

ABSTRACT

Allergies have become a serious health problem with considerable social and economic impact. Especially the indoor environment of New Zealand's residential buildings plays a major role in the increasing numbers of allergies, airways infections and cases of Sick Building Syndrome (SBS). This master thesis examines the indoor air pollution in relation to construction details, insulation levels, ventilation and humidity. Dampness problems such as condensation on windows and mould growth are related to the indoor humidity caused by wrong ventilation (or a lack thereof), heating habits, rising damp and building envelope. This thesis addresses these issues by studying moisture damage caused by damp housing in buildings with poor ventilation and insulation between the 1950's and the 1980's. The thesis argues that existing homes have to be retrofitted to meet new sustainable standards in order to provide a healthier indoor air quality (IAQ) and to reduce the risk of allergies and asthma.

The first part of this thesis examines general health effects which are related to IAQ and identifies common exposure sources in homes. The second part illustrates the problem of damp housing which currently presents the most common cause of allergies in New Zealand homes. Therefore, the thesis identifies their specific influence on health in general and possible risks of developing allergies in particular. Regarding this, it is proved that adequate ventilation in homes prevents adverse health effects, such as coughing, wheezing, airway infections and asthma and can also reduce and ideally eliminate existing mould in homes.¹ Part three gives a review of recent international and national research studies on this topic. Additionally, the thesis evaluates data of the University of Otago to determine the association between damp housing and allergies. Part four introduces the existing housing stock of New Zealand and its different building typologies in order to give examples of interventions to keep current mould and dampness problems under control.

Overall, this thesis addresses the lack of information about IAQ in New Zealand homes and illustrates the interrelation between ventilation, heating, building materials and dampness. Simulation software is also introduced to verify possible "changes" in terms of building physics after retrofit solutions have been applied. In this context, the thesis presents preventative actions, advises how dampness problems can be proactively avoided and provides practical recommendation for refurbishments of specific building typologies, built between the 1950's and the 1980's.

¹ Yuanhui Zhang. *Indoor air quality engineering*. Boca Raton, Florida, USA: CRC Press, 2005, pp.4-5.