

Building Excellence Research Bulletin

Balcony Overloading & Weight Restrictions

A chronic failure of balcony membranes and structures often relates to overloading and component placement that frequently results in additional damages to building envelope systems, windows, balcony railings, and landscaping. Property owners are advised to routinely inspect rooftop decks, balconies and patios for damages, drainage restrictions, membrane failures and overloading.

This bulletin highlights the concerns with potential overloading of decks and balconies constructed in British Columbia associated with changes that are under the control of the occupant and the property owners.



Balcony, Decks, Patios – Overloading Concerns

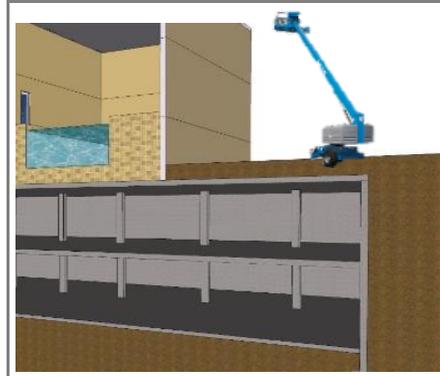
Most residential buildings have a balcony, a deck, or outdoor plaza/patio and some have all three. At the time of the original construction these areas would have been designed for a specific dead (fixed) and live (variable) load.

During the life of a building owners may consider altering the existing walking surfaces to facilitate membrane renewals or simply to change the appearance. Some owners may consider installing other features on their balcony or deck such as hot tubs, planters and water features. There are potential risks for making these changes without reviewing the capacity of the structure.

Generally ground level patios/plaza areas are designed for much higher loads than above grade deck and balconies. There are two types of ground level conditions, those on a suspended slab and those directly on soil substrates. Areas directly on soil are generally not a concern for most loading conditions.

However, potential issues can be created in areas over a parkade slab during maintenance activities. For example, heavy machinery like boom lifts, and other aerial platforms that reach 4 storeys can weigh up to 13,000lbs.

If the owners are considering loading anything at ground level over a parkade that is not usually present over occupied space of the building, they should consult a professional to reduce the risk of overloading the structure.



Maintenance activities may lead to overloading issues, if not properly reviewed by a professional.

Basic Structural Terminology:

→ **Dead Loads:** “a permanent load due to the weight of building components”

- Dead loads will include the weight of the structure itself and other long term constant loads such as soil overburden or pavers.
- During the life of the structure, some of these permanent loads can be changed or modified. This may increase the total dead load above the intended design.

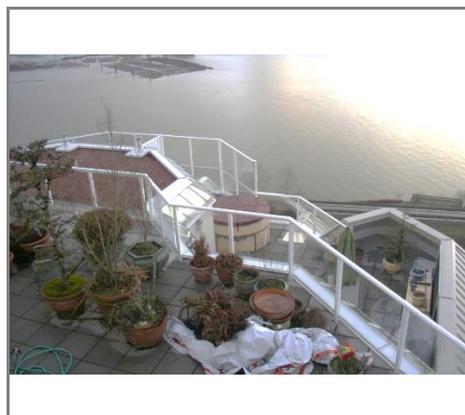


Example: concrete pavers as a dead load.

Adding concrete pavers to a deck or balcony may add an additional dead load that was not accounted for in the original design.

→ **Live Loads:** “a variable load due to intended use and occupancy (including loads due to cranes and the pressure of liquids in containers)”

- The most common form of live loads are people.
- Other types of live loads include planters, barbecues, hot tubs, and gas fireplaces. These items can be moved and are not permanent.



Example: live loads on decks.

Hot tubs, plant pots, planters, and barbecues are live loads because they are non-permanent additions.

For general reference purposes, live loads for human occupancy on balconies and decks for 4+ storey buildings are designed for **100** pounds per square foot (PSF) and buildings 3 storeys or less (small building) are designed for **40** PSF. Smaller buildings are designed with lower load capacity due to the reduced likelihood of having a large assembly of people on a surface that only serves one dwelling unit.

Load capacities of deck or balconies are highly variable so must be considered when changes to the live or dead loads are being contemplated.

Overloading Examples:

Photo shows a wood-frame residential building, typically designed for 40 PSF.

Adding a hot tub, presumably filled with approximately two feet of water, will create a load of 125 PSF, which is more than three times the normal design limits for a typical balcony on a small building.



Average sized hot tub placed on a second-floor wood-framed balcony.

Planters filled with wet soil can weigh approximately 100 pounds per cubic foot. Depending on the footprint of the planter this may exceed the design load.

Adding a small tree would be in addition to the weight of the soil in a planter or a pot.



Planter box with wet soil & vegetation.

Image ©enjoy container gardening

Concrete pavers stacked during deck membrane repair work are a concern since the deck is not typically designed to hold stacked pavers. Each 2' x 2' paver weighs approximately 70 lbs, so one paver adds 17.5 PSF. Three pavers stacked would exceed the typical design load for a small building.



Stacked concrete pavers during membrane repair work.

Common types of live loads that can be found on a deck or balcony and their estimated weights are in Table 1 below. Keep in mind that if two or more items occur on in the same area, the weights must be added together. If snow can build up on top of the item that load would be added to the table load.

TABLE 1				
ITEM	DESCRIPTION/SIZE	WEIGHT (lbs)	AREA (SAMPLE FOOTPRINT)	WEIGHT/AREA (PSF) based on SAMPLE FOOTPRINT
Barbecue (metal type)	Average Size	100 lbs	2FT X 2FT= 4 SQFT	100/4 = 25 PSF
Small Hot Tub	Small (3-person)	3200+ lbs (water and people)	5 FT X 7 FT = 35 SQFT	3200/35= 91 PSF
Large Hot Tub	Large (8-person)	7,500+ lbs (water and people)	8FT x 8FT = 64 SQFT	7,500/64 = 118 PSF
Small Planter	2'x2'x1' Planter box with wet soil	400+ lbs	2FT X 2FT = 4 SQFT	400/4= 100 PSF
Large (Tall) Planter	5FT X 4FT X 2FT	4000 LBS	5FT X 4FT = 20 SQFT	4000/20 = 200 PSF

*Values highlighted in red meet or exceed typical design loads and values in yellow exceed design loads for 3 storey and less buildings.

When should Strata Corporations/Owners consult a professional?

- When adding any load or item that was not originally planned for in the building design. This includes, but is not limited to, planters, heavy barbeques, hot tubs, trees, heavy fireplaces, concrete sculptures.
- Any changes to the existing walking surface materials that is heavier than the existing surface materials. For example, concrete pavers replacing cedar decking.
- During renovation or repair work, to confirm the existing construction is acceptable as it may not be built as per the original drawings. When performing repair work also consider the weight and storage locations of materials.
- Any contemplated additions which create point loads to the deck or balcony surface. For example, a post holding up a new roof or canopy will concentrate a load (i.e. snow plus the weight of the roof).
- Any concentrated loads that are heavier than 300 lbs or when lighter concentrated loads are closely spaced.
- Any changes to the podium or plaza assembly components that are heavier than the original components.
- Any repairs that relate to insurance claims or damages such as water ingress, fire or pest infestations.

Other Considerations:

- 1) **Maintenance:** Poorly maintained drains associated with decks and balconies that are clogged. The additional water load can be a concern for the structure if secondary overflow drains are not present.
- 2) **Water Ingress:** Should leaks affect the integrity of a wood-framed deck or balcony, risks of potential structural failure increase even before design loads are exceeded.
- 3) **Climbing hazards:** To prevent someone from falling over the existing guards, guardrail heights may need to be raised around hot tubs, planters or other items that are placed near the edge of decks and balconies.
- 4) **Change of exposure:** Snow sliding off higher areas onto decks or balconies due to changes to neighbouring buildings or roof renewals with slippery materials that no longer retain the snow.
- 5) **Change of use:** Excessive storage of belongings or materials.

Strata corporations may limit, restrict and control the use and enjoyment of decks, balconies and patios by adopting rules that apply to common property or bylaws that apply to all property including strata lots. The conditions may limit the type of planters, containers and furniture that may increase load and risk damage to surface membranes or obstruct the use and enjoyment of other strata lots. Excessive loads such as the decks and balconies being used for storage may also contribute to the failure of membranes and structures and pest infestations.

Strata corporations are recommended to seek legal advice before they adopt new bylaws to confirm the bylaws are enforceable and comply with the Strata Property Act and Regulations, the BC Human Rights Code and any other enactments of law.



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