CFD simulation; basement parking facility; smoke management system