

## Information Paper

# Designing to reduce the chemical, biological and radiological vulnerability of new buildings

Vina Kukadia and Alan Abela

Buildings are currently not designed specifically to offer protection against chemical, biological and radiological (CBR) releases. However, should a CBR event occur, it has the potential for a high adverse impact on buildings, their occupants' health and wellbeing, and also on business operations and services. Since buildings have a long lifespan, consideration of protection measures is particularly important at the early stages of design. Once built, retrofitting to mitigate CBR impact will be time-consuming, disruptive and expensive. It is therefore important to consider and incorporate means of reducing the impact of CBR releases as an integral part of the initial building design, planning and construction process.

Designing to reduce CBR vulnerability is likely to yield additional business benefits, including:

- improved security and protection for occupants
- enhanced indoor environments as a result of less environmental pollution ingress
- reduced cost compared with retrofitting
- commercial advantages to developers from providing a high quality building with an advanced level of security and protection
- shortened recovery phase following a CBR release, which may otherwise be extensive
- savings in costs for remediation (eg clean-up of the property).

This Information Paper considers ventilation and infiltration as prime routes for the ingress of external contaminants into buildings. It provides an overview of some existing design standards, methods and practices that may be further reviewed and implemented at the design stage without adding significantly to costs. It is intended to be used by the following stakeholders:

- building professionals (architects, planners, building services engineers, facilities managers)
- clients, developers, building owners and managers
- regulatory authorities (local authority environmental health, building control and planning officers).



**Figure 1:** Protection measures should be considered during the early stages of the design process

## Introduction

Buildings are required to maintain a high quality of indoor air for occupant health and wellbeing. To assist in achieving this, building regulations in the UK specify minimum ventilation requirements based on the assumption that outdoor air is 'fresh'. For example, Approved Document (AD) F of the Building Regulations for England<sup>[1]</sup> specifies a minimum fresh air requirement of 10 l/s/person for an office building. However, buildings in populated areas can be exposed to contaminants from a number of outdoor sources, including transport, combustion plant (eg boiler flues, combined heat and power [CHP], standby diesel generators), industrial processes (eg incinerators, fume cupboards), ventilation discharges,