

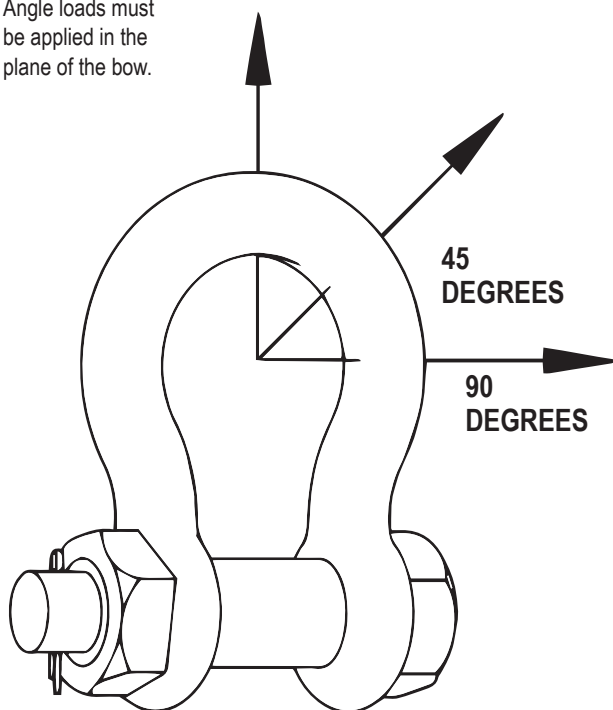
Point Loading of Crosby Shackles

It has been determined that all Crosby® shackles can be point-to-point loaded to the Working Load Limit without bending of the pin/bolt. This loading can be bow-to-bow, bow-to-pin, or pin-to-pin (if there is not interference between the diameter of the shackle ears). However, caution should be given to maintain the load at the center of the span by spacers so the load will not slide over to one side, and overload that ear. See "Off Center Loading Of Crosby® Screw Pin & Bolt Type Shackles – 3/16" to 3" Sizes"

Angular Loading Of Crosby® Screw Pin & Bolt Type Shackles

Crosby® has made representative tests with smaller size shackles with the load applied at 90 degrees to the normal plane of loading (ie. in-line). The test results indicated that in order to maintain a proof load of 2 times the Working Load Limit ($2 \times \text{WLL}$), the Working Load Limit should be reduced to 50% (ie. one-half the catalog working load rating). **DO NOT SIDE LOAD G/S-213 OR G/S-215 ROUND PIN SHACKLES.** Calculations based on the above test indicates the Working Load Limit should be reduced as shown below for loads applied at various angles to the normal plane of loading:

Angle loads must be applied in the plane of the bow.



**SIDE LOADED RATING REDUCTION
TABLE FOR 3/16" - 3" (120 METRIC TONS)**

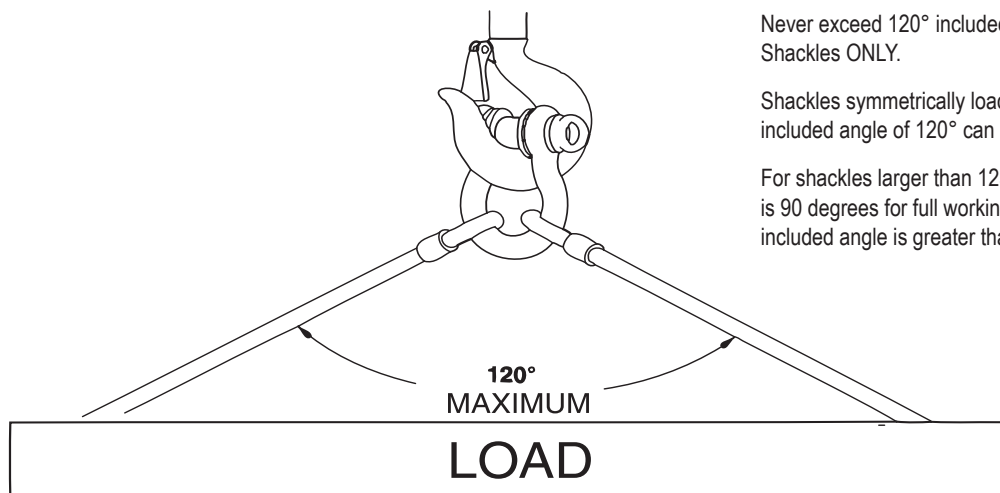
Table 1	
Side Loading Reduction Chart for Screw Pin and Bolt Type Shackles Only+	
Angle of Side Load from Vertical In-Line of Shackle	Adjusted Working Load Limit
0° - 10° In-Line*	0% of Rated Working Load Limit
11° - 20° from In-Line*	15% of Rated Working Load Limit
21° - 30° from In-Line*	25% of Rated Working Load Limit
31° - 45° from In-Line*	30% of Rated Working Load Limit
46° - 55° from In-Line*	40% of Rated Working Load Limit
56° - 70° from In-Line*	45% of Rated Working Load Limit
71° - 90° from In-Line*	50% of Rated Working Load Limit

+ In-Line load is applied perpendicular to pin. * **DO NOT SIDE LOAD ROUND PIN SHACKLE.**

Table 1	
SHACKLE SIZE GREATER THAN 3" ANGLE FROM IN-LINE (DEGREES) REDUCTION IN WLL	
0° - 5° In-Line*	0% of Rated Working Load Limit
6° - 10° from In-Line*	15% of Rated Working Load Limit
>10° from In-Line*	ANALYSIS REQ'D.

For shackles larger than 125 metric tons, where the angle of the side load is greater than 5 degrees, contact Crosby Engineering.

INCLUDED ANGLE - SHACKLES



Never exceed 120° included angle. Use Bolt Type and Screw Pin Shackles ONLY.

Shackles symmetrically loaded with two leg slings having a maximum included angle of 120° can be utilized to full Working Load Limit.

For shackles larger than 125 metric tons, the maximum included angle is 90 degrees for full working load limit. Contact Crosby Engineering if included angle is greater than 90 degrees.