


# Crosby USER'S GUIDE LIFTING

VERSION (L - 6/93)

RISK MANAGEMENT	TERMINOLOGY	INSPECTION OF FITTINGS
<b>DEFINITION</b> COMPREHENSIVE SET OF ACTIONS THAT REDUCES THE RISK OF A PROBLEM, A FAILURE, AN ACCIDENT	<b>WLL</b> THE MAXIMUM MASS OR FORCE WHICH THE PRODUCT IS AUTHORIZED TO SUPPORT IN A PARTICULAR SERVICE.	<b>DEFORMATION</b> CROSBY RECOMMENDS THAT NO SIGNIFICANT DEFORMATION BE ALLOWED.
<b>YOU NEED</b> <ul style="list-style-type: none"> <li>PRODUCT KNOWLEDGE</li> <li>APPLICATION KNOWLEDGE</li> <li>MANUFACTURER OF KNOWN CAPABILITY</li> <li>PRODUCTS THAT ARE CLEARLY IDENTIFIED WITH THE FOLLOWING:                             <ol style="list-style-type: none"> <li>MANUFACTURER'S NAME AND LOGO</li> <li>LOAD RATING OR SIZE THAT REFERENCES RATINGS</li> <li>TRACEABILITY CODE</li> </ol> </li> </ul>	<b>PROOF TEST</b> A TEST APPLIED TO A PRODUCT SOLELY TO DETERMINE INJURIOUS MATERIAL OR MANUFACTURING DEFECTS.	<b>WEAR</b> <b>ACCEPTABLE LIMITS:</b> 5% WEAR IN THE THROAT & EYE OF HOOKS AND OTHER CRITICAL SECTIONS OF ALL FITTINGS. 10% WEAR IN OTHER AREAS.
<b>A GOOD RISK MANAGEMENT PROGRAM RECOGNIZES</b> <ul style="list-style-type: none"> <li>PERFORMANCE REQUIREMENTS INCLUDE THE FOLLOWING:                             <ol style="list-style-type: none"> <li>LOAD RATED PRODUCTS</li> <li>QUENCH AND TEMPERED</li> <li>ABILITY TO DEFORM WHEN OVERLOADED.</li> <li>ABILITY TO WITHSTAND REAL WORLD LOADING IN DAY TO DAY USE, TOUGHNESS.</li> </ol> </li> </ul>	<b>ULTIMATE STRENGTH</b> THE AVERAGE LOAD OR FORCE AT WHICH THE PRODUCT FAILS OR NO LONGER SUPPORTS THE LOAD.	<b>CRACKS</b> REMOVE FITTINGS FROM SERVICE WITH CRACKS.
	<b>DESIGN FACTOR</b> 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 e.g. 5 TO 1	<b>WELDING AND MODIFICATIONS</b> DO NOT WELD ON OR MODIFY FITTINGS OR BLOCKS.
		<b>FOR ADDITIONAL SUPPORT</b>  P.O. BOX 3128 TULSA OKLAHOMA 74101

## WIRE ROPE SLING FACTS

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### INSPECTION AND REPLACEMENT PER ANSI B30.9

#### INSPECTION

ALL SLINGS SHALL BE VISUALLY INSPECTED BY THE PERSON HANDLING THE SLING EACH DAY THEY ARE USED; IN ADDITION, A PERIODIC INSPECTION SHALL BE PERFORMED BY A DESIGNATED PERSON, AT LEAST ANNUALLY, AND SHALL INCLUDE A RECORD OF THE INSPECTION.

- DISTORTION OF THE ROPE IN THE SLING SUCH AS KINKING, CRUSHING, UNSTRANDING, BIRDCAGING, MAIN STRAND DISPLACEMENT OR CORE PROTRUSION. LOSS OF ROPE DIAMETER IN SHORT ROPE LENGTHS OR UNEVENNESS OF OUTER STRANDS SHOULD PROVIDE EVIDENCE THE SLING SHOULD BE REPLACED.
- GENERAL CORROSION
- BROKEN OR CUT STRANDS
- NUMBER, DISTRIBUTION, AND TYPE OF VISIBLE BROKEN WIRES

#### REPLACEMENT

CONDITION SUCH AS THE FOLLOWING SHOULD BE SUFFICIENT REASON FOR CONSIDERATION OF SLING REPLACEMENT

- FOR STRAND LAID AND SINGLE PART SLINGS TEN RANDOMLY DISTRIBUTED BROKEN WIRES IN ONE ROPE LAY, OR FIVE BROKEN WIRES IN ONE ROPE STRAND IN ONE ROPE LAY.
- SEVERE LOCALIZED ABRASION OR SCRAPING
- KINKING, CRUSHING, BIRDCAGING, OR ANY DAMAGE RESULTING IN DISTORTION OF THE ROPE STRUCTURE.
- EVIDENCE OF HEAT DAMAGE
- END ATTACHMENTS THAT ARE CRACKED, DEFORMED, OR WORN TO THE EXTENT THAT THE STRENGTH OF THE SLING IS SUBSTANTIALLY AFFECTED.
- HOOKS SHOULD BE INSPECTED IN ACCORDANCE WITH ANSI B30.10
- SEVERE CORROSION OF THE ROPE OR END ATTACHMENTS

#### MULTI-PART REMOVAL CRITERIA FOR CABLE LAID AND BRAIDED SLINGS

SLING BODY	ALLOWABLE BROKEN WIRE PER LAY OR ONE BRAID	ALLOWABLE BROKEN STRANDS PER SLING LAY
LESS THAN 8 PER BRAID	20	1
CABLE LAID	20	1
8 PARTS AND MORE	40	1

REFER TO ANSI B30.9 FOR FULL DETAILS

## WIRE ROPE SLING CAPACITIES (LBS.) – FLEMISH EYE – ANSI B30.9

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6 X 19 AND 6 X 37  
IMPROVED PLOW STEEL – IWRC 5/1 DESIGN FACTOR

WIRE ROPE SIZE	Crosby Q & T CARBON SHACKLE MINIMUM SHACKLE SIZE FOR A D/d > 1 AT LOAD CONNECTION	ANGLE 120°					
		VERTICAL	CHOKER	TWO LEG	60 DEGREE SLING ANGLE	45 DEGREE SLING ANGLE	30 DEGREE SLING ANGLE
1/4	5/16	1120	820	2200	1940	1500	1100
5/16	3/8	1740	1280	3400	3000	2400	1700
3/8	7/16	2400	1840	4800	4200	3400	2400
7/16	1/2	3400	2400	6800	5800	4800	3400
1/2	5/8	4400	3200	8800	7600	6200	4400
9/16	5/8	5800	4000	11200	9600	7900	5800
5/8	3/4	6800	5000	13600	11800	9600	6800
3/4	7/8	9800	7200	19600	16900	13800	9800
7/8	1	13200	9600	26400	22800	18600	13200
1	1-1/8	17000	12600	34000	30000	24000	17000
1-1/8	1-1/4	20000	15800	40000	34600	28300	20000
1-1/4	1-3/8	26000	19400	52000	45000	36700	26000
1-3/8	1-1/2	30000	24000	60000	52000	42400	30000

- RATED CAPACITIES BASED ON PIN DIAMETER NO LARGER THAN THE NATURAL EYE WIDTH OR LESS THAN THE NOMINAL SLING DIAMETER

REFER TO ANSI B30.9 FOR FULL DETAILS

HORIZONTAL SLING ANGLES OF LESS THAN 30 DEGREES ARE NOT RECOMMENDED

## CHAIN SLING CAPACITIES (LBS.) – ANSI B30.9 DESIGN FACTOR 4/1

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CHAIN SIZE							
	VERTICAL	TWO LEG	60 DEGREE SLING ANGLE	45 DEGREE SLING ANGLE	30 DEGREE SLING ANGLE	SINGLE LEG MASTER LINK SIZE	DOUBLE LEG MASTER LINK SIZE
CHAIN GR - 8 DESIGN FACTOR 4/1	3500	7000	6100	4900	3500	1/2	1/2
1/4 - (9/32)	7100	14200	12300	10000	7100	3/4	3/4
1/2	12000	24000	20800	16900	12000	1	1
5/8	18100	36200	31300	25500	18100	1	1-1/4
3/4	28300	56600	49000	40000	28300	1-1/4	1-1/2
7/8	34200	68400	59200	48350	34200	1-1/2	1-3/4
1	47700	95400	82600	67450	47700		
1-1/4	72300	144600	125200	102200	72300		

### CHAIN – FACTS

#### INSPECTION AND REMOVAL FROM SERVICE PER ANSI B30.9

##### FREQUENT INSPECTION

- NORMAL SERVICE - MONTHLY
- SEVERE SERVICE - DAILY TO MONTHLY
- CHECK CHAIN AND ATTACHMENTS FOR WEAR, NICKS, CRACKS, BREAKS, GOUGES, STRETCH, BENDS, WELD SPLATTER, DISCOLORATION FROM EXCESSIVE TEMPERATURE, AND THROAT OPENINGS OF HOOKS.
- 1. CHAIN LINKS AND ATTACHMENTS SHOULD HINGE FREELY TO ADJACENT LINKS.
- 2. LATCHES ON HOOKS, IF PRESENT SHOULD HINGE FREELY AND SEAT PROPERLY WITHOUT EVIDENCE OF PERMANENT DISTORTION.

##### PERIODIC INSPECTION - INSPECTION RECORDS REQUIRED

- NORMAL SERVICE - YEARLY
- SEVERE SERVICE - MONTHLY
- THIS INSPECTION SHALL INCLUDE EVERYTHING IN A FREQUENT INSPECTION PLUS EACH LINK AND END ATTACHMENT SHALL BE EXAMINED INDIVIDUALLY.
- TAKING CARE TO EXPOSE INNER LINK SURFACES OF THE CHAIN AND CHAIN ATTACHMENTS
- 1. WORK LINKS SHOULD NOT EXCEED VALUES GIVEN IN TABLE 1 OR RECOMMENDED BY THE MANUFACTURER
- 2. SHARP TRANSVERSE NICKS AND GOUGES SHOULD BE ROUNDED OUT BY GRINDING AND THE DEPTH OF THE GRINDING SHOULD NOT EXCEED VALUES IN TABLE 1
- 3. HOOKS SHOULD BE INSPECTED IN ACCORDANCE WITH ANSI B30.10
- 4. IF PRESENT, LATCHES ON HOOKS SHOULD SEAT PROPERLY, ROTATE FREELY, AND SHOW NO PERMANENT DISTORTION

### TABLE 1

#### MAXIMUM ALLOWABLE WEAR AT ANY POINT OF LINK

NORMAL CHAIN OR COUPLING LINK CROSS SECTION	MAXIMUM ALLOWABLE WEAR DIAMETER INCHES
9/32	.037
3/8	.052
1/2	.069
5/8	.084
3/4	.105
7/8	.116
1	.137
1-1/4	.169

**REFER TO ANSI B30.9 FOR FULL DETAILS  
HORIZONTAL SLING ANGLES OF LESS THAN  
30 DEGREES ARE NOT RECOMMENDED**

## WEB SLING CAPACITIES – ANSI B30.9 – DESIGN FACTOR 5/1

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VERTICAL	CHOKER	TWO LEG OR BASKET	60 DEGREE SLING ANGLE	45 DEGREE SLING ANGLE	30 DEGREE SLING ANGLE
100% OF SINGLE LEG	80% OF SINGLE LEG	200% OF SINGLE LEG	170% OF SINGLE LEG	140% OF SINGLE LEG	SAME AS SINGLE LEG

### WEB SLING

#### INSPECTION AND REMOVAL FROM SERVICE PER ANSI B30.9

##### FREQUENT INSPECTION

THIS INSPECTION SHALL BE MADE BY THE PERSON HANDLING THE SLING EACH DAY THE SLING IS USED

##### PERIODIC INSPECTION WRITTEN INSPECTION RECORDS SHOULD BE KEPT FOR ALL SLINGS

THIS INSPECTION SHOULD BE CONDUCTED BY DESIGNATED PERSONNALL, FREQUENCY OF THE INSPECTION SHOULD BE BASED THE FOLLOWING:

1. FREQUENCY OF SLING USE
2. SEVERITY OF SERVICE CONDITIONS
3. EXPERIENCE GAINED ON THE SERVICE LIFE OF SLING USED IN SIMILAR APPLICATIONS
4. AT LEAST ANNUALLY

##### REMOVAL CRITERIA

1. ACID OR CAUSTIC BURNS
2. MELTING OR CHARRING OF ANY PART OF THE SLING
3. BROKEN, TEARS, CUTS, OR SNAGS
4. BROKEN OR WORN STITCHING IN LOAD BEARING SPLICES
5. EXCESSIVE ABRASIVE WEAR
6. KNOTS IN ANY PART OF THE SLING
7. EXCESSIVE PITTING OR CORROSION, OR CRACKED DISTORTED OR BROKEN FITTINGS
8. OTHER VISIBLE DAMAGE THAT CAUSES DOUBT AS TO THE STRENGTH OF THE SLING

**REFER TO ANSI B30.9 FOR FULL DETAILS**

**HORIZONTAL SLING ANGLES OF LESS THAN 30 DEGREES ARE NOT RECOMMENDED**

**PRICE \$3.50**

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# the Crosby<sup>®</sup> group, inc.

CROSBY PRODUCTS DISTRIBUTED BY:

### SLING ANGLES 7

#### TWO LEGGED SLING - WIRE ROPE, CHAIN, SYNTHETICS

LOAD = 500 X LOAD ANGLE FACTOR

LOAD IN EACH SLING = L/H X 500

HORIZONTAL SLING ANGLE (A) DEGREES

90	1.000
60	1.155
50	1.305
45	1.414
30	2.000

LOAD ANGLE FACTOR = L/H

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

A = HORIZONTAL SLING ANGLE

#### CHOKER HITCHES WIRE ROPE

**SLING RATED LOAD**

ANGLES OF CHÖKE	PERCENTAGE OF SINGLE LEG SLING CAPACITY
120 - 180	75%
90 - 119	65%
60 - 89	55%
30 - 59	40%

#### CHOKER HITCHES WIRE ROPE, CHAIN AND SYNTHETICS

A CHOKER HITCH HAS 75% OF THE CAPACITY OF A SINGLE LEG ONLY IF THE CORNERS ARE SOFTENED AND THE HORIZONTAL ANGLE IS GREATER THAN 30 DEGREES  
USE BLOCKS TO PREVENT ANGLES LESS THAN 30 DEGREES

#### BASKET HITCHES

##### WIRE ROPE

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

##### WIRE ROPE, CHAIN AND SYNTHETICS

PERCENTAGE ANGLES OF SINGLE LEG DEGREES	CAPACITY
90	200%
60	170%
45	140%
30	100%

### LOAD DISTRIBUTION - RIGGING 8

#### LOADWALKING

**LOAD ON SLING CALCULATED**

TENSION 1= LOAD X D2 X S1/H(D1 + D2)  
TENSION 2= LOAD X D1 X S2/H(D1 + D2)

#### UNEQUAL LEGS

**LOAD ON SLING CALCULATED**

TENSION 1= LOAD X D2 X S1/H(D1 + D2)  
TENSION 2= LOAD X D1 X S2/H(D1 + D2)

#### TRIPLE AND QUAD LEG SLING

TRIPLE LEG SLINGS HAVE 50% MORE CAPACITY THAN DOUBLE LEG ONLY IF THE CENTER OF GRAVITY IS IN CENTER OF CONNECTION POINT AND LEGS ARE ADJUSTED PROPERLY (EQUAL SHARE OF THE LOAD)

QUAD LEG SLINGS OFFER IMPROVED STABILITY BUT DOES NOT PROVIDE INCREASED LIFTING CAPACITY.

#### TYPES OF HITCH CONSIDERATION

**LOAD CONTROL**  
THE ABILITY OF THE SLING TO CONTROL THE MOVEMENT OF THE LOAD BEING LIFTED

**CAPACITY**  
THE LOAD CAPACITY OF THE SLING AND TYPE OF HITCH

**TYPE OF SLING**  
WIRE ROPE  
CHAIN  
WEBBING

**CENTER OF GRAVITY**  
THE LOCATION OF THE CENTER OF THE LOAD'S WEIGHT

#### POSITIVE LOAD CONTROL

YES

#### REEVING INCREASES LOADS

REEVING THROUGH CONNECTIONS TO LOAD INCREASES LOAD ON CONNECTIONS FITTINGS BY AS MUCH AS TWICE—  
**DO NOT REEVE!**

### Crosby® RIGGING HARDWARE 9

Crosby® SHACKLES					QUENCHED AND TEMPERED		Crosby® HOOKS		QUENCHED AND TEMPERED		
SCREW PIN AND BOLT TYPE	CARBON SHACKLE DESIGN FACTOR 6/1	ALLOY SHACKLE DESIGN FACTOR 5/1	INSIDE WIDTH AT PIN (INCHES)	DIAMETER OF PIN	CARBON MAXIMUM WORKING LOAD TONS	CODE	ALLOY MAXIMUM WORKING LOAD TONS	CODE	THROAT OPENING (INCHES)	DEFORMATION INDICATOR A - A	
3/16	1/3		.38	.25	3/4	DC	1	DA	.88	1.50	
1/4	1/2		.47	.31	1	FC	1-1/2	FA	.97	1.50	
5/16	3/4		.53	.38	1-1/2	GC	2	GA	1.00	2.00	
3/8	1	2	.66	.44	2	HC	3	HA	1.12	2.00	
7/16	1-1/2	2.6	.75	.50	3	IC	4-1/2	IA	1.06	2.50	
1/2	2	3.3	.81	.63	5	JC	7	JA	1.50	3.00	
5/8	3-1/4	5	1.06	.75	7-1/2	KC	11	KA	1.75	4.00	
3/4	4-3/4	7	1.25	.88	10	LC	15	LA	1.91	4.00	
7/8	6-1/2	9.5	1.44	1.00	15	NC	22	NA	2.75	5.00	
1	8-1/2	12.5	1.69	1.13	20	OC	30	OA	3.25	6.50	
1-1/8	9-1/2	15	1.81	1.25	25	PC	37	PA	3.00	7.00	
1-1/4	12	18	2.03	1.38	30	SC	45	SA	3.38	8.00	
1-3/8	13-1/2	21	2.25	1.50	40	TC	60	TA	4.12	10.00	
1-1/2	17	30	2.38	1.63							

MAXIMUM INCLUDED ANGLE 120 DEGREES

REFER TO Crosby® CATALOG FOR ADDITIONAL INFORMATION

MAXIMUM INCLUDED ANGLE 90 DEGREES

REFER TO Crosby® GROUP PRODUCT WARNING FOR ADDITIONAL INFORMATION

MAXIMUM INCLUDED ANGLE 90 DEGREES

REFER TO Crosby® GROUP PRODUCT WARNING FOR ADDITIONAL INFORMATION

## Crosby RIGGING HARDWARE

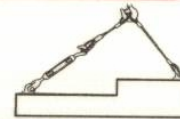
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### Crosby WIRE ROPE CLIPS



SIZE	EFFICIENCY	NUMBER OF CLIPS	TURNBACK LENGTH (IN)	TORQUE FT - (LBS.)
1/8	80%	2	3-1/4	4.5
3/16	80%	2	3-3/4	7.5
1/4	80%	2	4-3/4	15
5/16	80%	2	5-1/4	30
3/8	80%	2	6-1/2	45
7/16	80%	2	7	65
1/2	80%	3	11-1/2	85
9/16	80%	3	12	95
5/8	80%	3	12	95
3/4	80%	4	18	130
1	90%	5	26	225

### Crosby TURNBUCKLE

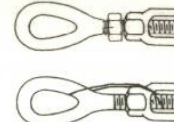


SIZE	WORKING LOAD LIMIT JAW AND EYE FITTINGS 5/1 DESIGN FACTOR	WORKING LOAD LIMIT HOOK END FITTING 5/1 DESIGN FACTOR (LBS.)
1/4	500	400
5/16	800	700
3/8	1200	1000
1/2	2200	1500
5/8	3500	2250
3/4	5200	3000
7/8	7200	4000
1	10000	5000
1-1/4	15200	5000
1-1/2	21400	7500

APPLY U-BOLT OVER DEAD END OF THE WIRE ROPE  
LIVE END OF THE ROPE RESTS IN THE SADDLE  
A TERMINATION IS NOT COMPLETE UNTIL IT HAS BEEN RETORQUED A SECOND TIME  
**NEVER SADDLE A DEAD HORSE!**



**THE USE OF LOCKNUTS OR MOUSING IS AN EFFECTIVE METHOD OF PREVENTING TURNBUCKLES FROM ROTATING**



FOR ADDITIONAL INFORMATION REFER TO THE Crosby PRODUCT WARNING

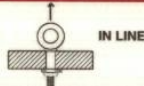
REFER TO THE Crosby CATALOG FOR ADDITIONAL INFORMATION

## Crosby RIGGING HARDWARE

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### Crosby SHOULDER EYEBOLTS

QUENCHED AND TEMPERED  
DESIGN FACTOR 5/1



SHANK DIAMETER	WORKING LOAD LIMITS IN LINE PULL (LBS.)	WORKING LOAD LIMITS ANGLE LESS THAN 45 DEGREES (LBS.)		
		60 DEGREE SLING ANGLE (LBS.)	45 DEGREE SLING ANGLE (LBS.)	WORKING LOAD LIMITS ANGLE LESS THAN 45 DEGREES (LBS.)
1/4	650	420	195	160
5/16	1200	780	360	300
3/8	1550	1000	465	380
1/2	2600	1690	780	650
5/8	5200	3380	1560	1300
3/4	7200	4680	2160	1800
7/8	10600	6890	3180	2650
1	13300	8645	3990	3325
1-1/4	21000	13600	6300	5250
1-1/2	24000	15600	7200	6000

SHOULDER EYEBOLTS

### Crosby SWIVEL HOIST RING

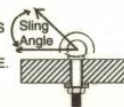


DESIGN FACTOR 5/1

WORKING LOAD LIMIT PULL FULL 180 DEGREE PIVOT (LBS.)	THREAD SHANK SIZE U.N.C.	TORQUE FT - (LBS.)
800	5/16	7
1000	3/8	12
2500	1/2	28
4000	5/8	60
7000	3/4	100
8000	7/8	160
10000	1	230
15000	1-1/4	470
24000	1-1/2	800
30000	2	1100

SWIVEL HOIST RING

- NEVER EXCEED WORKING LOAD LIMITS
- NEVER USE REGULAR NUT EYEBOLTS FOR ANGULAR LIFTS
- ALWAYS USE SHOULDER NUT EYEBOLTS FOR ANGULAR LIFTS
- FOR ANGULAR LIFTS, ADJUST WORKING LOAD AS FOLLOWS
- ALWAYS APPLY LOAD TO EYE BOLT IN THE PLANE OF THE EYE.



- WHEN USING LIFTING SLINGS OF TWO OR MORE LEGS MAKE SURE THE FORCES IN THE LEG ARE CALCULATED. SELECT THE PROPER SIZE SWIVEL HOIST RING TO ALLOW FOR LOAD IN SLING LEG.



REFER TO THE Crosby GROUP WARNINGS FOR ADDITIONAL INFORMATION

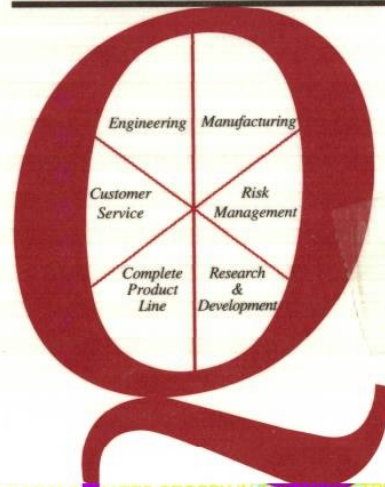
## Crosby Quality Continuum

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1-800-772-1500  
CROSBY SPECIAL PRODUCTS  
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1-800-777-1555



ONE, DIFFERENTIATES CROSBY IN THE MARKETPLACE.  
THE QUALITY CONTINUUM IS A SYMBOL IDENTIFYING