1.0 GENERAL

1.1 Related Work and UBC Guidelines

.1 Section 07 50 00 Membrane Roofing
.2 Section 07 55 63 Vegetated Protected Membrane Roofing
.3 Section 07 61 00 Sheet Metal Roofing
.4 Section 07 62 00 Sheet Metal Flashing and Trim
.5 Section 07 72 00 Roof Accessories

1.2 Related External Documents

1. Latest edition of the British Columbia Building Code (BCBC)
2. Province of British Columbia Industrial Health and Safety Regulations pursuant to WorkSafe BC.
3. CAN/CSA-Z91-M90 Safety Code for Window Cleaning Operations.

1.3 Description

.1 Section includes design and installation of fall protection systems for UBC maintenance personnel (particularly when parapets are less in height than required for guards), and for window washing equipment and personnel.

1.4 Coordination

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 the UBCV Technical Review Team Architect and UBCO Facilities Management.
3. These guidelines are intended to be read by design consultants and their content integrated into construction drawings and specifications. Construction documents are not to reference the technical guidelines directly.
4. The Coordinating Registered Professional (CRP) is required to coordinate these requirements with other disciplines.
5. All proposed exterior or interior fall arrest or fall restraint systems for new buildings, renewals and roof replacements must be reviewed and signed off by UBC Facilities Building Operations. The UBCV Facilities Technical Review Team Architect or UBCO Facilities Management is to be contacted for assistance with coordination of the review by Building Operations prior to tendering.

1.5 Submittals and Handover

.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 Anchor design and load rating drawings shall be provided for each type of anchor in the system.

.3 Anchor fastening details must be provided for each type of fastening. The fastener load ratings must be indicated.

.4 At project completion, submit as-built and record drawings.

.2 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.

.3 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.

.4 Provide instructions on the proper use and limitations of the system and testing requirements and frequency.

.2 Handover/Turn-Over

.1 Provide two (2) copies of a reduced plastic laminated record drawing showing anchor locations and detailed fall protection plan clearly depicting the intent and usage of each component and overall system. Copies to be supplied to the UBC Project Manager for posting near roof entrances.

.2 Provide 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.

.3 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.

.4 Roof anchor designer/manufacturer to provide a comprehensive seminar or demonstration to UBC Facilities Building Operations staff on the components and use of the roof anchor and lifeline anchoring system installation.

.5 Window cleaning requirements are to be documented and provided for use by Facilities Custodial Services.

.3 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.

.4 Quality Control

.1 Design structural engineer to carry out site reviews and submit a Letters of Assurance certifying that the anchors meet the performance requirements of CSA Z91M.

.2 RCABC Inspector to review roof anchor installation to ensure all penetrations are weathertight and detailed to RCABC standards.

2.0 DESIGN AND PERFORMANCE REQUIREMENTS

2.1 Design Requirements for Exterior Fall Arrest or Fall Restraint System

.1 **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.

.2 **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 maintenance personnel for the purpose of fall restraint and fall arrest at this height. Guardrails are the preferred method for fall protection. If guardrails are not used, a variance request will be required for approval.Design for window cleaning is only required on buildings where access is not practical from the ground via extension poles or a mobile lift.

.3 **Buildings or surfaces greater than 25 feet above grade**

.1 A fall protection system design is required for use by maintenance personnel for the purpose of fall restraint or fall arrest and window cleaning via a bosun's chair at this height. Guardrails are the preferred method for fall protection. If guardrails are not used, a variance request will be required for approval. 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.

.4 **Fall arrest or fall restraint system designs shall include:**

.1 Fall arrest or fall restraint system to meet all requirements of the Province of British Columbia Industrial Health and Safety Regulations as per WorkSafe BC regulations.

.2 Installation of an exterior monorail system for servicing is not acceptable.

.3 All roofing work and roof repair work around roof anchors shall be in accordance with Section 07500 - Membrane Roofing.

.4 The fall arrest or fall restraint system shall incorporate the use of rust resistant (e.g. galvanized metal), railing anchors, horizontal life lines, signage, etc.

.5 *Roof* anchor design must allow for *window cleaning and include safety provisions such as a safety lines* for the person (safety line) and *suspension lines for* the suspension equipment (bosun's chairs, swing stages etc.).

.6 Adhesive and expansion shield anchors are not be used due to load testing inspection requirements.

.7 Anchors must be certified that they meet the performance requirements of CSA Z91M.

.8 Imposed loads on the parapet walls shall be identified on the drawings and the information provided to the Coordinating Registered Professional (CRP) , to ensure that parapets are designed accordingly.

.9 The *Coordinating Registered Professional* 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.

.10 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.

2.2 Design Requirements for Interior Fall Protection System

.1 Installation of an interior monorail system for servicing is not acceptable.

.2 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".

.3 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.

.4 Related to item #3 above, the Lighting System Maintainability Plan as per Section 26 51 00, 2.1.8. is to be reviewed with the UBCV Facilities Technical Review Team or UBCO Facilities Management.

.5 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.

.6 If manlift access into the building is needed for repair and maintenance activities, lift types and loading diagrams on floor finish types within a project to be reviewed with the UBCV Facilities Technical Review Team or UBCO Facilities Management prior to tender.

2.3 Performance Requirements

.1 Anchor supplier's structural engineer to design a complete fall protection system to prevent a worker from falling according to WorkSafe BC requirements.

3.0 MATERIALS

3.1 Product Selection

.1 Cast-in-place material: stainless steel type 304.

.2 Exposed anchor surfaces and exposed structural components: stainless steel type 304.

END OF SECTION