

MAINTENANCE MATTERS



Balcony Overloading and Weight Restrictions

When balcony membranes and structures fail, it is often related to overloading and the placement of heavy items that the balcony was not designed to carry. These factors can also result in additional damage to building envelope systems, windows, balcony railings, and landscaping. Property owners are advised to routinely inspect rooftop decks, balconies and patios for damage, drainage restrictions, membrane failure and overloading.

This bulletin highlights the concerns with potential overloading of decks and balconies. The following considerations are up to the occupant or property owner to manage.

Balcony, Decks, Patios – Overloading Concerns

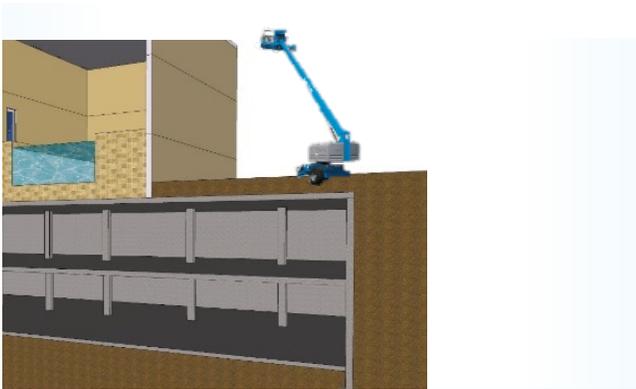
Most residential buildings have a balcony, a deck, or outdoor plaza/patio and some have all three. When they were first constructed, these areas were designed for a specific dead (fixed) and live (variable) load. During the life of a building, owners may consider altering the existing walking surfaces 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.



Maintenance Matters

This series of bulletins and companion videos is designed to provide practical information on maintaining residential buildings. Produced by BC Housing, this bulletin was prepared by RDH Building Science in collaboration with the Condominium Home Owners Association.

Generally, ground level patios/plaza areas are designed for much higher loads than above grade decks 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.



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

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

If you want to add a significant new feature to an area at ground level, that also happens to cover a parkade, consult a professional to reduce the risk of overloading.

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 beyond the intended design.



Example of 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 resulting from 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 may include planters, barbecues, hot tubs, and gas fireplaces. These items can be moved and are not permanent.



Example of live loads on decks.

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

For general reference, live loads for human occupancy on balconies and decks for four or more storey buildings are designed for 100 lbs per square foot (psf). Buildings three storeys or less (small buildings) are designed for 40 psf. Smaller buildings are designed with lower load capacity because the surface of a single dwelling unit is unlikely to have a large gathering of people.

When contemplating changes to the live load or dead load, consider the high variability in load capacities of decks and balconies.

Overloading Examples:

The photo below 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. This is more than three times the normal design limit for a typical balcony on a small building.



Average size hot tub placed on a second-floor, wood-framed balcony

Planters filled with soil can be very heavy depending on the area and depth of the planter. Wet soil weighs around 100 lbs per cubic foot.

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



Planter boxes with wet soil and vegetation

Concrete pavers stacked during deck membrane repair work are a concern because decks are not typically designed to hold such weight. 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 found on a deck or balcony, and their estimated weights are shown in Table 1. If two or more items occur in the same area, the weights must be added together. If snow builds up on top of the item, that load must be calculated into the overall weight.

Table 1 – Estimated Weights of Live Loads Found on Decks/Balconies

Item**	Description/Size	Weight (lbs)	Area (item footprint)	Weight/Area (psf) based on item footprint
Barbecue (metal type)	Average size	100 lbs	2 ft x 2 ft = 4 ft ²	100/4 = 25 psf
Small hot tub	Small (3-person)	3,200+ lbs (water and people)	5 ft x 7 ft = 35 ft ²	3,200/35 = 91 psf
Large hot tub	Large (8-person)	7,500+ lbs (water and people)	8 ft x 8 ft = 64 ft ²	7,500/64 = 118 psf
Small planter	2 ft x 2 ft x 1 ft planter box with wet soil	400+ lbs	2 ft x 2 ft = 4 ft ²	400/4 = 100 psf
Large (tall planter)	5 ft x 4 ft x 2 ft	4,000 lbs	5 ft x 4 ft = 20 ft ²	4,000/20 = 200 psf

*Values highlighted in red meet or exceed typical design loads. Values in yellow exceed design loads for three storeys or less.

**Items are examples only, each pound per square foot (psf) calculation needs to be determined based on actual measurements and weights.

When to consult a professional?

A qualified professional may be needed when the following situations occur:

- ▶ 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, and concrete sculptures.
- ▶ If there are any changes to the existing walking surface materials that are heavier than the existing surface materials. For example, cedar decking replaced with concrete pavers.
- ▶ To confirm that the existing building structure is acceptable before renovation or repair work is done. It may not be built according to the original drawings. When performing repair work, also consider the weight and storage location of materials.
- ▶ When you are considering any 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. If there is snow build-up, the weight of the roof plus the snow will be focused on this location.
- ▶ When any concentrated loads are heavier than 300 lbs or when lighter concentrated loads are closely spaced.
- ▶ If any changes to the podium or plaza assembly components are heavier than the original components.
- ▶ If you are conducting 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:** If 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 to minimize load increases and the risk of damage to surface membranes. These restrictions may also be implemented to avoid obstructing the use and enjoyment of common property and other strata lots (ensuring access to all owners and residents). Excessive loads, such as the storage of heavy materials may also contribute to structural failures and pest infestations.

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

More Information

- ▶ Maintenance Matters No. 6: Decks and Balconies, available at www.bchousing.org
- ▶ BC Government, Strata Housing Repair and Maintenance, visit www2.gov.bc.ca
- ▶ Condominium Home Owners Association (CHOA), visit www.choa.bc.ca
- ▶ Subscribe to receive Builder Insight and Maintenance Matters publications at www.bchousing.org

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