Technical Sheet

ALUMINUM DECKING SYSTEM FOR BALCONIES AND PATIOS

ALLIUM

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INTRODUCTION

ALLIUM aluminum decking system is the ideal solution for terraces and balconies. With an ALLIUM aluminum decking, it is not necessary to replace rotted, cracked or warped wood. In addition, there is no need to paint, stain or waterproof.

IDEAL FOR ALL CLIMATES

Because it is made of aluminum, a metal that dissipates heat well, the floor will remain cool during the summer, even under direct sunlight. Because it does not absorb moisture, it won't crack due to frost and cold.

LIGHTWEIGHT, WATERPROOFAND FIRE-RESISTANT

ALLIUM decking system are waterproof and can be easily installed on any structure or surface, provided there is a sufficient slope to allow for water flow. They are light and entirely fireproof (the melting point of aluminum is 660º C).

A NON-SLIP AND WEAR-RESISTANT FINISH

Powder coating is one of the most durable, wear-resistant and environmentally-friendly finishes. Available in two colours, gray and beige, ALLIUM decking finishes are anti-slip and exceed the requirements of the AAMA (American Architectural Manufacturers Association) 2604. The boards measure 6 1/32" (153mm) in width and have a length up to 244" (6402mm).

ALLIUM ALUMINUM DECKING COMPONENTS

ALLIUM aluminum decking system is composed of the following elements, as shown in Figure 1 and the Annex:

- Starter board
- Main board
- End board
- Front trim
- Side trim

FIGURE 1: ALLIUM aluminum decking components

PHYSICAL PROPERTIES

According to the CSA S175-05 standard calculation of aluminum structures, the physical characteristics of aluminum alloys are as follows:

- Linear thermal expansion coefficient, $\alpha = 24 \times 10^{-6} / ^\circ C$
- Modulus of elasticity, E = 70,000 MPa
- Poisson's ratio v = 0.33
- Shear modulus, G = 26,000 MPa
- Density, $\rho = 2700 \text{ kg/m}^3$

The section properties of the components used for the ALLIUM decking system are displayed in Table 1. Mechanical properties and physical properties of floor elements are used to assess the bearing capacity of these elements against the applied loading.

MECHANICAL PROPERTIES

The mechanical characteristics of ALLIUM decking system components conform to the standard CAN/CSA-S157-05 calculation of the mechanical resistance of the aluminum elements and can be found in Table 2.

	Starter board	**Main board**	**End board**
A mm^2 (in^2)	578 (0,897)	505 (0,783)	442 (0,68)
I_{xx} 10^6 mm^4 (in^4)	0.069 (0,165)	0,054 (0,131)	0,048 (0,115)
S_{xx} 10^3 mm^3 (in^3)	3,96 (0,24)	2,69 (0,164)	2.44 (0,149)

TABLE 1: Properties of board segments

	F_u	F_y Traction	F_y Compression
6360-T6	210 MPa (30 ksi)	160 MPa (23 ksi)	160 MPa (23 ksi)

TABLE 2: Resistance of alloy used in ALLIUM decking system

ANALYSIS AND DESIGN PROCEDURES

5.1 Loading

The loads applied on terrace and balcony floors according to the Ontario Building Code 2012 are mentioned in Chapter 4: Calculation rules. Loads to consider are the permanent load, surcharge due to use and snow loads.

5.1.1 Permanent Load

The permanent (dead load) of aluminum flooring consists of the following:

- Weight of aluminum flooring: 2 lbs/ft^2 (0.096 kPa)
- Weight of plywood: 1.5 lbs/ft^2 (0.072 kPa)
- Weight of joists: 1.5 lbs/ft^2 (0.072 kPa)

Therefore, the permanent load is 5 lbs/ft^2 (0.24 kPa).

5.1.2 Surcharge due to usage

According to section 4.1.5 of Ontario Building Code 2012 (Table 4.1.5.3), the maximum uniformly distributed load due to the use of the floor on balconies and terraces is 100 lbs/ft^2 (4.8 kN/m^2).

According to article and table 4.1.5.10, a concentrated load of 295 lbs (1.3 kN) should be considered on a surface of 30'' x 30'' (750 mm x 750 mm). Given the low surfaces of aluminum decking boards (width of 150 mm or 6"), this can be considered as an equivalent distributed load of 47.2 lbs/ft^2 (2.3 kPa). This equivalent value is less than distributed load of 100 lbs/ft^2 (4.8kPa), so this latter value governs for the structural calculation.

5.1.3 Snow load

The snow load (with a possible snow accumulation) is considered 200 lbs/ft^2 (9.6 kPa). For very special cases involving extreme snow loads, consult the manufacturer.

5.2 Load combination

Load combination is defined as follows according to the Ontario Building Code 2012:

- Calculation of ultimate limit states resistance:
  - 1.25 D + 1.5 L+ 0.5 S
  - 1.25 D + 0.5 L+ 1.5 S
- Calculation of limit states service deflection:
  - 1.0 D, 1.0 L, 1.0 S
  - 1.0 D + 1.0 L + 1.0 S

➢ D: Dead load

➢ L: surcharge due to use

➢ S: Snow load

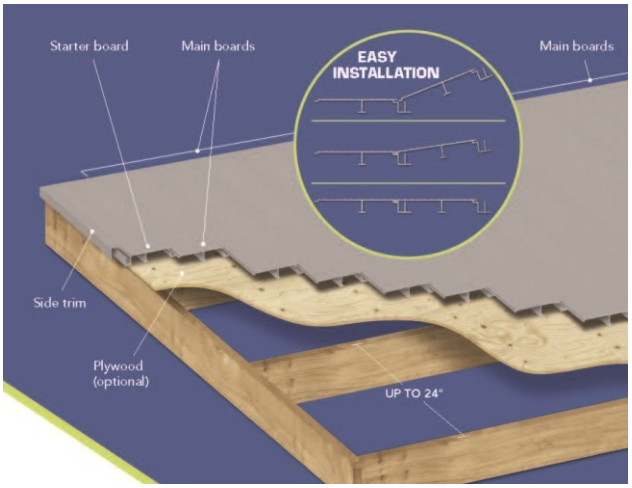

FIGURE 2: ALLIUM aluminum decking system installation

STRUCTURAL ANALYSIS AND DESIGN

Structural analyses were performed to determine factored bending moment and deflection under service loads. The tributary surface of each floor element (starter board, main board and end board) have been calculated according to their width (see Figure 1). The spacing between joists (as floor support components) was considered to be a maximum of 24". Table 3 presents the results of the structural analysis for each decking boards.

	Starter board	**Main board**	**End board**
M_f kN.m (lb.ft)	0.11 (82)	0.11 (82)	0.11 (82)
Δ mm (in)	0,55 (0,02)	0,8 (0,03)	0,7 (0,03)
M_r kN.m (lb.ft)	0.57 (420)	0.39 (287)	0.35 (258)
$\Delta_{allowed}$ mm (in)	1,67 (0,065)	1,67 (0,065)	1,67 (0,065)

TABLE 3: Analysis and design results

- **M_r**: Maximum factored bending moment obtained through structural analysis.
- **Δ**: Deflection calculated under service loads.
- **M_f**: Resistance of board bending moment.
- **$\Delta_{allowed}$**: Maximum deflection allowed by the Ontario Building Code 2012 is equal to L/360 (L = the span of the decking between two joists).

Based on the results of our structural analysis, we certify that ALLIUM decking products are able to support applicable loading according to Ontario Building Code 2012 with a large margin of safety.

CODES AND STANDARDS

- National Building Code of Canada 2010
- Ontario Building Code 2012
- Strength Design in Aluminum CAN/CSA-S157-05