1.0 *GENERAL*

1.1 *Related UBC Guidelines*

.1 Section 07 00 10 Building Envelope – General Requirements
.2 Section 08 00 10 Openings – General Requirements
.3 Section 0841 13 Aluminum Entrances and Storefronts
.4 Section 08 44 14 Glazed Aluminum Curtain Wall
.5 Section 08 50 00 Windows
.6 UBC Bird Friendly Design Guidelines
.7 UBC LEED Implementation Guide
.8 UBC Energy Modelling Guidelines
.9 Owner's Project Requirements
.10 UBC Resilience-Based Design Guide for Nonstructural Systems

1.2 *Related External Documents*

1. *Latest edition of the British Columbia Building Code (BCBC).*
2. *British Columbia Energy Efficiency Act.*
3. *National Energy Code for Buildings (NECB).*
4. *ANSI/ASHRAE 90.1.*
5. *CAN/CGSB-12 Series Standards: glass types; performance.*
6. *CAN/CGSB-12.20: Structural Design for Buildings.*
7. *IGMAC Insulating Glass Manufacturers of Canada guidelines.*
8. *IGMA TM-3000-90, TB-3001 and TM-1300 guidelines.*
9. *Glazing Contractors' Association of British Columbia (GCABC) Manual.*
10. *ANSI/ASTM E330, Test Method for Structural Performance of Exterior Windows, Curtainwalls and Doors by Uniform Static Air Pressure Difference.*

1.3 *Description*

1. *Section includes glass and glazing.*

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 or 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, including:*
   - .1 *Building Envelope Consultant.*
   - .2 *Code Consultant.*
   - .3 *Energy Modeler.*

1.5 *Submittals*

.1 Submit required documents to consultants in accordance with Section 013300 Submittal Procedures
.2 O&M Submittals
   - .1 *Manufacturers Safety Data sheet (MSD) for all toxic or potentially toxic materials.*
   - .2 *Environmental Product Declaration (EPD)*

.3 Shop drawings (including all enclosure interface details) sealed and signed by a professional Engineer registered in the Province of British Columbia.
.4 Manufacturer performance test data to confirm performance criteria.

.5 Maintenance Data
.1 As-installed hardware.
.2 Source for replacement parts.
.3 Maintenance instructions
.6 Warranties
.1 10-year warranty for IGU's.

1.6 *Quality Control and Assurance*

.1 Quality Assurance
.1 Work shall be performed by a qualified glazing contractor with minimum five (5) years experience, with adequate facilities and skilled personnel suitable for this work.
.2 Quality Control
.1 Drawings indicate minimum thicknesses and other requirements such as coatings, tempering and other requirements
.2 Final thickness, safety glazing, heat strengthening, and other performance requirements to meet codes and standards, Owner's Project Requirements, and required structural performance are the responsibility of the Contractor based on location and intended use.
.3 Structural performance requirements of exterior glazing, as well as exterior and interior structural glazing including anchorage and fasteners, to be designed and certified by a Professional Structural Engineer registered in the Province of British Columbia who is to also submit a Letter of Assurance.

2.0 ***DESIGN AND PERFORMANCE REQUIREMENTS***

2.1 *Design Requirements*

.1 Exterior glazing at a minimum shall be insulated sealed double-glazed units to meet as a minimum to meet fenestration overall thermal transmittance 1.9 W/m2K. Design to maximize energy performance as established by the Owners Project Requirements (OPR), including orientation and expected functional use of space where installed.
.2 Consideration to be given to access for glass cleaning including the structural capacity of floors to support appropriate man-lifts. The use of monorail systems for interior glass cleaning is not allowed.
.3 For design of interior full-height glazing with butt-glazed joints near an interior walking surface, ensure the deflection is not thicker than the thickness of the glass. This eliminates the possibility of someone leaning against the glass panels and causing it to deflect and preventing movement of glazing panels.

2.2 *Performance Requirements*

.1 The overall thermal transmittance of fenestration and doors shall be determined for the reference sizes listed in accordance with:
.1 CSAA440.2/A440.3,"Fenestration energy performance/User guide to CSA A440.2:19, Fenestration energy performance,"
.2 NFRC100,"Procedure for Determining Fenestration Product U-factors."
.2 The overall thermal transmittance of fenestration and doors that are not within the scope of the standards listed shall be determined from:
.1 Calculations carried out using the procedures described in the "ASHRAE Handbook – Fundamentals," or
.2 laboratory tests performed in accordance with ASTM C1363, "Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus," using an indoor air temperature of 21±1°Candan outdoor air temperature of–18±1°C measured at the mid-height of the fenestration or door.
.3 Any staining of glass or other surfaces by alkaline materials prior to installation will be cause for rejection.

.4 Installation of glazing to conform with IGMA TM-3000-90, TB-3001 and TM-1300.

3.0 *MATERIALS*

3.1 *Product Selection*

.1 Locally produced materials should be used whenever possible. Consideration to be given to the local availability of replacement glass when specifying glazing.

.2 Manufacturer of IGU, must be IGMA certified.

.3 Glass spacer type: thermally improved as required to meet specified energy performance requirements. Non-thermally broken aluminum spacers shall not be used.

.4 Allowable glass types with applications (no tempered glass on buildings except where required to be safety glass in doors and sidelights:

- *.1 Exterior glazing - simple building form and small units – annealed or heat strengthened glass.*
- *.2 Exterior glazing - complex building, solar shading, reflective glass, large glazing units - heat strengthened glass to reduce risk of breakage due to thermal stress.*
- *.3 Exterior glazing -all buildings- low-E coating on #2 surface of the insulated glazing unit (IGU). If triple-glazed units are considered for use on a project, project team to consult with the UBCV Technical Review Team Architect/UBCO Facilities Management and the C&CP Green Buildings Manager and to confirm final location of low-e coating and ceramic fritting. A variance will need to be granted if the low e-coating is in a different location from the #2 surface.*
- *.4 Exterior glazing- appropriate bird friendly design includes ceramic fritting. Acid-etched glass applications would need to be reviewed at the design stage. Consult with the UBC Technical Team Architect if acid-etched glass is proposed. Film application is not acceptable since the IGU warranty is voided as per current industry standards.*
- *.5 Spandrel glass - heat strengthened glass.*
- *.6 Skylight, canopy and overhead glass – fully tempered, laminated (minimum PVB interlayer 1.5mm).*
- *.7 Skylight glazing - glazing to be minimum double-glazed heat strengthened glass. Inboard pane to be laminated glass with a minimum PVB film thickness of 1.5 mm. Insulated glass units to have a soft coat metallic low-e coating on surface #2. Low-e coating shall have edge deletion with warm edge spacer and argon- filled.*
- *.8 Guardrail glass - Heat-strengthened and laminated glass or tempered and laminated glass.*
- *.9 Safety glass in doors and sidelights: fully tempered.*
- *.10 Safety glass in fire rated doors and sidelights and in all applications subject to human impact: non-wired fire-rated tempered glass or intumescent glass. Fire-rated glass installations to be certified and permanently labelled by the manufacturer.*
- *.11 Clearstory and atrium vertical glazing over occupied space: heat strengthened laminated glass with a minimum 1.5 mm PVB interlayer.*
- *.12 Heat soak testing required to reduce nickel sulphide impurities in spandrel glass or IGUs where heat development is a concern.*

.5 Any staining of glass or other surfaces by alkaline materials is cause for rejection.

4.0 *LESSONS LEARNED AND COMMON MISSES ON UBC PROJECTS*

Items in this section are lessons learned, and may be code or industry best practices which have been missed on past projects. If not applicable to a project, a variance is not required.

.1 Item 2.1.3 notes that interior full-height, butt-jointed glazing should have restricted deflection. This requirement has come about due to complaints from user groups in buildings with examples of full-height glazing installations in research labs and boardrooms. Users have complained about the movement noted in the glass and as a consequence not feeling safe when walking past such glass walls. It is not possible to address this issue during the O&M phase without removal and replacement of the glass walls. Design teams are to ensure that glazing specifications and shop drawings adequately address this issue.

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