

Aluminum Decking Span Recommendation Eagle Aluminum DDB-393

Abstract:

Eagle Aluminum DDB-393 Aluminum Decking was theoretically modeled and analyzed with physical testing to verify analysis results. The decking was found to perform within Industry standards at interior spans at and below 24" spacing. The load testing shows lower than standard deflection of the decking for distributed loads. A load point of 300 lbs, as required by code, can cause a deflection of up to 0.1" with a 24" span resulting in L/240 deflection. For this reason, it is not recommended that the decking be used for spans exceeding 24"

Background/ Methodology:

Eagle Aluminum DDB-393 aluminum decking is approximately 1" deep and 5 7/8" wide intended to be placed with 1/4" spacing between each piece to put the pieces at 6" on center (a depiction of the section is included below). The decking is proposed for live loading per the code, with approximately 24" support spacing (multi-span min 3 locations). Individual rows of decking do not lock to adjacent rows and as such will support imposed loads independently of other decking members.

Analysis for load recommendations are typically done for one, two, and three span installations. As a maximum condition for loading, for this analysis, single span loading with pinned ends was the only condition analyzed. Sections were secured using the clips provided by Eagle Aluminum. Two loading conditions were analyzed. Loading the span uniformly and with a concentrated load, measured results were compared to the calculated deflection.

This methodology results in a somewhat conservative analysis. However, if the decking is installed, bolted to every third support, the results will be accurate. In addition, given the relatively short spacing between each support, a point load for a single person on a board will result in a higher stress state and deflection greater than typical distributed loads required by code. For decking that is able to span longer distances, point loads would result in a lower stress state. The recommendation is for 24" max spacing of supports based on this. However, if the decking is installed per the recommended methods, the results should be sufficient for code compliance.

Properties:

Material: T6 6063 Aluminum
Modulus of elasticity: 10,000ksi
Yield Strength: 23ksi
Shear Strength: 22ksi
Shear Modulus: 3740ksi
Fatigue Strength: 10 ksi

Values derived from measurement of supplied decking

Cross Section Area: 0.60 in²
Section Modulus: 0.114 in³
Moment of inertia: 0.080 in⁴

DDB-393 Deck Shape:

Shown below is a cross section drawing of the decking shape

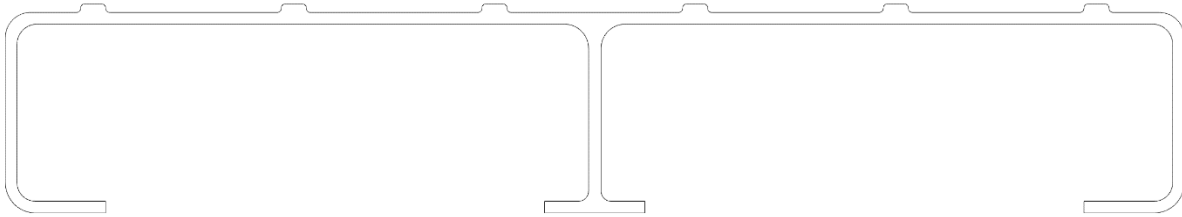


Figure 1: Decking Shape not to scale.

The section is approximately 1” high and 5 7/8” wide. It is assumed in this report that the individual planks are intended to be placed at 6” increments on center, leaving a ¼” gap between planks.

Analysis results:

Table 1 outlines the result of the structural analysis of the aluminum decking.

The first column labelled Column A indicates the maximum load allowable limited by the bending strength of the decking. Column B indicates the maximum load allowable by a maximum deflection of L/240 for that span. Column C indicates the maximum load allowable by a maximum deflection of L/360 for that span. Column D shows the maximum load allowable limited by the bending strength of the decking. Note the unit change for columns D and E. Column E shows the maximum load allowable for a maximum deflection of L/240.

Table 1 Aluminum Decking Load Table										
Allowable Live Loads in Pounds per Square Foot (psf)										
Span (in)	Column A Max. Load (psf) Deflection (in)		Column B Max. Load (psf) Deflection L/240		Column C Max. Load (psf) Deflection L/360		Column D Max. Load (lbs) Deflection (in)		Column E Max. Load (lbs) Deflection L/240	
18	480	psf. in.	1050	psf. in.	700	psf. in.	520	lbs. in.	490	lbs. in.
	0.0342		0.075		.050		0.074		0.074	
	L/527		L/240		L/360		L/227		L/240	
24	270	psf. in.	440	psf. in.	300	psf. in.	390	lbs. in.	300	lbs. in.
	0.0608		0.099		0.068		0.14		0.10	
	L/395		L/240		L/360		L/170		L/240	

The decking shape was also analyzed using FEA analysis to determine potential failure at the support locations. Figure 1 shows a strongly exaggerated deformed shape of the decking with a 300lb concentrated load placed near the support which would greatly exceed the relative load of a 100 psf distributed load over a 24” span. The stress approaches the yield strength of the material, so any loading requirements requiring a concentrated load above 300 lbs should not use this decking material.

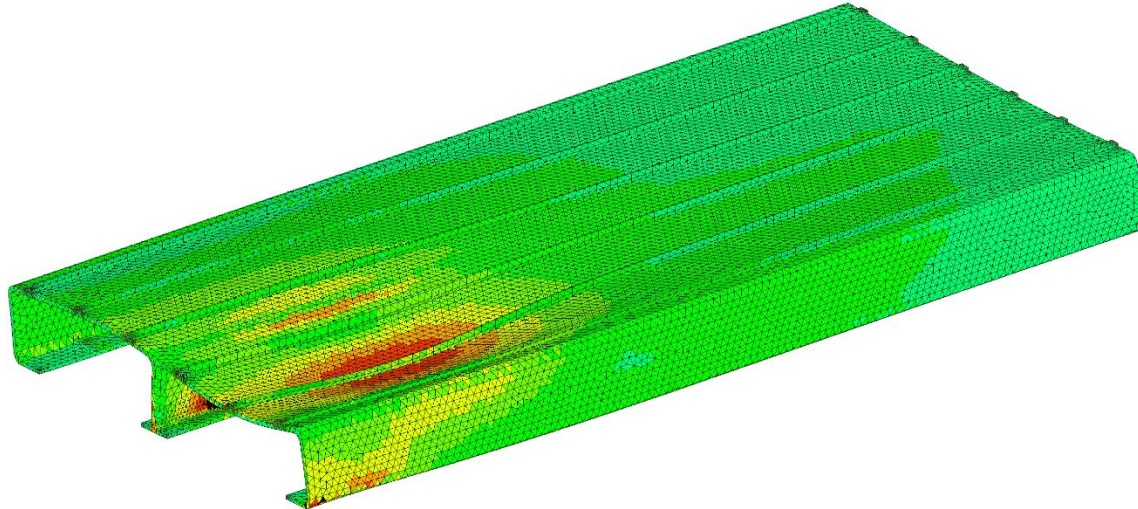


Figure 1 Decking colorized for von mises stress of the decking and exaggerated deflection for a concentrated load.

Recommendations:

It is recommended that the decking have a span not greater than 24" limited by a L/240 deflection with 300 lbs concentrated load. If the decking is installed and secured to every third support, the results should be accurate. The decking easily meets typical deflection criteria by required live loads in the IBC 2021 under any condition except where a concentrated load is required that is greater than 300 lbs. In that case, this decking is not recommended to be used due to potential buckling of the webbing members. Moreover, care should be taken as loads as low as a 400 lb concentrated load can cause permanent deformation and the decking may be subject to denting given the low wall thickness.

