ASME B29.8-2002
(Revision of ASME B29.8M-1993)

LEAF CHAINS, CLEVISES, AND SHEAVES

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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(Revision of ASME B29.8M-1993)

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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

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FOREWORD

For many years, roller chain manufacturers have furnished a substantial volume of chains consisting of link plates assembled on pins without the use of bushings and rollers. These chains provide relatively high strength per unit of weight and have found wide usage where sprockets are not required and high-speed power transmission characteristics are not needed.

Previously, variation in link plate thickness, link plate contour, diameter of pins, and the method of lacing limited its interchangeability and restricted its use. For these reasons the Association of Roller and Silent Chain Manufacturers appointed a task subcommittee on September 21, 1951 to develop this Standard.

The scope of the resultant Standard covers the lacing, pin diameter, diameter of link plate holes, link plate contour and thickness, chain widths, and minimum ultimate tensile strengths. The Standard also recommends clevis and sheave design. Supplementary information to guide users in the application of these chains appeared in the 1958 edition and was deleted in 1960.

The 1971 reaffirmation was approved by the American National Standards Institute on September 10, 1971.

Prior to 1975, all B29.8 leaf chain standards included both Type A and Type B leaf chain designs. Type A, the lighter series, was characterized by even or balanced lacing, while Type B, the heavier series, was shown only with uneven or unbalanced lacing of chain links.

During the decade preceding 1975, it became increasingly apparent that the use of Type A leaf chain was declining and that it was being used primarily for replacement. Most new design applications used the heavier Type B design either with the standard uneven lacing or with even lacing, which was shown as standard only for Type A leaf chain. The increased use of Type B chain and the desire to simplify chain standards led the American Chain Association to undertake a revision of B29.8 to:

(a) eliminate Type A leaf chain from the standard;

(b) add even lacing (balanced) to the Type B chain series;

(c) include a $2\frac{1}{2}$ in. pitch chain to the list of Type B chain.

These revisions were subsequently included in ANSI B29.8-1977 and approved by the American National Standards Institute on May 4, 1977.

In tabulating dimensional information in this Standard, customary inch-pound units have been used. Additionally, companion tabulations have been included that provide metric (S.I.) unit conversions of these values in accordance with SI-I, ASME Orientation and Guide for Use of Metric Units. Certain formulas and relationships have intentionally been presented only in customary units to eliminate ambiguity between them and the tabulated values.

Revisions incorporated in ANSI/ASME B29.8M-1985 provided additional information on clevises, clevis pins, minimum sheave size, and lubrication.

Revisions incorporated in ASME B29.8M-1993 included changes in format, restatement of the definition of Minimum Ultimate Tensile Strength and, most notably, minor changes in the standard values for maximum pin diameter and the minimum hole diameter. The dimensional changes were required to allow a direct, error-free conversion between conventional units (inches) and metric units (millimeters).

Revisions incorporated in ASME B29.8-2002 include the elimination of 8×8 lacing. Tables 1A and 1B have been revised to show minimum width between outside plates (L_m) and Tables 3A and 3B have been revised to show the dimensions for an inside clevis. An appendix has been added that contains information on lubrication and maintenance, connect and disconnect, and general inspection criteria. Preload and manufacturer's identification marking have been added in compliance with the requirements of ISO 4347.

This Standard was approved by the American National Standards Institute on March 27, 2002.

ASME STANDARDS COMMITTEE B29
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.)

CORRESPONDENCE WITH THE B29 COMMITTEE

General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B29 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Interpretations. Upon request, the B29 Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B29 Standards Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry.
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.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Attending Committee Meetings. The B29 Standards Committee regularly holds meetings, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B29 Standards Committee.

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LEAF CHAINS, CLEVISES, AND SHEAVES

1 LEAF CHAINS

1.1 Description

A leaf chain consists of a series of link plates alternately assembled with pins in such a way that the joint is free to articulate between adjoining pitches. Typical assemblies are depicted in Figs. 1 and 2.

1.2 Numbering and Marking System

The chain described in this Standard shall carry the prefix BL. The last two digits of the number following the prefix denote the lacing. The right-hand digit designates the number of link plates in the articulating pitch. The digit to the left of this designates the number of plates in the pin link pitch. The digits to the left of those two digits denote the number of eighths of an inch in the chain pitch.

EXAMPLE: BL523 indicates Type BL leaf chain, $\frac{5}{8}$ in. pitch with a 2 × 3 lacing; that is, two plates in the pin link pitch and three plates in the articulating link pitch.

Chains shall be marked with the manufacturer's name or trademark.

1.3 Assemblies and General Proportions

Various assemblies and general proportions for leaf chains are depicted in Fig. 3. Dimensions used in the figures are as follows:

CL = clearance
D = pin diameter
$D_{max.}$ = maximum pin diameter
H = link plate height
$H_{max.}$ = $0.95P$
L_m = minimum width between pin link plates
P = chain pitch
S = hole diameter of articulating link plates
$S_{min.}$ = approximately $D_{max.} + 0.0012$ in.
T = link plate thickness
$T_{max.}$ = maximum link plate thickness (based on normal steel tolerance). (See Table 1A or 1B for values or $T_{max.}$)
W = width of chain over pin ends
$W_{max.}$ = $w_{max.} + 0.5D_{max.}$
w = width over pin link plates
$w_{max.}$ = $(T_{max.} + CL) \times$ number of link plates across width of chain

NOTE: Style of heading pins is optional with the manufacturer.

1.4 General Chain Dimensions for Interchangeability

The dimensions given in Tables 1A and 1B provide guidance that will ensure interchangeability and compatibility with standard design clevises. It is recommended

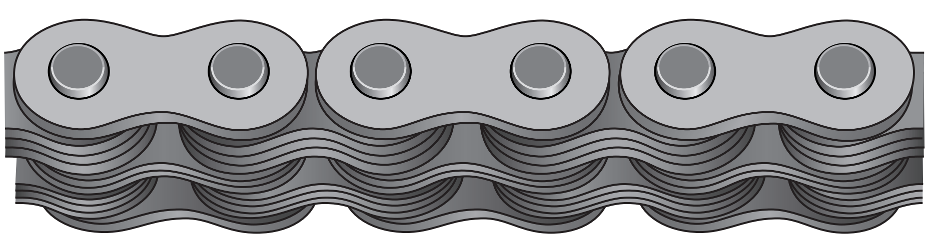


FIG. 1 ASSEMBLY SHOWING 3 × 4 LACING

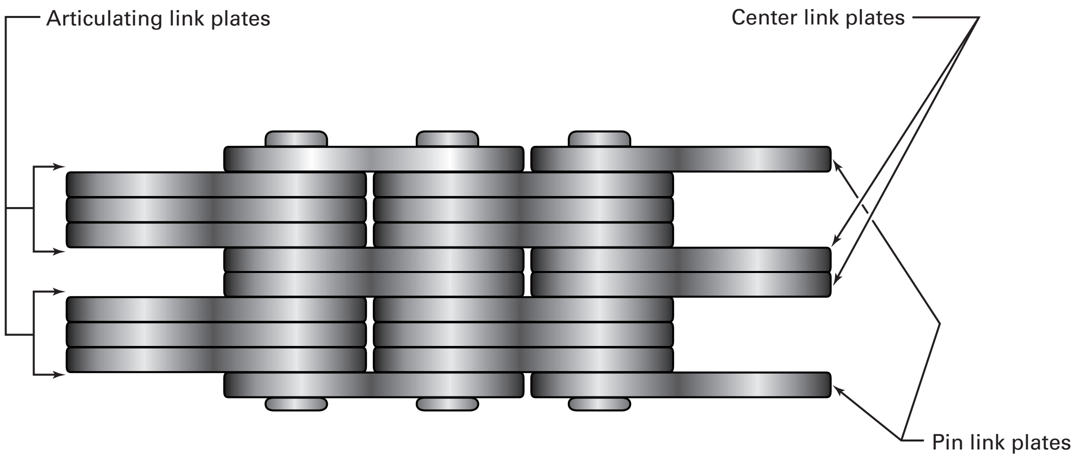


FIG. 2 ASSEMBLY SHOWING 4 × 6 LACING AND PARTS

that these dimensions be considered for actual minimum and maximum limits. Manufacturers are responsible for the actual dimensional features of their products.

NOTE: Chains from different manufacturers must never be placed together within the same application.

1.5 Minimum Ultimate Tensile Strength (M.U.T.S.)

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.

(a) WARNING: The Minimum Ultimate Tensile Strength is *not* a "working load." The M.U.T.S. greatly exceeds the maximum force that may be safely applied to the chain.

(b) Test Procedure: A tensile force is slowly applied, in a uniaxial direction, to the ends of the chain sample.

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

1.6 Tolerance for Chain Length

New chains may have a tolerance of ±0.031 in./ft (2.58 mm/m) when measured under standard measuring load as outlined in para. 1.7.

1.7 Measuring Load

This is the load under which a chain is to be measured for length. It is equal to 1% of the minimum ultimate tensile strength. Length measurements are to be taken over a length of at least 12 in. (300 mm).

1.8 Preload

All chains shall be preloaded by applying a tensile force equivalent to at least 30% of the Minimum Ultimate Tensile Strength given in Table 2.

2 CLEVISES

This section gives recommended design dimensions of terminal clevises for use with Type B leaf chains. Limiting dimensions herein established are for the purpose of ensuring acceptance of chains built in accordance with foregoing standards.

2.1 Design Considerations

Care must be exercised in the manufacture and attachment of clevises to ensure equal load distribution across the chain. Failure to do so will seriously reduce the chain load-carrying capacity.

It is recommended that the material used for the construction of clevises be through-hardening steel.

The clevises and pins used to anchor the chain shall be of adequate strength to withstand at least the breaking load of the chain.

2.2 Clevis Types

The clevis may be designed so that the clevis block fits inside the end plates of the chain, or so that the clevis block fits outside the end plates of the chain, as illustrated in Fig. 4.

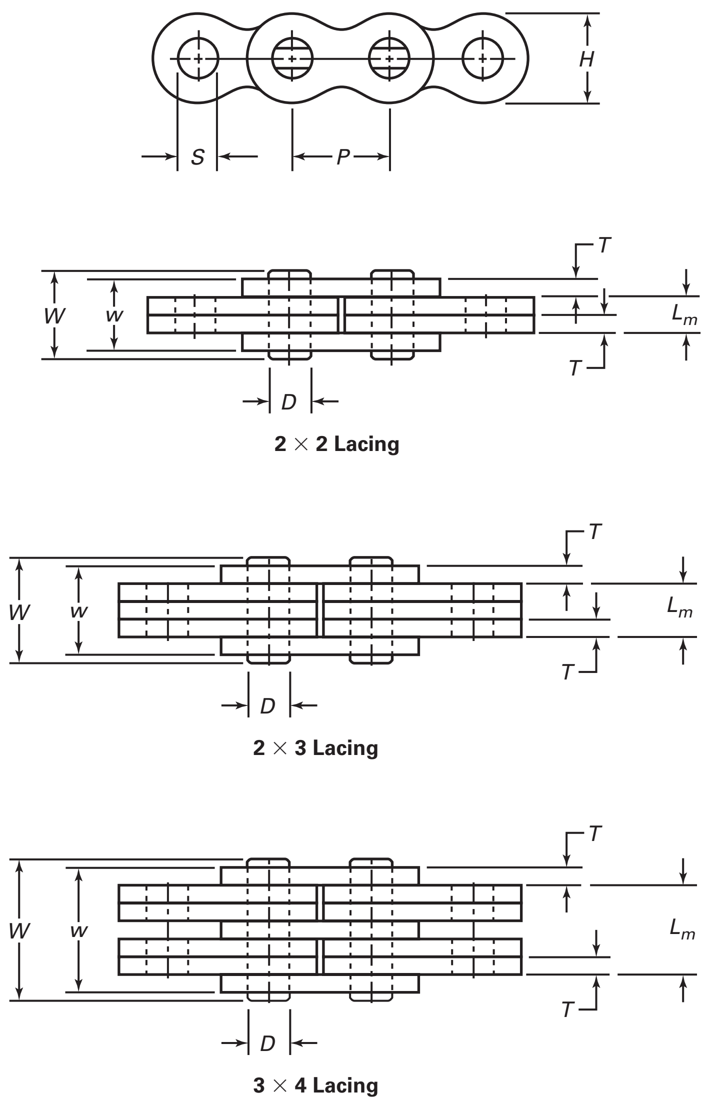
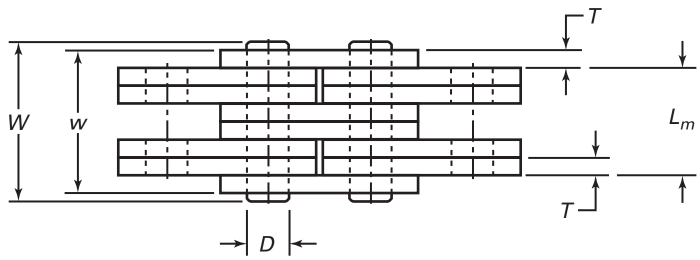
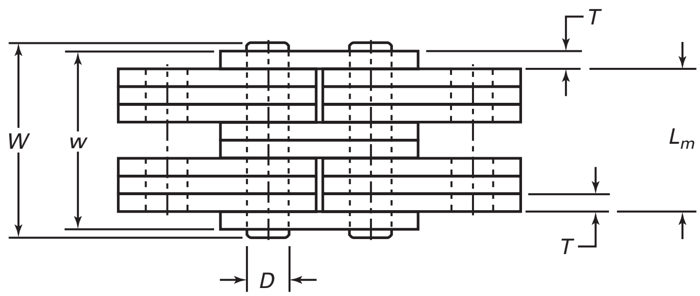


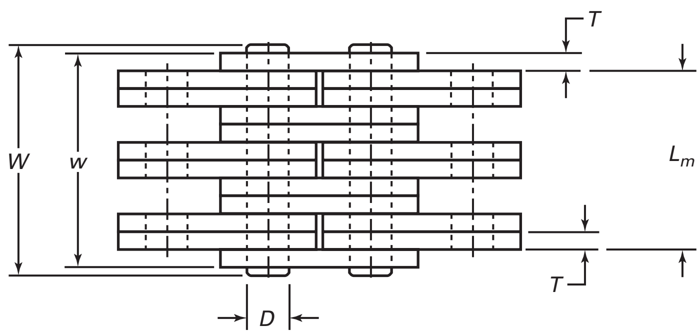
FIG. 3 LEAF CHAIN ASSEMBLIES AND PROPORTIONS



4 × 4 Lacing



4 × 6 Lacing



6 × 6 Lacing

FIG. 3 LEAF CHAIN ASSEMBLIES AND PROPORTIONS (CONT'D)

TABLE 1A GENERAL CHAIN DIMENSIONS, in.

Chain No.	Pitch	Lacing	$w_{max.}$	$W_{max.}$	L_m	$D_{max.}$	$S_{min.}$	$H_{max.}$	$T_{max.}$
BL-422	...	2 × 2	0.334	0.434	0.166	...	...	...	...
BL-423	...	2 × 3	0.418	0.518	0.249	...	...	...	...
BL-434	...	3 × 4	0.585	0.685	0.411	...	...	...	...
BL-444	0.500	4 × 4	0.668	0.768	0.491	0.2004	0.2016	0.475	0.082
BL-446	...	4 × 6	0.835	0.935	0.654	...	...	...	...
BL-466	...	6 × 6	1.002	1.102	0.827	...	...	...	...
BL-522	...	2 × 2	0.390	0.507	0.193	...	...	...	...
BL-523	...	2 × 3	0.488	0.605	0.292	...	...	...	...
BL-534	...	3 × 4	0.683	0.800	0.485				
BL-544	0.625	4 × 4	0.780	0.897	0.579	0.2346	0.2358	0.594	0.098
BL-546	...	4 × 6	0.975	1.092	0.768	...	...	...	...
BL-566	...	6 × 6	1.170	1.287	0.969	...	...	...	...
BL-622	...	2 × 2	0.528	0.684	0.260	...	...	...	...
BL-623	...	2 × 3	0.660	0.816	0.390	...	...	...	...
BL-634	...	3 × 4	0.924	1.080	0.650	...	...	...	...
BL-644	0.750	4 × 4	1.056	1.212	0.780	0.3126	0.3134	0.713	0.130
BL-646	...	4 × 6	1.320	1.476	1.040	...	...	...	...
BL-666	...	6 × 6	1.584	1.740	1.300	...	...	...	...
BL-822	...	2 × 2	0.652	0.840	0.323	...	...	...	...
BL-823	...	2 × 3	0.815	1.003	0.485	...	...	...	...
BL-834	...	3 × 4	1.141	1.329	0.808	...	...	...	...
BL-844	1.000	4 × 4	1.304	1.492	0.969	0.376	0.376	0.950	0.161
BL-846	...	4 × 6	1.630	1.818	1.288	...	...	...	...
BL-866	...	6 × 6	1.956	2.144	1.619	...	...	...	...
BL-1022	...	2 × 2	0.780	0.999	0.386	...	...	...	...
BL-1023	...	2 × 3	0.975	1.194	0.583	...	...	...	...
BL-1034	...	3 × 4	1.365	1.584	0.965	...	...	...	...
BL-1044	1.250	4 × 4	1.560	1.779	1.162	0.4374	0.4386	1.188	0.193
BL-1046	...	4 × 6	1.950	2.169	1.552	...	...	...	...
BL-1066	...	6 × 6	2.340	2.559	1.937	...	...	...	...
BL-1222	...	2 × 2	0.916	1.166	0.457	...	...	...	...
BL-1223	...	2 × 3	1.145	1.395	0.685	...	...	...	...
BL-1234	...	3 × 4	1.603	1.853	1.138	...	...	...	...
BL-1244	1.500	4 × 4	1.832	2.082	1.355	0.5004	0.5016	1.425	0.227
BL-1246	...	4 × 6	2.290	2.540	1.823	...	...	...	...
BL-1266	...	6 × 6	2.748	2.998	2.280	...	...	...	...
BL-1422	...	2 × 2	1.040	1.321	0.520	...	...	...	...
BL-1423	...	2 × 3	1.300	1.581	0.776	...	...	...	...
BL-1434	...	3 × 4	1.820	2.101	1.288	...	...	...	...
BL-1444	1.750	4 × 4	2.080	2.361	1.540	0.5626	0.5634	1.663	0.260
BL-1446	...	4 × 6	2.600	2.881	2.060	...	...	...	...
BL-1466	...	6 × 6	3.120	3.401	2.579	...	...	...	...
BL-1622	...	2 × 2	1.192	1.536	0.595	...	...	...	...
BL-1623	...	2 × 3	1.490	1.834	0.890	...	...	...	...
BL-1634		3 × 4	2.086	2.430	1.477	...	...	...	...
BL-1644	2.000	4 × 4	2.384	2.728	1.764	0.6874	0.6886	1.900	0.296
BL-1646	...	4 × 6	2.980	3.324	2.359	...	...	...	...
BL-1666	...	6 × 6	3.576	3.920	2.957	...	...	...	...
BL-2022	...	2 × 2	1.568	2.037	0.784	...	...	...	...
BL-2023	...	2 × 3	1.960	2.429	1.174	...	...	...	...
BL-2034	...	3 × 4	2.744	3.213	1.945	...	...	...	...
BL-2044	2.500	4 × 4	3.136	3.605	2.327	0.9374	0.9386	2.375	0.390
BL-2046	...	4 × 6	3.920	4.389	3.107	...	...	...	...
BL-2066	...	6 × 6	4.704	5.173	3.989	...	...	...	...

TABLE 1B GENERAL CHAIN DIMENSIONS, mm

Chain No.	Pitch	Lacing	$w_{max.}$	$W_{max.}$	L_m	$D_{max.}$	$S_{min.}$	$H_{max.}$	$T_{max.}$
BL-422	...	2 × 2	8.48	11.1	4.2	...	...	...	...
BL-423	...	2 × 3	10.62	13.2	6.3	...	...	...	...
BL-434	...	3 × 4	14.86	17.40	10.4	...	...	...	...
BL-444	12.70	4 × 4	16.97	19.6	12.4	5.09	5.11	12.07	2.08
BL-446	...	4 × 6	21.21	23.8	16.6	...	...	...	...
BL-466	...	6 × 6	25.45	28.00	21.0	...	...	...	...
BL-522	...	2 × 2	9.91	12.9	4.9	...	...	...	...
BL-523	...	2 × 3	12.40	15.4	7.4	...	...	...	...
BL-534	...	3 × 4	17.35	20.4	12.3	...	...	...	...
BL-544	15.88	4 × 4	19.81	22.8	14.7	5.96	5.98	15.09	2.48
BL-546	...	4 × 6	24.77	27.7	19.5	...	...	...	...
BL-566	...	6 × 6	29.72	32.7	24.6	...	...	...	...
BL-622	...	2 × 2	13.41	17.4	6.6	...	...	...	...
BL-623	...	2 × 3	16.76	20.8	9.9	...	...	...	...
BL-634	...	3 × 4	23.47	27.5	16.5	...	...	...	...
BL-644	19.05	4 × 4	26.82	30.8	19.8	7.94	7.96	18.11	3.30
BL-646	...	4 × 6	33.53	37.5	26.4	...	...	...	...
BL-666	...	6 × 6	40.23	44.2	33.2	...	...	...	...
BL-822	...	2 × 2	16.56	21.4	8.2	...	...	...	...
BL-823	...	2 × 3	20.70	25.5	12.3	...	...	...	...
BL-834	...	3 × 4	28.98	33.8	20.5	...	...	...	...
BL-844	25.40	4 × 4	33.12	37.9	24.6	9.54	9.56	24.13	4.09
BL-846	...	4 × 6	41.40	46.2	32.7	...	...	...	...
BL-866	...	6 × 6	49.68	54.5	41.1	...	...	...	...
BL-1022	...	2 × 2	19.81	25.4	9.8	...	...	...	...
BL-1023	...	2 × 3	24.77	30.4	14.8	...	...	...	...
BL-1034	...	3 × 4	34.57	40.3	24.5	...	...	...	...
BL-1044	31.75	4 × 4	39.62	45.2	29.5	11.11	11.14	30.18	4.90
BL-1046	...	4 × 6	49.53	55.1	39.4	...	...	...	...
BL-1066	...	6 × 6	59.44	65.0	49.2	...	...	...	...
BL-1222	...	2 × 2	23.27	29.7	11.6	...	...	...	...
BL-1223	...	2 × 3	29.08	35.5	17.4	...	...	...	...
BL-1234	...	3 × 4	40.72	47.1	28.9	...	...	...	...
BL-1244	38.10	4 × 4	46.53	52.9	34.4	12.71	12.74	36.20	5.77
BL-1246	...	4 × 6	58.17	64.6	46.3	...	...	...	...
BL-1266	...	6 × 6	69.80	76.2	57.9	...	...	...	...
BL-1422	...	2 × 2	26.42	33.6	13.2	...	...	...	...
BL-1423	...	2 × 3	33.02	40.2	19.7	...	...	...	...
BL-1434	...	3 × 4	46.23	53.4	32.7	...	...	...	...
BL-1444	44.45	4 × 4	52.83	60.0	39.1	14.29	14.31	42.24	6.6
BL-1446	...	4 × 6	66.04	73.2	52.3	...	...	...	...
BL-1466	...	6 × 6	79.25	86.4	65.5	...	...	...	...
BL-1622	...	2 × 2	30.28	40.0	15.0	...	...	...	...
BL-1623	...	2 × 3	37.05	46.6	22.5	...	...	...	...
BL-1634	...	3 × 4	52.98	61.8	37.5	...	...	...	...
BL-1644	50.80	4 × 4	60.55	69.3	44.8	17.46	17.49	48.26	7.52
BL-1646	...	4 × 6	75.69	84.5	59.9	...	...	...	...
BL-1666	...	6 × 6	90.83	100.0	75.0	...	...	...	...
BL-2022	...	2 × 2	39.83	51.8	19.9	...	...	...	...
BL-2023	...	2 × 3	49.78	61.7	29.8	...	...	...	...
BL-2034	...	3 × 4	69.70	81.7	49.4	...	...	...	...
BL-2044	63.50	4 × 4	81.61	91.6	59.1	23.81	23.84	60.33	9.91
BL-2046	...	4 × 6	91.57	111.5	78.9	...	...	...	...
BL-2066	...	6 × 6	111.48	131.4	99.0	...	...	...	...

GENERAL NOTE: Millimeters are converted from inches.

TABLE 2 MINIMUM ULTIMATE TENSILE STRENGTH

Chain No.	Minimum Ultimate Tensile Strength		Chain No.	Minimum Ultimate Tensile Strength	
	lb	kN		lb	kN
BL-422	5,000	22.2	BL-1044	52,000	231.3
BL-423	5,000	22.2	BL-1046	52,000	231.3
BL-434	7,500	33.4	BL-1066	78,000	347.0
BL-444	10,000	44.5			
BL-446	10,000	44.5	BL-1222	34,000	151.2
BL-466	15,000	66.7	BL-1223	34,000	151.2
			BL-1234	55,000	244.6
BL-522	7,500	33.4	BL-1244	68,000	302.5
BL-523	7,500	33.4	BL-1246	68,000	302.5
BL-534	11,000	48.9	BL-1266	102,000	453.7
BL-544	15,000	66.7			
BL-546	15,000	66.7	BL-1422	43,000	191.3
BL-566	22,500	100.1	BL-1423	43,000	191.3
			BL-1434	71,000	315.8
BL-622	11,000	48.9	BL-1444	86,000	382.6
BL-623	11,000	48.9	BL-1446	86,000	382.6
BL-634	17,000	75.6	BL-1466	130,000	578.3
BL-644	22,000	97.9			
BL-646	22,000	97.9	BL-1622	65,000	289.1
BL-666	33,000	146.8	BL-1623	65,000	289.1
			BL-1634	99,000	440.4
BL-822	19,000	84.5	BL-1644	130,000	578.3
BL-823	19,000	84.5	BL-1646	130,000	578.3
BL-834	29,000	129.0	BL-1666	195,000	867.4
BL-844	38,000	169.0			
BL-846	38,000	169.0	BL-2022	97,500	433.7
BL-866	57,000	253.6	BL-2023	97,500	433.7
			BL-2034	146,000	649.4
BL-1022	26,000	115.6	BL-2044	195,000	867.4
BL-1023	26,000	115.6	BL-2046	195,000	867.4
BL-1034	41,000	182.4	BL-2066	292,500	1 301.1

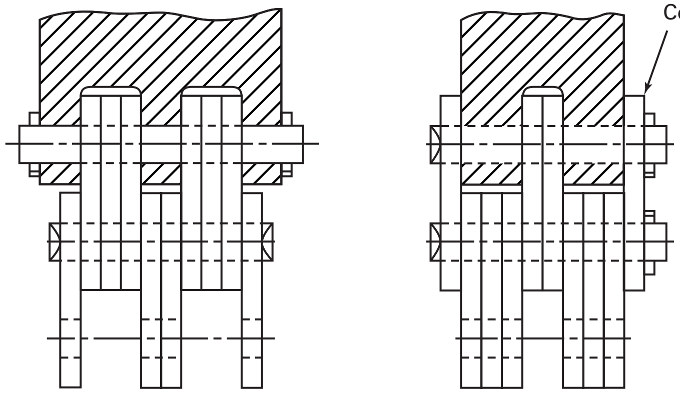


FIG. 4 CLEVIS TYPES

The required chain end configuration must be specified when ordering cut lengths of chain.

2.3 General Proportions

General proportions for clevises are shown in Fig. 5. Dimensions used in the figures are as follows:

B = fillet radius
CL = clearance
= 0.0015 in. for $5/8$ in. pitch and smaller, or 0.002 in. for $3/4$ in. pitch or larger
P = chain pitch
R = end radius
= $0.5P$
S = minimum hole diameter
T = $T_{max.} - 0.005P$
$T_{max.}$ = maximum link plate thickness
t = minimum thickness of outside flange (outside clevis)
= $T_{max.}$
U = minimum depth of slot for clearance
= $0.50P$

2.4 Dimensions of Anchor Clevises

Clevis dimensions are given in Tables 3A and 3B. Lacing for A, G, K, L, M, N, and O in Fig. 5 is as follows:

2 × 2 $G = 2 \times T_{max.} + 4CL + 0.008P$
$L = 2 \times T$

2 × 3 $G = 3 \times T_{max.} + 5CL + 0.008P$
$L = 3 \times T$

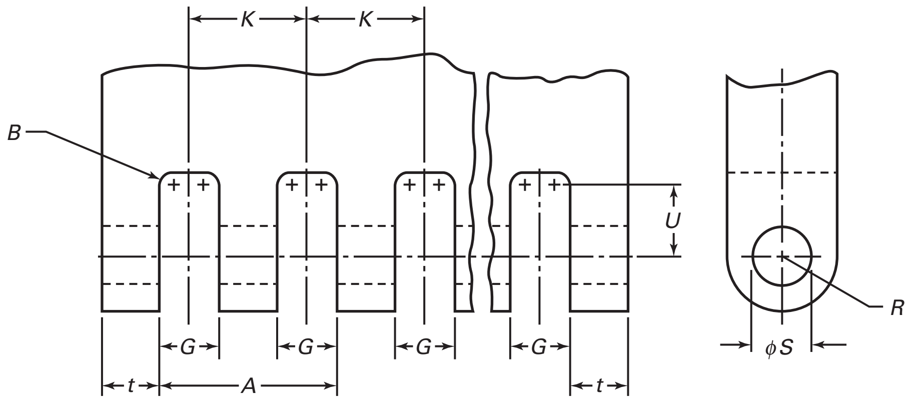
3 × 4 $K = 3\,(T_{max.} + CL)$
$G = 2 \times T_{max.} + 3CL + 0.004P$
$A = K + G$
$M = T_{max.} + 2CL + 0.004P$
$L = 2 \times T$
$N = (K + L) \times 0.98$

4 × 4 $K = 4(T_{max.} + CL)$
$G = 2 \times T_{max.} + 4CL + 0.008P$
$A = K + G$
$M = G$
$L = 2 \times T$
$N = (K + L) \times 0.97$

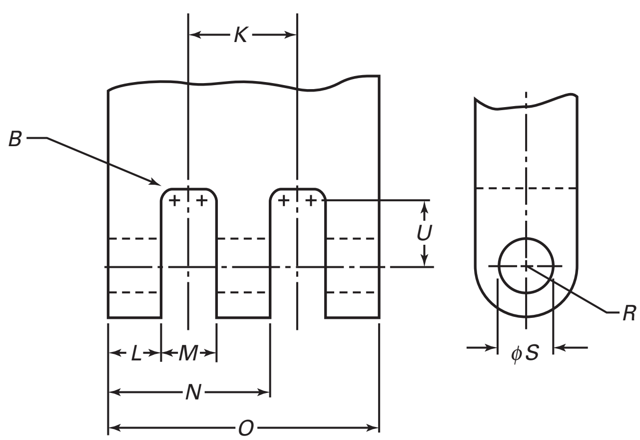
4 × 6 $K = 5(T_{max.} + CL)$
$G = 3 \times T_{max.} + 5CL + 0.008P$
$A = K + G$
$M = 2 \times T_{max.} + 4CL + 0.008P$
$L = 3 \times T$
$N = (K + L) \times 0.98$

6 × 6 $K = 4(T_{max.} + CL)$
$G = 2 \times T_{max.} + 4CL + 0.008P$
$A = K + G$
$M = G$
$L = 2 \times T$
$N = 6 \times T_{max.} + 4CL - 0.008P$
$O = (10 \times T_{max.} + 8CL - 0.008P) \times 0.96$

NOTE: Tolerance on A, G, M, and N = $+(0.002P + 0.004) / -0$.



Outside Clevis



Inside Clevis

FIG. 5 GENERAL CLEVIS PROPORTIONS

TABLE 3A DIMENSIONS FOR ANCHOR CLEVISES — TYPE B LEAF CHAIN, in.

Chain No.	Pitch	Lacing	$t_{min.}$	*CL*	*A*	$R_{max.}$	$S_{min.}$	$U_{min.}$	$B_{min.}$	*K*	*G*	*L*	*M*	*N*	*O*
BL-422		2 × 2			. . .					. . .	0.174	0.159	. . .	. . .	. . .
BL-423		2 × 3			. . .					. . .	0.258	0.239	. . .	. . .	. . .
BL-434		3 × 4			0.421					0.251	0.171	0.159	0.087	0.401	. . .
BL-444	0.500	4 × 4	0.080	0.0015	0.508	0.250	0.2016	0.250	0.03	0.334	0.174	0.160	0.174	0.478	. . .
BL-446		4 × 6			0.675					0.418	0.258	0.239	0.174	0.643	. . .
BL-466		6 × 6			0.508					0.334	0.174	0.159	0.174	0.494	0.795
BL-522		2 × 2			. . .					. . .	0.203	0.186	. . .	. . .	. . .
BL-523		2 × 3			. . .					. . .	0.301	0.279	. . .	. . .	. . .
BL-534		3 × 4			0.421					0.251	0.199	0.186	0.102	0.469	. . .
BL-544	0.625	4 × 4	0.094	0.0015	0.508	0.312	0.2358	0.312	0.03	0.334	0.204	0.186	0.204	0.558	. . .
BL-546		4 × 6			0.788					0.488	0.301	0.279	0.204	0.751	. . .
BL-566		6 × 6			0.593					0.390	0.203	0.186	0.203	0.577	0.928
BL-622		2 × 2			. . .					. . .	0.274	0.253	. . .	. . .	. . .
BL-623		2 × 3			. . .					. . .	0.406	0.379	. . .	. . .	. . .
BL-634		3 × 4			0.665					0.396	0.269	0.253	0.137	0.636	. . .
BL-644	0.750	4 × 4	0.127	0.002	0.804	0.375	0.3134	0.375	0.06	0.528	0.276	0.253	0.276	0.757	. . .
BL-646		4 × 6			1.066					0.660	0.406	0.379	0.276	1.018	. . .
BL-666		6 × 6			0.802					0.528	0.274	0.253	0.274	0.782	1.258
BL-822		2 × 2			. . .					. . .	0.338	0.312	. . .	. . .	. . .
BL-823		2 × 3			. . .					. . .	0.501	0.468	. . .	. . .	. . .
BL-834		3 × 4			0.821					0.489	0.332	0.312	0.169	0.785	. . .
BL-844	1.000	4 × 4	0.157	0.002	0.992	0.500	0.3764	0.500	0.06	0.652	0.340	0.312	0.340	0.935	. . .
BL-846		4 × 6			1.316					0.815	0.501	0.468	0.340	1.257	. . .
BL-866		6 × 6			0.990					0.652	0.338	0.312	0.338	0.966	1.553
BL-1022		2 × 2			. . .					. . .	0.404	0.374	. . .	. . .	. . .
BL-1023		2 × 3			. . .					. . .	0.599	0.599	. . .	. . .	. . .
BL-1034		3 × 4			0.982					0.585	0.397	0.374	0.202	0.939	. . .
BL-1044	1.250	4 × 4	0.188	0.002	1.186	0.625	0.4386	0.625	0.06	0.780	0.406	0.374	0.406	1.119	. . .
BL-1046		4 × 6			1.574					0.975	0.599	0.560	0.406	1.505	. . .
BL-1066		6 × 6			1.184					0.780	0.404	0.374	0.404	1.156	1.859

(continued)

TABLE 3A DIMENSIONS FOR ANCHOR CLEVISES — TYPE B LEAF CHAIN, in. (CONT'D)

Chain No.	Pitch	Lacing	$t_{min.}$	*CL*	*A*	$R_{max.}$	$S_{min.}$	$U_{min.}$	$B_{min.}$	*K*	*G*	*L*	*M*	*N*	*O*
BL-1222		2 × 2			. . .					. . .	0.474	0.439	. . .	. . .	. . .
BL-1223		2 × 3			. . .					. . .	0.703	0.659	. . .	. . .	. . .
BL-1234		3 × 4			1.153					0.687	0.466	0.439	0.237	1.103	. . .
BL-1244	1.500	4 × 4	0.227	0.002	1.392	0.750	0.5016	0.750	0.09	0.916	0.476	0.439	0.474	1.314	. . .
BL-1246		4 × 6			1.848					1.145	0.703	0.659	0.474	1.767	. . .
BL-1266		6 × 6			1.390					0.916	0.474	0.439	0.474	1.358	2.183
BL-1422		2 × 2			. . .					. . .	0.538	0.499	. . .	. . .	. . .
BL-1423		2 × 3			. . .					. . .	0.798	0.748	. . .	. . .	. . .
BL-1434		3 × 4			1.319					0.786	0.533	0.502	0.271	1.262	. . .
BL-1444	1.750	4 × 4	0.260	0.002	1.592	0.875	0.5634	0.875	0.09	1.048	0.544	0.502	0.542	1.503	. . .
BL-1446		4 × 6			2.114					1.310	0.804	0.753	0.542	2.022	. . .
BL-1466		6 × 6			1.590					1.048	0.542	0.502	0.542	1.554	2.497
BL-1622		2 × 2			. . .					. . .	0.616	0.572	. . .	. . .	. . .
BL-1623		2 × 3			. . .					. . .	0.914	0.858	. . .	. . .	. . .
BL-1634		3 × 4			1.500					0.894	0.606	0.572	0.308	1.437	. . .
BL-1644	2.000	4 × 4	0.296	0.002	1.812	1.000	0.6886	1.000	0.12	1.192	0.620	0.572	0.616	1.711	. . .
BL-1646		4 × 6			2.404					1.490	0.914	0.858	0.616	2.301	. . .
BL-1666		6 × 6			1.808					1.192	0.616	0.572	0.616	1.768	2.842
BL-2022		2 × 2			. . .					. . .	0.808	0.755	. . .	. . .	. . .
BL-2023		2 × 3			. . .					. . .	1.200	1.133	. . .	. . .	. . .
BL-2034		3 × 4			1.972					1.176	0.796	0.755	0.404	1.892	. . .
BL-2044	2.500	4 × 4	0.390	0.002	2.356	1.250	0.9386	1.250	0.15	1.568	0.788	0.755	0.808	2.253	. . .
BL-2046		4 × 6			3.160					1.960	1.200	1.133	0.808	3.031	. . .
BL-2066		6 × 6			2.376					1.568	0.808	0.755	0.808	2.328	3.740

TABLE 3B DIMENSIONS FOR ANCHOR CLEVISES — TYPE B LEAF CHAIN, mm

Chain No.	Pitch	Lacing	$t_{min.}$	*CL*	*A*	$R_{max.}$	$S_{min.}$	$U_{min.}$	$B_{min.}$	*K*	*G*	*L*	*M*	*N*	*O*
BL-422		2 x 2			. . .					. . .	4.41	4.03	. . .		
BL-423		2 x 3			. . .					. . .	6.53	6.05	. . .		
BL-434		3 x 4			10.68					6.35	4.33	4.03	2.21	10.18	
BL-444	12.70	4 x 4	2.08	0.038	12.89	6.35	5.11	6.35	0.76	8.47	4.41	4.03	4.41	12.13	
BL-446		4 x 6			17.12					10.59	6.53	6.05	4.41	16.31	
BL-466		6 x 6			12.89					8.47	4.41	4.03	4.41	12.53	20.16
BL-522		2 x 2			. . .					. . .	5.24	4.80	. . .		
BL-523		2 x 3			. . .					. . .	7.76	7.20	. . .		
BL-534		3 x 4			12.49					7.55	5.14	4.80	2.62	12.11	. . .
BL-544	15.88	4 x 4	2.48	0.038	15.31	7.92	5.98	7.92	0.76	10.07	5.24	4.80	5.24	14.43	
BL-546		4 x 6			20.35					12.59	7.76	7.20	5.24	19.40	
BL-566		6 x 6			15.31					10.07	5.24	4.80	5.24	14.91	23.98
BL-622		2 x 2			. . .					. . .	6.96	6.41	. . .	. . .	. . .
BL-623		2 x 3			. . .					. . .	10.31	9.61	. . .	. . .	. . .
BL-634		3 x 4			16.88					10.05	6.83	6.41	3.48	16.13	. . .
BL-644	19.05	4 x 4	3.30	0.051	20.41	9.53	7.96	9.53	1.52	13.40	7.01	6.41	6.96	19.22	. . .
BL-646		4 x 6			27.06					16.75	10.31	9.61	6.96	25.84	. . .
BL-666		6 x 6			20.36					13.40	6.96	6.41	6.96	19.85	31.92
BL-822		2 x 2			. . .					. . .	8.59	7.93	. . .	. . .	. . .
BL-823		2 x 3			. . .					. . .	12.73	11.89	. . .	. . .	. . .
BL-834		3 x 4			20.86					12.42	8.43	7.93	4.29	19.94	. . .
BL-844	25.40	4 x 4	4.09	0.051	25.20	12.70	9.56	12.70	1.52	16.56	8.64	7.93	8.59	23.75	. . .
BL-846		4 x 6			33.43					20.70	12.73	11.89	8.59	31.94	. . .
BL-866		6 x 6			25.15					16.56	8.59	7.93	8.59	24.54	39.46
BL-1022		2 x 2			. . .					. . .	10.26	9.48	. . .		
BL-1023		2 x 3			. . .					. . .	15.21	14.22	. . .		
BL-1034		3 x 4			24.93					14.85	10.08	9.48	5.13	23.85	. . .
BL-1044	31.75	4 x 4	4.90	0.051	30.11	15.88	11.14	15.88	1.52	19.80	10.31	9.48	10.26	28.41	. . .
BL-1046		4 x 6			39.96					24.75	15.21	14.22	10.26	38.20	. . .
BL-1066		6 x 6			30.06					19.80	10.26	9.48	10.26	29.35	47.19

(continued)

TABLE 3B DIMENSIONS FOR ANCHOR CLEVISES — TYPE B LEAF CHAIN, mm (CONT'D)

Chain No.	Pitch	Lacing	$t_{min.}$	*CL*	*A*	$R_{max.}$	$S_{min.}$	$U_{min.}$	$B_{min.}$	*K*	*G*	*L*	*M*	*N*	*O*
BL-1222		2 x 2			. . .					. . .	12.05	11.16	. . .	. . .	. . .
BL-1223		2 x 3			. . .					. . .	17.87	16.74	. . .	. . .	. . .
BL-1234		3 x 4			29.31					17.46	11.84	11.16	6.02	28.05	. . .
BL-1244	38.10	4 x 4	5.77	0.051	35.38	19.05	12.74	19.05	2.29	23.28	12.10	11.16	12.05	31.41	. . .
BL-1246		4 x 6			46.97					29.10	17.87	16.74	12.05	44.93	. . .
BL-1266		6 x 6			35.33					23.28	12.05	11.16	12.05	34.52	55.49
BL-1422		2 x 2			. . .					. . .	13.66	12.66	. . .	. . .	. . .
BL-1423		2 x 3			. . .					. . .	20.26	18.98	. . .	. . .	. . .
BL-1434		3 x 4			33.25					19.80	13.43	12.66	6.83	31.81	. . .
BL-1444	44.45	4 x 4	6.55	0.051	40.11	22.23	14.31	22.23	2.29	26.40	13.71	12.66	13.76	37.89	. . .
BL-1446		4 x 6			53.26					33.00	20.26	18.98	13.76	50.95	. . .
BL-1466		6 x 6			40.06					26.40	13.66	12.66	13.76	39.15	62.93
BL-1622		2 x 2			. . .					. . .	15.65	14.53	. . .	. . .	. . .
BL-1623		2 x 3			. . .					. . .	23.22	21.80	. . .	. . .	. . .
BL-1634		3 x 4			38.11					22.71	15.40	14.53	7.82	36.50	. . .
BL-1644	50.80	4 x 4	7.52	0.051	46.03	25.40	17.49	25.40	3.05	30.28	15.75	14.53	15.65	43.47	. . .
BL-1646		4 x 6			61.07					37.85	23.22	21.80	15.65	58.46	. . .
BL-1666		6 x 6			45.93					30.28	15.65	14.53	15.65	44.92	72.19
BL-2022		2 x 2			. . .					. . .	20.53	19.19	. . .	. . .	. . .
BL-2023		2 x 3			. . .					. . .	30.49	28.78	. . .	. . .	. . .
BL-2034		3 x 4			50.11					29.88	20.23	19.19	10.27	48.09	. . .
BL-2044	63.50	4 x 4	9.91	0.051	59.87	31.75	23.84	31.75	3.81	39.84	20.02	19.19	20.53	57.26	. . .
BL-2046		4 x 6			80.30					49.80	30.49	28.78	20.53	77.01	. . .
BL-2066		6 x 6			60.37					39.84	20.53	19.19	20.53	59.16	95.04

GENERAL NOTE: Metric dimensions are the same as ISO 4347.

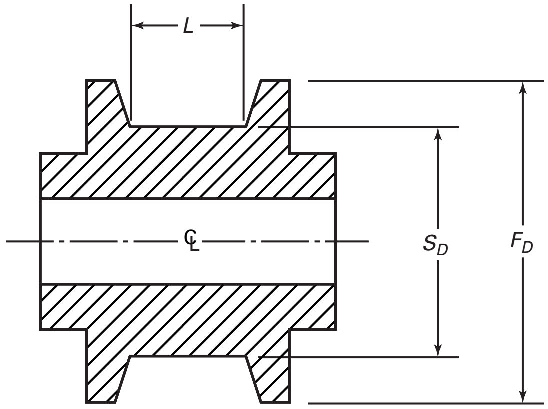


FIG. 6 GENERAL SHEAVE PROPORTIONS

3 SHEAVES

General sheave proportions are depicted in Fig. 6. Dimensions used are as follows:

F_D = flange diameter
= $SD + H_{max.}$ (see Note)
$H_{max.}$ = $0.95P$ (see Table 1A)
L = minimum distance between flanges
= $1.05W_{max.}$ (see Table 1A)
S_D = minimum recommended sheave diameter
= $5P$ (see Note)

NOTE: Smaller diameters may be used where such practice is supported by testing.

4 LUBRICATION

Chain must be lubricated periodically to give maximum wear life and inhibit corrosion. Motor oil is an excellent chain lubricant and must be applied copiously to reach the chain joints.

5 ADDITIONAL INFORMATION

For further information, see American Chain Association Bulletin, "Identification, Inspection, Maintenance, and Replacement of B29.8 Leaf Chain."

NONMANDATORY APPENDIX A
SUPPLEMENTARY INFORMATION: LUBRICATION AND MAINTENANCE

Using good maintenance practices along with regular inspection should provide satisfactory chain service provided the correct product has been selected.

This Appendix provides valuable information that will assist end users in evaluating the condition of their application and in making adjustments to the maintenance schedule when necessary.

A1 GENERAL CAUTIONS

(a) Use lengths of factory-assembled chain. Do not build lengths from individual components.

(b) Do not attempt to rework damaged chains by replacing only the components that are obviously faulty. The entire chain may be compromised and should be discarded.

(c) Never electroplate assembled leaf chain or its components. Plating will result in failure from hydrogen embrittlement. Plated chains are assembled from modified, individually plated components.

(d) Welding should not be performed on any chain or component. Welding spatter should never be allowed to come in contact with chain or components.

(e) Leaf chains are manufactured exclusively from heat-treated steels and therefore must not be annealed. If heating a chain with a cutting torch is absolutely necessary for its removal, the chain must not be reused.

(f) The practice of joining chain lengths is not recommended, and chains from different manufacturers should not be placed together within the same application.

(g) The Minimum Ultimate Tensile Strength of a chain means the minimum load at which it may break when subjected to a destructive tensile test. *It does not mean working load.*

A2 LUBRICATION

An important consideration in field maintenance of leaf chain is lubrication. In order to get satisfactory service life, periodic lubrication must be provided. Like all bearing surfaces, the precision-manufactured, hardened-steel, joint-wearing surfaces of leaf chain require a film of oil between mating parts to prevent accelerated wear.

Maintaining a lubricant film on all chain surfaces should achieve the following:

(a) Minimize joint wear.

(b) Improve corrosion resistance.

(c) Reduce the possibility of pin turning.

(d) Minimize tight joints.

(e) Promote smooth, quiet chain action.

(f) Lower chain tension by reducing internal friction in the chain system.

Laboratory wear tests show #40 oil to have greater ability to prevent wear than #10 oil. Generally, the heaviest (highest viscosity) oil that will penetrate the joint is best.

Whatever method is used, the oil must penetrate the chain joint to prevent wear. Applying oil to external surfaces will prevent rust, but oil must flow into the live bearing surfaces for maximum wear life.

To prepare the chain for oiling, the leaf chain plates should be brushed with a stiff brush or wire brush to clear the space between the plates so that oil may penetrate the live bearing area.

Oil may be applied with a narrow paint brush or directly poured on, but the chain should be well flooded to ensure that the oil penetrates into the joints.

In locations that are difficult to reach, it may be necessary to use a good-quality oil under pressure, such as an aerosol can or pump pressure spray.

A3 INSTALLATION

A3.1 Chain Movement

Ascertain that the chain operating path is clear and that the chain articulates freely through its full range of operation.

A3.2 Lubrication

Ensure that the chain is well lubricated with the heaviest oil that will penetrate the void between the link plate apertures and the pins.

A3.3 Paint

Make sure that the chain does not get painted over at any time.

A3.4 Protection

The chain may be covered with a layer of grease, where necessary, as a protection from atmosphere or sliding wear. It should be noted, however, that the grease will have to be removed at a later date before chain inspection and relubrication.

A3.5 Chain Mountings

Double check to be sure that all chain fastening devices are secured and that all adjustments have been made to ensure uniform loading of multiple chain applications. Check chain anchors and pins for wear, breakage, and misalignment. Damaged anchors and pins should be replaced.

A3.6 Sheaves

Sheaves with badly worn flanges and outside diameter should be replaced. This wear may be due to chain misalignment or seized bearings.

A4 ENVIRONMENTAL CONDITIONS

A4.1 Effects of Environment

Environments in which material handling and lifting mechanisms operate can vary widely, from outdoor moisture to mildly corrosive or highly corrosive industrial atmospheres, in addition to abrasive exposures such as sand and grit. Some effects can be as follows:

Moisture: corrosive rusting reduces chain strength by pitting and cracking.

Temperature: low temperature reduces chain strength by embrittlement. Going in and out of cold storage results in moisture from condensation.

Chemical solutions or vapors: corrosives attach on the chain components and/or the mechanical connections between the chain components. Cracking can be (and often is) microscopic. Propagation to complete failure can be either abrupt or may require an extended period of time.

Abrasives: accelerated wearing and scoring of the articulating members of the chain (pins and plates), with a corresponding reduction in chain strength. Due to the inaccessibility of the bearing surfaces (pin surfaces and plate apertures), wear and scoring are not readily visible to the naked eye.

A4.2 Inspection for Chain Damage

Each specific application should be evaluated, based on the degree of exposure and the areas of possible operation, and to prevent chain failure, a chain replacement schedule should be established. This schedule can be determined through inspection and the frequency of inspection can be changed, based on the observations. This inspection procedure should continue until a projected time of replacement can be predicted.

A chain by its very nature and exposure should be considered an expendable item. It is further recommended that chain exposed to very low temperatures or chain used in corrosive atmospheres receive frequent and very thorough inspection until a reliable replacement cycle can be determined and a safe chain replacement schedule can be established.

A5 DYNAMIC IMPULSE/SHOCK LOADS

The following are examples of dynamic shock loading that can impose abnormal loads above the endurance limit of leaf chain:

(a) high velocity movement of load, followed by sudden, abrupt stops;

(b) carrying loads in suspension over irregular surfaces such as railroad tracks, potholes, and rough terrain;

(c) attempting to "inch" loads that are beyond the rated capacity of the handling or lifting mechanism.

The above load cycles and environmental conditions make it impossible to predict chain life. It is therefore necessary to conduct frequent inspections until replacement life can be predicted.

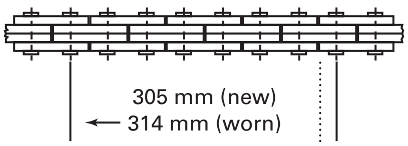
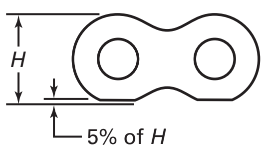
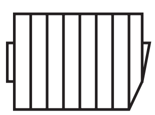
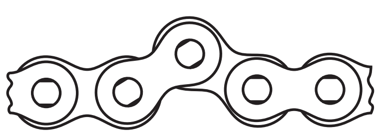
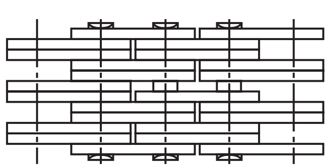
A6 PERIODIC INSPECTION

After each 30 days of operation (more frequently in hostile environments), leaf chains should be inspected and lubricated. Inspection details are described in Table A1. The inspection should focus on the details described in subparas. A6.1 through A6.4.

A6.1 Elongation

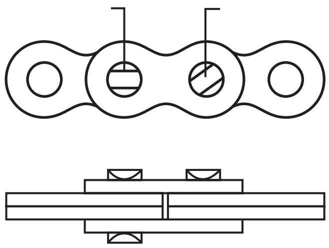
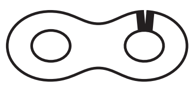
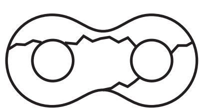
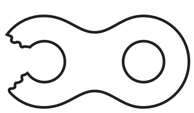
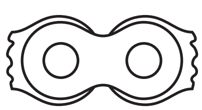
When a theoretical length of 12.000 in. per foot of new chain has elongated from wear to a length of 12.360 in., it should be discarded and replaced. It is important to measure the chain in the section that moves over the sheaves because it receives the most frequent articulation. Measuring the chain near its clevis terminals could give an erroneous reading, for it would not have flexed there as frequently, if at all, as it would near the middle of the assembly.

TABLE A1
PERIODIC INSPECTION ADDENDA

Appearance or Symptom	Probable Cause	Correction
Excessive length	Wear between pin and link plate apertures	Replace chain [Note (1)]
		3% wear elongation can reduce chain tensile strength by as much as 18%
Measure section of chain that runs over sheaves	Permanent deformation (stretch) from overload	Chain wear life can be improved by proper lubrication
3% wear elongation is normal maximum (refer to Table A2)		Replace chain
Worn link plate contour	Normal wear against sheave	Replace chain when wear reaches 5% of height
	Abnormal wear against guide	Correct alignment Increase clearance Replace chain
Worn edges of outside links or pin ends 	Misalignment, rubbing on guides	Correct alignment Increase clearance Replace chain
Tight joints 	Dirt or foreign matter packed in joints or Corrosion and rust or Bent pins	Clean and relubricate Replace chain Replace chain
Missing parts 	Missing at original assembly	Replace chain

(continued)

TABLE A1
PERIODIC INSPECTION ADDENDA (CONT'D)

Appearance or Symptom	Probable Cause	Correction
Abnormal protrusion or turned pins 	Excessive friction from heavy loading or inadequate lubrication	Eliminate overload Improve lubrication Replace chain
Cracked plates (fatigue)  Crack from aperture to edge of link plate, approximately 90 deg to pitch line	Load exceeded chain's dynamic capacity	Eliminate cause of overloading and replace chain with chain of greater dynamic capacity
Cracked plates (stress corrosion)  Arclike cracks from apertures to edge of link plate	Severe rusting, or exposure to acidic or caustic medium, plus static stress from press fit	Replace chain and protect from hostile environment
Fractured plates (tensile) 	Extreme overload	Eliminate cause of overload and replace chain
Enlarged plate holes 	High overload	Eliminate cause of overload and replace chain
Corrosion pitting	Exposure to corrosive environment (often salt or chlorides)	Replace chain and protect from hostile environment
Worn connecting clevis or clevis pins	Normal wear	Replace all worn components and realign as in original installation

NOTE:
(1) Chain tensile strength diminishes as the chain elongates from wear.

TABLE A2
WEAR ELONGATION

Chain Series	Chain Pitch, mm	Number of Pins in Span	Recommended Measuring Force, N [Note (1)]	Maximum Rec. Span Measurement, mm
BL 4	12.70	25	222	314
LL08			1180	
BL 5	15.87	21	334	327
LL10			222	
BL 6	19.05	17	489	314
LL12			290	
BL 8	25.40	13	845	314
LL16			600	
BL 10	31.75	11	1156	327
LL20			950	
BL 12	38.10	9	1512	314
LL24			1700	
BL 14	44.45	8	1913	320
LL28			2000	
BL 16	50.80	7	2891	314
LL32			2600	
BL 20	63.50	6	4337	327
LL40			3600	
LL48	76.20	5	5600	314

GENERAL NOTE: This table is based on a maximum wear elongation of 3%. The span measurement is from pin center to pin center for the number of pins indicated. Chains exceeding the maximum recommended span measurement should be replaced.

NOTE:
(1) The recommended measuring force is for 2 × 2 lacing. That force must be multiplied by a lacing factor to obtain the actual measuring force.

Lacing	Lacing Factor
2 × 2	1.0
2 × 3	1.0
3 × 4	1.5
4 × 4	2.0
4 × 6	2.0
6 × 6	3.0

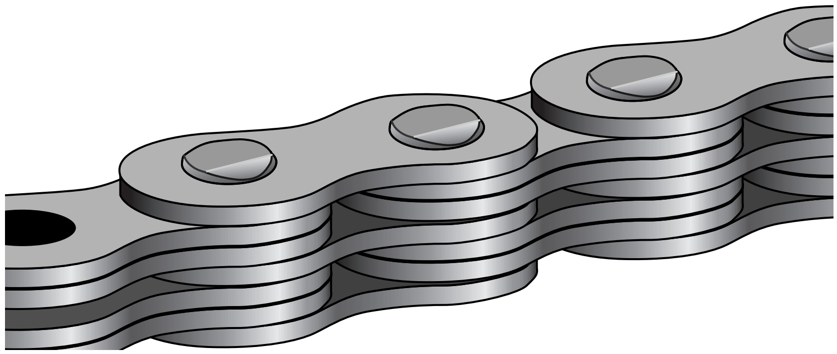


FIG. A1 DISTORTED OR BATTERED PLATES ON LEAF CHAIN CAN CAUSE TIGHT JOINTS AND PREVENT FLEXING

A6.2 Edge Wear

Check the chain for wear on the link plate edges, caused by running back and forth over the sheave. The maximum reduction of material should not exceed 5%. This can be compared to a normal link plate height by measuring a portion of chain that does not run over the sheave. See Fig. A1.

A6.3 Turning or Protruding Pins

Highly loaded chain, operating with inadequate lubrication, can generate abnormal frictional forces between pin and link plates. In extreme instances, the torque could surpass the press fit force between the pins and the outside plates, resulting in pin rotation.

When chain is allowed to operate in this condition, a pin, or series of pins, can begin to twist out of a chain, resulting in failure. The pin head rivets should be examined to determine if the "V" flats are still in correct alignment. Chain with rotated/displaced head or abnormal pin protrusion should be replaced immediately. Do not attempt to repair the chain by welding or driving the pin(s) back into the chain. Once the press fit integrity between outside plates and pins has been altered, it cannot be restored.

Any wear pattern on the pin heads or the sides of the link plates indicates misalignment in the system. This condition damages the chain as well as increases frictional loading, and should be corrected. See Fig. A2.

A6.4 Cracked Plates

Chains should periodically be inspected very carefully, front and back as well as side to side, for any evidence of cracked plates. If any crack is discovered, the chain(s) should be replaced in its entirety. It is important, however, to determine the cause of the crack before installing new chain so the condition does not repeat itself.

A6.4.1 Fatigue Cracking. Fatigue cracks are a result of repeated cyclic loading beyond the chain's endurance limit. The magnitude of the load and frequency of its occurrence are factors that determine when fatigue failure will occur. The loading can be continuous or intermittent (impulse load).

Fatigue cracks almost always start at the link plate aperture (point of highest stress) and perpendicular to the chain pitch line.

They are often microscopic in their early stage. Unlike a pure tensile failure, there is no noticeable yielding (stretch) of the material. See Fig. A3.

A6.4.2 Stress Corrosion Cracking. The outside link plates, which are heavily press-fitted to the pins, are particularly susceptible to stress corrosion cracking. Like fatigue cracks, these originate at the point of highest stress (aperture) but tend to extend in an arclike path between the holes in the pin plate.

More than one crack can often appear on a link plate. This condition, like rusting, can be caused by exposure to an acidic or caustic medium or atmosphere.

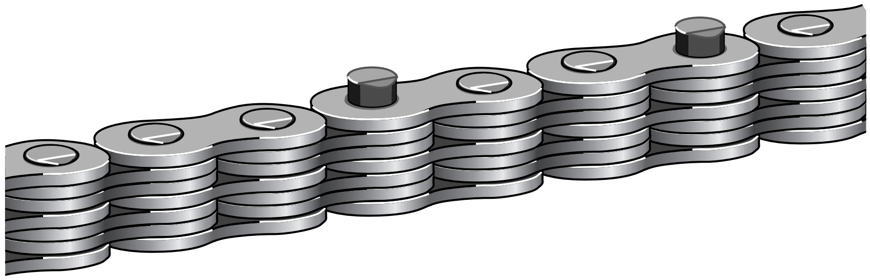


FIG. A2 OUT-OF-LINE FLATS ON V HEADS AND PROTRUDING HEADS: INDICATIONS THAT PINS MAY HAVE TURNED IN PLATES

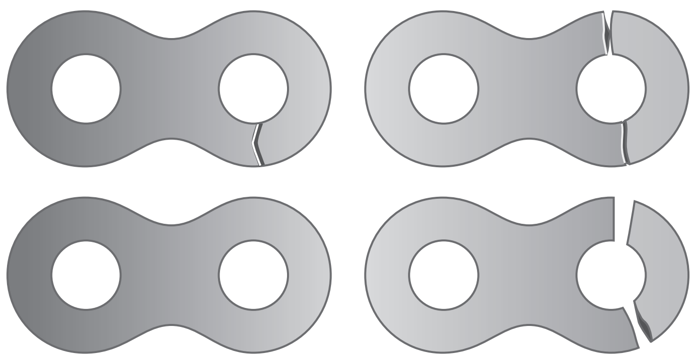


FIG. A3 CRACKED PLATES RESULTING FROM FATIGUE FAILURE

Stress corrosion is an environmentally assisted failure. Two conditions must be present: corrosive agent and static stress. In the chain, static stress is present at the aperture due to the press fit pin. No cyclic motion is required, and the plates can crack during idle periods. The reactions of many chemical agents (such as battery acid fumes) with hardened steel can liberate hydrogen, which attacks and weakens the steel grain structure.

For this same reason, never attempt to electroplate a leaf chain or its components. The plating process liberates hydrogen, and hydrogen embrittlement cracks will appear. These are similar in appearance to stress corrosion cracks.

If a plated chain is required, consult the manufacturer. Plated chains are assembled from modified, individually plated components, which may reduce the chain rating.

A6.4.3 Corrosion Fatigue. Corrosion fatigue cracks are very similar in appearance (in many cases identical) to normal fatigue cracks. They generally begin at the aperture and propagate perpendicular to the chain pitch line.

Corrosion fatigue is not the same as stress corrosion. Corrosion fatigue is the combined action of an aggressive environment and a cyclic stress (not static stress alone, as in stress corrosion).

A6.5 Other Modes of Failure

A6.5.1 Ultimate Strength Failure. This type of failure is caused by overloads far in excess of the design load. See Fig. A4.

A6.5.2 Tight Joints. All joints in leaf chain should flex freely. Thigh joints resist flexure and increase internal friction, thus increasing chain tension required to lift a given load. Increased tension accelerates wear and fatigue problems. See Fig. A5.

The following chart is based on a maximum wear elongation of 3%. The span measurement is from pin

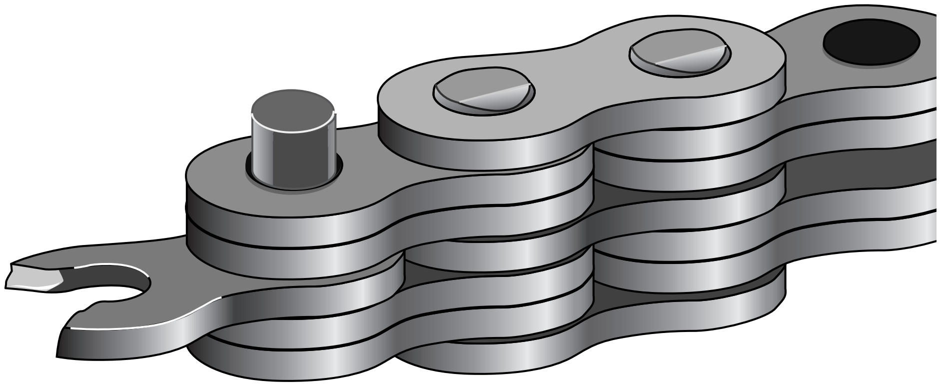


FIG. A4 BROKEN PLATE CAUSED BY OVERLOAD

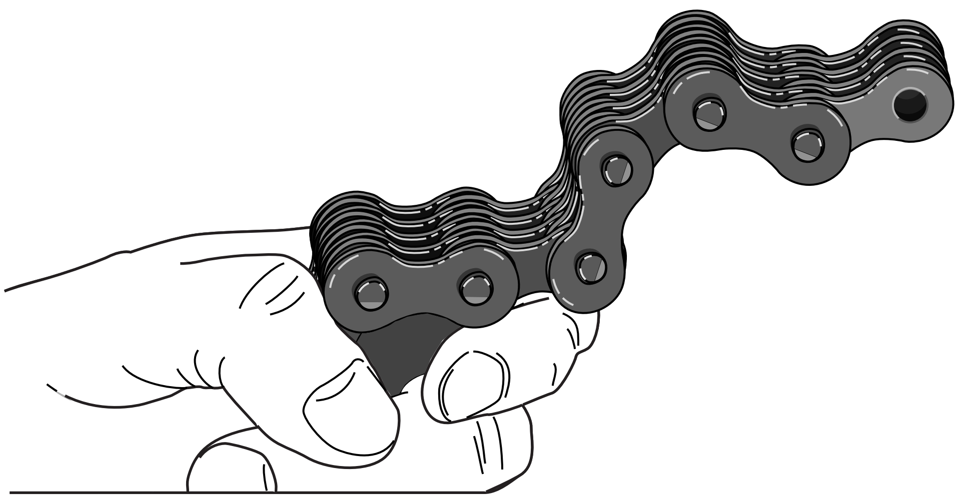


FIG. A5 TIGHT JOINTS PREVENTING PROPER FLEXING OF LEAF CHAIN

center to pin center for the number of pins indicated. Chains exceeding the maximum recommended span measurement should be replaced.

A7 LEAF CHAIN DISCONNECT INSTRUCTIONS

A7.1 Introduction

These disconnect instructions permit the disassembly of chain with a minimum of hazard while also protecting the design integrity of the chain. The following guidelines should be observed:

(a) Always use safety glasses to protect the eyes.

(b) Wear protective gloves and clothing, as appropriate.

(c) Be sure the chain is supported adequately during disassembly to prevent damage to chain components and to prevent uncontrolled movements of the chain.

(d) Use proper equipment.

(e) Discard removed components. Components should not be reused.

A7.2 General

Although the use of pressing equipment is preferred, this procedure assumes the use of a hammer and knockout punch. The use of pressing equipment is

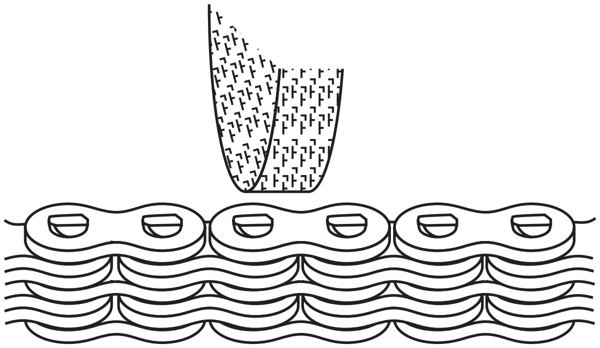


FIG. A6 GRINDING OFF THE PIN HEAD AT JOINT TO BE SEPARATED

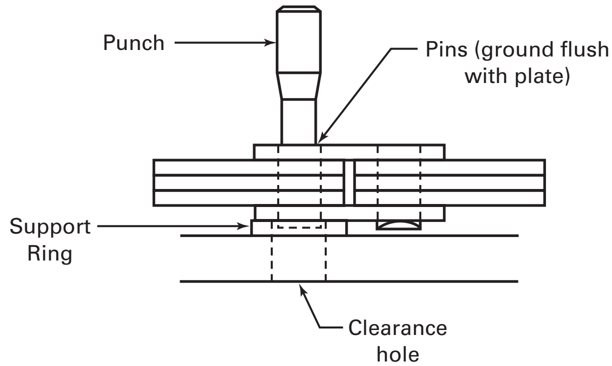


FIG. A7 LEAF CHAIN DISCONNECT

recommended when available. Disconnecting should be done on a workbench or other sturdy support surface.

When disconnecting chain, an entire pin link must be removed. Discard components after removal.

A7.3 Tools

Tool requirements are a grinding wheel, knockout punch, hammer, support ring, and a work surface with knockout aperture.

A7.4 Procedure

Step 1. Select the pin link to be removed. Be sure both pins are in the same pin link (both pins pressed through the same outside links). With the grinding wheel, grind the heads of both pins flush with the pin link plate. This prevents potential scoring damage to inside link apertures during disassembly. If the chain is exposed to grinding dust, it should be cleaned and relubricated. See Fig. A6.

Step 2. Position the support ring over the knockout aperture of the work surface. The support ring serves to support the bottom pin link plate and to prevent damage to chain components while driving the pin through the chain. The support ring should have an inside diameter slightly greater than the pin diameter and height equal to the exposed portion of the pin. The knockout aperture should provide room for the pin to extend beneath the work surface as it is driven through the top pin link plate.

Step 3. Standing the chain on its side, seat one pin of the designated pin link in the support ring.

Step 4. Drive the pin through the top pin link plate with a hammer and knockout punch. The knockout punch should have a diameter slightly less than the pin link plate aperture. Use steady, controlled blows.

Step 5. Repeat the above steps with the other pin in the pin link.

Step 6. Remove the pin link from the chain by hand. If both pins have been completely driven through the top pin link plate, the pin link should remove easily.

Step 7. Discard components. See Fig. A7.

A8 LEAF CHAIN CONNECT INSTRUCTIONS

A8.1 Introduction

These connect instructions permit the assembly of chain with a minimum of hazard while also protecting the design integrity of the chain. The following guidelines should be observed:

(a) Always use safety glasses to protect the eyes.

(b) Wear protective gloves and clothing, as appropriate.

(c) Be sure the chain is supported adequately during assembly to prevent damage to chain components and to prevent uncontrolled movements of the chain.

(d) Use proper equipment.

(e) All press fit parts (pins and outside plates) that are removed during chain preparation shall be discarded.

A8.2 General

Although the use of pressing equipment is preferred, this procedure assumes the use of a hammer and hand tools. The use of pressing equipment is recommended when available. Connecting should be done on a workbench or other sturdy surface.

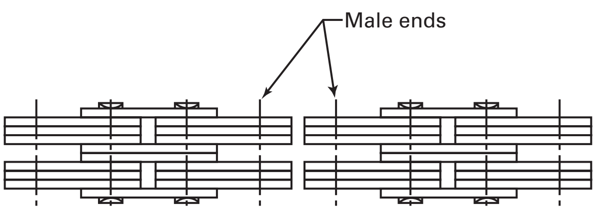
When connecting chain, an entire pin link must be installed.

A8.3 Tools

Tool requirements are hand punches, hammer, and a supporting work surface.

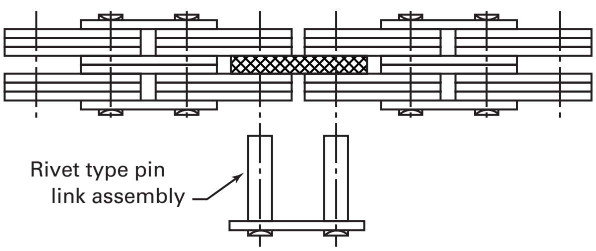
A8.4 Procedure

Step 1. Lay the two sections of chain on the workbench with male ends from each piece adjacent to each other.



Step 1

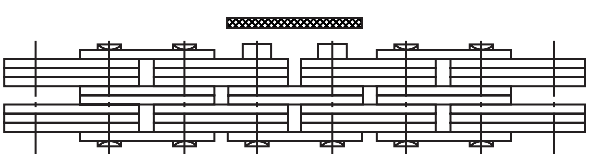
Step 2. Lace ends together using the proper number of loose fit inside links. Always use new, undamaged links.



Step 2

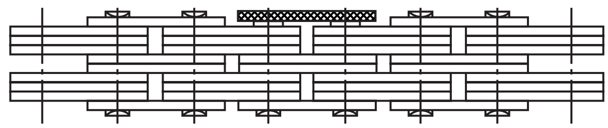
Step 3. Insert a new pin link assembly. Parts should always be from the same manufacturer as the chain.

Step 4. Flip the connected chain onto its side with pin ends facing upward.



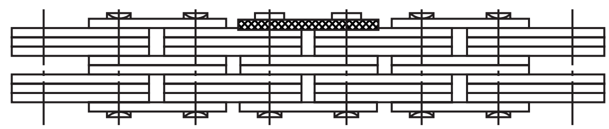
Step 4

Step 5. Place the press fit outside plate on the pins and, being sure that pin and holes are aligned, drive the plate on, using a hammer. Pin ends are now flush with the top side of the link plate.



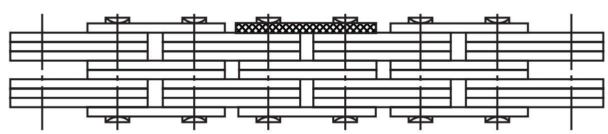
Step 5

Step 6. Use the setting punch and hammer to drive the plate the remaining distance. Pin end protrusion is controlled with depth of grove in setting punch.



Step 6

Step 7. Rivet the pin ends using the proper size riveting tool and hammer. Width of rivet head must meet specified dimensional minimum.



Step 7

Step 8. Inspect the connection for proper alignment and freedom of movement. Tight joints are not allowed. No damage to links during assembly is permissible. Any pins chipped during riveting must be removed and replaced.

Step 9. Connected section of chain is to be lubricated with a liberal application of oil.

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