

1.0 **GENERAL**

1.1 **Related UBC Guidelines & Documents**

- .1 Section 23 00 00 HVAC (and all subsections)
- .2 Section 20 00 00 Mechanical - General Requirements
- .3 Section 01 91 00 Commissioning Requirements
- .4 Section 25 05 00 Building Management Systems (BMS) Design Guidelines
- .5 All other Tech Guidelines as may be applicable to a given project.

1.2 **Related Documents External to UBC**

- .1 BC Plumbing Code and all references contained there within
- .2 BC Building Code and all references contained there within
- .3 Work Safe BC Occupational Health and Safety Regulation

1.3 **Description**

- .1 The Guidelines apply to all work completed within buildings on both UBC Vancouver and UBC Okanagan campuses unless stated otherwise.
- .2 In instances where conflicts are found between these guidelines and provincial regulations or codes, please notify UBC Mechanical Engineer.
- .3 These guidelines are intended to be read by designers and their content integrated into construction drawings and specifications. Construction documents are not to reference the technical guidelines directly.
- .4 It is the requirement of the mechanical designer to coordinate these requirements with other disciplines.

2.0 **MATERIAL AND DESIGN REQUIREMENTS**

These are requirements specific to UBC that may not exist in code or other jurisdictions. Any deviation from these guidelines requires a variance be granted.

2.1 **Design Requirements**

- .1 Designs shall incorporate strategies for maximizing the delta-t of heating water across the building's mechanical systems. The maximum acceptable supply water temperature to the building heating system shall be 46°C with a preference for lower temperatures whenever possible. Return water temperature on a design day should be 35°C. For UBC Vancouver, refer to section 33 61 00 for maximum supply and return water temperatures to the district energy system on the primary side of the HEX. Select heat exchangers and system designs that can meet these requirements. Design strategies that may be employed to achieve the low return water temperature requirements include:
 - .1 Selecting heating coils for large delta-t or using switchover coils.
 - .2 Cascading perimeter heat in series with heating coils.
 - .3 Heating water temperature reset.

- .2 Controls design and specification shall comply with TG Section 25 05 00 – Building Management Systems Design Guidelines
- .3 Any system that utilizes large central air handlers to serve multiple zones shall include re-heat coils for all zones.
 - .1 VAV box's shall have re-heat coils
 - .2 Zones within displacement ventilation systems shall have re-heat coils
- .4 All perimeter air terminal units shall have heating coils (or re-heat coils)
- .5 Freezer farms, rooms that are specifically designated to hold multiple freezers have special design requirements.
 - .1 Freezer farms shall have dedicated cooling equipment (such as fancoils or water to air heatpumps), it's not acceptable to have freezer farms drive the supply air temperature of large air systems (which would then require excessive re-heat in other zones).
 - .2 Due to the amount of equipment located in freezer farms, accessing equipment above the ceiling can be challenging. Special care needs to be employed to ensure reliable equipment access.
 - .3 Ensure that freezer farms are designed for future capacity. At the engineer's discretion, it may be reasonable to assume that all available floor space is filled with freezers comparable to the units being installed at the time of design.
 - .4 Depending on the quantity and nature of the equipment, consider installing parallel cooling equipment.
 - .5 If the room cannot be sufficiently cooled (to prevent equipment trip) by jamming the door open then make sure that the ac equipment (and all associated central infrastructure) is on emergency power.
 - .6 Freezers associated with research should be on emergency power
 - .7 Floor mounted cooling units should be considered for these spaces for the ease of service access. Alternatively, consider high wall fancoils (see discussion in bullet below about cooling for IT and electrical rooms).
- .6 Window mounted air conditioners and exhaust fans are not acceptable.
- .7 Open ceilings generally make maintenance easier than drywall or t-bar. Work with the architect to install open ceilings in spaces such as communication closets, freezer farms, back of house prep areas, hallways, research labs.
 - .1 Many of UBC's clientele (especially in the Science departments) prefer utility and flexibility over aesthetics. Consider the wide use of open ceilings when it has service or future flexibility benefits.
- .8 All mechanical equipment that is related to temperature control, equipment that that requires scheduling, or any item that requires remote monitoring shall be connected to BMS.
- .9 This point and all sub-bullets for UBC Vancouver Only: Refer to Section 20 00 30 Indoor Thermal Environment (UBC Vancouver) and I-B-53 Energy Policy for Classrooms for thermal design criteria. Some key points are:

- .1 2.5% summer design condition for cooling systems at UBC shall be 31°C DB/ 23°C WB based on projected 2050s climate. See 20 00 30 for more info on how this was determined.
- .2 Many spaces including learning spaces shall be designed for indoor temperatures of 25°C.
- .3 Where possible use natural ventilation and passive principles to cool offices and transient spaces.
- .4 Refer to the following for detailed design guidance:
 - .1 Climate Ready Requirements for UBC Buildings
 - .2 TG Section 20 00 30 – Indoor Thermal Environment
 - .3 I-B-53 Energy Policy for Classrooms.
- .10 UBC's Climate Action Plan (CAP) has set a target of 100% reduction in GHG emissions below 2007 levels by 2050. In support of this plan, natural gas shall not be used as the primary heating source in new and replacement air handling and space heating equipment, including but not limited to rooftop units, unit heaters, space heaters, etc.
 - .1 At UBC Okanagan, gas heating is acceptable for backup heating where critical spaces require redundancy. Reach out to UBCO Campus Operation for details.
 - .2 At UBC Vancouver, gas is not acceptable, even for backup.
- .11 *Preferred approaches to cooling of electrical, IT, elevator machine rooms or similar utility spaces are below.*
 - .1 Preferred cooling strategies (from preferred to least desirable are):
 - .1 No HVAC if loads are small enough
 - .2 Exhaust fan and transfer air if loads are small enough
 - .3 Chilled water fancoils
 - .4 Terminal heatpumps
 - .5 VRF or split cooling
 - .2 When loads are moderate, a cost-effective and maintenance supported approach to installing fancoils is to install ductless high wall fancoils (HWFC).
 - .1 These are most commonly seen on VRF systems but are available by several manufacturers with chilled water.
 - .2 The electrical TG's specifically ask designers to leave space above the doors for the installation of HWFCs. This is an ideal location because:
 - .1 If it is possible to open the door then it is possible to erect a ladder at this location.
 - .2 It is unlikely that there will be equipment below this location and therefore drips are less of a concern.
 - .3 Electrical is unlikely to clutter this space with riser conduits.
 - .3 Coordinate electrical rooms to not have ceilings whenever possible. Install the HWFC at high level so that the condensate drain can be run by gravity. Drop to the floor below if necessary. Avoid condensate whenever possible.\
- .12 *Demand controlled ventilation requirements*
 - .1 *For spaces larger than 20m² - provide occupancy sensor(s) that adequately detect motion of entire space.*

- .2 *When motion has not been detected for a minimum of 15 minutes, the system goes into standby mode. Refer to section 25 05 00 for specifications on sensors and sequences. Unoccupied nighttime setbacks in laboratories are required per Section 23 38 00.*
 - .3 *For UBCO only - for spaces with a design occupancy larger than 50 people, provide CO2 sensors*
 - .4 *Additional requirements may apply as dictated by external codes and standards such as LEED.*
- .13 All spaces with critical humidity requirements such as galleries or sensitive research spaces shall be specified with Vaisala HMT-120/130 sensors c/w display screen. Refer to the BMS TG 25 05 00 for more information.

2.2 Testing and Commissioning Requirements

- .1 Any project which is modifying the central building system or installing new central infrastructure that will affect multiple spaces shall hire a Commissioning Authority (CxP). Refer to section 01 91 00 for more information. Some examples where this would apply are:
- .1 Chiller replacement
 - .2 Boiler replacement where the piping has significant modifications
 - .3 Installation of manifolded fumehood exhaust system
 - .4 Full floor renovations
 - .5 Any project with a moderate mechanical scope or controls scope. If unsure, ask UBC Building Operations Mechanical Engineer

3.0 LESSONS LEARNED & COMMON MISSES ON UBC PROJECTS

Items in this section are not specific requirements of UBC but are code or industry best practices which have been missed on past jobs. These items should be considered in mechanical designs at UBC. However, if they're not applicable then a variance is not required.

- .1 Displacement ventilation systems are not suitable in many office environments where they may blow under desks or be affected by moving furniture. Displacement ventilation systems also provide limited options for modifications (i.e. increasing/decreasing supply air temp) if comfort requirements aren't being met.
- .2 Condensation from cooling coils is a common source of leaks. Please make sure that designs include these best practices:
 - .1 Condensate pans for all cooling coils
 - .2 Condensate pans for all heat recovery coils including glycol run around loops and chilled water exhaust coils
 - .3 Appropriately designed p-traps for negatively or positively pressurized plenums
 - .4 Adequate ceiling space for p-trap drops and sloped condensate lines
 - .5 Only use condensate pumps where absolutely necessary. Drain by gravity whenever possible.

- .3 Elevator machine room drip pans under fancoils. Please be aware that the TSBC Elevator inspector expects that drain pans are installed under fancoils if they are installed in the elevator machinery room.
 - .1 If possible, provide cooling with an exhaust fan or locate the cooling device outside the room and duct in.
 - .2 If installing a fancoil in the room (for example high wall fancoil above the door) please coordinate a drain pan that does not encumber maintenance access.

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