

All guidelines apply to both UBC Vancouver and UBC Okanagan campuses unless stated otherwise.

INDEX

Section		UBC Campus
Section 11 53 13	Fume Hoods and Biological Safety Cabinets	Okanagan
Section 11 53 13	Fume Hoods and Biological Safety Cabinets	Vancouver
Section 11 53 33	Emergency Safety Appliances	Vancouver and Okanagan
Section 11 60 00	Cranes and Hoists	Vancouver and Okanagan
Section 11 81 29	Facility Fall Protection	Vancouver and Okanagan
Section 11 82 00	Waste Handling Equipment	Vancouver and Okanagan

1.0 **GENERAL**

1.1 **Related UBC Guidelines**

- .1 Section 12 35 53 Laboratory Casework
- .2 Section 23 38 16 Fume Hood Exhaust Systems
- .3 Section 20 00 08 Mechanical Identification for the details for fume hood labelling requirements.

1.2 **Co-ordination Requirements**

- .1 Design development protocols will be issued by the user group in consultation with UBC Risk Management Services, to the Consultant defining in detail the laboratory function, requirements, and systems to be provided.
- .2 Review design intent and additional requirements with UBC Risk Management Services. Co-ordinate with Risk Management Services early in the design process.
- .3 Consult with Facilities Maintenance on requirements to tie Fume Hoods into existing Building Management Systems and the building's laboratory induction exhaust system (Strobic).
- .4 The selection of fume hoods and biological safety cabinets is to be made in consultation with Risk Management Services, Facilities Maintenance and the principal researcher to ensure that the scientific, safety and engineering concerns are properly addressed.
- .5 Operable windows are not to be installed in labs in order to allow negative pressures to be maintained relative to adjacent spaces and to prevent draft conditions. If installing a fume hood into a space with operable windows, windows will be permanently secured in the closed position.

2.0 **MATERIAL AND DESIGN REQUIREMENTS**

2.1 **Design Requirements**

- .1 All fume hoods and exhaust systems shall conform to Part 30 Laboratories, of the Occupational Health and Safety (OHS) Regulation under the inspection jurisdiction of WorkSafeBC, and the latest edition for CSA-Z- 316.5 Fume Hoods, and Associated Exhaust Systems, and show evidence of being performance tested in accordance with ASHRAE 110, Method of Testing Performance of Laboratory Fume Hoods.

2.2 **Certification and Commissioning Requirements**

- .1 Fume hood installations must be certified by a professional engineer. To certify the installation of a laboratory fume hood, a professional engineer is required to conduct an assessment of OHS Regulation requirements related to the installation of the fume hood, duct work, exhaust system, lab requirements, make-up and air balance requirements.
- .2 Following installation of the fume hood and before it is used, the installation must be fully tested to confirm all air flow requirements are met, including face velocity, containment, balancing and makeup air. Face velocity requirements are as per current WorkSafeBC / OHS requirements.

- .3 It must be demonstrated to the UBC Project Manager, and UBC Risk Management Services that the fume hoods have been designed and installed to meet all requirements of the UBC Technical Guidelines.

2.3 Performance Standards

- .1 Fume hoods and biological safety cabinets shall conform to the following function-specific requirements, including as applicable:
 - .1 Laboratory Bio-Safety Guidelines, (latest revision), published Public Health Agency of Canada.
 - .2 Containment Standards for Veterinary Facilities, Canadian Food Inspection Agency, Publication 1921/E.
 - .3 Canadian Nuclear Safety Commission Standard GD-52, Design Guide for Nuclear Substance Laboratories and Nuclear Medicine Rooms.
 - .4 NSF (National Science Facilities) standards: for all biosafety cabinets; fully reticulating HEPA filters typical.
 - .5 CSA: including requirement for flow sensors.
 - .6 Controls for the operation of the fume hood and service fixtures must be located external to the fume hood, per WorkSafe BC.
 - .7 UBC Risk Management Services to determine additional regulatory and construction standards.
 - .8 Performance.
 - .1 Life Cycle Costing is to be calculated based on a 15 year life.

2.4 General Requirements

- .1 Set the fume hood sash at 15" (375 mm).
- .2 The correct operating height of the sash must be clearly marked on the cabinet frame.
- .3 A fume hood must be connected to a local exhaust ventilation system which will provide air velocities over the operational face area of the hood that meet the current Work Safe BC / OHS Requirements.
- .4 *All fumehoods shall be installed with an airflow monitor which complies with WSBC 30.9(5), (6). Any fumehoods within a project's boundaries (i.e. lab renovation) that do not have an existing airflow monitor shall have an airflow monitor installed as part of the project.*
- .5 Design of building structure to accommodate the provision of shielded radio isotope hoods (UBC to establish which hoods).
- .6 Whenever a project permits, conform to the most stringent Containment Level requirements to allow flexibility of use.
- .7 Hoods intended for use with Perchloric acid shall be specifically designed for that use and shall be reviewed with UBC Risk Management Services and Facilities Management, Technical Services. Material that is resistant to Perchloric Acid must be used for the

fume hood, duct work, fans and stacks. Stainless steel is not an acceptable material for this service.

- .8 *For new lab buildings with numerous fumehoods, manifolded central systems which meet the requirements of ANSI Z9.5 are generally preferred complete with variable volume hoods, redundant high plume central fans and pressure independent air control valves. In situations with only a few hoods, constant volume hoods with a 1:1 hood to fan ratio may be more economical, simpler and have lower operating costs.*

2.5 Seismic Restraint Requirements

- .1 A professional engineer registered in BC, shall be engaged by manufacturer, and shall seal shop drawings, confirmed by Letters of Assurance, for seismic restraints including anchorage.
- .2 Means for attachment for seismic restraint to be incorporated in the manufacture of fume hoods and bio-safety cabinets. Restraints and anchorage shall be designed to the BC Building Code.

2.6 Components

- .1 Fume hoods to be either stainless steel lined or epoxy lined. All fume hood materials must be non-flammable. Radioisotope hoods to be of stainless steel construction.
- .2 Hoods intended for use with radioisotopes to have a reinforced work surface capable of supporting 500 kg.
- .3 Majority of bio-safety cabinets will be Class II Type A2. UBC Risk Management Services to determine if Class II Type B1 or B2 cabinets are required at a meeting between the Consultants and UBC Risk Management Services.
- .4 Fume Hoods to be variable air volume type.
- .5 As per BCOHS regulation 30.21; an exhaust duct wash down system shall be part of the design in Perchloric Acid fume hoods.

2.7 Finishes

- .1 All fittings or trim in fume hoods to be non-corrosive. Chrome-plated or similar types of 'non-corrosive' finishes are not acceptable.

2.8 Fabrication

- .1 The fume hood must be double walled construction permitting mechanical and electrical service fittings to be mounted on the vertical front stiles.
- .2 Heavy duty galvanized steel framework as well as the service fixture valves and boxes must be housed and concealed within the service chase on both sides of the hood.
- .3 Exterior or interior panels must be independently mounted and easily removable, complete with panels required completing service connections. Exterior service panels are preferred where the installation permits.
- .4 The exterior panels and front stiles must be minimum 1.2 mm powder coated epoxy steel. Air foil must be Type 316L 1.5 mm gauge stainless steel, number 4 finish.

2.9 Materials

- .1 Consult with Facilities Management for UBC mandatory, approved, or not approved products and materials.
- .2 Type 316L 16 gauge stainless steel number #4 finish and be of seamless one piece construction with all corners coved and radii.
- .3 All welds ground smooth and polished. A liner must be bolted and cemented to the steel framework forming a rigid and completely sealed chamber.
- .4 The duct stub must be 316L stainless steel.
- .5 Hood baffles are required with top and bottom ventilation slots. These must be fully adjustable and of the same material as the hood liner.
- .6 The vertical sliding sash must be full view type with 6 mm thick tempered safety glass panel and stainless steel pull, and be counter balanced for smooth operation. Sash shall latch when fully open and when released shall automatically close by gravity.
- .7 Fume hoods and biological safety cabinets shall be equipped with a positive lockable latching system. The locking system must allow for the addition of a tradesman's lock that complies with lockout procedures.
- .8 For a stainless steel liner, hood work surface must be type 316L 16 gauge stainless steel, seamless welded and integral with liner. The work surface must have 6 mm high marine type edge. The underside of the work surface must have a 20 mm thick plywood sheet bonded to it for rigidity and sound deadening.
- .9 For an epoxy lined hood, the hood work surface must be 20 mm solid black epoxy sealed to the hood liner with a 6 mm high marine type edge sealed to the hood liner.
- .10 A recess mounted electronic air monitor shall be mounted on the front face of the hood, indicating high, normal and low air flows, complete with audio and visual alarms.
- .11 Where provided, the hood accessories must conform to the following specifications:
 - .1 Provide outside controls for all fume hoods as per OHS requirements.
 - .2 Sinks must be integrally welded to the work top or, if epoxy, sealed and recessed into the counter with 38 mm tail pieces.
 - .3 Flush type electrical receptacle consisting of a box 120 volt 15 amp U ground duplex stainless steel face plate must be located on the exterior of the fume hood preferably on the vertical stile.
 - .4 A flush mounted stop/start blower switch must be located in the fume hood front stile. The switch must be suitable for the specified horsepower characteristics of the fan and be labeled as to its function and status.
 - .5 The fume hood must be prewired and CSA approved.

- .6 The hood must be equipped with a vapor proof lamp and light switch and all wired to a junction box on top of the hood.

2.10 Service Connection to Biological Safety Cabinets

- .1 Natural Gas
 - .1 Natural gas connections to Biological Safety Cabinets are no longer permitted by the Public Health Agency of Canada (PHAC).
- .2 Water, Drain and Vacuum Services
 - .1 Water, drain, air and vacuum are normally not recommended. In instances where users request any of these services, the Consultant to discuss and obtain approval from Risk Management Services.
- .3 Electrical
 - .1 A duplex outlet is required adjacent to each cabinet supplied from two separate circuits.

2.11 Labelling

- .1 Fume Hoods and Biological Safety Cabinets to be labeled in accordance with the requirements of Technical Services, and this labeling must be coordinated with the similar identification number of the related fan located on the roof.

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

1.0 **GENERAL**

1.1 **Related UBC Guidelines**

- .1 Section 12 35 53 Laboratory Casework
- .2 Section 23 38 16 Fume Hood Exhaust Systems
- .3 Section 20 00 08 Mechanical Identification for the details for fume hood labelling requirements.

1.2 **Co-ordination Requirements**

- .1 Design development protocols will be issued by Fume Hood Safety Committee to the Consultant defining in detail the laboratory function, requirements, and systems to be provided.
- .2 Review design intent and additional requirements with UBC Risk Management Services. Co-ordinate with Risk Management Services early in the design process.
- .3 Consult with Facilities Maintenance on requirements to tie Fume Hoods into existing Building Management Systems.
- .4 The selection of fume hoods and biological safety cabinets is to be made in consultation with Risk Management Services, Facilities Maintenance and the principal researcher to ensure that the scientific, safety and engineering concerns are properly addressed.
- .5 Operable windows are not to be installed in labs in order to allow negative pressures to be maintained relative to adjacent spaces and to prevent draft conditions.

2.0 **MATERIAL AND DESIGN REQUIREMENTS**

2.1 **Design Requirements**

- .1 All fume hoods and exhaust systems shall conform to Part 30 Laboratories, of the Occupational Health and Safety (OHS) Regulation under the inspection jurisdiction of WorkSafeBC, and the latest edition for CSA-Z- 316.5 Fume Hoods, and Associated Exhaust Systems, and show evidence of being performance tested in accordance with ASHRAE 110, Method of Testing Performance of Laboratory Fume Hoods.

2.2 **Certification and Commissioning Requirements**

- .1 Testing of fume hood airflow performance shall be done by a party approved by UBC. Note that the face velocity requirement is more stringent than WSBC and that efforts shall be made to ensure that all tests are in the middle of their range. The reason for this is that fumehoods which are passed near the limit of the passing values have been found to be less likely to pass their annual re-certifications for the life of the fumehoods. The test report requires the following results as part of UBC Safety and Risk Services' requirement to approve fume hoods for occupancy:
 - .1 Average face velocity is measured between 0.43-0.57m/s (85-115FPM).
 - .2 No single point in the average face velocity is less than 80% of the average face velocity.

- .3 No single point in the average face velocity is greater than 120% of the average face velocity.
 - .4 Cross draft measurements are less than 50% of the average face velocity (as measured 45cm from the face of the sash, using the procedure described in CSA Z316.5).
 - .5 Good smoke containment shown with a smoke test.
- .2 It must be demonstrated to the UBC Project Manager, and UBC Risk Management Services that the fume hoods have been designed and installed to meet all requirements of the UBC Technical Guidelines.

2.3 Performance Standards

- .3 Fume hoods shall conform to the following function-specific requirements, including as applicable:
- .1 Laboratory Bio-Safety Guidelines, (latest revision), published Public Health Agency of Canada.
 - .2 Containment Standards for Veterinary Facilities, Canadian Food Inspection Agency, Publication 1921/E.
 - .3 Canadian Nuclear Safety Commission Standard GD-52, Design Guidelines for Basic and Intermediate Level Radioisotope Laboratories.
 - .4 NSF (National Science Facilities) standards: for all biosafety cabinets; fully reticulating HEPA filters typical.
 - .5 CSA: including requirement for flow sensors.
 - .6 Controls for the operation of the fume hood and service fixtures must be located external to the fume hood, per WorkSafeBC.
 - .7 UBC Risk Management Services to determine additional regulatory and construction standards.
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 - .1 Life Cycle Costing is to be calculated based on a 15 year life.

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- .6 Whenever a project permits, conform to the most stringent Containment Level requirements to allow flexibility of use.
- .7 Hoods intended for use with Perchloric acid shall be specifically designed for that use and shall be reviewed with UBC Risk Management Services and Building Operations, Technical Services. Material that is resistant to Perchloric Acid must be used for the fume hood, duct work, fans and stacks. Stainless steel is not an acceptable material for this service.
- .8 *For new lab buildings with numerous fumehoods, manifolded central systems which meet the requirements of ANSI Z9.5 are generally preferred complete with variable volume hoods, redundant high plume central fans and pressure independent air control valves. In situations with only a few hoods, constant volume hoods with a 1:1 hood to fan ratio may be more economical, simpler and have lower operating costs.*

2.5 Seismic Restraint Requirements

- .1 A professional engineer registered in BC, shall be engaged by manufacturer, and shall seal shop drawings, confirmed by Letters of Assurance, for seismic restraints including anchorage.
- .2 Means for attachment for seismic restraint to be incorporated in the manufacture of fume hoods and bio-safety cabinets. Restraints and anchorage shall be designed to the BC Building Code.

2.6 Components

- .1 Fume hoods to be either stainless steel lined or epoxy lined. All fume hood materials must be non-flammable. Radioisotope hoods to be of stainless steel construction.
- .2 Hoods intended for use with radioisotopes to have a reinforced work surface capable of supporting 500 kg.
- .3 Window sash to be equipped with a tempered safety glass.
- .4 Majority of bio-safety cabinets will be Class II Type A2. UBC Risk Management Services to determine if Class II Type B1 or B2 cabinets are required at a meeting between the Consultants and UBC Risk Management Services.
- .5 As per BCOHS regulation 30.21; an exhaust duct wash down system shall be part of the design in Perchloric Acid fume hoods.

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- .1 All fittings or trim in fume hoods to be non-corrosive. Chrome-plated or similar types of 'non-corrosive' finishes are not acceptable.

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- .1 The fume hood must be double walled construction permitting mechanical and electrical service fittings to be mounted on the vertical front stiles.
- .2 Heavy duty galvanized steel framework as well as the service fixture valves and boxes must be housed and concealed within the service chase on both sides of the hood.

- .3 Exterior or interior panels must be independently mounted and easily removable, complete with panels required completing service connections. Exterior service panels are preferred where the installation permits.
- .4 The exterior panels and front stiles must be minimum 1.2 mm powder coated epoxy steel. Air foil must be Type 316L 1.5 mm gauge stainless steel, number 4 finish.

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- .2 Type 316L 16 gauge stainless steel number #4 finish and be of seamless one piece construction with all corners coved and radii.
- .3 All welds ground smooth and polished. A liner must be bolted and cemented to the steel framework forming a rigid and completely sealed chamber.
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 - .3 Flush type electrical receptacle consisting of a box 120 volt 15 amp U ground duplex stainless steel face plate must be located on the exterior of the fume hood preferably on the vertical stile.

- .4 A flush mounted stop/start blower switch must be located in the fume hood front stile. The switch must be suitable for the specified horsepower characteristics of the fan and be labeled as to its function and status.
- .5 The fume hood must be prewired and CSA approved.
- .6 The hood must be equipped with a vapor proof lamp and light switch and all wired to a junction box on top of the hood.

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 - .1 Natural gas connections to Biological Safety Cabinets are no longer permitted by the Public Health Agency of Canada (PHAC).
- .2 Water, Drain and Vacuum Services
 - .1 Water, drain, air and vacuum are normally not recommended. In instances where users request any of these services, the Consultant to discuss and obtain approval from Risk Management Services.
- .3 Electrical
 - .1 A duplex outlet is required adjacent to each cabinet supplied from two separate circuits.

2.11 Labelling

- .1 Refer to section 2.1.5 in Section 23 38 00 Fumehood, Lab and Contaminated Exhaust System.

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

1.0 **GENERAL**

1.1 **Related UBC Guidelines**

- .1 UBC Standard Details - Standard Flammable Liquid Storage

1.2 **Coordination Requirements**

- .1 Section 06 40 00 Architectural Woodwork
- .2 Section 12 35 53 Laboratory Casework

1.3 **Description**

- .1 Flammable Liquid Storage Cabinets.
- .2 Acid Storage Cabinets.

1.4 **Performance Standards**

- .1 Construct flammable liquid storage cabinets in accordance with the requirements of the B.C. Fire Code. Storage capacity must comply with the B.C. Fire Code. The UBC Fire Department must approve the cabinet size and exact location for each installation.
- .2 Acid storage cabinets: the final design must be approved by the chemical safety officer, Department of Risk Management Services.
- .3 Construction to be similar to the requirements for flammable liquids storage cabinets except as noted below.
- .4 Requirements of Section 06 40 00 Architectural Woodwork apply to this section.
- .5 Seismic restraints and anchorages shall be engineered to the BC Building Code.

1.5 **Quality Control and Assurance**

- .1 Submittals
 - .1 Shop drawings.
- .2 Quality Assurance
 - .1 The work to conform to AWMAC Manual of the Architectural Woodwork Association of Canada
 - .2 Professional Engineer registered in BC, engaged by manufacturer, to seal shop drawings and carry out site reviews, confirmed by Letters of Assurance, for seismic restraints including anchorage.
- .3 Quality Control
 - .1 Same as Section 06 40 00 Architectural Woodwork.
- .4 Warranties
 - .1 Same as Section 06 40 00 Architectural Woodwork.

2.0 MATERIALS

2.1 Prescriptive Requirements

- .1 Material
 - .1 Products (UBC Mandatory, approved, or not approved for UBC projects - typ.).
- .2 Components
 - .1 Flammable Liquid Storage Cabinet
 - .1 No UBC standards are available.
 - .2 Acid Storage Cabinet
 - .1 Construction similar to the requirements for Flammable Liquids Storage Cabinets except as follows:
 - .1 Interior lined with glass reinforced cement board.
 - .2 One fixed shelf shall be provided.
 - .3 Bottom shall be liquid tight to contain spills.
 - .4 Vents shall be provided in doors.
 - .5 Hinges shall be corrosion resistant and surface mounted.
 - .6 Exterior Caution Label; A 300 mm x 175 mm blue plastic plate with 38 mm white letters stating CAUTION ACIDS CORROSIVE will be provided by Building Operations. This plate is to be screwed to the cabinet by the manufacturer.
- .3 Finishes
 - .1 Factory finish.
 - .2 Refer to UBC Refer Standard Details - Standard Flammable Liquid Storage Cabinet for details.

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

1.0 **GENERAL**

1.1 **Coordination Requirements**

- .1 UBC Infrastructure Development, Transition Team for Maintenance information.

1.2 **Description**

- .1 Cranes and Hoists.

2.0 **DESIGN REQUIREMENTS**

2.1 **General**

1. Equipment design and installation requires full compliance with all applicable regulatory bodies including:
 1. Worksafe BC
 2. CSA B167-96
 3. ASME B30.2-2001
2. Each crane and hoist shall have a separate disconnect switch capable of being locked in the open position. The switch shall be horsepower rated and capable of interrupting the locked rotor current of the crane or hoist motor.

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

1.0 **GENERAL**

1.1 **Co-ordination Requirements**

- .1 All proposed systems must be reviewed and signed off by UBC Building Operations. The *UBCV Facilities Technical Review Team or UBCO Facilities Management* is to be contacted for assistance with coordination of review prior to tendering.
- .2 *The Lighting System Maintainability Plan as per Section 26 51 00, 2.1.8. to be reviewed with the UBCV Facilities Technical Review Team or UBCO Facilities Management.*
- .3 *If manlift access into the building is needed for repair and maintenance activities, lift types and loading diagrams to be reviewed with the UBCV Facilities Technical Review Team or UBCO Facilities Management prior to tender.*

1.2 **Description**

- .1 The design, supply and installation of fall protection systems for maintenance personnel (particularly when parapets are less in height than required for guards), and for window washing equipment and personnel.
- .2 Meet all requirements of the Province of British Columbia Industrial Health and Safety Regulations pursuant to WorkSafe BC.
- .3 Be responsible for determining the location and types of anchorages required to provide a complete system.
- .4 Special consideration shall be applied to *mechanical and electrical* equipment *including light fixture and sprinkler head* installation locations in *atriums, common public areas and other unique interior locations that have high ceilings above 10'-0"*. *Installation of a monorail system for servicing is not acceptable.*
- .5 *All building equipment and fixtures that require periodic maintenance are to be located in areas that do not require fall protection. If not possible, access should be provided for an appropriately-sized man lift to provide servicing needs of mechanical/electrical equipment, light fixtures and sprinklers located in high ceiling areas.*
- .6 *Ensure that floor structure loading, elevator loading plus car dimensions and door heights and widths are adequately-sized to allow a manlift to be brought into the building.*

1.3 **Performance Standards**

- .1 Province of British Columbia Industrial Health and Safety Regulations pursuant to WorkSafe BC.
- .2 CAN/CSA-Z91-M90 Safety Code for Window Cleaning Operations.
- .3 Engineer to design a complete fall protection system to prevent a worker from falling according to WorkSafe BC requirements.

1.4 Quality Control and Assurance

- .1 Submittals
 - .1 Shop Drawings
 - .1 *Shop drawings to be signed and sealed by a professional engineer registered in the Province of BC and to submit Letter of Assurance ensuring code compliance. Include final reviewed shop drawings and Letter of Assurance in the O&M manual at project completion.*
 - .2 At completion, submit as-built *and Record* drawings. *Two (2)* copies of a reduced plastic laminated as-built shop drawing showing anchor locations and detailed fall protection plan clearly depicting the intent and usage of each component and overall system, to be supplied to the UBC Project Manager for posting near roof entrances.
 - .2 Quality Assurance
 - .1 Work to be carried out by a company specializing in the type of safety equipment required.
 - .2 All components to be designed and certified by a professional engineer registered in the Province of British Columbia.
 - .3 Roofing penetrations to conform to Roofing Contractors Association of BC (RCABC) standards.
 - .4 Follow manufacturers and roofing inspector's recommendations.
 - .3 Quality Control
 - .1 Design Engineer to carry out site reviews and submit a Letters of Assurance certifying that the anchors meet the performance requirements of CSA Z91M.

2.0 **MATERIAL and DESIGN REQUIREMENTS**

2.1 Prescriptive Requirements

- .1 All roofing work and roof repair work shall be in accordance with Section 07500 - Membrane Roofing.
- .2 Components
 - .1 Cast-in-place material: stainless steel type 304.
 - .2 Exposed anchor surfaces and exposed structural components: stainless steel type 304.
 - .3 Rotating heads are not allowed on campus, as they make safety inspections more difficult.
 - .4 Adhesive and expansion shield anchors are not be used due to load testing inspection requirements.
 - .5 Anchors must be certified that they meet the performance requirements of CSA Z91M.

- .6 No adhesive or expansion shield anchoring of anchors.

2.2. *Design Requirements for Fall Restraint or Fall Arrest Systems*

.1 Overview

- .1 All new buildings, major renovations, and roof replacement projects be reviewed with UBC *Facilities* to determine the design *and requirements* of a permanent, engineered, fall protection system. The system shall incorporate the use of rust resistant (e.g. galvanized metal), railing anchors, horizontal life lines, signage, etc.

.2 Buildings or Rooftop Surfaces less than 10 feet above Grade

- .1 Fall protection design is not typically required unless the hazard of falling is greater than the hazard of impacting a flat surface. Consideration must be given to what periodic maintenance is required to be performed while on these surfaces to ensure that safe access is achievable using ladders, et.al.

.3 Buildings or Surfaces greater than 10 feet but less than 25 feet above Grade

- .1 A fall protection system design is required for use by employees for the purpose of fall restraint and fall arrest. Design for window cleaning is only required on buildings where access is not practical from the ground via extension poles or a mobile lift.

.4 Buildings or Surfaces greater than 25 feet above Grade

- .1 A fall protection system design is required for use by employees for the purpose of fall restraint, fall arrest, and window cleaning via a bosun's chair. Attachment mechanisms for swing stage or other roof supported maintenance equipment should only be designed if specifically required for the project; like a high-rise building. A wall stabilization anchoring system is to be provided to prevent the working platform from dangerously swaying in the wind while suspended, where required by code or deemed necessary due to the combination of building accessibility, building height and wind speeds.

.5 Fall Protection System Designs Shall Include:

- .1 Adherence to WorkSafe BC guidelines and regulations required.
- .2 Adherence to applicable latest building code required.
- .3 *Fall restraint or fall arrest systems to be* signed and sealed by a Professional Engineer registered in the province of BC.
- .4 *Roof anchor design must allow for window cleaning and include safety provisions such as a safety line* for the person (safety line) and *suspension line for* the suspension equipment (bosun's chairs, swing stages etc.).
- .5 Drawing(s) indicating the anchoring locations and instructions for use regarding angles and tie off locations. Indicate ground areas requiring pedestrian protection while suspension equipment (bosun's chairs, swing stages etc.) is being used for maintenance, areas over doorways, etc. The drawing shall be printed on a durable medium and mounted at each rooftop access location and fall protection access location inside of buildings.

- .6 The drawings shall include instructions on any protection requirements for the building parapet walls and/or flashings to ensure that the ropes do not damage the building components and the building components do not damage the ropes.
- .7 Imposed loads on the parapet walls shall be identified on the drawings and the information provided to the project lead designer, usually the Architect, to ensure that parapets are designed accordingly.
- .8 The *Coordinating Registered Professional (CRP)* must ensure that rooftop mounted equipment, ducting, skylights, piping, vent stacks, etc. are taken into account and do not impact the operation of the *fall restraint or fall arrest* system.
- .9 Areas of the roof that are accessible to the general public shall use guardrails that are side-mounted to the parapet or guardrail-height insulated parapets to ensure protection against falls. *Coordinate with section 07 00 10 – Building envelope- General Requirements.*
- .10 An annual inspection checklist indicating each anchor shall be developed. Every anchor on the roof shall be uniquely identified, and the checklist will correspond to these identifiers. The checklist shall be prepared on 8.5" x 11" sheets. A copy of the checklist will be left in a mounted pouch at the entrance of the fall protection area for review by personnel accessing the fall protection area.
- .11 Anchor design and load rating drawings shall be provided for each type of anchor in the system.
- .12 Anchor fastening details must be provided for each type of fastening. The fastener load ratings must be indicated.
- .13 Anchor manufacturer's shop drawings, installation instructions, and inspection / testing requirements.
- .14 Provide a comprehensive and detailed description of anchor inspections needed to allow anchors and fastening mechanisms to be inspected by third party personnel. This information is to be included within the O&M manual.
- .15 Provide a copy of all components of the anchor system and design in a three-ring binder complete with a stamped and sealed cover letter and system certification from the Professional Engineer. The binder shall include shop drawings, anchor detail drawings, fastener detail drawings and specifications, inspection instructions and checklists, instructions on the proper use and limitations of the system and testing requirements and frequency. This binder is to be provided to the general Contractor and UBC Project Manager for inclusion into the O&M manual.

.6 *Handover*

- .1 Roof anchor designer/manufacturer to provide a comprehensive seminar *or demonstration* to UBC's maintenance staff on the *components and use* of the *roof anchor* and lifeline anchoring system *installation*.
- .2 *Window cleaning requirements are to be documented and provided to Facilities Custodial Services.*

END OF SECTION

1.0 **GENERAL**

1.1 **Related UBC Guidelines**

- .1 Coordinate with Section 10 00 10 Special Room Requirements for Interior Waste and Recycling Room requirements near the Loading Bay.
- .2 Coordinate with Campus Wide Design Guidelines, Part 3 for exterior enclosure and screening requirements of garbage and recycling containers stored on the outside of the building.

2.0 **DESIGN REQUIREMENTS**

2.1 Building designs need to allow adequate service area space for garbage and recycling containers to be stored and collected or emptied with waste management vehicles. Containers and vehicles are described in 3.0 below. Minimum requirements for most buildings include:

- .1 Concrete pad for placement of front-load waste containers to prevent long-term surface damage.
- .2 3-sided enclosure around concrete pad such that waste bins are visible only from the direction of service vehicle approach. Design to be approved by University Architect.
- .3 Direct in-line service access to front-load waste containers at least 1.5 times the length of an industry standard front-load compactor truck.
- .4 Outside service area for recycling cart pickup using an industry standard side-load truck which loads from the right side only.
- .5 Ramp or ground level access from the interior waste and recycling storage area to the service area to allow recycling carts to be wheeled easily to the designated outside pickup area. Refer to Section 10 00 10 for coordination with the interior waste and recycling storage area requirements.
- .6 Service lane widths, turning radii and load bearing capability sufficient to accommodate all waste collection vehicles noted above. Fire truck access standards are typically sufficient.
- .7 Minimum access width of 12' (feet) to any front-loads waste container enclosures.
- .8 Minimum vertical clearance above waste containers of 23' (feet).
- .9 Project specifications are to describe any proposed waste management systems or equipment within the building that differ from the standard equipment types listed in 3.0 below, and identify any anticipated need to recycle or dispose any significant amount of "specialty" waste materials that would require additional storage or handling equipment.

3.0 EQUIPMENT

3.1 UBC uses a number of standard Waste Management containers and vehicle types and utilizes the same types throughout the campus: These include:

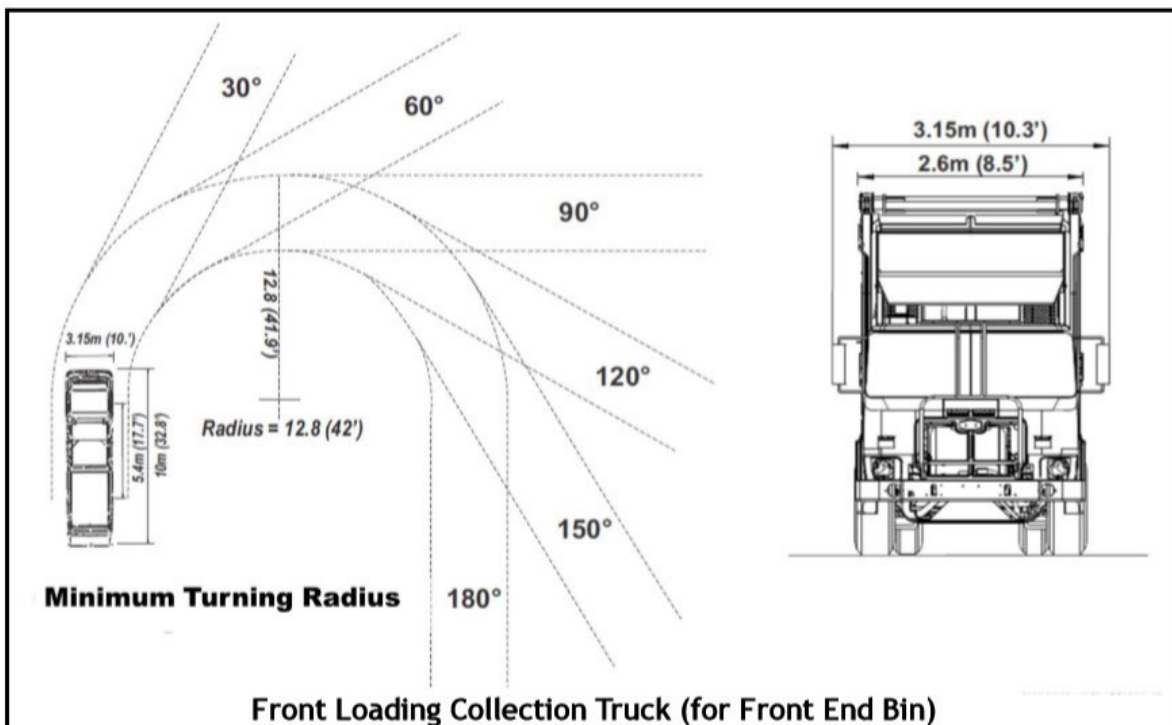
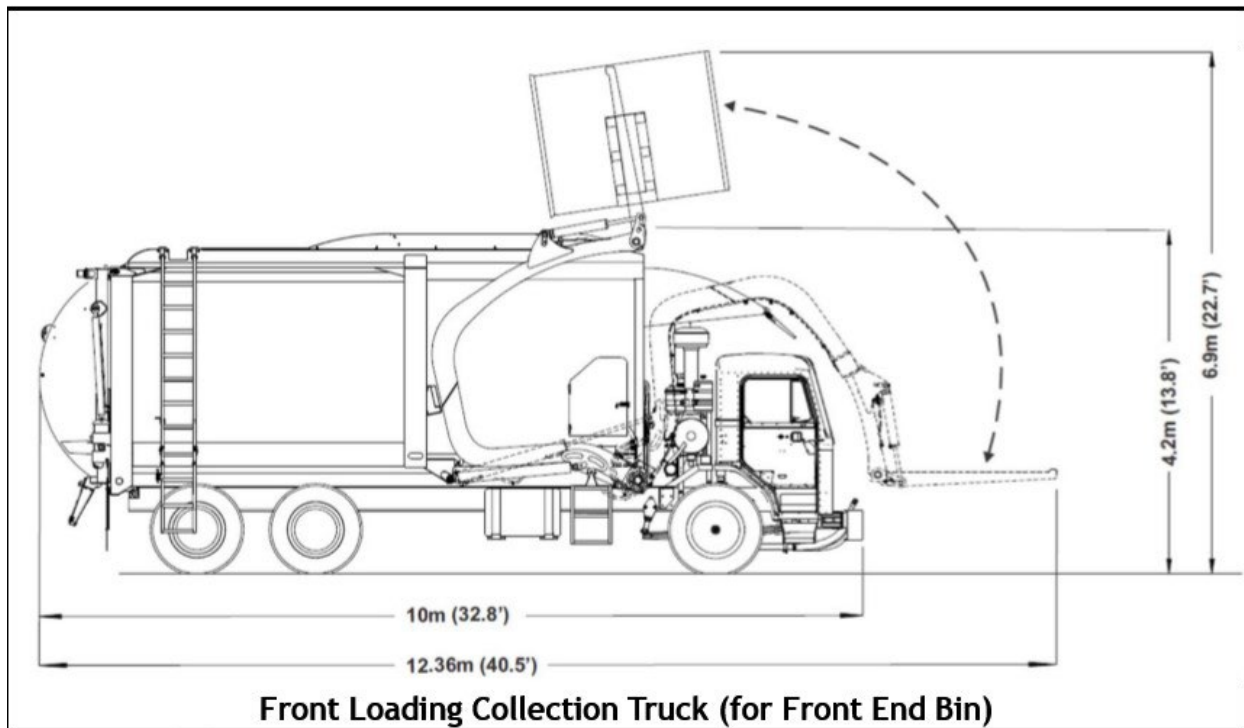
- .1 3, 4 and 6 cubic yard steel containers for collection of garbage and recyclable cardboard, serviced using an industry standard front-load compactor truck which requires direct drive-in access.
- .2 35, 65 and 95 gallon wheeled Schaefer carts for collection of recyclable paper and mixed containers, serviced using an industry standard side-load recycling truck which loads from the right side only.
- .3 30 and 40 cubic yard compactor container for collection of garbage at high waste generation, facilities, serviced, using an industry standard roll-off container truck which requires direct back-in access.
- .4 10, 20, 30, and 40 yard bins for concrete, gypsum, construction, yard waste, and steel recycling, serviced using an industry standard roll-off container truck which requires direct back-in access.
- .5 Consult with UBC Waste Management to confirm the waste management equipment that is appropriate for the project.
- .6 Standard dimensions of waste containers, recycling carts and waste vehicles are as follows:

Type	Description	Size (W x D x H)	Weight (kg)
Waste Containers	3 cubic yard front-load	79 x 42 x 48"	320
	4 cubic yard front-load	79 x 54 x 48"	410
	6 cubic yard front-load	79 x 66 x 58"	550
	30 cubic yard roll-off	96 x 256 x 79"	3,270
	40 cubic yard roll-off	96 x 256 x 90.5"	3,400
Recycling Carts	35 gallon	22.75 x 22.35 x 39.5"	
	65 gallon	28.0 x 26.8 x 42.2"	
	95 gallon	28.0 x 30.5 x 46.5"	

Vehicle Type	Size (W x D x H)	Gross Vehicle Weight (kg)
Front-Load Compactor Truck	8.5 x 32.5 x 13.5'	25,000
Roll-Off Container Truck	9.75 x 33.3 x 9.75'	25,000
Side-Load Recycle Truck	9.5 x 31.5 x 12.5'	17,000
Side-Load Truck Extended	12.5 x 31.5 x 16.0'	-

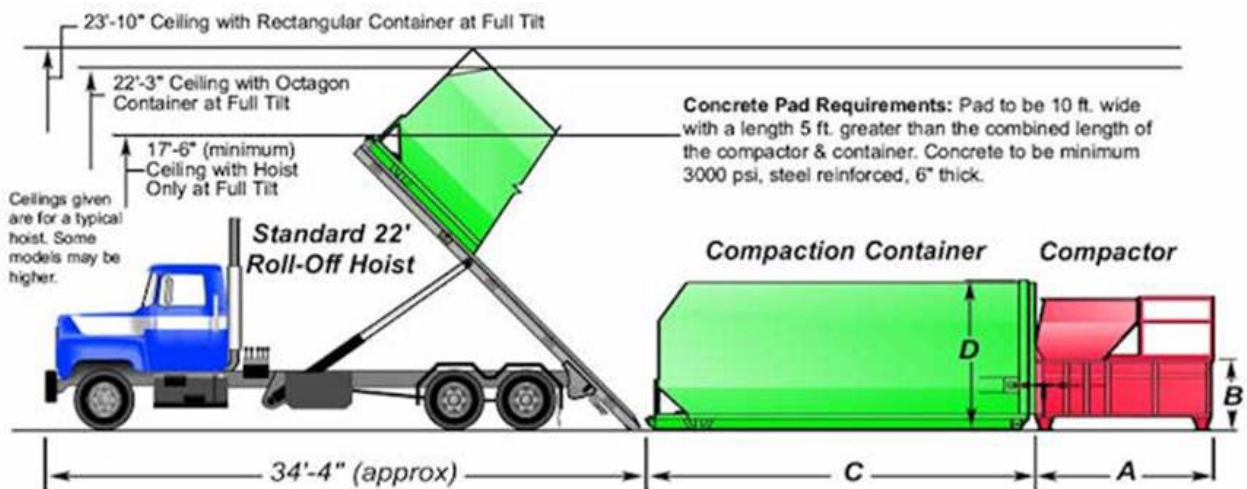
4.0 **BUILDING ACCESS**

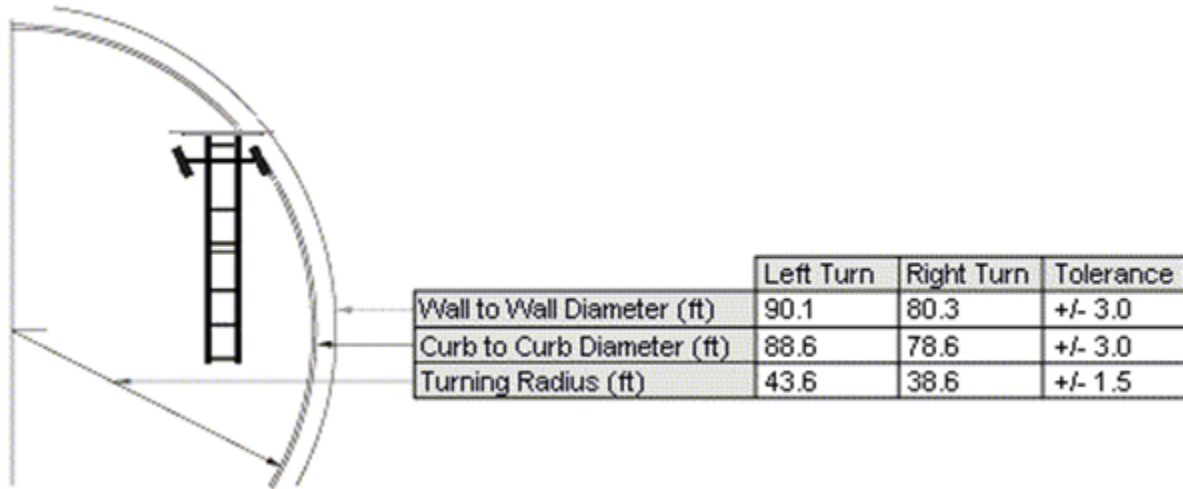
- 4.1 The access route and loading area must be designed in such a way as to allow collection vehicles to enter the site, collect the waste and exit without the need to back up onto a public street.
- .1 A turnaround area allowing for a three-point turn of not more than one truck length or a drive through access route are acceptable options. The approximate dimensions of the collection vehicle that must be accommodated are presented in the table below.
 - .2 Access driveways must be a minimum of 6 meters wide at the point of ingress/egress to the site and a minimum of 4.5 meters wide throughout the site with an unencumbered vertical clearance of 4.4 meters. Consideration should be made regarding width requirements for right or left-hand turns.
 - .3 Turning radii of 9.5 meters inside and 14 meters outside should be available throughout the access route. The slope of the access route shall not exceed 8% and provide adequate vertical clearance throughout the access route.
- 4.2 Typical Recycling, Garbage and Cardboard Collection Truck Dimensions
- .1 Typical dimensions for collection trucks used on campus are provided below together with diagrams:
 - Front Loading Collection Truck
 - (approximate) Length 10.0 m - 12.4 m
 - Width 3.2 m Minimum inside turning radius 10.0 m
 - Minimum outside turning radius 12.8 m
 - Height clearance 6.5 m - 7.5 m
 - Width clearance 4.0 m
 - Length clearance 15.2 m
 - Side Loading Recycling Truck
 - (approximate) Length 10.0 m - 12.4 m
 - Width 3.2 m Minimum inside turning radius 10.0 m
 - Minimum outside turning radius 12.8 m
 - Height clearance 6.5 m - 7.5 m
 - Width clearance 4.0 m
 - Length clearance 15.2 m
 - Compactor, Roll-Off Bin and Collection Truck
 - (approximate) Length 10.0 m - 12.4 m
 - Width 3.2 m Minimum inside turning radius 10.0 m
 - Minimum outside turning radius 12.8 m
 - Height clearance 6.5 m - 7.5 m
 - Width clearance 4.0 m
 - Length clearance 15.2 m





Typical Compactor, roll-off bin and collection truck dimensions





END OF SECTION