

Leak Path Factor Study at Savannah River Site

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The Leak Path Factor analysis has been traditionally performed at Savannah River Site for facilities subject to accident analysis. This paper addresses some recent work for the FB-Line building which needed refinements to previous work, which was based on a single volume approach. To model the entire building and all its simultaneous spills of contaminants in the different floors after a seismic event, a more complex multi-compartment analysis was performed using CONTAIN 2.0 computer code. This work enabled the analysts to improve the assessment of the source term for the consequent evaluation of the onsite and offsite doses.

The model developed for the FB-Line building includes 45 control volumes connected by 67 flow paths, and the contaminants were located at each floor of the building. The seismic qualified structures were modeled to bound the various volumes, and the interconnecting flow paths were modeled as closed doors with gaps, open doors, and doors opening with specified flow area time-history. Since the ventilation system is not seismically qualified, it was kept non-operational. The model included cracks in the expansion joints of the structural walls, and additional paths to the outside environment such as doorways and roll-up doors. The only forcing condition applied to the building was the wind pressure across the structures. Because of the geometrical location of the pathways to the outdoor environment, the analyses were performed using one contaminant location at the time, with wind pressure applied at the four wind directions independently. Heat transfer was included to account for the difference in temperature between the building environment and the outside. The outside environment was modeled using five volumes (one at each side of the building, and one on top) at set ambient conditions and large enough to maintain constant pressure and temperature. This yielded a bounding LPF for each contaminant location and wind direction.

Since the LPF is strongly dependent on the contaminant location and building geometrical configuration, the five calculated LPF were used to evaluate five source terms, which in turn were added for the consequent dose evaluation. The calculated LPF values were lower than those previously calculated, thus successfully reducing the source term.

This type of analysis using CONTAIN was very efficient. The building model, when well detailed, can subsequently be used for additional LPF analyses such as fires, accidental spills, uncontrolled blowdown of gas bottles, and others. The analyses were performed using the PC version of the computer code in a Windows NT environment. The code execution time was quite fast considering the large amount of computation for the size of the model. The code is simple to use and it has shown a great improvement for the performance of this type of analyses.