Chapter 7: Conclusions and Recommendations

7.1 Conclusions

This project involved the development of fire loads and design fires for residential and non-residential mid-rise buildings. For the purposes of this project, mid-rise buildings were defined as buildings from four- to eight-storeys.

The literature review showed that most of the available surveys have usually focused on particular occupancies without any conscious consideration for building height. The best way of obtaining fire loads for mid-rise buildings for this project would have been to conduct a fire load survey of mid-rise buildings. This was not possible due to the challenges involved in doing this which the time consuming process of obtaining permission from building owners and conducting the survey, privacy concern issues, and also a large number of buildings will need to be surveyed to establish a meaningful data set for realistic analyses. The alternative that was therefore settled on was to use data available for other surveys that have already been conducted. In the first step the appropriateness of this data for the objectives of this project was established. It was found that the contents found in rooms for particular uses do not necessarily vary because the height of a building changes. It was therefore possible to make use of the data currently available for various building occupancies to establish fire loads for mid-rise buildings. It

was also found that average floor areas for low-rise buildings are close to those for mid-rise buildings but maximum floor areas in mid-rise buildings are much lower than those in low-rise buildings.

Through review of statistical data on fires, it was discovered that a large majority of fire deaths and injuries occur in residential buildings with the most number of these fires originating in the kitchen. Also, non−residential building fires account for only a small fraction of all building fires but lead to some of the highest costs in fire losses. Based on the fire load surveys and fire statistics, fuel packages were established and design fire scenarios selected.

Simulations were performed using CUrisk, a two-zone fire risk analysis computer model software currently under development at Carleton University. The modelling involved a six-storey building with six apartments per floor. Each apartment contained a living room, two bedrooms, a kitchen, and a bathroom. Design fires were established for living rooms, bedrooms, and kitchens according to the results that were obtained from the simulation. Most of the results obtained were reasonable and compared well with some previous experiments. The results show that closed doors delay if not prevent smoke spread from the compartment of fire origin allowing occupants in other areas of the building time to evacuate.

7.2 Recommendations for Future Work

The fire loads in this project were developed using available data that was not specifically obtained from mid-rise buildings. It will be valuable to conduct fire load surveys for mid-rise buildings to establish types, amounts, and distribution of combustible materials found

in midrise buildings as well as size and location of openings and floor areas. It will be worthwhile to conduct this survey for both combustible and non-combustible construction to determine whether or not type of construction affects fire loads.

Once the development of fire spread sub-model for CUrisk is complete, the simulation could be run to determine the speed and effects of fire spread on the occupants and structure of mid-rise buildings. Improvements will need to be made to CUrisk such that one can enter different fire loads for different compartments; currently one can only enter an initial growth rate of the fire and the maximum HRR. Future experiments could also be carried out using other fire simulation software such as FDS.