Ekachai Kaewkanjanadit 2010: A Numerical Simulation of Atrium Smoke Ventilation in Mechanical Engineering Building, Kasetsart University. Master of Engineering (Fire Protection Engineering), Major Field: Fire Protection Engineering, Interdisciplinary Graduate Program. Thesis Advisor: Assistant Professor Nathasak Boonmee, Ph.D. 205 pages.

This thesis presents a numerical simulation of mechanical smoke exhaust system in an atrium of the Mechanical Engineering building, Kasetsart University. The simulations were performed by a computational fluid dynamics program called Fire Dynamics Simulator (FDS) developed by the National Institute of Standards and Technology (NIST), USA. The simulations were carried out for 3 fire sizes: 2.2 MW, 6 MW, and 12 MW. The fire location was placed at the center of the atrium on the second floor in order to depict the worst case scenario atrium fire. For all fire sizes, the calculations were carried out for 3 main cases: no smoke exhaust system, smoke exhaust system without smoke reservoir and smoke exhaust system with smoke reservoir.

The numerical results shown that for the case of no smoke exhaust system, the average smoke temperatures on the 4^{th} and 5^{th} floor corridors were over $49^{o}C$ for all fire sizes. The temperature above $49^{o}C$ is considered to be harmful for occupant according to the appendix B of NFPA 130, 2000 edition. For the case of 2.2 MW fire, the smoke exhaust system could vent out smoke reducing the temperature to be under $49^{o}C$. However, the smoke exhaust system only could not decrease the temperatures of the 4^{th} and 5^{th} corridor to be under $49^{o}C$ for the cases of 6 and 12 MW fires. As installing smoke reservoir, the smoke exhaust system could vent out smoke providing the smoke temperatures on the 4^{th} and 5^{th} floor corridor below $49^{o}C$ for all fire sizes. Therefore, the corridors of the 4^{th} and 5^{th} floors were safe for fire evacuation.

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