DISTRICT OF SUMMERLAND

BUILDING BULLETIN

RESIDENTIAL GAURDRAIL REQUIREMENTS

Bulletin No. 20-003

A GUIDE TO RESIDENTIAL GUARDRAIL REQUIREMENTS

Purpose

The purpose of this brochure is to provide a consistent interpretation for the installation of guard rails in residential applications as outlined in Part 4 and Section 9.8 of the BC Building Code. The following information will clarify typical installation requirements to ensure minimum Building Code standards are achieved.

All guards in other than residential applications will require Letters of Assurance from a Registered Professional.

Standard Metal / Wood with glass in-fill panels

Manufacturer's specifications provided for review by Building Official showing conformance to BC Building Code.
Guard details to be submitted at time of submission of building permit application.
Projects under supervision of a Registered Professional must provide confirmation of installation as outlined within the Letters of Assurance.

Custom or topless free standing glass guard systems

Where custom site built or topless glass guard rail systems are proposed (laminated and/or tempered), the following is to be provided by a Registered Engineer:

Verification of free standing rail systems to be reviewed by:

- Engineer of record for the building project (verification of shop drawings and field installation); or
- Where there is no Engineer of record for the building project, third party verification from a Structural Engineer for the design and field installation of the guards

Residential Guard design must include verification to: (including proprietary guard shop drawings)

- 9.8.8.2 Loads on Guards
- 9.8.8.3 Height of Guards
- 9.8.8.5 Openings in Guards
- 9.8.8.6 Design of Guards to Not Facilitate Climbing
- 9.8.8.7. Glass in Guards – including the glass guard complies with the structural redundancy requirement without the top rails (CAN/CGSB-12.1 "Tempered or Laminated Safety Glass")

Non-compliance

Guard / handrail assemblies that cannot be shown to meet the manufacturer's specifications or design standards are to be removed or remediated to meet structural standards under supervision of a Structural Engineer. On-site installations that vary from the original design / install specification will require a review from a Structural Engineer and non-occupancy of the deck until installation confirmation is received.

Horizontal / Cable guards

Guards less than 4.2 m above grade or an adjacent level do not need to meet the requirement to not facilitate climbing. All other requirements including loads on guards, height, and size of openings must be adhered to.

Cable guards will require Letters of Assurance from a Registered Professional to ensure minimum loading and tensile strength requirements are adhered to.

Background and Technical Information

Glass Guardrail Systems

The use of glass guardrail systems has been increasing for a number of years and has led to questions on the structural integrity of the glass and rail components as well as impact resistance to objects both horizontally and vertically. Glass is a strong material but is very brittle and must be designed to meet structural loads and have redundancy of fail-safe load transfer. Failure of the glass can result in instantaneous failure resulting in no protection for a fall hazard.

Concerns with structural failures when glass is used as the main structural component:

- No top rail to resist vertical & horizontal impacts
- Tempered glass fails instantaneously into many blunt pieces
- Manufacturing of glass can include imperfections in the glass, which can expand and cause the glass to fail
- Design and installation of framing brackets. Who is designing for the loads and ensuring proper installation in the field?

Loads within the BCBC are expressed in kN or kN/m (kilo Newton metre). In simple terms this is a quantity very similar to 100 Kg (220 lb) of pressure per metre length. If, for example, it is stated that there is 1.0 kN/m it will be approximate to the equivalent of one person weighing 100 kg (220 lbs) putting their full weight on one metre length.

All guards shall be designed to withstand loads specified in BCBC 9.8.8.2. *(see attached)*

BC Building Code requirements

Guard: means a protective barrier around openings in floors or at the open sides of stairs, landings, balconies, mezzanines, galleries, raised walkways or other locations to prevent accidental falls from on level to another. Such a barrier may or may not have openings through it.

Guardrail design

Guards must be constructed so as to be strong enough to protect persons from falling under normal use. Many guards installed in dwelling units or on exterior stairs serving one or two dwelling units have demonstrated acceptable performance over time. All guards shall be designed to withstand loads specified in the BC Building Code. Owners and/or contractors shall be responsible for ensuring documentation is provided at the time of permit plan review, or prior to the installation of the guards. Permit drawings should indicate the guardrail design. Heights and restrictions to openings as outlined in Section 9.8 BCBC must also be adhered to.

9.6.1.3. Structural Sufficiency of Glass

1) Except as permitted by Sentence (2), glass used in buildings shall be designed in conformance with

   a) CAN/CGSB-12.20-M89, "Structural Design of Glass for Buildings", or

   b) ASTM E-1300, "Standard Practice for Determining Load Resistance of Glass in Buildings" (see also Article 4.3.6.1.)

CAN/CGSB – 12.20-M89 Structural Design of Glass for Buildings

Note: this general guide has been prepared to assist homeowners and is not to be considered as a substitute for DOS Bylaws and Regulations.

- This is a limit states design code. The code addresses the brittle nature of glass where used as a structural material by stipulating that support members be designed with a redundant load path. The underlying principal being that if one member fails, a cascading or catastrophic failure mechanism does not develop.
- Free standing glass guards must have a top cap which spans over two or more panels and be designed to resist the factored load after failure of alternate panels.
- The deflection of the guard at the point of application of the load, with all panels intact must not exceed 40 mm

9.8.8.2. Loads on Guards

1) Guards shall be designed to resist the specified loads prescribed in Table 9.8.8.2. (*see attached*)

9.8.8.7. Glass in Guards

1) Glass in guards shall be:

a) safety glass of the laminated or tempered type conforming to CAN/CGSB-12.1-M90, "Tempered or Laminated Safety Glass" or

b) wired glass conforming to CAN/CGSB-12.11-M, "Wired Safety Glass"

9.8.8.2. Loads on Guards

(See Note A-9.8.8.2.)

1) Except as provided in Sentences (2) and (4), *guards* shall be designed to resist the specified loads prescribed in Table 9.8.8.2.

Table 9.8.8.2.
Specified Loads for Guards
Forming Part of Sentence 9.8.8.2.(1)

Location of *Guard*	Minimum Specified Loads		
	Horizontal Load Applied Inward or Outward at any Point at the Minimum Required Height of the *Guard*	Horizontal Load Applied Outward on Elements Within the *Guard*, Including Solid Panels and Balusters	Evenly Distributed Vertical Load Applied at the Top of the *Guard*
Guards within *dwelling units* and exterior *guards* serving not more than 2 *dwelling units*	0.5 kN/m OR concentrated load of 1.0 kN applied at any point(1)	0.5 kN applied over a maximum width of 300 mm and a height of 300 mm(2)	1.5 kN/m
Guards serving access ways to equipment platforms and similar areas where the gathering of many people is improbable	Concentrated load of 1.0 kN applied at any point	Concentrated load of 0.5 kN applied over an area of 100 mm by 100 mm located at any point on the element or elements so as to produce the most critical effect	1.5 kN/m
All other *guards*	0.75 kN/m OR concentrated load of 1.0 kN applied at any point(1)	Concentrated load of 0.5 kN applied over an area of 100 mm by 100 mm located at any point on the element or elements so as to produce the most critical effect	1.5 kN/m

Notes to Table 9.8.8.2.:
(1) The load that creates the most critical condition shall apply.
(2) See Sentence (2).

2) For *guards* within *dwelling units* and within houses with a *secondary suite* including their common spaces and for exterior *guards* serving not more than 2 *dwelling units*, where the width and spacing of balusters are such that 3 balusters can be engaged by a load imposed over a 300 mm width, the load shall be imposed so as to engage 3 balusters.

3) None of the loads specified in Table 9.8.8.2. need be considered to act simultaneously.

4) For *guards* within *dwelling units* and within houses with a *secondary suite* including their common spaces and for exterior *guards* serving not more than 2 *dwelling units*, Table 9.8.8.2. need not apply where the *guard* construction used has been demonstrated to provide effective performance.

This bulletin is a guide only, prepared to assist homeowners and ccontractors, and is not to be considered as a substitute for District of Summerland Bylaws and Regulations and current editions of the BC Building Code