Abstract

Radon is a ubiquitous radioactive noble gas, which has no taste, smell nor color, and cannot be detected by any of human's sensations. It is known to be the first leading cause of lung cancer among non-smokers. As a result, Radon has been recognized as one of the most hazardous indoor air pollution to human's exposure.

Soil is the main source of Radon, whereas another powerful source of indoor radon level is building materials. Specifically, this focuses on the utilization of by-products from industrial processes, which contain relatively high concentration of Radium; such as fly ash, ore – tailing and phosphogypsum; as a component of building materials. Consequently, these building materials produce more radon than the general ones. Unfortunately, they are extensively used in the current constructions. Thus, the research is aimed to study the radon exhalation rate of the concrete containing fly ash and phosphogypsum; and indoor radon concentration and distribution when used as building materials.

The study is divided into two parts. The first part is a focus on studying the influence of fly ash (for short: FA) and phosphogypsum (for short: PG) on radon – exhalation rate from cementatious materials. The tests were carried out on cement clinker specimens with varied FA and PG contents. The second part is a focus on studying the concentrations and distributions of radon in shop-houses, a type of one of the most Thailand's popular residential buildings. This has been achieved by using the technique of computational fluid dynamics (CFD). The results are employed to propose potential ways in indoor radon reduction.

From the first part, it is shown that the radon exhalation rate is significantly lower in concrete containing FA 20 – 40 percents than in ordinary concrete; however gradually increase when adding more FA from 40 – 60 percents. In the case of PG, it is found a clear exponential correlation between radon exhalation rate and PG content. From the second part, the simulations show that interior partitions in the modeled room have elevate average radon concentration level, and accumulate this noble gas in the

areas of poor ventilation. Two ways to reduce radon are proposed. First, reducing height of interior partitions, and second, increasing ventilation rate by installation a ventilating fan. Radon concentration can be reduced to even lower than 75 percents of an original level as a result of a combined effect.

The results from this research can serve as a guideline to the selection of concrete additives (fly ash and phosphogypsum) in building constructions. Since the shop-house case portrays for a limited ventilation place, the simulations were carried out to suit lifestyles and economical limitations, while at the same time, help in reducing residential risk from radon exposure.