

## 5.1 Basic Construction Materials & Systems

### 5.1.1 General Structural Design Requirements & Information

1. Structural design to be in accordance with Alberta Building Code Part 4, all ABC Supplements, and all referenced codes and standards.
2. Structural drawings to include a summary of the structural systems and to provide supplementary information as required.
3. Depth of frost protection for footings shall be not less than 1200 mm for heated structures, and not less than 2100mm for unheated structures unless otherwise recommended by the geotechnical consultant.
4. In addition to the information specified in the Alberta Building Code, structural drawings and related documents shall include the following additional supplementary information:
  - a. Identification of the loads and locations of any special loadings such as fire truck loading, storage areas, landscaped areas, areas with heavy equipment, or other unusual load conditions.
  - b. Identification of areas of future additions indicating loads and assumptions.
  - c. A key plan indicating design loads for floors with varying live loads.
  - d. A complete detailed description of the lateral load-resisting system.
5. All roofs are to be designed for a minimum net factored uplift of 1.0 kPa.
6. Design Live Loads
  - a. The following minimum uniform live loads shall be used for the occupancies indicated. These increased values replace those indicated in Table 4.1.5.3 of ABC 2006.

Use of Area of Floor or Roof	Minimum Specified Load kPa
Equipment areas and service rooms	4.8
Libraries - Reading and study rooms	7.2
Office areas - floors above first storey	3.1
Recreation areas	4.8
Classrooms & lab floors (minimum)	3.6

### 5.1.2 Structural Concrete

1. Design concrete building structures and their components for a 100 year service life.
2. Increase live loads for specific U of C occupancies, see Section 5.1.1.
3. Ensure that the design and field review of non-structural components is covered in the contract documents (drawings and/or specifications), see Section 5.1.9.

4. Treat exposed concrete elements with beveled edges or tooling, as appropriate. Bottom edges of exposed slabs and beams, and exposed column and wall edges as well as all top edges of exposed slabs, upstands, stairs, and other concrete as appropriate are to be beveled 20mm x 20mm.
5. Reinforcing steel forming part of the seismic load-resisting system must be weldable grade conforming to current relevant CAN/CSA Standard.
6. Do not use calcium chloride (in any form) in concrete mixes.
7. Post-tensioned floor systems are not preferred by U of C. Obtain pre-approval and acceptance from FM&D in writing before considering post tensioning.

### **5.1.3 Architectural Concrete**

1. Architectural concrete to be co-ordinated with Building Envelope Consultant where in contact with envelope.
2. Reinforcing and other steel requiring corrosion protection shall be embedded so that the minimum depth of concrete cover is in all cases greater than 40 mm. Stainless steel is to be used where reinforcement or other embedded metal has less cover than 40 mm.
3. The concrete mix and placement and curing procedures are to be designed to provide the required quality of surface appearance and texture.
4. Concrete structure that penetrates through the building enclosure constitutes a large thermal bridge and requires careful detailing to ensure continuity of insulation.
5. Construction of mock-ups of select assemblies may be required upon the request of FM&D. The purpose is to clarify contractor's procedures, verify quality of finish, and ensure proper design and trade coordination.
6. Contractor to submit mix designs and placement procedures for architectural panels.
7. Surfaces of exterior concrete to be treated with opaque paint coatings or a clear silane/siloxane type sealer after final cleaning.
8. Surfaces of exterior concrete up to 2440mm [8'] above finished grade to be treated with a clear anti-graffiti type coating where required by U of C. Anti-graffiti coating systems with a wax top coat are preferred.

### **5.1.4 Flat Slabs on Grade**

1. Slabs-on-grade are to be 150mm minimum thickness, reinforced and provided with well spaced control joints in an approximately square pattern, spacing is to be less than 4000 mm on center.
2. Concrete strength to be minimum 30 MPa for interior slabs, and to meet CSA A23.1 exposure class C1 (35 MPa) for exterior slabs.
3. Appropriate vapour barrier is required: perforating vapour barriers to avoid "slab curling" is not acceptable.

4. Slabs on grade require appropriate rigid insulation to meet requirements of MNECB.
5. Finishes
  - a. Specify finish for slab as recommended for final floor finishes
  - b. Specify through a written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.
6. Exterior concrete steps must have a minimal slope of 0.5% towards the downward direction of the stair to allow for sufficient water drainage and to prevent ice formation.
7. For existing concrete slabs, the maximum level difference shall be 3mm per 1m. When leveling of existing slabs:
  - a. Patching less than 2 m diameters: use “Planipatch” as manufactured by Mapei, or approved equivalent
  - b. Surface leveling differences from 1 mm to 50 mm, use: “Duocrete” as manufactured by Duochem, or approved equivalent.

#### **5.1.5 Metal Fabrication – Structure**

1. Design building structures and their structural components for a 100 year service life.
2. Shop drawings to be sealed and signed by a Professional Engineer.
3. A Professional Engineer registered in Alberta and engaged by the fabricator to engineer components including connections where listed and/or required, seal and sign shop drawings and provide related Letters of Assurance for professional design.
4. Qualified independent certified inspection agency to be engaged by the U of C or the Prime Consultant on behalf of the U of C.
5. Where decking is specified, use only galvanized steel decking as suitable for the exposure of the decking (interior or exterior). Exterior exposures shall meet the Z275 requirements; Interior exposures may be wipe coated.
6. All structural steel shall be shop primed except for steel to be encased in concrete, steel to be fireproofed, steel to receive shear studs, faying surfaces of slip resistant connections, and the underside of base plates and bearing plates.
  - a. Touch up any damaged areas using the same primer.
  - b. Ensure that the contract documents indicate that all structural steel to be shop primed except for exclusions mentioned above. Any other exclusions are to be approved in writing by FM&D.

**5.1.6 Miscellaneous metal fabrication**

1. Includes:
  - a. Handrails, guards and balustrades (handrails & guardrails attached to or inside buildings are considered to be structural items requiring certified welding).
  - b. Non-structural steel angles, plates, brackets and closures.
  - c. Metal stairs and ladders.
  - d. Loose steel lintels.
  - e. Rough hardware and fasteners.
  - f. Burglar bars.
2. Fabricated steel components exposed to exterior to be hot dip galvanized.
3. All exterior ledger angles and related components (connections, bolts, plates, etc.) to be hot dip galvanized.
4. Use Zinc Rich Galvanized Primer for touch-up work.
5. Exterior ledger angles and related components (connections, bolts, etc.) not accessible after installation are to be galvanized for corrosion protection.
6. High zinc dust content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, to current relevant CGSB standard.
7. Chain-link patterned screens are not acceptable. Rectangular patterned screens are required in the landscape and on building elevations, for use in bike shelters, gas and bin storage areas, etc.

**5.1.7 Masonry Construction**

1. Load bearing masonry units to be minimum H/15/A/H laid up with Type 'S' mortar, running bond.
2. Minimum reinforcement to include 15m @ 1200 o/c vertically and #9 GA galvanized ladder-reinforcement every second course. Grout solid all reinforced cores.
3. Provide reinforced bond-beams at all floor levels and maximum 2400 o/c.
4. Ensure lateral support provided to head of all masonry partitions.

**5.1.8 Wood Construction**

1. Woodframe structures are to be designed to Part 4 of the Alberta Building Code. The use of Part 9 for structural design is not acceptable.
2. Sill plates are to be preservative treated and installed over foam sill gaskets.

3. Wood members in contact with concrete or masonry are to be preservative treated and installed with a moisture barrier between the wood and concrete surface.
4. Finger-jointed studs are not acceptable.
5. Shrinkage must be considered and allowed for in all design and detailing.
6. Wood members in a dry service condition shall not have a moisture content exceeding the code limit of 19%.
7. Wood products susceptible to moisture penetration or damage must be protected from moisture until completely installed and weather protected.
8. Subfloors shall be constructed with exterior grade tongue and groove plywood, glued and screwed in place.
9. Lateral load-resisting systems
  - a. The lateral load resistance of woodframe structures is to be provided by plywood shearwalls or other acceptable engineered systems complying with Part 4 of the AB Building Code.
  - b. The use of gypsum wallboard in contributing to the lateral load resistance of woodframe structures is not permitted.
  - c. Oriented strand board is not acceptable as sheathing for woodframe shearwalls.
  - d. The load path of the lateral load resisting system must be clearly defined from the lowest level to the underside of the roof deck.
  - e. Continuity of the plywood floor diaphragm must be maintained on all floors.
  - f. Do not cut or stop the plywood at party-wall locations.

#### **5.1.9 Structural Design of Non-Structural Components**

1. The structural design and field review of non-structural elements, restraints, and anchorages shall be provided by a Professional Engineer registered in Alberta. Design shall accommodate all applicable load conditions (dead loads, live loads, wind loads, and seismic loads) and must conform to the current edition of the AB Building Code.
2. Non-structural elements include (but are not limited to) the following:
  - a. Cladding, glazing, window mullions, and exterior wall assemblies.
  - b. Architectural precast or other precast concrete.
  - c. Architectural components such as guardrails, handrails, flag posts, canopies, ceilings, skylights, interior partitions, millwork, etc.
  - d. Mechanical and electrical equipment, components and their attachment. Window washing equipment and their attachment.

- e. Escalators, elevators, and conveying systems.
  - f. Brick, block, or masonry veneers and their attachment.
  - g. Non-load bearing masonry.
  - h. Glass block and its attachments.
  - i. Non-structural concrete toppings.
  - j. Landscape elements such as benches, light posts, planters, walls, etc.
3. Partition walls are to be detailed to allow for deflection of the structural building system.
4. The maximum allowable deflections for glazing, studs, partitions, and cladding under the design wind loads shall meet the architectural specifications, the AB Building Code and the manufacturer's specifications. In no case shall the deflections exceed the following:
- a. Elements supporting brick  $L/720$ , (max. 25mm)
  - b. Elements supporting precast or stucco  $L/360$ , (max. 25mm)
  - c. Elements supporting wood or metal siding  $L/180$ , (max. 25mm)
  - d. Elements supporting glazing  $L/360$ , (max. 25mm)

**Revision History**

<b>Revision Date</b>	<b>Version</b>	<b>Description</b>
Feb 2014	1.0	Baseline version
July 6, 2023	1.0	Added Revision History table to end of document and reset to Version 1.0.