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 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. In instances where conflicts are found between these guidelines and provincial regulations or codes, please notify UBC Mechanical Engineer.
.2 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.
.3 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 All exhaust ductwork for Class 3 exhaust or greater (as defined by Ashrae 62.1) shall be negative while within the building. Class 3 exhaust may be positive in mech rooms. Class 4 exhaust may be positive in mech rooms provided that exhaust fans are in their own separate mech room. Please review The Fumehood Mechanical Room and Rooftop Access Policy I-B-06 and ensure that all designs comply with this policy – some pitfalls are:
  .1 UBC uses leak detector on the flex connections and ductwork on the positive side of the fan to check for air leaks.
  .2 Special attention must be paid to drains on fumehood exhaust fans. Many fans have these drains on the positive side of the fans. Where this is the case, these drains are a source of contaminated air leakage that must be addressed to comply with UBC's roof access policy. Caution that there are many pitfalls with using p-traps as maintaining a positive seal is challenging – trap primers typically have air gaps built in which can themselves become a source of leakage. Please reach out to UBC Facilities if you would like to discuss this item.

.2 On all manifolded fumehood exhaust systems, provide pressure relief doors (implosion doors) on the pressure exterior ductwork. Mechanical engineer to size the door to ensure that duct pressure cannot exceed duct pressure rating in any foreseeable operating circumstance (ie all upstream dampers closed or in min position with fan running).

.3 See Section 11 53 13 Fume Hoods, for design and face velocity requirements for fume hoods.

.4 Radio isotope cabinets to be on separate fans, not connected to other systems or other RI cabinets.

.5 Fumehood numbering/labelling requirements:
- .1 Attached to the fumehood
  - .1 Fumehood equipment tag (FH-ROOM-INDEX#) (see TG 20 00 08)
  - .2 Associated exhaust fan
    - .1 If installing a new system then the exhaust fan tag should indicate the location of it. However, if connecting to a fan where the tag does not indicate the location then add this information (ex FEF-05 (Roof)).
- .2 Attached to the exhaust fan
  - .1 Exhaust fan tag (FEF-FLOOR-INDEX#) (see TG 20 00 08)
  - .2 List of associated fumehoods
    - .1 These lamacoids made end up being quite large for manifolded systems, be sure to allow for this. Use multiple lamacoids if required.
  - .3 Associated disconnect (VFD, starter, or breaker)
- .3 Attached to the VFD
  - .1 VFD tag (VFD-FLOOR-INDEX#) (see TG 20 00 08)
  - .2 Associated exhaust fan
  - .3 Associated disconnect

.6 Decision to install scrubbers for percloric acid or similar uses shall be reviewed with UBC Risk Management Services during the design phase.

.7 Where fume hood exhaust stacks are used their design shall comply to WSBC and ANSI Z9.5.
- .1 Manifolded exhaust systems are often preferred and are acceptable as described by WSBC.

.8 In new buildings, stacks shall be grouped together to provide an aesthetic appearance when viewed from street level.

.9 When installing manifolded fumehood exhaust systems with heat recovery coils:
- .1 Filters shall be provided upstream of the coils.
- .2 Means shall be provided to service the filters or coils without shutting down the fumehood exhaust system. Options for this include:
  - .1 Large by-pass sections complete with dampers (which may be motorized or have manual handles)
  - .2 Installing a coil for each fan, downstream of the isolation damper.

.10 For lab exhaust systems all devices directly related to the lab need to be on the same BMS controller so that there isn't a lag in response times. For example if a fumehood sash height sensor isn't on the same controller as the exhaust fan (or pressure independent exhaust valve) then there can be a lag in response time and the hood can go into alarm before the fan speed ramps up.

.11 Provide minimum of 8 air changes per hour (ACH) for all wet laboratories during occupied hours and, where possible, an unoccupied nighttime setback to 4 ACH. Laboratories designed with 4 ACH unoccupied nighttime setback must have adequate motion detection to override nighttime setback conditions when occupied, as well as adequate VAV supply and exhaust control. Alternate proposals to be reviewed with UBC Facilities and approved by UBC Safety and Risk Services.

.12 All constant volume, bypass type fumehoods must run 24/7 including new installs and renovations of existing as per UBC Safety and Risk Services. This policy is in place to protect against possible improper use of the hood such as storing chemicals or running an experiment within a closed hood that is turned off.

.1 This approach simplifies the HVAC system as the supply and general exhaust does not need to account for changes in the hood operation.

.2 If there is a lab renovation where the hood previously had a on/off switch, then the project shall modify fumehoods that are within scope to run 24/7 including the associated room HVAC pressure controls sequence if necessary.

.3 In many cases there is no energy penalty to this approach as spaces with a low density of fumehoods are unlikely to dictate the room air change rate.

.4 See TG 11 53 13 for possible other scope on existing hoods.

.13 Makerspaces, workshops, electronics laboratories with soldering and other similar spaces shall be appropriately ventilated to manage airborn contaminants. Air within these spaces shall be considered, at a minimum, Class 2 as defined by ASHRAE 62 and shall not be suitable for recriculation to most other spaces.

.14 3D Printers are a source of airborne contaminants. Spaces that house 3D printers shall be designed with the below considerations in mind:

.1 Designers shall be familiar with the document "Approaches to Safe 3D Printing: A Guide for Makerspace Users, Schools, Libraries and Small Businesses" as published by the US National Institute of Occupational Safety and Health (NIOSH) especially 4.4 - Engineering Controls.

.2 Mechanical Engineers shall utilize a combination of local exhaust, ventilated enclosures, air change rate and filtration as recommended by the NIOSH article above.

.3 The air in spaces that contain more than two PLA 3D printers shall be considered Class 2 as defined by ASHRAE 62 and shall not be suitable for recirculation to other spaces

.4 The air in spaces that contain any number of resin or ABS 3D printers shall be considered, at a minimum Class 2 as defined by ASHRAE 62 and shall not be suitable for recirculation to most other spaces

2.2 Construction and Material Requirements

.1 Fumehood exhaust material requirements - All fumehood exhaust shall be constructed of welded stainless steel as a minimum. Mechanical Engineer to determine if a more resistant material is required such as CPVC. Lesser materials such as galvanized steel aren't acceptable even if the exhaust is non-corrosive because it's impossible to forecast future uses of fumehoods.

.1 Whatever resistant material is deemed necessary, this standard must be carried through all connected equipment including fans and pressure independent air control valves.

.2 Flex connections on inlet and outlet of fumehood exhaust fans shall be installed:

.1 Between two round ducts of the same diameter which are completely in line with each other and which are ~1" apart.

.2 Out of a single piece of flexible material (rubber or other material suitable for the contaminated exhaust stream) which overlaps the ducts on each side by 1" minimum and overlaps onto itself by 3" minimum.

.3 The flexible material shall be glued to itself to create continuous loop around the duct.

.4 The flexible connector shall be connected to the ductwork with two stainless steel worm-drive duct clamps on each side of the flex connector.

.3 Sound attenuators and internally line ductwork are not acceptable on fumehood exhaust ductwork.

.4 Provide hasps on all fumehoods so that the fumehoods can be locked shut for servicing the exhaust air system.

2.3 Testing and Commissioning Requirements

.1 Refer to section 11 53 13 - Fumehoods

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 When manifolding multiple fumehoods into a single exhaust system, ensure that the requirements of ANSI Z9.5 are met for system reliability (typically multiple fans) and flow regulating devices (pressure independent air valves).

.1 All manifolded exhaust systems need to run 24/7 as per ANSI Z9.5. Minimum airflow volumes for closed vav hoods shall be per ANSI Z9.5 (3.3.2).

.2 WSBC regulations do not currently allow low flow fumehoods. Face velocities must be between 80-120fpm

.1 WSBC regulations do not currently allow fumehood occupancy sensors to reduce face velocity (when the area in front of the hood is vacant). However, a hood occupancy sensor may be used to prompt the researchers to close the sash.

END OF SECTION