SUMMARY

People are spending more of their time in a building, either for work or leisure. Most of these buildings are air-conditioned and designed to be air-tight so as to conserve energy. With this objective in mind, the buildings tend to encourage the build-up of contaminants within it. Although it is mandatory to introduce a certain percentage of fresh air to replace the used air, a certain degree of the contaminants would still be re-introduced to the occupants through the return air. It is therefore important to have a filtration system that is effective enough to deal with all kinds and sizes of contaminants to increase productivity.

This dissertation is done to determine if a normal media filter is sufficient to effectively remove small size particle, which is the main cause of health problem to human body. In order to prove this hypothesis, a case study was performed at Guthrie House, a commercial building along Bukit Timah Road. It is a low-rise office building with commercial food and shopping outlets. The particle and biological count readings were sampled over a one-week period. The sampling was performed at three different levels of the building. Sampling results were then analysed to ascertain the following:

1) Whether the main source of pollutants is from within the building (i.e. internal) or from the fresh air intake (i.e. external).
2) Whether the normal filter is effective enough to remove small size particle and to what extent is it effective.
3) Whether the normal filter or the electronic filter is more effective to deal with small size particles.
4) Whether biological contaminants are a problem in the building and how do these contaminants correlate with the particle counts obtained.
The results obtained showed that a normal media air filter is ineffective against small size particles of 0.8 microns and below. It only has an efficiency of about 50% and below for that size range as compared to the filter's specification of about 65% to 98%. The results also demonstrated that an electronic air filter is more efficient when dealing with small size particles. It has a higher efficiency throughout the different size range. It was also determined that in AHU level 1, there is a high level of small size contaminants from the internal source as compared to the fresh air intake. This could be due to the biological contaminants at that level as well as the way the room was used, partly as a cleaner's room. However, biological contaminants are not a problem in the building as it is well below the threshold level of 500 cfu/m³.

Finally, this dissertation highlighted the point that filtration is becoming increasingly important in helping to minimise sick building. There is no single filtration system that can be applied and be effective to all. Therefore, it will be worthwhile to further research into a combination of filtration system to see how effective combination filtration is as compared to a single filtration system.