



Project Number: U6022.0003.231

January 12, 2024

K2 Systems LLC
4665 North Avenue, Ste 1
Oceanside, CA 92056

REFERENCE: K2 Drop N Lock Mount: California

To Whom It May Concern:

Vector Structural Engineering, LLC has reviewed the below listed testing report(s) for the K2 Drop N Lock mounting system as shown in Figure 1. Based on the testing reports, we have determined that the mount is adequate to resist the loads listed in Table 1, and is in compliance with the below listed building codes and reference standards when installed per the limitations of this letter and the manufacturer’s recommendations.

Design Reference Standards:

- 2022 California Building Code
- 2022 California Residential Code
- ASCE/SEI 7-16
- Aluminum Design Manual (2020 Edition)
- AWC NDS (2018 Edition)

Overview:

The purpose of this report is to provide allowable capacities of the K2 Drop N Lock mounting system for mounting configurations into timber rafter and roof deck configurations. K2 Systems conducting testing of the mount for both the 4-1/2” and 6” post length configurations. K2 Systems has provided our office with the following testing report(s):

Testing Reports:

- Drop N Lock Load test report (Rigid Base)
- #14x3”x5/16” Hex Head Screw Uplift Test Report (Hex head screw performance in rafter)
- K2 Drop N Lock System: Test Report No. (Hex head screw performance in plywood decking)

Testing Results:

The K2 Drop N Lock mount was tested in both the 4-1/2” and 6” post length configurations. The mount was tested for resistance to uplift forces and shear forces in two perpendicular horizontal directions. All tests were conducted until failure of the mount was observed. The following failure modes were found to control. Refer to Figure 3 for loading directions and Figures 4 & 5 for part specific failure locations.

	4-1/2” Post Configuration	6” Post Configuration
Uplift	Universal Base Flange Shear Rupture	Universal Base Flange Shear Rupture
Shear (X)	Post Ring Shear Rupture	Post Ring Shear Rupture
Shear (Z)	Universal Base Flange Shear Rupture	Universal Base Flange Shear Rupture

Since rupture of the materials was the failure mode in testing of the K2 Drop N Lock Mounts, a factor of safety of 1.95 is used to determine the capacity of the mount per the Aluminum Design Manual. These capacities are listed in Table 1.

Furthermore, since the posts are fabricated from solid aluminum, and are relatively short, it has been determined that buckling of the posts in compression is not a limiting factor. Since the failure mode of the mount in tension was the shear rupture of the flanges of the Universal Base, we conclude that the failure mode in compression will be similar. Given these factors, it is our conclusion that the tensile capacity of the mount is representative of the compression capacity.

The K2 Drop N Lock mount was also tested to determine the shear and tensile capacities of the screws when connected to 1/2" thick plywood with (6) #14x3" stainless steel (18-8) wood screws as shown in Figure 2. This connection configuration was tested with both the 4.5" and 6" post length configurations when loaded in tension and shear. During testing the failure method was pullout of the screws from the plywood substrate under both tension and shear loads. This would indicate that the mount is subject to prying action when loaded in shear. All screw capacities provided in this letter that are derived from testing include a safety factor of 3.

Shear capacity of the mount into OSB/Plywood decking has been determined based on the results from the above-referenced reports. This has been compared with capacities as determined from the provisions of the AWC NDS Standards for a screw in single shear. The limiting capacity between the testing and code provisions is provided in Table 1.

The screw was also tested to determine the tensile capacity when installed into a 2x4 Radiata Pine member with (2) #14-3" stainless steel (18-8) wood screws, simulating a connection to a roof rafter. The head of the screw was set approximately 0.2" above the 2x4 for attachment to the universal testing machine. Tension was then applied until the screw was withdrawn from the 2x4. Radiata Pine is assumed to have a specific gravity of 0.48. Connections into wood members with other specific gravities should be adjusted by utilizing the applicable equations in the AWC NDS Standard. Capacities provided in Table 1 assume a similar condition with a safety factor of 3.

Allowable loads for the screws in tension and shear do not include any adjustment factors per AWC NDS. Each project should be reviewed in order to determine if any adjustment factors apply. Connections into wood members with specific gravities other than 0.48 should be adjusted by utilizing the applicable equations in the AWC NDS Standard. Combined tension and shear of the screws has not been accounted for. If such loading is expected, the screw capacity shall be adjusted in accordance with AWC NDS Eq. 12.4-1.

Limitations:

The capacities provided in Table 1 assume that the mount and substrate are in good condition and have not been damaged. The mount shall be installed in accordance with this letter and the manufacturer's instructions. Adequacy of the substrate material to support the intended loads is outside the scope of work provided by this letter and shall be reviewed by a registered design professional to ensure it is adequate to support the intended loads. The recommendations above are provided based upon our review of testing and drawings generated from information the client provided. Vector Structural Engineering requires that a registered design professional licensed in the jurisdiction review each site-specific install. Vector Structural Engineering is not liable for installs at site-specific locations that we have not reviewed. This document does not address site-specific installations.

Sincerely,
VECTOR STRUCTURAL ENGINEERING, LLC



01/16/2024

Russell N. Emery, P.E.
Project Engineer

RNE/svh
Enclosures

Table 1: K2 Drop N Lock Allowable Loads

	Uplift ⁴ [lbs]	Shear (x) [lbs]	Shear (z) [lbs]
4-1/2" Snap N Lock Post			
Mount	1242	131	239
Decking ¹	504	126	126
Rafter ^{2,3}	1556	252	252
6" Snap N Lock Post			
Mount	1242	95	175
Decking ¹	504	92	92
Rafter ^{2,3}	1556	167	167

1. Decking connections are to be with (6) #14x3" Wood Screws into all holes of the Universal Base.
2. Rafter Connections are to be with (2) #14x3" Wood Screws into opposing holes of the Universal Base.
3. Capacities listed are based the members having a specific gravity of 0.48.
4. Compression capacity of the mount can be taken as equal to the Uplift capacity.

Figure 1: K2 Drop N Lock Universal Base, 4-1/2" Post, & 6" Post



Figure 1: The K2 Drop N Lock Post 4.5" (left), 6.0" (center), and Drop N Lock Universal Base (right).

Figure 2: #14 x 3 in Wood Screw



Figure 1: #14 x 3in x 0.3125 in Hex Head Screw. [Isometric view]