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 BCand 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 Registerd Profesional (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*****