ASME B29.24-2002

(Revision of ASME B29.24M-1995)

ROLLER LOAD CHAINS FOR OVERHEAD HOISTS

AN AMERICAN NATIONAL STANDARD

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This Standard will be revised when the Society approves the issuance of a new edition. There will be no addenda or written interpretations of the requirements of this Standard issued to this Edition.

The American Society of Mechanical Engineers
Three Park Avenue, New York, NY 10016-5990

CONTENTS

FOREWORD

A number of specialized roller chains are made and supplied to original equipment manufacturers for use as load chains on overhead hoists. Although these chains are of similar design and construction, and are usually dimensionally interchangeable with equivalent pitch ANSI B29.1, Power Transmission Roller Chains, they differ in that they are normally made using select steels and/or specially treated chain parts to provide for the higher tensile and fatigue strength properties required to meet the rate load capacitites of the overhead hoists in which they are used.

Hoist load chains are consequently assigned special chain numbers to distinguish them from equivalent pitch B29.1 or other roller chains, which even if dimensionaly interchangeable, may not have the necessary strength or special characteristics for replacement of the original hoist load chain.

It was recognized by the Roller Chain Technical Committee of the American Chain Association that a potential risk of personal injury could occur as a result of chain failure if the original load chiain was inadvertently replaced by a lower strenght chain, or if proper use, care, and maintenace procedures were not followed. Consequently, a committee was formed in October 1978 to prepare a standared for chains used in overhead hoists to serve as a guide to users and purchasers of overhead hoists with regard to hoist chain designations, dimensions, ultimate strength, maintenance, and inspection procedures, and restrictions for chain replacement. The standard would also provide a reference in related standards such as ASME/ANSI B30.16, Overhead Hoists (Underhung), (latest edition) with regard to chain care and replacement.

In tabulating dimensional information in this Standard, customary inch-pound units have been used. Additionally, companion tabulations have been included in order to provide translations of these values into metric (SI) units in accordance with ASME Guide SI-1, ASME Orientation and Guide for use of SI (Metric) Units. For this reason, certain formulas and relationships have been intentionally presented only in customary units so as to preclude any ambiguity between them and the tablulated values.

ASME B29.24M-1995 included two significant modifications. The first is a revised definition of *Minimum Ultimate Tensile Strength* that clarifies the meaning and use of the term. The second is a revision to the listed values for *maximum pin diameter*. The changes in pin diameter will not affect the interchangeability of the chains. The pin diameters were changed to provide a national basis for conversion between conventional (inch) and SI (metric) dimensions. With concurrent changes in the related ISO standards, a long-standing source of potential discrepancies will be eliminated.

The lastest revision of this Standard includes two changes. One is the inclusion of the requirements to preload all chains covered by this Standard. The minimum preload values are derived from the requirements specified in the hoist standards such as ASME B30.21, Manually Lever Operated Hoists. The second change is the removal of 1 in. pitch–80 HS series chain.

Suggestions for the improvement of this Standard are welcome. They should be addressed to the Secretary, ASME B29 Committee, Three Park Avenue, New York, NY 10016-5990.

This Standard was approved as an American National Standard on August 20, 2002.

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Chains, Attachments, and Sprockets for Power Transmission and Conveying

(The following is the roster of the Committee at the time of approval of this Standard.)

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Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings, which are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

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ROLLER LOAD CHAINS FOR OVERHEAD HOISTS

1 SCOPE

This Standard covers specialized roller chains that are designed specifically as load chains for use in overhead hoists.

2 PURPOSE

The purpose of this Standard is to serve as a guide to purchasers and users of overhead hoists, and also as a reference in related standards such as ASME/ANSI B30.16, Overhead Hoists (Underhung), (latest edition) with respect to roller load chains being made specifically for use in various types of overhead hoists, including general chain dimensions, chain strengths, inspection and maintenance procedures, and guidelines for the proper selection of replacement chain.

3 ROLLER LOAD CHAINS

3.1 Nomenclature

These chains consist of a series of alternately assembled roller links and pin links in which the pins articulate inside the bushing and the rollers are free to turn on the bushing. The pins and bushing are press fit in their respective link plates. See Fig. 1.

3.2 General Proportions

(a) Roller diameter is approximately $\frac{5}{8}$ of the pitch.

(b) Chain width is defined as the distance between roller link plates. It is approximately $\frac{5}{8}$ of the chain pitch.

(c) Pin diameter is approximately $\frac{5}{16}$ of the pitch or $\frac{1}{2}$ the roller diameter.

(d) Maximum height of the roller link plates — 0.95 of the pitch.

(e) Maximum height of pin link plates — 0.82 of the pitch.

(f) Link plate thickness is approximately $\frac{1}{8}$ of the chain pitch.

3.3 Numbering System

The chain numbering system adopted for this Standard is based on chain pitch, and also on chain proportions and link plate thickness as compared to the majority of chains shown for a given pitch. A listing of load chain numbers and related chain dimensions is given in Table 1. The numbering system consists of a two digit number, followed by either a single or double letter suffix. These numbers and letter denote the following:

(a) Left-Hand Digit — denotes number of $\frac{1}{8}$ in. in the chain pitch

(b) Right-Hand Digit

(1) 0 (zero) denotes chain of usual proportions

(2) 1 (one) denotes chain of special proportions

(c) Letter Suffix

(1) S denotes normal link plate thickness

(2) HS denotes heavier than normal link plate thickness

3.4 Minimum Ultimate Tensile Strength

Minimum Ultimate Tensile Strength (M.U.T.S.) for chain covered by this Standard is the minimum force at which an unused, undamaged chain could fail when subjected to a single tensile loading test.

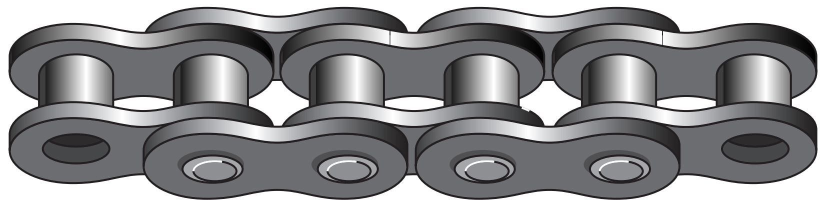
WARNING: The Minimum Ultimate Tensile Strength is NOT a “working load”! The M.U.T.S. greatly exceeds the maximum force that may be applied to the chain.

(a) *Test Procedure.* A tensile force is slowly applied, at a rate not to exceed 2.0 in. per min, in a uniaxial direction, to the ends of the chain sample.

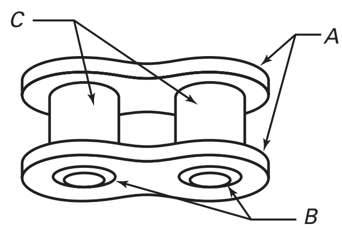
(b) The tensile test is a destructive test. Even though the chain may not visibly fail when subjected to the Minimum Ultimate Tensile Force, it will have been damaged and will be unfit for service.

3.5 Length Tolerance

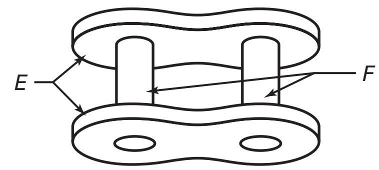
New chains under standard measuring load should not be underlength. The overlength tolerance is shown in Table 1 and it is based on:



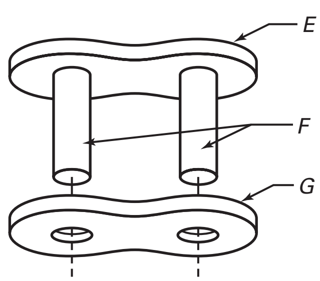
Typical Hoist Roller Load Chain



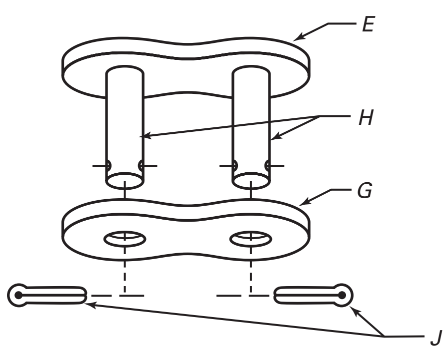
Roller Link – an inside link consisting of two roller link plates *A*, two bushings *B*, and two rollers *C*



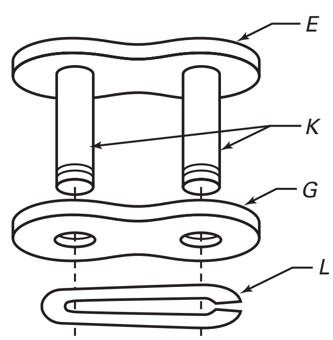
Pin Link – an outside link consisting of two press fit pin plates *E* assembled with two pins *F*



Riveted Type Connecting Link – an outside link consisting of one press fit pin link plate *E* assembled with two riveted pins *F*, and one separate press fit pin link plate *G*



Cotter Type Connecting Link – an outside link consisting of one press fit pin link plate *E* assembled with two cotter type chain pins *H*, one separate press fit pin link plate *G*, and two wire cotters *J*



Spring Clip Type Connecting Link – an outside link consisting of one press fit link plate *E* assembled with two spring clip type chain pins *K*, one separate press fit pin link plate *G*, and one spring clip *L*

FIG. 1 TYPICAL HOIST ROLLER LOAD CHAIN

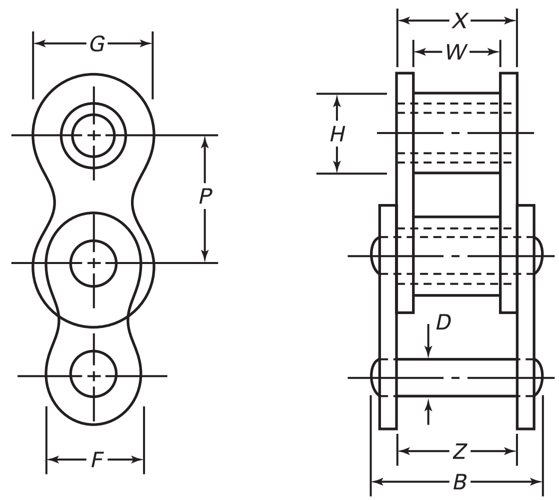


TABLE 1 GENERAL LOAD CHAIN DIMENSIONS

ANSI Chain No.	Dimensions, in. (mm)											
	Nominal Pitch, *P*	Max. Roller Diameter, *H*	Min. Width Between Inner Plates, *W*	Min. Width Between Outer Plates, *Z*	Max. Inner Plate Height, *G*	Max. Outer Plate Height, *F*	Max. Pin Diameter, *D*	Max. Width Over Inner Link, *X*	Max. Width Over Pins, *B*	Min. Ultimate Tensile Strength, lb (kN)	Measuring Load, lb (N)	Length Tolerance, in./ft (mm/m)
50S	0.625 (15.87)	0.400 (10.16)	0.370 (9.40)	0.547 (13.89)	0.594 (15.09)	0.513 (13.03)	0.2004 (5.09)	0.545 (13.84)	0.825 (20.96)	7,000 (31.14)	50 (222)	0.035 (2.91)
50HS	0.625 (15.87)	0.400 (10.16)	0.370 (9.40)	0.577 (14.66)	0.594 (15.09)	0.513 (13.03)	0.2004 (5.09)	0.573 (14.55)	0.881 (22.38)	7,800 (34.69)	50 (222)	0.035 (2.91)
60S	0.750 (19.05)	0.469 (11.91)	0.495 (12.57)	0.701 (17.81)	0.713 (18.11)	0.615 (15.62)	0.2346 (5.96)	0.699 (17.75)	1.007 (25.58)	9,000 (40.03)	70 (311)	0.034 (2.83)
60HS	0.750 (19.05)	0.469 (11.91)	0.495 (12.57)	0.767 (19.48)	0.713 (18.11)	0.615 (15.62)	0.2346 (5.96)	0.765 (19.43)	1.130 (28.70)	10,000 (44.48)	70 (311)	0.034 (2.83)
81S	1.000 (25.4)	0.562 (14.27)	0.495 (12.57)	0.767 (19.48)	0.820 (20.83)	0.820 (20.83)	0.2815 (7.15)	0.765 (19.43)	1.180 (29.97)	12,500 (55.60)	125 (556)	0.032 (2.66)

$$\frac{0.002}{[\text{pitch (in.)}]^2} + 0.030 \text{ in. / ft}$$

3.6 Measuring Load

Chains are to be measued for length while supporting measuring loads shown in Table 1. Length measurements are to be taken over a length of at least 12 in. (305 mm).

3.7 Preload

All chains shall be preloaded by applying a tensile force equivalent to at least 40% of the Minimum Ultimate Tensile Strength given in Table 1.

3.8 General Chain Dimensions

See Table 1.

4 ROLLER CHAIN INSPECTION, REPLACEMENT, AND MAINTENANCE

Roller load chains used on overhead hoists require care and periodic inspection (see Fig. 2). They will give a long period of service if the user provides a reasonable amount of care, such as keeping loads within the rated capacity of the hoist and keeping the chain clean and properly lubricated. The following procedures ae recommended to promote safe operation and provide maximum load chain life.

4.1 Chain Inspection

4.1.1 Inspection Intervals. The chain should be inspected and lubricated at given intervals as outlined in the hoist manufacturer's instructions, or in the absence of these, as outline in the latest edition of ASME/ANSI B30.16, to determine if the chain operates smoothly while under load in both lifting and lowering directions. See para. 4.2.1 for lubrication instructions.

4.1.2 Inspection Procedure. If chain binds, or jumps, or is noisy when cleaned and properly lubricated, it should be inspected in accordance with paras. 4.1.3 and 4.1.4. The chain mating parts such as sprockets, guides, and stripper should also be inspected for evidence of wear, distortion, or other damage as outlined in the lastest edition of ASME/ANSI B30.16.

4.1.3 Inspection for Wear, Twist, and Camber. The chain should first be inspected while still in the hoist for twist, camber, wear, and elongation.

4.1.3.1 Wear and Elongation. Chain wear should be checked in that section of the chain that normally operates over the hoist load sprocket. Inspection should be made by applying the measuring load shown in Table 1 times the number of parts of load chain to the lower hook and measuring the distance between the upper edges of pins (Fig. 3), being sure that the measurement is made over the section of chain which most frequently engages the hoist load sprocket. If the elongation exceeds $\frac{1}{4}$ in. (6.3 mm) for the number of pitches comprising 1 ft of chain (305 mm), the chain should be replaced. For example, a $\frac{3}{4}$ in. (19.1 mm) pitch chain should measure 12 in. (305mm) over 16 pitches. The chain should be replaced if measurements over 16 pitches exceed $12\frac{1}{4}$ in. (311 mm).

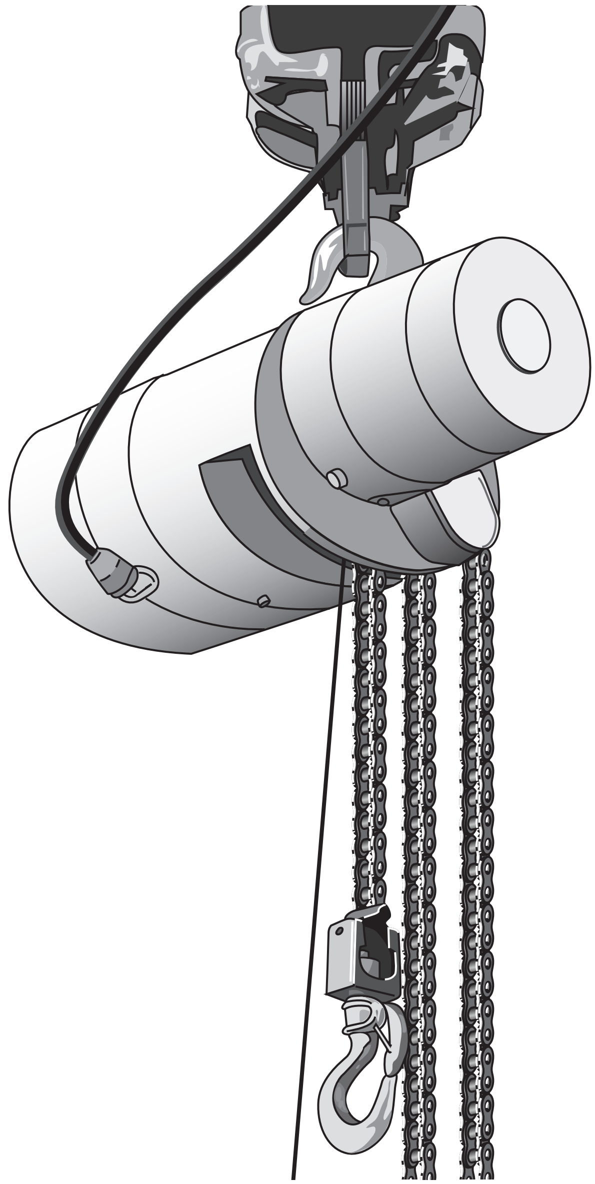


FIG. 2 OVERHEAD HOIST

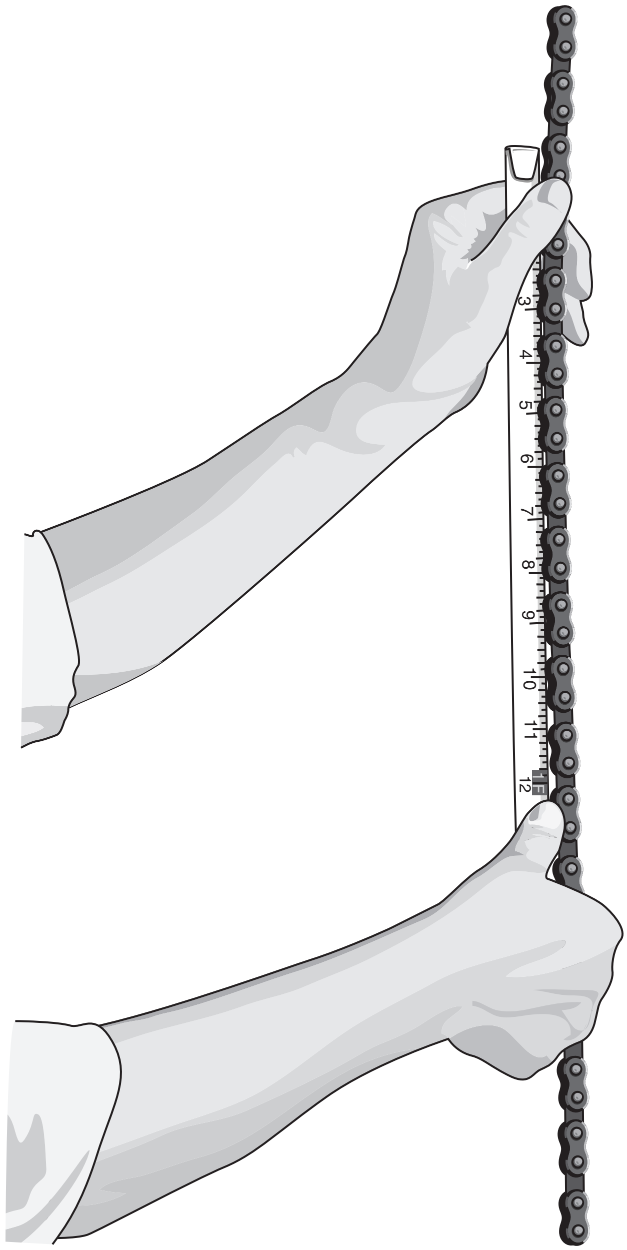


FIG. 3 ELONGATION MEASUREMENT

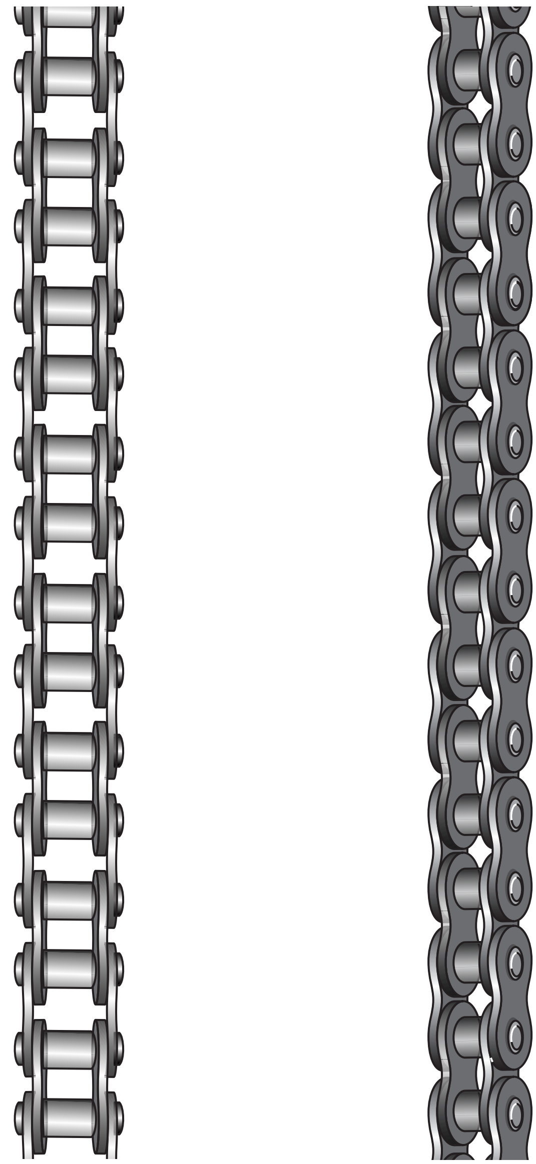


FIG. 4 ILLUSTRATION OF CAMBER AND TWIST

4.1.3.2 Twist. Twist is the condition whereby the chain exhibits a twist as illustrated in Fig. 4. The load chain should be replaced if the twist in any 5 ft (1.52 m) section exceeds 15 deg.

4.1.3.3 Camber. Camber or sidebow is the condition whereby the chain does not hang in a reasonably straight line as illustrated in Fig. 4, in the plane perpendicular to the plane of the rollers. A chain which has camber exceeding $\frac{1}{4}$ (6.3 mm) in any 5 ft (1.52 m) section should be replaced. Inadvertent misalignment of a hoist, off-center loading, and lack of swivel connections at the lower hook (a swivel hook is shown in Fig. 5) and/or at the hoist supporting hook are causes of twist or camber. Load chain should be replaced if twist or camber is in excess of the limits listed above.

4.1.3.4 Chain Configuration. The entire chain shall be a continuous strand, by one manufacturer, with connection links only at the terminal ends. The load chain should be replaced if the configuration is not as described.

4.1.4 Additional Inspection. Additional inspection should also be made of the load chain even though

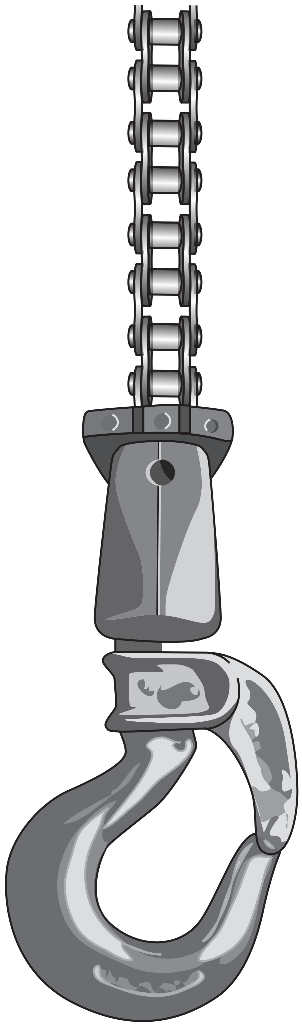


FIG. 5 HOOK

it is found to be within limits on twist, camber, and elongation. This additional inspection should be made by removing the chain from the hoist and cleaning the chain as presented in para. 4.2.1. The following inspections should then be made.

4.1.4.1 Chain Link Plates. Chain link plates should be checked for cracks around chain pins and bushings. Cracking of link is frequently due to exposure to corrosive operation environments. The link plates should also be checked for any evidence of bending, nicks, elongated pitch holes, scuffed edges, or electrical arcing. If any of these conditions is found to exist, the chain should be replaced.

4.1.4.2 Chain Pins. Chain pins should frequently be visually checked for evidence of rotation from the original position in the link plate and for looseness in the link plate holes as shown in Fig. 6. Turning of

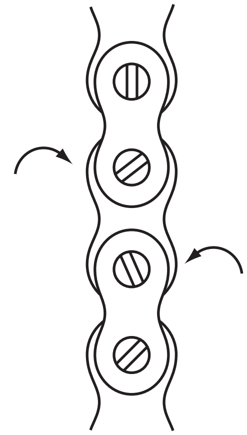


FIG. 6 PIN TURNING

pins with upset rivet heads is easily visible. It is virtually impossible to visibly detect turned pins which have round (spun) heads. Rotation of these pins in the pin link plates becomes apparent only after the pins have caused wear elongation of the link plate holes. Pins are initially assembled with a substantial press fit in link plate holes in order to maintain load capacity. If turned or loose pins are found, the chain should be replaced. Turned or loose pins are generally the result of excess load or lack of lubrication in the chain joint.

4.1.4.3 Chain Rollers. All rollers in the chain should turn freely by hand (see Fig. 7). If any do not, it might indicate the bushings in the chain are broken. A visual inspection should also be made to see if any rollers are broken. If either broken rollers or bushings are found, the chain should be replaced and the cause of the breakage corrected. Broken bushings or rollers are caused by worn sprockets or overloading.

4.1.4.4 Tight Joint. Each chain should be flexed by hand (see Fig. 8). If there is any binding that cannot be freed by flexing, it indicates that the inner or roller link plates have been forced off the bushing by misaligned loads or overloads, or that the chain has not been properly lubricated. Replace a load chain having a tight joint or joints.

4.1.4.5 Corrosion. The chain pats should be inspected for evidence of corrosion or chemical attack. Corrosion or chemical attack can lower the chain's load carrying capacity and is often the cause of cracked link plates. Replace a load chain with any evidence of severe corrosion or chemical attack.

4.1.4.6 Spread Pin Link Plates. Spread pin link plates are generally caused by misalignment loading

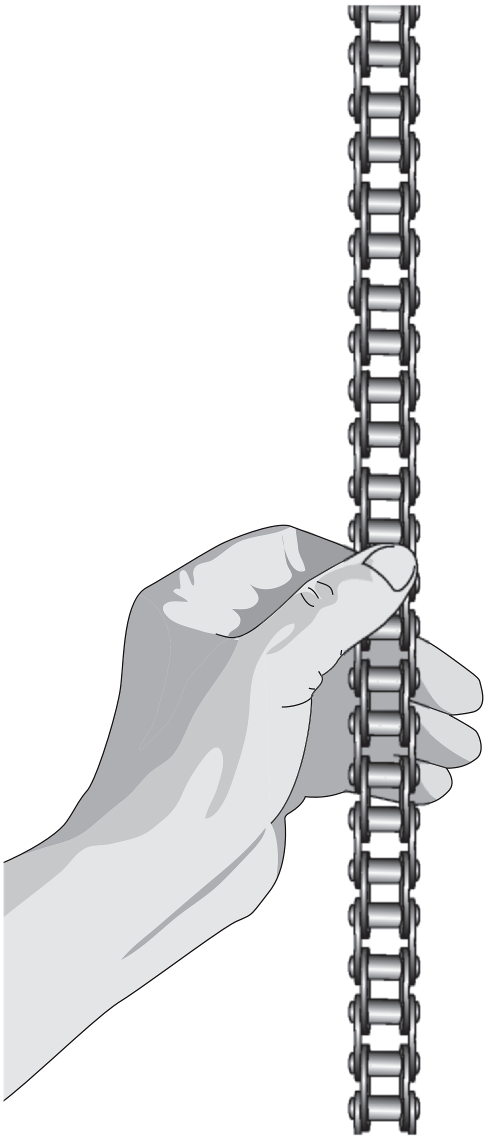


FIG. 7 INSPECTION OF CHAIN ROLLERS

FIG. 8 INSPECTION FOR TIGHT JOINTS

and require close inspection to detect. This condition is one where the pin links have been forced outward on the headed end of the pin, giving an appearance of extreme indentation of the link plate at the area around the pin head. If this condition is found, the chain should be replaced.

4.1.4.7 Sprockets. Before replacing the hoist in service, the sprocket should be inspected for any undue wear or evidence of the load chain riding over the tooth ends. The latter can occur if the hoist enclosure over the sprocket has worn excessively. Worn or damaged hoist parts must be replaced.

4.1.4.8 Load Hook Connection. Examine the hole in the load hook clevis through which the load chain connecting link pin will pass. If the hole has become worn, distorted, or damaged so that full engagement of the pin is not provided, refer to the hoist manufacturer's instructions for proper replacement. A worn or damaged bore can seriously reduce the load bearing capacity of the chain press fit connecting link.

4.2 Maintenance

4.2.1 Cleaning and Lubrication. To clean the load chain, it should be immersed in a suitable solvent such as kerosene (do not use acid or alkaline cleaners).

The links should be flexed until all lubricant, dirt, or foreign matter has been removed from the chain surface and chain joints to allow the chain to operate freely. The chain should then be lubricated in accordance with the manufactuer's recommendations. In the absence of such instructions, the chain should be soaked in a lubricating oil having viscosity of SAE 20, 30, or 40. The chain should be flexed while in the oil bath so that all chain joints received adequate lubrication. Excess oil should be allowed to drain fom the chain. The lubrication, like the cleaning, can be done with the chain installed in the hoists, provided all sections of the chain are properly treated. Grease should not be used to lubricate the load chain.

4.3 Replacement of Load Chain

(a) The chain should be replaced if any of the conditions exist as stated in paras. 4.1.3.1, 4.1.3.2, 4.1.3.3, 4.1.4.1, 4.1.4.2, 4.1.4.3, and 4.1.4.6.

(b) The existence of any of the conditions as stated in para. 4.1.4.5 or 4.1.4.7 is reason to question chain safety and give consideration for chain replacement by evaluation the degree of deficiency.

(c) Replacement chain and connection links shall be the same size, grade, strength, and construction as the original chain unless recommended otherwise by the hoist manufacturer. The entire chain shall be a continuous strand, by one manufacturer with connecting links only at the terminal ends. Press fit type connecting links should always be used.

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