

1.0 **GENERAL**

1.1 **Related UBC Guidelines**

- .1 Building Operations Energy Management Policy

1.2 **Coordination Requirements**

- .1 Coordinate with UBC Building Operations - Technical Services and Energy and Water Services – BMS Office.

1.3 **Description**

- .1 Guidance for the design and operation of HVAC systems in order to provide a suitable thermal environment for sedentary work (e.g. in office, classroom, library, laboratory).
- .2 The basis for design and operation are the applicable ASHRAE standards, however guidance is required for interpreting them in the context of UBC's Vancouver campus.

2.0 **MATERIALS AND DESIGN REQUIREMENTS**

2.1 **Applicable Codes, Standards and Guidelines**

- .1 ASHRAE 55-2010 Thermal Environmental Conditions for Human Occupancy.

The purpose of this standard is to specify the combinations of indoor thermal environmental factors and personal factors that will produce thermal environmental conditions acceptable to a majority of occupants within the space.
- .2 ASHRAE 10-2011 Interaction Affecting the Achievement of Acceptable Indoor Environments.

This guideline raises awareness of interactions affecting the achievement of acceptable indoor environments
- .3 ASHRAE 62.1-2013 - Ventilation for Acceptable Indoor Air Quality

Natural ventilation design guidance (Section 5)

2.2 **Principles**

- .1 **Passive design:** designers shall adopt passive design approaches that use the building architecture to improve indoor thermal comfort and minimize energy use and equipment sizing.
- .2 **Adaptive thermal comfort:** where occupants are free to adapt their clothing to the indoor temperature, mechanical cooling is not necessary. Where design conditions in such spaces have been shown to need mechanical cooling, submissions for variance are to be made as part of the initial design philosophy submission.
- .3 **Humidity control:** Vancouver's temperate climate, with mild temperatures and moderate humidity levels year round, allows the humidity in a space to be uncontrolled and the space still be considered comfortable, unless there is a particular reason for humidity control e.g. rare book storage, laboratory operations.
- .4 **Adaptation:** Where possible space for future cooling coils shall be provided to mitigate risk of increased cooling degree days. Provide thermal comfort modelling in support of design.

- .5 Thermal modeling simulation shall be used to verify mechanical cooling requirements.
- .6 Mechanical cooling shall be provided where process or code requirements dictate e.g. high heat loads in laboratories, IT server rooms, control rooms, AV rooms, electrical rooms, etc.
- .7 Large classrooms (>50 students) may require 100% fresh air supply for air quality and/or provision of mechanical cooling, due to high heat load.

2.3 Selection of Ventilation Strategy

- .1 Select a ventilation strategy which is most suitable for the building design. Passive or natural ventilation should be used wherever appropriate. For buildings where passive ventilation is unable to meet either the thermal comfort requirements given in this guideline or the program requirements of the building, a mixed-mode ventilation strategy should be considered that uses a combination of natural ventilation and mechanical HVAC where necessary.
- .2 Refer to CIBSE – Natural Ventilation in Non-Domestic Building – Chapter 2 “Selecting a natural ventilation concept” as a source of reference.

2.4 Design of Naturally Conditioned Space (i.e. no mechanical cooling)

- .1 Naturally conditioned space shall be designed to satisfy the following criteria through passive design practices and shall be verified using thermal modeling simulation:
 - .1 Internal Temperature (T_i) $\geq 24^\circ\text{C}$ shall not exceed 150 occupied hours.
 - .2 Internal Temperature (T_i) $\geq 27^\circ\text{C}$ shall not exceed 50 occupied hours.
 - .3 Internal Temperature (T_i) $\geq 30^\circ\text{C}$ shall not exceed 20 occupied hours.
- .2 Operable windows shall be provided. Sensors shall interlock space heating. See ASHRAE Handbook Fundamentals, Natural Ventilation and Infiltration, Chapter 22.
- .3 15% additional supply air capacity is required to provide a means of maintaining a suitable thermal environment during extreme temperature events. Where possible space for future cooling coils shall be provided.

2.5 Design of Active Systems

- .1 Active systems shall be designed to achieve the following minimum conditions during occupied hours:
 - .1 Heating systems shall be designed to maintain an indoor temperature of 21°C for an external temperature of -9°C (BC Building Code 1% value for January).
 - .2 Cooling systems shall be designed to maintain an indoor temperature of 25°C for an external temperature of 28°C (BC Building Code 2.5% value for July).

2.6 Operation of Active Systems

- .1 Space Heating Systems: Set point $21^\circ\text{C} \pm 1^\circ\text{C}$
- .2 Space Cooling Systems: Set point $25^\circ\text{C} \pm 1^\circ\text{C}$
- .3 Night Time Setback conditions:

- .1 Buildings will be maintained between 15°C to 17°C during winter, depending on building recovery time.
- .2 No ventilation, unless nighttime cooling control strategy is required.
- .3 Pre-conditioning time of 1 hour prior to occupancy, depending on building recovery time.
- .4 Research laboratories that require continuous ventilation: During unoccupied conditions reduced ventilation and temperature conditions are expected.

*****END OF SECTION*****