



April 9, 2009

Mr. Dave Hauge
Sign Specialties, Inc.
120 15th Street NE
Watertown, South Dakota 57201

RE: Analysis of Aluminum J-Bracket Sign Mounting Hardware

REF: CE Proj. No. 090303

Dear Mr. Hauge:

You have provided us with drawings of your J-Bracket mounting clips. I have enclosed a copy of your detail drawings with this report. There are two different extruded aluminum brackets. One is 2" tall by 2" long by 1 1/2" wide and the second is 2" tall by 2" long by 1 1/4" wide and both are made of 6063-T6 structural aluminum. The primary application of the brackets is to wall mount individual channel letters. You have requested that we analyze the brackets and determine a maximum allowable use load under service conditions. A summary of the calculations used in this analysis are enclosed as well.

The typical applied loads on this type bracket are due to wind forces on the front of the letter and the dead weight of the letter. The wind force is assumed to be applied either toward or away from the bracket through the front hole. The dead weight of the letter is assumed to act down vertically through the line of the front of the bracket. Other loading conditions, such as snow and seismic loading or alternate directional affects of dead and wind loading can be substituted for the noted allowable vertical dead and horizontal wind loads. Horizontal loads applied parallel to the back of the letters (and parallel to the wall) were not considered in this analysis.

The main failure modes considered in the structural analysis of the J-Bracket were the overall bending of the bracket legs, the shear and/or tensile failure of the bracket, and localized bending at the point of load application. Failure is considered to be any breaking of or permanent deformation of the bracket. The analysis was done using the allowable stress provisions of the Aluminum Design Manual. As noted in the calculations, the applied loading (non-factored) shall meet each of the following three loading conditions:

1 1/2" J-Bracket

1. The calculated wind load (horizontal) per 1 1/2" J-Bracket shall not exceed 122 pounds.
2. The calculated wind load (WL) and calculated dead load (DL) per each 1 1/2" bracket shall satisfy the following equation: $WL / 153 + DL / 49 < 1.0$
3. The calculated dead load (vertical) per 1 1/2" J-Bracket shall not exceed 36 pounds.

1 1/4" J-Bracket

1. The calculated wind load (horizontal) per 1 1/4" J-Bracket shall not exceed 102 pounds.
2. The calculated wind load (WL) and calculated dead load (DL) per each 1 1/4" bracket shall satisfy the following equation: $WL / 127 + DL / 40 < 1.0$
3. The calculated dead load (vertical) per 1 1/4" J-Bracket shall not exceed 28 pounds.

These allowable loads provide safe working limits for various combinations of horizontal and vertical loading. These limits are well within the normal loading for most wall mounted channel letters. The actual load per each J-Bracket can be found approximately by dividing the total wind force per letter and the total weight of the letter by the number of brackets per letter. The total wind force per letter can be found by multiplying the design wind pressure for the height and location by the actual front area of the letter. The engineer responsible for the design of the wall mounted signage and for its attachment to the wall shall calculate the actual loads on each J-Bracket and make their own evaluation as to the appropriate use of this product for their application. Further, the engineer responsible for the signage attachment shall select the appropriate fastener type for this bracket and the attached-to wall system.

While these loads are acceptable for many applications, it should be noted that a bending type failure controls the calculation of the allowable loading on the bracket. While a bending failure will permanently deform the bracket, it will not likely result in the loosening of the bracket from the wall. In fact, only a shear or tensile failure of the bracket or a failure of or slippage from the attaching bolt will result in the letters detaching from the wall. Under very high wind loading, the bracket will elongate and flatten, naturally leaning toward a tensile/shear type resistance. The bracket will likely be able to sustain loads much higher than these listed before complete failure. This is a very useful characteristic because the main loading on the bracket is a transient load due to wind. Deformed brackets can be identified and replaced following major wind events with no resulting liability due to detached letters acting as projectiles during a

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wind event. Because a major concern with any wall mounted sign product is potential liability, this is a benefit to the use of this product.

The slotted holes for mounting the bracket to the wall are useful and convenient for attachment but may potentially slide off the wall anchorage hardware. To avoid this, the washer for the anchor shall bear against the projecting tabs on the bottom of the slotted legs against the wall. Further, these brackets shall only be used where the wall attachment hardware can pull the bracket snugly against the wall material in a friction fit. It is recommended that the engineer responsible for the attachment of the signage to the wall consider these issues and specify appropriate uses of the J-Brackets.

The analysis is based on the strength of the bracket only and does not provide for the strength of the mounting material within the channel letter or for the strength of the mounting bolts. The analysis is based on the use of the brackets to mount channel letters, but the use of the brackets for other wall-mounted applications is quite reasonable provided the appropriate quantity of brackets are used. The same allowable loads will apply.

I hope that this analysis has provided useful information concerning the use of your product. Feel free to call with any further questions or comments. Thank you for the opportunity to be of service to you.

Sincerely,

CORNERSTONE ENGINEERING, INC.



JAMES E. WRIGHT, JR., P.E.
S.D. P.E. No. 7047



Enclosures

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