



G-209

Crosby®

"There is No Equal"

The Market Leader: Yesterday Today and Tomorrow

G-2130

Shackles

DESIGN

The theoretical reserve capability of carbon shackles should be as a minimum 5 to 1, and alloy shackles a minimum of 5 to 1*. Known as the DESIGN FACTOR, it is usually computed by dividing the catalog ultimate load by the working load limit. The ultimate load is the average load or force at which the product fails or no longer supports the load. The working load limit is the maximum mass or force which the product is authorized to support in general service. The design factor is generally expressed as a ratio such as 5 to 1. Also important to the design of shackles is the selection of proper steel to support fatigue, ductility and impact properties.

THE COMPETITION

- Ask:** *What is the Working Load Limit and design factor for shackles?*
- Ask:** *Is deformation upon overloading a critical consideration in their design?*
- Ask:** *Do they jeopardize other properties by having hardness high in order to increase working load or design factor?*

Crosby®

Crosby carbon shackles have the highest design factor (6 to 1) in the industry. All of Crosby's design factors are documented. Crosby purchases only special bar forging quality steel with cleanliness and guaranteed harden ability. All material chemistry is independently verified prior to manufacturing. The design of Crosby shackles assures that strength, ductility and fatigue properties are met.

Load Rated®

CLOSED DIE FORGED

The proper performance of premium shackles depends on good manufacturing techniques that include proper forging and accurate machining. Closed die forging of shackles assures clear lettering, superior grain flow, and consistent dimensional accuracy. A closed die forged bow allows for an increased cross section that, when coupled with quench and tempering, enhances strength and ductility. Closed die bow forgings combined with close tolerance pin holes assures good fatigue life. Close pin-to-hole tolerance has been proven to be critical for good fatigue life, particularly with screw pin shackles.

THE COMPETITION

- Ask:** *Are their shackles closed die forged with close tolerance pin holes?*
- Ask:** *Do their shackles have good fatigue life?*
- Ask:** *Do their shackles have a fatigue life that meets the new world standards?*

Many forge bows utilize an open die forging process which allows for inconsistent dimensional accuracy and increased pin hole clearance, thus jeopardizing the fatigue life of the shackle in actual use.

Crosby®

Each shackle is closed die forged. Closed die forging produces consistent dimensions. A closed die forged bow allows for an increased cross section that, when coupled with quench and tempering, enhances strength and ductility. Close tolerance holes and concentric pins with good surface finishes are provided by Crosby and are proven to provide improved fatigue life in actual use. Crosby shackles are fatigue rated as well as load rated. Close pin to hole tolerance has been proven to be critical for good fatigue life, particularly with screw pin shackles.

Fatigue Rated®

QUENCHED AND TEMPERED

Quench and tempering assures the uniformity of performance and maximizes the properties of the steel. This means that each shackle meets its rated strength and has required ductility, toughness, impact and fatigue properties. The requirements of your job demand this reliability and consistency. This quench and tempering process develops a tough material that reduces the risk of brittle, catastrophic failure. The shackle bow will deform if overloading occurs, giving warning before ultimate failure.

THE COMPETITION

- Ask:** *Are their bows and pins quenched and tempered?*
- Ask:** *If not, are they willing to accept the increased risk of inconsistency?*
- Ask:** *If not, why are they willing to accept inferior impact, toughness, and product deformation?*
- Ask:** *Why do many manufacturers not recommend non-heat-treated shackles for overhead lifting?*
- Ask:** *Why do some recommend Quench and Tempering for alloy but not carbon grades?*

Many normalize the shackle bows. As a result, desired properties are not achieved. A few even provide bows in an "as-forged" condition, resulting in the possibility of brittle failure.

Crosby®

All Crosby shackle bows and pins are quenched and tempered, which enhances their performance under cold temperatures and adverse field conditions. Crosby's Quenched and Tempered carbon shackles are recommended for all critical applications including overhead lifting. Alloy shackles are recommended when specific dimensional requirements dictate a size that requires higher working load limits. Crosby's Quenched and Tempered shackles provide the tensile strength, ductility, impact and fatigue properties that are essential if they are to perform time after time in adverse conditions. These properties assure that the inspection criteria set forth by ANSI will effectively monitor the ability of the shackles to continue in service.

"QT"
QUENCHED & TEMPERED

IDENTIFICATION AND APPLICATION INFORMATION

The proper application of shackles requires that the correct type and size of shackle be used. The shackle's working load limit, its size, a traceability code and the manufacturer's name should be clearly and boldly marked in the bow. Traceability of the material chemistry and properties is essential for total confidence in the product. Material chemistry should be independently verified prior to manufacturing.

THE COMPETITION

- Ask:** *Do they have an active traceability system used in manufacturing?*
- Ask:** *Is the material chemistry independently verified?*
- Ask:** *What training support is provided?*

Crosby®

Crosby forges "Crosby" or "CG", the Working Load Limit, and the Product Identification Code (PIC) into each bow and "Crosby" or "CG", and the Product Identification Code (PIC) into each pin of its full line of screw pin, round pin, and bolt type anchor and chain shackles. Seminars conducted by Crosby provide training on the proper use of shackles. Crosby training packets, supplied free to attendees of Crosby seminars, provide training materials needed to explain the proper use of shackles.

QUIC-CHECK®

* G-2160 Wide Body Shackles are metric rated at 5 to 1. G-2140 Shackles, 200 ton and above, are rated at 4 to 1 in short tons.

Crosby® VALUE ADDED

- **Charpy impact properties:** Crosby's Quenched and Tempered shackles have enhanced impact properties for greater toughness at all temperatures. If requested at the time of order, Crosby can provide Charpy impact properties.
- **Fatigue properties:** Fatigue properties are available for 1/3 to 55 metric ton shackles. These Crosby shackles are fatigue rated to 20,000 cycles at 1-1/2 times the Working Load Limit.
- **Ductility properties:** Typical ductility properties are available for all sizes upon special request.
- **Hardness levels and material tensile strengths:** Typical values are available for all sizes of shackles, and actual values can be furnished if requested at the time of order.
- **Proof Testing:** If requested at the time of order, shackles can be proof tested with certificates.
- **Mag Certification:** If requested at the time of order, shackles can be Mag inspected with certificates.
- **Certification:** Certification to world class standards is available upon special request at the time of order; American Bureau of Shipping, Lloyds Register of Shipping, Det Norske Veritas, American Petroleum Institute, RINA, Nuclear Regulatory Commission, and several other worldwide standards.
- **Applications:** **Round Pin Shackles** can be used in tie down, towing, suspension or lifting applications where the load is strictly applied in-line. **Screw Pin Shackles** can be used in any application where a round pin shackle is used. In addition, screw pin shackles can be used for applications involving side-loading circumstances. Reduced working load limits are required for side-loading applications. **Bolt-Type Shackles** can be used in any application where round pin or screw pin shackles are used. In addition, they are recommended for permanent or long-term installations and where the load may slide on the shackle pin causing the pin to rotate.
- **Material analysis:** Crosby can provide certified material (mill) analysis for each production lot, traceable by the Product Identification Code (PIC). Crosby, through its own laboratory, verifies the analysis of each heat of steel. Crosby purchases only **special bar** forging quality steel with specific cleanliness requirements and guaranteed hardenability.
- **Field inspection:** Written instructions for visual, magnaflux, and dye penetrant inspection of shackles are available from Crosby. In addition, acceptance criteria and repair procedures for shackles are available.
- **QUIC-CHECK®:** Shackles incorporate two marking indicators forged into the shackle bow at 45° angles from vertical. These are utilized to quickly check the approximate angle of a two-legged hitch or check the angle of a single leg hitch. If the load is off vertical or side loaded a reduction in the working load limit of the shackle is required.

G-209

Screw pin anchor shackles meet the performance requirements of Federal Specification RR-C-271F Type IVA, Grade A, Class 2, except for those provisions required of the contractor.



G-213

Round pin anchor shackles meet the performance requirements of Federal Specification RR-C-271F Type IVA, Grade A, Class 1, except for those provisions required of the contractor.



G-2130

Bolt-type anchor shackles meet the performance requirements of Federal Specification RR-C-271F Type IVA, Grade A, Class 3, except for those provisions required of the contractor.



G-210

Screw pin chain shackles meet the performance requirements of Federal Specification RR-C-271F Type IVB, Grade A, Class 2, except for those provisions required of the contractor.



G-215

Round pin chain shackles meet the performance requirements of Federal Specification RR-C-271F Type IVB, Grade A, Class 1, except for those provisions required of the contractor.



G-2150

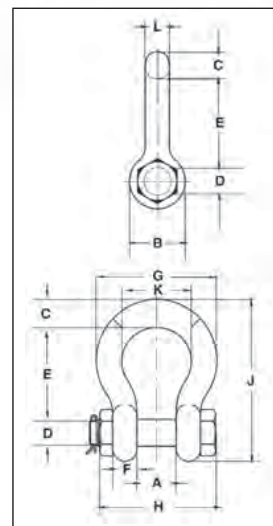
Bolt-type chain shackles meet the performance requirements of Federal Specification RR-C-271F Type IVB, Grade A, Class 3, except for those provisions required of the contractor.



**G-2140 / S-2140**

G-2140 meets the performance requirements of Federal Specification RR-C-271F, Type IVA, Grade B, Class 3, except for those provisions required of the contractor. For additional information, see page 475.

- Quenched and Tempered.
- Alloy bows, Alloy bolts.
- Forged Alloy Steel 2 thru 200 metric tons. Cast Alloy Steel 250 thru 400 metric tons. Meets performance requirements of Grade 8 shackles.
- Working Load Limit is permanently shown on every shackle.
- 30, 40, 55, and 85 metric ton shackle bows are available galvanized or self colored with pins that are galvanized and painted red.
- 120, 150, 175 metric ton shackle bows are hot-dip galvanized; bolts are Dimetcoated® and painted red.
- 400 metric ton shackle bows are Dimetcoated®; bolts are Dimetcoated® and painted red.
- Sizes 1-1/2 and larger are **RFID EQUIPPED**.
- Approved for use at -40 degrees C (-40 degrees F) to 204 degrees C (400 degrees F).
- Shackles are Quenched and Tempered and can meet DNV impact requirements of 42 joules (31 ft.-lbs.) at -20 degrees C (-4 degrees F).
- All sizes are individually proof tested if requested at time of order, to 2.0 times the Working Load Limit.
- Refer to page 88 for Crosby COLD TUFF® shackles that meet the additional requirements of DNV rules for certification of lifting applications - Loose Gear.
- Shackles 200 metric tons and larger are provided as follows.
 - Serialized pin and bow
 - Material certification (chemical)
 - Magnetic particle inspected.
 - Certification must be requested at time of order.
- Meets or exceeds all requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements. 2140 shackles meet other critical performance requirements including impact properties and material traceability, not addressed by ASME B30.26.
- Type Approval certification in accordance with ABS 2007 Steel Vessel Rules 1-11-17.7 and ABS Guide for Certification on Cranes available. Certificates available when requested at time of order and may include additional charges.
- Look for the Red Pin® . . . the mark of genuine Crosby quality.



Load Rated



QUIC-CHECK®

**SEE APPLICATION INFORMATION**

On Page 92 of the General Catalog
Para Español: www.thecrosbygroup.com

G-2140 / S-2140 Crosby® Alloy Bolt Type Anchor Shackles

Nominal Shackle Size (in.)	Working Load Limit (t)*	Stock No.			Weight Each (kg)	Dimensions (mm)											Tolerance + / -	
		G-2140	S-2140	S-2140OC		A	B	C	D +/- .5	E	F	G	H	J	K	L	A	E
3/8	2	1021015	-	-	0.15	16.8	23.1	9.7	11.2	36.6	9.7	45.2	55.1	63.2	26.2	9.7	1.5	3.3
7/16	2 2/3	1021020	-	-	0.22	19.1	26.9	11.2	12.7	42.9	10.4	51.6	63.8	73.9	29.5	11.2	1.5	3.3
1/2	3 1/3	1021029	-	-	0.36	20.6	30.2	12.7	16.3	47.8	11.7	58.7	71.1	83.3	33.3	12.7	1.5	3.3
5/8	5	1021038	-	-	0.76	26.9	38.1	17.5	19.6	60.5	14.7	74.7	90.4	106.4	42.9	16.0	1.5	3.3
3/4	7	1021047	-	-	1.23	31.8	46.0	20.6	22.6	71.4	17.5	88.9	105.4	126.2	50.8	19.1	1.5	6.4
7/8	9 1/2	1021056	-	-	1.79	36.6	53.1	24.6	25.9	84.1	20.6	102.4	122.4	148.1	57.9	22.4	1.5	6.4
1	12 1/2	1021065	-	-	2.57	42.9	60.5	26.9	29.2	95.3	23.4	119.1	136.9	166.6	68.3	25.4	1.5	6.4
1 1/8	15	1021074	-	-	3.75	46.0	68.3	31.8	31.8	108.0	26.4	131.1	149.9	189.7	73.9	28.7	1.5	6.4
1 1/4	18	1021083	-	-	5.31	51.6	76.2	35.1	35.6	119.1	29.5	146.1	169.9	209.6	82.6	32.8	1.5	6.4
1 3/8	21	1021092	-	-	7.18	57.2	84.1	38.1	38.9	133.4	32.5	162.1	183.1	232.7	92.2	36.1	3.3	6.4
1-1/2	30	1021110	1021129	1262407	8.52	60.5	91.9	41.1	41.4	146	35.3	175	196	254	98.6	38.9	3.3	6.4
1-3/4	40	1021138	1021147	1262416	15.4	73.2	106	57.2	50.8	178	44.5	224	237	313	127	46.7	3.3	6.4
2	55	1021156	1021165	1262425	23.6	82.6	122	61.0	57.2	197	50.8	258	264	347	146	52.8	3.3	6.4
2-1/2	85	1021174	1021183	1262434	43.5	105	148	79.2	69.9	267	66.5	324	345	455	184	68.8	6.4	6.4
3	120	1021192	-	1262443	81	127	165	92.2	82.6	330	76.2	371	384	546	200	79.2	6.4	6.4
3-1/2	† 150	1021218	-	1262452	120	133	203	111	95.3	372	95.3	432	448	632	229	91.9	6.4	6.4
4	† 175	1021236	-	1262461	153	140	229	116	108	368	102	457	517	652	254	102	6.4	6.4
4 3/4	† 200	1021234	-	-	209	184	267	127	121	386	116	529	611	706	279	121	6.35	6.35
5	† 250	1021243	-	-	276	216	305	143	127	470	123	600	632	828	330	127	4.0	1.80
6	† 300	1021252	-	-	362	213	330	154	152	475	124	629	666	871	330	149	4.0	1.80
7**	† 400	1021478	-	-	500	210	356	184	178	572	165	660	728	1022	330	152	6.4	6.4

* Note: Maximum Proof Load is 2.0 times the Working Load Limit. Minimum Ultimate Load is 4.5 times the Working Load Limit on 2 thru 21 metric tons. For sizes 30 thru 175 metric tons, Minimum Ultimate Load is 5.4 times the Working Load Limit for 200 thru 400 metric tons, Minimum Ultimate Load is 4 times the Working Load Limit. ** Cast Alloy Steel.

† Furnished with Round Head Bolts with an eyebolt for handling. For Working Load Limit reduction due to side loading applications, see page 94.