



RIGGING INFORMATION



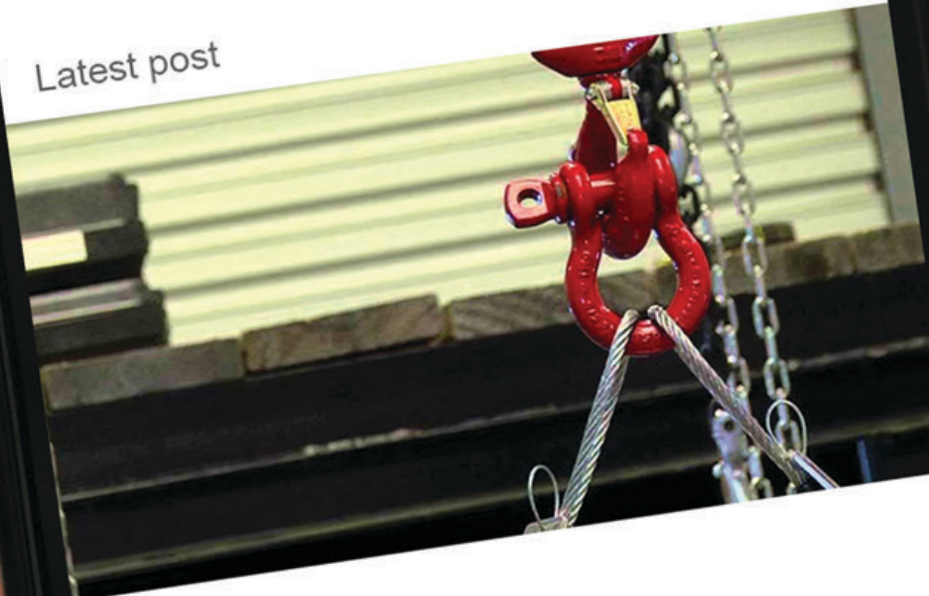
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Latest post



Slings: Angles & Multiples

In a recent study on sling angle best



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Crosby® USERS GUIDE FOR LIFTING

ASME VERSION (3/18)

RISK MANAGEMENT	TERMINOLOGY	FOR ADDITIONAL SUPPORT
DEFINITION	WORKING LOAD LIMIT (WLL)	
COMPREHENSIVE SET OF ACTIONS THAT REDUCES THE RISK OF A PROBLEM, A FAILURE, AN ACCIDENT	THE MAXIMUM MASS OR FORCE WHICH THE PRODUCT IS AUTHORIZED TO SUPPORT IN A PARTICULAR SERVICE.	
ASME B30.9 (SLINGS) AND ASME B30.26 (RIGGING HARDWARE) REQUIRES USERS TO HAVE TRAINING.	PROOF TEST	
USERS SHALL BE TRAINED IN THE SELECTION, INSPECTION, CAUTIONS TO PERSONNEL, EFFECTS OF ENVIRONMENT AND RIGGING PRACTICES.	A TEST APPLIED TO A PRODUCT SOLELY TO DETERMINE INJURIOUS MATERIAL OR MANUFACTURING DEFECTS.	
ALL SLINGS AND RIGGING HARDWARE REQUIRE PROPER IDENTIFICATION.	ULTIMATE STRENGTH	
RIGGING HARDWARE AT MINIMUM TO BE IDENTIFIED WITH NAME OR TRADEMARK OF THE MANUFACTURER.	THE AVERAGE LOAD OR FORCE AT WHICH THE PRODUCT FAILS OR NO LONGER SUPPORTS THE LOAD.	
SEE ASME B30.9, ASME B30.10 AND ASME B30.26 FOR FULL INFORMATION	DESIGN FACTOR	
REFER TO CROSBY GROUP CATALOG AND OTHER PRODUCT APPLICATION INFORMATION.	AN INDUSTRIAL TERM DENOTING A PRODUCT'S THEORETICAL RESERVE CAPABILITY; USUALLY COMPUTED BY DIVIDING THE CATALOG ULTIMATE LOAD BY THE WORKING LOAD LIMIT. GENERALLY EXPRESSED AS A RATIO, e.g. 5 TO 1.	
	Load Rated®	
		<p>P.O. Box 3128 Tulsa Oklahoma 74101 Phone: (918) 834-4611 1-800-777-1555</p> <p>Web: www.thecrosbygroup.com E-Mail: crosbygroup@thecrosbygroup.com</p> <p>BLOCKS & FITTINGS FOR WIRE ROPE & CHAIN</p> <p>CROSBY® FITTINGS LEBUS® McKISSICK® CROSBY IP® NATIONAL®</p>

THE BASIC RIGGING PLAN

PLAN EVERY LIFT. THE QUESTIONS TO ANSWER BELOW ARE JUST A GOOD STARTING POINT BEFORE THE MATERIAL MOVING ACTIVITY BEGINS. ADD QUESTIONS FROM YOUR PAST EXPERIENCE OR JOB SPECIFIC REQUIREMENTS.

1. WHO IS RESPONSIBLE FOR THE RIGGING?
2. HAS COMMUNICATION BEEN ESTABLISHED?
3. IS THE RIGGING IN ACCEPTABLE CONDITION?
4. IS THE RIGGING APPROPRIATE FOR LIFTING?
5. DOES THE RIGGING HAVE PROPER IDENTIFICATION?
6. DOES ALL GEAR HAVE KNOWN WORKING LOAD LIMITS?
7. WHAT IS THE WEIGHT OF THE LOAD?
8. WHERE IS THE LOAD'S CENTER OF GRAVITY?
9. WHAT IS THE SLING ANGLE OF LOADING?
10. WILL THERE BE ANY SIDE OR ANGULAR LOADING?
11. ARE THE SLINGS PROTECTED FROM CORNERS, EDGES, PROTRUSIONS AND ABRASIVE SURFACES?
12. ARE THE WORKING LOAD LIMITS ADEQUATE?
13. IS THE LOAD RIGGED TO THE CENTER OF GRAVITY?
14. IS THE HITCH APPROPRIATE FOR THE LOAD?
15. IS A TAG LINE REQUIRED TO CONTROL THE LOAD?
16. WILL PERSONNEL BE CLEAR OF SUSPENDED LOADS?
17. IS THERE ANY POSSIBILITY OF FOULING?
18. WILL THE LOAD LIFT LEVEL AND BE STABLE?
19. ANY UNUSUAL ENVIRONMENTAL CONCERNS?
20. ANY SPECIAL REQUIREMENTS?

THE RIGGING MUST BE USED WITHIN MANUFACTURER'S RECOMMENDATIONS AND INDUSTRY STANDARDS THAT INCLUDE OSHA, ASME, ANSI, API AND OTHERS.

RESPONSIBILITY

USER RESPONSIBILITY

1. UTILIZE APPROPRIATE RIGGING GEAR SUITABLE FOR OVERHEAD LIFTING.
2. UTILIZE THE RIGGING GEAR WITHIN INDUSTRY STANDARDS AND THE MANUFACTURER'S RECOMMENDATIONS.
3. CONDUCT REGULAR INSPECTION AND MAINTENANCE OF THE RIGGING GEAR.
4. PROVIDE EMPLOYEES WITH TRAINING TO MEET OSHA, API AND ASME (B30.9, B30.26, ETC.) REQUIREMENTS.

MANUFACTURER'S RESPONSIBILITY

1. PROVIDES PRODUCT AND APPLICATION INFORMATION
2. PROVIDES PRODUCT THAT IS CLEARLY IDENTIFIED
 - NAME OR LOGO
 - LOAD RATING AND SIZE
 - TRACEABILITY
3. PROVIDES PRODUCT PERFORMANCE
 - WORKING LOAD LIMIT
 - DUCTILITY
 - FATIGUE PROPERTIES
 - IMPACT PROPERTIES
4. PROVIDES PRODUCT TRAINING AND TRAINING RESOURCES



INSPECTION OF RIGGING HARDWARE

INSPECTION FREQUENCY PER ASME B30.26

A VISUAL INSPECTION SHALL BE PERFORMED BY THE USER OR DESIGNATED PERSON EACH DAY BEFORE THE RIGGING HARDWARE IS USED.

A PERIODIC INSPECTION SHALL BE PERFORMED BY A DESIGNATED PERSON, AT LEAST ANNUALLY. THE RIGGING HARDWARE SHALL BE EXAMINED AND A DETERMINATION MADE AS TO WHETHER THEY CONSTITUTE A HAZARD. WRITTEN RECORDS ARE NOT REQUIRED.

SEMI-PERMANENT AND INACCESSIBLE LOCATIONS WHERE FREQUENT INSPECTIONS ARE NOT FEASIBLE SHALL HAVE PERIODIC INSPECTIONS PERFORMED.

REJECTION CRITERIA PER ASME B30.26

MISSING OR ILLEGIBLE MANUFACTURER'S NAME OR TRADEMARK AND/OR RATED LOAD IDENTIFICATION (OR SIZE AS REQUIRED)

A 10% OR MORE REDUCTION OF THE ORIGINAL DIMENSION

BENT, TWISTED, DISTORTED, STRETCHED, ELONGATED, CRACKED OR BROKEN LOAD BEARING COMPONENTS

EXCESSIVE NICKS, GOUGES, PITTING AND CORROSION

INDICATIONS OF HEAT DAMAGE INCLUDING WELD SPATTER OR ARC STRIKES, EVIDENCE OF UNAUTHORIZED WELDING

LOOSE OR MISSING NUTS, BOLTS, COTTER PINS, SNAP RINGS, OR OTHER FASTENERS AND RETAINING DEVICES

UNAUTHORIZED REPLACEMENT COMPONENTS OR OTHER VISIBLE CONDITIONS THAT CAUSE DOUBT AS TO THE CONTINUED USE OF THE SLING

ADDITIONALLY, INSPECT WIRE ROPE CLIPS FOR:

1. INSUFFICIENT NUMBER OF CLIPS
2. INCORRECT SPACING BETWEEN CLIPS
3. IMPROPERLY TIGHTENED CLIPS
4. INDICATIONS OF DAMAGED WIRE ROPE OR WIRE ROPE SLIPPAGE
5. IMPROPER ASSEMBLY

ADDITIONALLY, INSPECT WEDGE SOCKETS FOR:

1. INDICATIONS OF DAMAGED WIRE ROPE OR WIRE ROPE SLIPPAGE
2. IMPROPER ASSEMBLY

ADDITIONAL REJECTION CRITERIA AND INFORMATION PER ASME B30.10 - HOOKS

- ANY VISIBLY APPARENT BEND OR TWIST FROM THE PLANE OF THE UNBENT HOOK
- ANY DISTORTION CAUSING AN INCREASE IN THROAT OPENING OF 5%, NOT TO EXCEED 1/4"
- MISSING OR ILLEGIBLE RATED LOAD IDENTIFICATION
- MISSING OR ILLEGIBLE HOOK MANUFACTURER'S IDENTIFICATION OR SECONDARY MFG. IDENTIFICATION
- HOOKS SHALL NOT BE RETURNED TO SERVICE UNTIL APPROVED BY A QUALIFIED PERSON
- HOOKS REQUIRE A WRITTEN RECORD OF THE PERIODIC INSPECTION, MINIMUM OF ONCE PER YEAR

INSPECTION OF SLINGS

INSPECTION FREQUENCY PER ASME B30.9

A VISUAL INSPECTION FOR DAMAGE SHALL BE PERFORMED BY A DESIGNATED PERSON EACH DAY OR SHIFT THE SLING IS USED. A COMPLETE INSPECTION FOR DAMAGE SHALL BE PERFORMED PERIODICALLY BY A DESIGNATED PERSON, AT LEAST ANNUALLY.

REJECTION CRITERIA PER ASME B30.9

MISSING OR ILLEGIBLE SLING IDENTIFICATION; EVIDENCE OF HEAT DAMAGE; SLINGS THAT ARE KNOTTED; FITTINGS THAT ARE PITTED, CORRODED, CRACKED, BENT, TWISTED, GOUGED, OR BROKEN; OTHER CONDITIONS, INCLUDING VISIBLE DAMAGE, THAT CAUSE DOUBT AS TO THE CONTINUED USE OF THE SLING.

WIRE ROPE SLINGS

EXCESSIVE BROKEN WIRES, FOR STRAND-LAID AND SINGLE PART SLINGS, TEN RANDOMLY DISTRIBUTED BROKEN WIRES IN ONE ROPE LAY OR FIVE BROKEN WIRES IN ONE STRAND IN ONE ROPE LAY

SEVERE LOCALIZED ABRASION OR SCRAPING, KINKING, CRUSHING, BIRDCAGING

ANY OTHER DAMAGE RESULTING IN DAMAGE TO THE ROPE STRUCTURE

SEVERE CORROSION OF THE ROPE OR END ATTACHMENTS

DOCUMENTATION THAT THE MOST RECENT PERIODIC INSPECTION WAS PERFORMED SHALL BE MAINTAINED

INSPECTION RECORDS OF INDIVIDUAL SLINGS ARE NOT REQUIRED

CHAIN SLINGS

CRACKS OR BREAKS

EXCESSIVE WEAR, NICKS OR GOUGES

STRETCHED CHAIN LINKS OR COMPONENTS

BENT, TWISTED OR DEFORMED CHAIN LINKS OR COMPONENTS

EXCESSIVE PITTING OR CORROSION

LACK OF ABILITY OF CHAIN OR COMPONENTS TO HINGE FREELY

WELD SPATTER

A WRITTEN RECORD OF THE INITIAL INSPECTION REFERENCING INDIVIDUAL SLING IDENTIFICATION IS REQUIRED

A WRITTEN RECORD OF THE MOST RECENT PERIODIC INSPECTION SHALL BE MAINTAINED AND SHALL INCLUDE THE CONDITION OF THE SLING

WEB SLINGS

ACID OR CAUSTIC BURNS

MELTING OR CHARRING OF ANY PART OF THE SLING

HOLES, TEARS, CUTS OR SNAGS

BROKEN OR WORN STITCHING IN LOAD BEARING SPLICES

EXCESSIVE ABRASIVE WEAR DISCOLORATION AND BRITTLE

OR STIFF AREAS ON ANY PART OF THE SLING, WHICH

MAY MEAN CHEMICAL OR ULTRAVIOLET / SUNLIGHT DAMAGE

DOCUMENTATION THAT THE MOST RECENT PERIODIC INSPECTION WAS PERFORMED SHALL BE MAINTAINED

ROUND SLINGS

ACID OR CAUSTIC BURNS EVIDENCE OF HEAT DAMAGE

HOLES, TEARS, CUTS, ABRASIVE WEAR OR SNAGS THAT EXPOSE THE CORE YARNS

BROKEN OR DAMAGED CORE YARNS

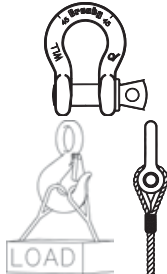
WELD SPATTER THAT EXPOSES CORE YARNS

DISCOLORATION AND BRITTLE OR STIFF AREAS ON ANY PART OF THE SLINGS, WHICH MAY MEAN CHEMICAL OR OTHER DAMAGE

DOCUMENTATION THAT THE MOST RECENT PERIODIC INSPECTION WAS PERFORMED SHALL BE MAINTAINED

WIRE ROPE SLING CONNECTIONS AND HITCHES

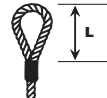
CONNECTION TO FITTINGS



USE A THIMBLE TO PROTECT SLING AND INCREASE D/d

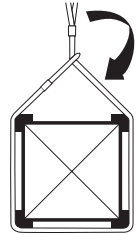
NEVER PLACE EYE OVER A FITTING WITH SMALLER DIAMETER OR WIDTH THAN THE ROPE'S DIAMETER.

NEVER PLACE A SLING EYE OVER A FITTING WITH A DIAMETER OR WIDTH GREATER THAN ONE HALF THE LENGTH OF THE EYE.

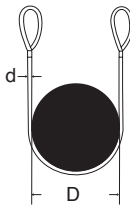


CHOKER CAPACITY

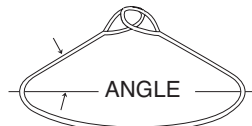
A CHOKER HITCH HAS 75% OF THE CAPACITY OF A SINGLE LEG SLING ONLY IF THE ANGLE OF CHOKE IS 120 DEGREES OR GREATER. A CHOKE ANGLE LESS THAN 120 DEGREES CAN RESULT IN A CAPACITY AS LOW AS 40% OF THE SINGLE LEG.



BASKET HITCH CAPACITY



A BASKET HITCH HAS TWICE THE CAPACITY OF A SINGLE LEG ONLY IF D/d RATIO IS 25/1 AND THE LEGS ARE VERTICAL.



CAPACITY % OF ANGLE SINGLE LEG

90	200%
60	170%
45	140%
30	100%

MULTIPLE LEG SLINGS

TRIPLE LEG SLINGS HAVE 50% MORE CAPACITY THAN DOUBLE LEG SLINGS (AT SAME SLING ANGLE) ONLY IF THE CENTER OF GRAVITY IS IN CENTER OF CONNECTION POINTS AND LEGS ARE ADJUSTED PROPERLY. THEY MUST HAVE AN EQUAL SHARE OF THE LOAD.

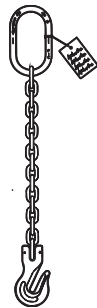
QUAD (4 LEG) SLINGS OFFER IMPROVED STABILITY BUT PROVIDE INCREASED CAPACITY ONLY IF ALL LEGS SHARE AN EQUAL SHARE OF THE LOAD.

CHAIN SLING CONNECTIONS AND HITCHES

CONNECTION TO FITTINGS

USE MASTER LINKS TO COLLECT SLINGS AND TO CONNECT TO HOOK

USE GRADE 8 (80) OR GRADE 10 (100) FITTINGS THAT MATCH THE WLL OF CHAIN AND OFFER PROPER SECUREMENT.



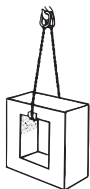
CHOKER CAPACITY

A CHAIN CHOKER HITCH HAS 80% OF THE CAPACITY OF A SINGLE LEG SLING ONLY IF THE ANGLE OF CHOKE IS 120 DEGREES OR GREATER. RATED LOADS FOR ANGLES OF CHOKE LESS THAN 120 DEGREES SHALL BE DETERMINED BY THE SLING MFG OR A QUALIFIED PERSON.

NO LOSS IN CAPACITY RESULTS IF A CRADLE GRAB HOOK IS USED WHEN ANGLE OF CHOKE IS 120 DEGREES OR GREATER



BASKET HITCH CAPACITY



A TRUE BASKET HITCH HAS TWICE THE CAPACITY OF A SINGLE LEG ONLY IF THE LEGS ARE VERTICAL. NOTE THAT THE BASKET IS FORMED BY USING A CHAIN SLING WITH TWO MASTERLINKS AT EACH END CONNECTED TO THE HOOK.

HORIZONTAL CAPACITY % OF ANGLE SINGLE LEG

90	200%
60	170%
45	140%
30	100%

MULTIPLE LEG SLINGS

TRIPLE LEG CHAIN SLINGS HAVE 50% MORE CAPACITY THAN DOUBLE LEG CHAIN SLINGS (AT SAME SLING ANGLE) ONLY IF THE CENTER OF GRAVITY IS IN THE CENTER OF THE CONNECTION POINTS AND LEGS ARE ADJUSTED PROPERLY. THEY MUST HAVE AN EQUAL SHARE OF THE LOAD.

QUAD (4 LEG) CHAIN SLINGS OFFER IMPROVED STABILITY, BUT DO NOT PROVIDE INCREASED CAPACITY. THE CAPACITY OF A FOUR LEG CHAIN SLING IS CONSIDERED THE SAME AS THREE LEG CHAIN SLING.

WEB SLING AND ROUND SLING CAPACITIES

WEB SLING IDENTIFICATION INCLUDES:

SLING TYPE:

TC - TRIANGLE CHOKER

TT - TRIANGLE TRIANGLE

EE - EYE AND EYE

EN - ENDLESS

NUMBER OF PLIES: 1 OR 2

WEBBING GRADE: 9 OR 6

SLING WIDTH (INCHES)

EE 2-9 04 X 12 ← SLING LENGTH (FEET)

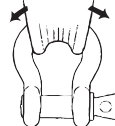
ROUND SLING IDENTIFICATION INCLUDES:

SLING NUMBER: 1-13

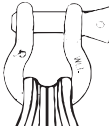
SLING NUMBERS ARE FOR REFERENCE ONLY, SOME ROUND SLINGS HAVE DIFFERENT RATINGS.

SLING COLOR: PURPLE, GREEN, YELLOW, TAN, RED, WHITE, BLUE, ORANGE
SLING COLOR IS NOT FOLLOWED BY ALL MANUFACTURERS AND SOME COLORS HAVE MORE THAN ONE RATED LOAD.

FOLDING, BUNCHING, OR PINCHING OF SYNTHETIC SLINGS, WHICH OCCURS WHEN USED WITH SHACKLES, HOOKS OR OTHER APPLICATIONS WILL REDUCE THE RATED LOAD.



BUNCHING



PINCHING

CHOKER CAPACITY

A CHOKER HITCH HAS 80% OF THE CAPACITY OF A SINGLE LEG SLING ONLY IF THE ANGLE OF CHOKE IS 120 DEGREES OR GREATER. A CHOKE ANGLE LESS THAN 120 DEGREES WILL RESULT IN A CAPACITY AS LOW AS 40% OF THE SINGLE LEG.

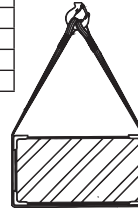


BASKET HITCH CAPACITY

HORIZONTAL CAPACITY % OF ANGLE SINGLE LEG

90	200%
60	170%
45	140%
30	100%

A TRUE BASKET HITCH HAS TWICE THE CAPACITY OF A SINGLE LEG ONLY IF THE LEGS ARE VERTICAL



MULTIPLE LEG SLINGS

TRIPLE LEG SLINGS HAVE 50% MORE CAPACITY THAN DOUBLE LEG SLINGS (AT SAME SLING ANGLE) ONLY IF THE CENTER OF GRAVITY IS IN THE CENTER OF CONNECTION POINTS AND LEGS ARE ADJUSTED PROPERLY. THEY MUST HAVE AN EQUAL SHARE OF THE LOAD.

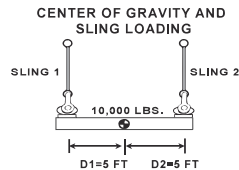
QUAD (4 LEG) SLINGS OFFER IMPROVED STABILITY BUT PROVIDE INCREASED CAPACITY ONLY IF ALL LEGS SHARE AN EQUAL SHARE OF THE LOAD.

NEVER PLACE A SYNTHETIC SLING EYE OVER A FITTING WITH A DIAMETER OR WIDTH GREATER THAN ONE THIRD THE LENGTH OF THE EYE. CONSULT MANUFACTURER OR QUALIFIED PERSON WHEN EXPECTED LOAD ON SYNTHETIC SLING IS EXPECTED TO EXCEED 80% OF THE SLING RATED LOAD.

CENTER OF GRAVITY AND SLING LOADING

WHEN LIFTING VERTICALLY, THE LOAD WILL BE SHARED EQUALLY IF THE CENTER OF GRAVITY IS PLACED EQUALLY BETWEEN THE PICK POINTS.

IF THE WEIGHT OF THE LOAD IS 10,000 LBS., THEN EACH SLING WILL HAVE A LOAD OF 5,000 LBS. AND EACH SHACKLE AND EYEBOLT WILL ALSO HAVE A LOAD OF 5,000 LBS.



WEIGHTS AND MEASURES

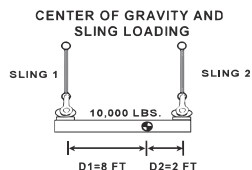
UNIT WEIGHT STEEL = 490 LBS/FT³
 UNIT WEIGHT ALUMINUM = 165 LBS/FT³
 UNIT WEIGHT CONCRETE = 150 LBS/FT³
 UNIT WEIGHT WOOD = 50 LBS/FT³
 UNIT WEIGHT WATER = 62 LBS/FT³
 UNIT WEIGHT SAND AND GRAVEL = 120 LBS/FT³
 UNIT WEIGHT COPPER = 560 LBS/FT³
 UNIT WEIGHT OIL = 58 LBS/FT³

1 CUBIC FT. = 7.5 GALS
 1 METRIC TON = 1.1 US TONS
 1 KILOGRAM = 2.2 LBS

1/2 INCH = 12.7 mm
 1 INCH = 25.4 mm

CENTER OF GRAVITY AND SLING LOADING

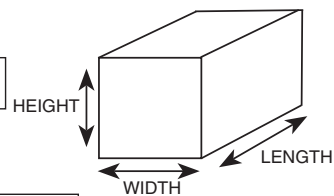
WHEN THE CENTER OF GRAVITY IS NOT EQUALLY SPACED BETWEEN THE PICK POINTS, THE SLING AND FITTINGS WILL NOT CARRY AN EQUAL SHARE OF THE LOAD. THE SLING CONNECTED TO THE PICK POINT CLOSEST TO THE CENTER OF GRAVITY WILL CARRY THE GREATEST SHARE OF THE LOAD.



SLING 2 IS CLOSEST TO COG. IT WILL HAVE THE GREATEST SHARE OF THE LOAD.

SLING 2 = $10,000 \times 8 / (8+2) = 8,000$ LBS.
 SLING 1 = $10,000 \times 2 / (8+2) = 2,000$ LBS.

VOLUME OF RECTANGLE =
 HEIGHT x WIDTH x LENGTH



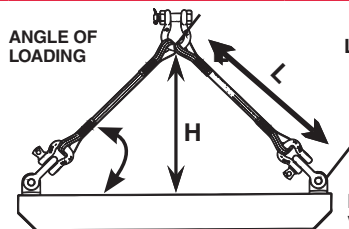
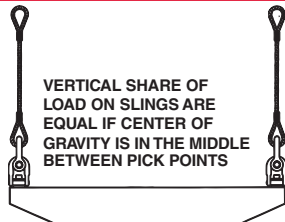
VOLUME OF SPHERE =
 $3.14 \times (\text{DIAM.} \times \text{DIAM.} \times \text{DIAM.}) / 6$

VOLUME OF CYLINDER =
 $3.14 \times (\text{DIAM.} \times \text{DIAM.} \times \text{LENGTH}) / 4$



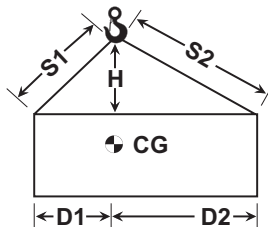
SLING ANGLES

TWO LEGGED SLING - WIRE ROPE, CHAIN, SYNTHETICS



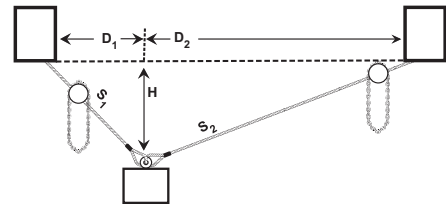
ANGLE OF LOADING (A) DEGREE	LOAD ANGLE FACTOR = L/H
90	1.000
60	1.155
50	1.305
45	1.414
30	2.000

LOAD ON EACH LEG OF SLING =
VERTICAL SHARE OF LOAD X LOAD ANGLE FACTOR



LOAD ON SLING CALCULATED
TENSION 1 = $\text{LOAD} \times D2 \times S1 / (H(D1+D2))$
TENSION 2 = $\text{LOAD} \times D1 \times S2 / (H(D1+D2))$

ANGLE OF LOADING
OF LESS THAN 30
DEGREES ARE NOT
RECOMMENDED REFER
TO ASME B30.9 FOR FULL
INFORMATION



LOAD ON SLING CALCULATED
TENSION 1 = $\text{LOAD} \times D2 \times S1 / (H(D1+D2))$
TENSION 2 = $\text{LOAD} \times D1 \times S2 / (H(D1+D2))$

OPERATING PRACTICES - ASME B30.9

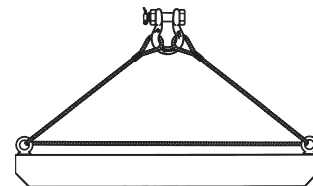
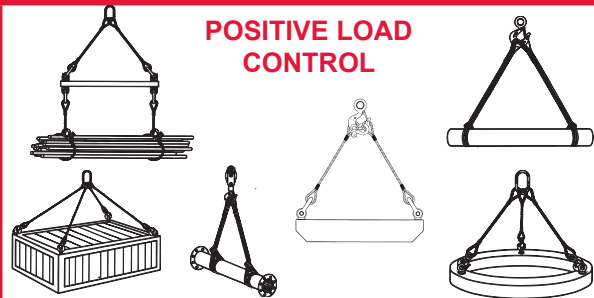
WHENEVER ANY SLING IS USED, THE FOLLOWING PRACTICES SHALL BE OBSERVED.

1. SLINGS THAT ARE DAMAGED OR DEFECTIVE SHALL NOT BE USED.
2. SLINGS SHALL NOT BE SHORTENED OR LENGTHENED BY KNOTTING OR TWISTING.
3. SLING LEGS SHALL NOT BE KINKED.
4. THE RATED LOAD OF THE SLING SHALL NOT BE EXCEEDED.
5. SLINGS USED IN A BASKET HITCH SHALL HAVE THE LOADS BALANCED TO PREVENT SLIPPAGE.
6. SLINGS SHALL BE SECURELY ATTACHED TO THEIR LOAD.
7. SLINGS SHALL BE PROTECTED FROM EDGES, CORNERS, PROTRUSIONS AND ABRASIVE SURFACES TO PREVENT SLING DAMAGE.
8. DURING LIFTING, WITH OR WITHOUT LOAD, PERSONNEL SHALL BE ALERT FOR POSSIBLE SNAGGING.
9. ALL EMPLOYEES SHALL BE KEPT CLEAR OF LOADS ABOUT TO BE LIFTED AND OR SUSPENDED LOADS.
10. HANDS OR FINGERS SHALL NOT BE PLACED BETWEEN THE SLING AND ITS LOAD WHILE THE SLING IS BEING TIGHTENED AROUND THE LOAD.
11. SHOCK LOADING SHOULD BE AVOIDED.
12. A SLING SHALL NOT BE PULLED FROM UNDER A LOAD WHEN THE LOAD IS RESTING ON THE SLING.

INSPECTION: EACH DAY BEFORE BEING USED, THE SLING AND ALL FASTENINGS AND ATTACHMENTS SHALL BE INSPECTED FOR DAMAGE OR DEFECTS BY A COMPETENT PERSON DESIGNATED BY THE EMPLOYER. ADDITIONAL INSPECTIONS SHALL BE PERFORMED DURING SLING USE WHERE SERVICE CONDITIONS WARRANT. DAMAGED OR DEFECTIVE SLINGS SHALL BE IMMEDIATELY REMOVED FROM SERVICE.

LOAD CONTROL

POSITIVE LOAD CONTROL



REEVING THROUGH CONNECTIONS TO LOAD
INCREASES LOAD ON CONNECTION FITTINGS BY AS
MUCH AS TWICE.

DO NOT REEVE!

VERSION
(2/1/17)**Crosby® BLOCK SELECTION AND APPLICATION GUIDE****RISK MANAGEMENT**

COMPREHENSIVE SET OF ACTIONS THAT REDUCES THE RISK OF A PROBLEM, A FAILURE, AN ACCIDENT

YOU NEED

- PRODUCT KNOWLEDGE
- APPLICATION KNOWLEDGE
- MANUFACTURER OF KNOWN CAPABILITY
- PRODUCTS THAT ARE CLEARLY IDENTIFIED WITH THE FOLLOWING:

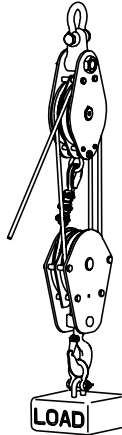
1. MANUFACTURER'S NAME AND LOGO
2. LOAD RATING OR SIZE THAT REFERENCES RATINGS
3. TRACEABILITY CODE

A GOOD RISK MANAGEMENT PROGRAM RECOGNIZES

- PERFORMANCE REQUIREMENTS INCLUDE THE FOLLOWING:
1. LOAD RATED PRODUCTS
 2. QUENCHED AND TEMPERED
 3. ABILITY TO DEFORM WHEN OVERLOADED.
 4. ABILITY TO WITHSTAND REAL WORLD LOADING IN DAY TO DAY USE, TOUGHNESS.

MECHANICAL ADVANTAGE AND TOTAL LOAD

MECHANICAL ADVANTAGE IS THE LEVERAGE GAINED BY A MULTIPLE PART BLOCK. MUST HAVE A TRAVELING BLOCK TO HAVE MECHANICAL ADVANTAGE. THE THEORETICAL ADVANTAGE IS EQUAL TO THE NUMBER OF PARTS OF LINE SUPPORTING THE TRAVELING BLOCK.

**TRUE MECHANICAL ADVANTAGE**

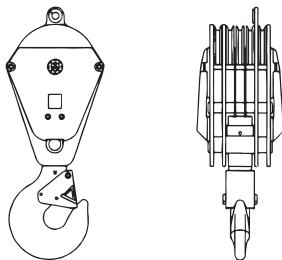
ADVANTAGE FOR BRONZE BUSHING	ADVANTAGE FOR ANTI FRICTION	NUMBER OF LINE PARTS
5.16	5.60	6
5.90	6.47	7
6.60	7.32	8
7.27	8.16	9
7.91	8.98	10
8.52	9.79	11
9.11	10.60	12

TOTAL LOAD

THE TOTAL LOAD PLACED ON THE BLOCK AND ITS END FITTING DETERMINES THE WORKING LOAD LIMIT REQUIRED.

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Crosby®

WORKING WITH BLOCKS**OVERHAUL WEIGHT**

To determine the weight of the block or overhaul ball that is required to free fall the block, the following information is needed: **Size of wire rope, Number of line parts, Type of sheave bearing, Length of crane boom, and Drum Friction.**

BLOCK REAVING

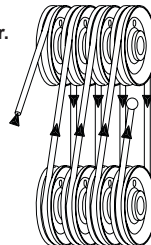
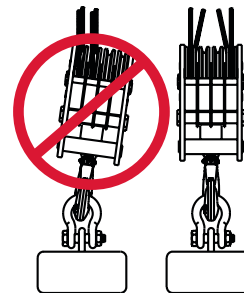
Straight laced reeving is a basic method of placing the rope through a set of blocks. The end of the rope is fed through the outside sheave of the upper block to the outside sheave of the lower (traveling) block. This continues to the last sheave.

ADVANTAGES:

1. Allows blocks to run closer together.
2. Is simple.
3. Has no reverse bends.

DRAWBACKS:

Tilting because of imbalanced loading can cause block rotation and wear of the sheaves and wire rope

**SYMMETRICAL REEving**

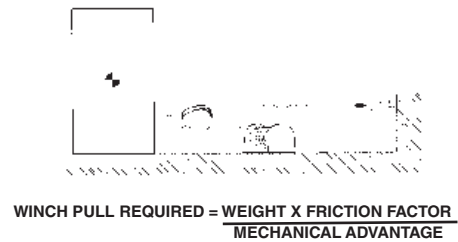
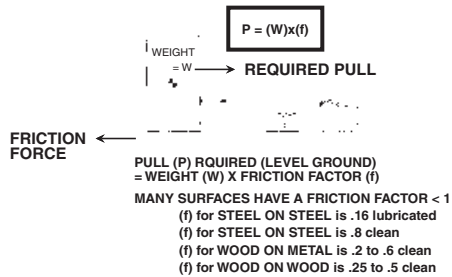
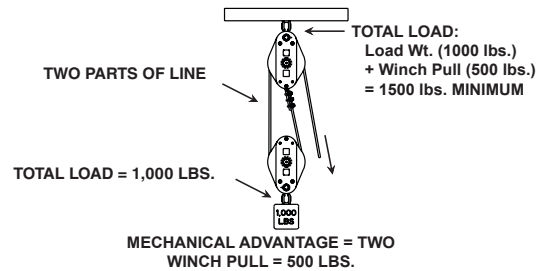
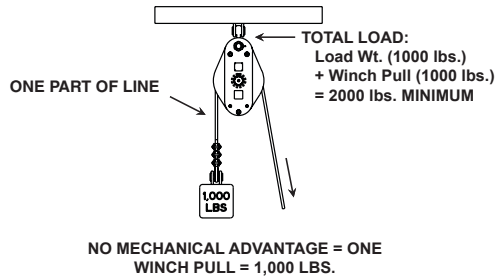
Reeve blocks symmetrically to distribute load evenly. All sheaves must be reeved to achieve the full working load limit of the block.

BLOCK CABLING

1. Reduce wire rope length
2. Use even part reeving
3. Dead end to boom
4. Evaluate wire rope construction

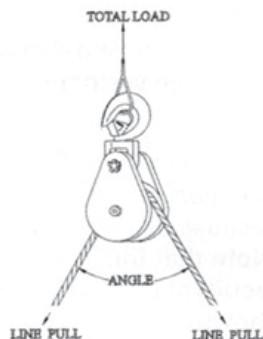
FOR ADDITIONAL INFORMATION REFER TO THE CROSBY GENERAL CATALOG

RIGGING WITH BLOCKS



BLOCK LOADING - ANGLE FACTOR MULTIPLIERS

A single line sheave block used to change load line direction can be subject to total loads greatly different from the line pull



ANGLE FACTOR MULTIPLIERS

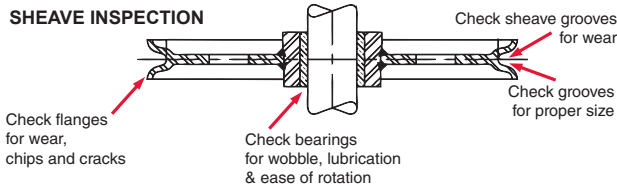
ANGLE	FACTOR	ANGLE	FACTOR
0°	2.00	100°	1.29
10°	1.99	110°	1.15
20°	1.97	120°	1.00
30°	1.93	130°	.84
40°	1.87	135°	.76
45°	1.84	140°	.68
50°	1.81	150°	.52
60°	1.73	160°	.35
70°	1.64	170°	.17
80°	1.53	180°	.00
90°	1.41	—	—

TOTAL LOAD = LINE PULL X ANGLE FACTOR
EXAMPLE, AT 45 DEGREES, AND 10,000 LB LINE PULL,
TOTAL LOAD = 10,000 X 1.84 = 18,400 LBS.

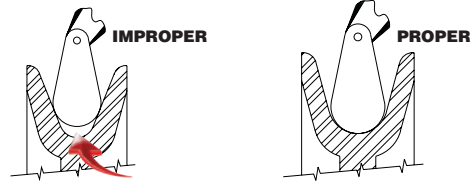
FOR ADDITIONAL INFORMATION REFER TO THE CROSBY GENERAL CATALOG

SHEAVE INSPECTION

SHEAVE INSPECTION



CHECKING GROOVE SIZE FOR PROPER SIZE



SHEAVE INSPECTION

Minimum groove radii for worn sheave tolerances per "Wire Rope User's Manual" (third edition)

NOMINAL WIRE ROPE SIZE (in.)	RADII (in.)	NOMINAL WIRE ROPE SIZE (in.)	RADII (in.)
1/4	.128	3/4	.384
5/16	.160	7/8	.448
3/8	.192	1	.513
7/16	.224	1-1/8	.577
1/2	.256	1-1/4	.641
9/16	.266	1-3/8	.705
5/8	.320	1-1/2	.769

SHEAVE FLEET ANGLE*

- Fleet Angle is the entrance and exit angle of the wire rope relative to the sheave
- Fleet angle should be no more than 1-1/2 degrees



* NOTE: "Wire Rope User's Manual" allows 2 degrees on grooved winch drums.

FOR ADDITIONAL INFORMATION REFER TO THE CROSBY GENERAL CATALOG

BLOCK HOOK INSPECTION

CROSBY RECOMMENDS AS A MINIMUM:

- A visual inspection for cracks, nicks, wear, gouges and deformation as part of a comprehensive documented inspection program, should be conducted by trained personnel in compliance with the schedule in ASME B30.10.
- For hooks used in frequent load cycles or pulsating load, or exposed to corrosive conditions (Road Salt, etc.) the hook and thread should be periodically inspected by Magnetic Particle or Dye Penetrant.

LUBRICATION OF HOOK BEARINGS:

Anti Friction — Every 14 days for frequent swiveling; every 45 days for infrequent swiveling.

Bronze Thrust Bushing or No Bearing — Every 16 hours for frequent swiveling; every 21 days for infrequent swiveling.

ASME B30.10 INSPECTION FREQUENCY

- Initial Inspection** - prior to use, all new, altered, modified, or repaired hooks shall be inspected to verify compliance with the applicable provisions in ASME B30.10 by a designated person. Written records are not required.
- Frequent Inspection** - shall include observations during operation by a designated person. Written records are not required.
 - Normal service - monthly. Normal service is operating at less than 85 percent of rated load except for isolated instances.
 - Heavy service - weekly to monthly. Heavy service is operating at 85 to 100 percent of rated load as a regular specified procedure.
 - Severe service - daily to weekly. Severe service is heavy service coupled with abnormal operating conditions.
- Periodic Inspection** - a complete visual inspection by a designated person. Disassembly may be required. Periodic inspection interval shall not exceed one year except as approved by a qualified person. Written records are required. (See definition of services above).
 - Normal service - yearly with equipment in place.
 - Heavy service - semi-annually, with equipment in place unless external conditions indicate need for disassembly.
 - Severe service - quarterly with equipment in place unless external conditions indicate the need for disassembly. Detailed inspection may show the need for a non-destructive test.

Note: Hooks that do not meet manufacture or ASME B30.10 requirements should be removed from service. Hooks shall not be returned to service until approved by a qualified person.

FOR ADDITIONAL INFORMATION REFER TO ASME B30.10 AND OSHA 1910.179 OVERHEAD GANTRY CRANES

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