

# **High-Strength Chains for Power Transmission and Tension Linkages**

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**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**

**ASME B29.28-2015**

# **High-Strength Chains for Power Transmission and Tension Linkages**

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**The American Society of  
Mechanical Engineers**

Two Park Avenue • New York, NY • 10016 USA

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# CONTENTS

Foreword .....	iv
Committee Roster .....	v
Correspondence With the B29 Committee .....	vi
<b>1 Scope .....</b>	<b>1</b>
<b>2 High-Strength Roller Chains .....</b>	<b>1</b>
<b>3 References .....</b>	<b>2</b>
<b>Figure</b>	
1 High-Strength Roller Chain and Components .....	3
<b>Tables</b>	
1 General Chain Dimensions, in. and lb .....	4
1M General Chain Dimensions, mm and N .....	4
2 Dimensional Limits for Interchangeability, in. ....	5
2M Dimensional Limits for Interchangeability, mm .....	5
<b>Nonmandatory Appendices</b>	
A Supplementary Information on Chain Selection for Drives .....	7
B Supplementary Information on Chain Selection for Tension Linkages ....	19

# FOREWORD

For many years, several manufacturers have provided a line of high-strength chains for use on certain construction equipment and other machinery that encounter high starting or shock loads. These high-strength chains generally have medium-carbon, through-hardened pins to withstand high shock loads and solid rollers to withstand very high tooth pressures. These chains are normally offered only in heavy series.

In 2014, the ASME B29 Committee decided to develop a new standard to cover these high-strength chains. The new standard is intended to list limiting dimensions to ensure interchangeability, to set forth minimum tensile strength and dynamic strength values, and to provide supplemental information concerning the application of high-strength chains. This Standard was approved as an American National Standard on September 9, 2015.

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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 that are necessary to explain the question; however, they should not contain proprietary names or information.

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

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# HIGH-STRENGTH CHAINS FOR POWER TRANSMISSION AND TENSION LINKAGES

## 1 SCOPE

This Standard covers roller chains that are specifically designed to withstand occasional high shock loads or high starting loads that are encountered in certain construction equipment and other severe-duty applications.

**WARNING:** Chains covered in this Standard shall not be used as the primary lifting member, or in the direct drive line of elevators, escalators, or similar devices for lifting human passengers unless applied in accordance with ASME A17.1. Chains covered in this Standard shall not be used as climbing chains.

## 2 HIGH-STRENGTH ROLLER CHAINS

### 2.1 Nomenclature

*high-strength roller chain:* roller chain consisting of a series of alternately assembled roller links [see Fig. 1, illustrations (a) and (b)] and pin links [see Fig. 1, illustration (c) and *pin link*] in which the pins articulate inside the bushings and the rollers are free to turn on the bushings. The pins and bushings are press fit in their respective link plates.

*roller link:* link consisting of two roller link plates A–A, two bushings B–B, and two rollers C–C.

*pin link:* link consisting of two pin link plates E–E, and two pins F–F.

NOTES:

- (1) Only heavy series high-strength roller chains are covered in this Standard.
- (2) Multiple-strand high-strength roller chains are not covered in this Standard.

*cotter-type connecting link:* link consisting of a pin link plate E, two cross-drilled pins G–G, and a detachable pin link plate D, retained by two cotters H–H. Cotter-type connecting links are used to connect the chain end-less on a drive, or to connect the ends of the chain to terminal fittings in a tension linkage [see Fig. 1, illustration (d)]. Some manufacturers may use a retention means other than, but equivalent to, cotters.

NOTE: Offset links for high-strength roller chains are not covered in this Standard.

### 2.2 General Proportions

The general proportions of high-strength roller chains are the same as for heavy series chains listed in ASME B29.1.

### 2.3 Numbering System

For chains covered in this Standard, the right-hand digit in the number is a zero. The numbers to the left of the right-hand digit denote the number of eighths-of-an-inch in the chain pitch. The letters following the chain number shall be “HE,” with the letter “H” denoting heavy series and the letter “E” denoting high-tensile strength.

### 2.4 Chain Strength Requirements

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

**WARNING:** The M.U.T.S. is NOT a working load! The M.U.T.S. greatly exceeds the maximum force that may be applied to the chain in service.

(a) *Test Specimen.* A length of chain, containing not less than five free pitches, shall be submitted for testing.

(b) *Test Procedure.* A tensile force shall be applied slowly, not to exceed 2.0 in./min (50.8 mm/min), in a uniaxial direction, to the ends of the test specimen.

(c) *Conformance.* Chains conforming to this Standard shall have a M.U.T.S. equal to or greater than the value listed for that specific chain listed in Table 1 or 1M.

**WARNING:** The tensile test is a destructive test! Even though the chain might not visibly fail when subjected to the minimum ultimate tensile force, it will have been damaged and will be unfit for service.

**2.4.2 Minimum Dynamic Strength.** Only high-strength chains are subject to the minimum dynamic strength requirement; connecting links are not.

**WARNING:** The dynamic test values are not valid characteristics for designing actual applications. Neither the specified values nor the test results are to be interpreted as allowable working loads.

(a) *Test Procedure.* The chain shall be tested according to the conformance test described in ASME B29.26.

(b) *Conformance.* Chains covered in this Standard shall survive a conformance test at load listed for the subject chain in Table 1 or 1M.

**WARNING:** The dynamic test is a destructive test! Even though the chain might have survived the test without failure, it will have been damaged and will be unfit for service.



## 2.5 Chain Preloading

Chains covered in this Standard shall be preloaded during manufacture by applying an axial tensile force equal to a minimum of 30% of the M.U.T.S. listed for the subject chain in Table 1 or 1M.

## 2.6 Chain Length

**2.6.1 Measuring Load.** Measuring load is the tensile force under which the chain is to be measured. It is equal to  $125 \times (\text{chain pitch in inches})^2$  in pounds, with a minimum of 70 lb (0.31 kN), and a maximum of 1,000 lb (4.45 kN). Length measurements are to be taken over a length of at least 12 in. (300 mm).

**2.6.2 Chain Length Tolerance.** New chains, under standard measuring load, shall not be underlength. Overlength tolerance, under standard measuring load, is  $0.001/(\text{pitch, in inches})^2 + 0.015$ , in./ft.

## 2.7 General Chain Dimensions

See Tables 1 and 1M.

## 2.8 Dimensional Limits for Interchangeability

See Tables 2 and 2M.

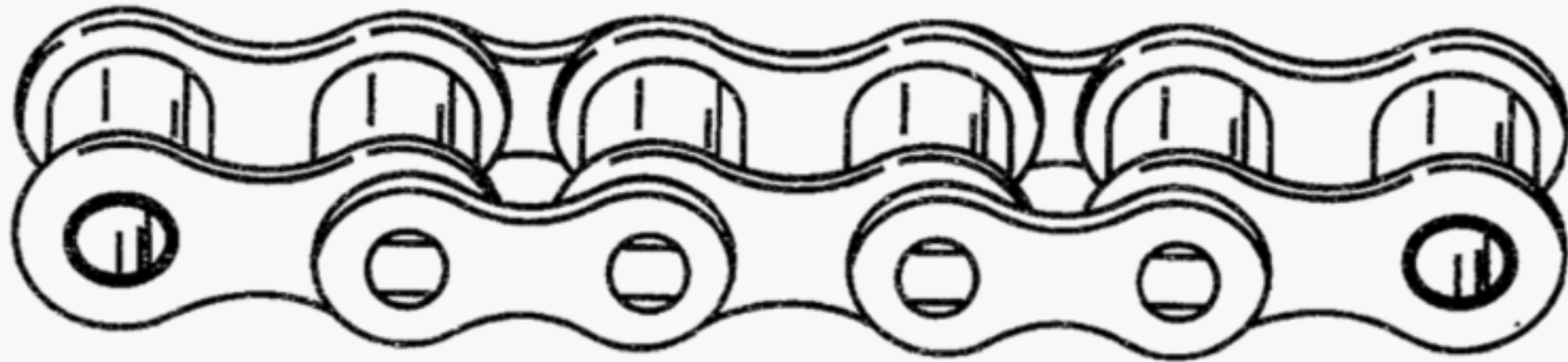
## 3 REFERENCES

The following is a list of publications referenced in this Standard. Unless otherwise specified, the standard(s) referenced shall be the most recently issued at the time of order placement.

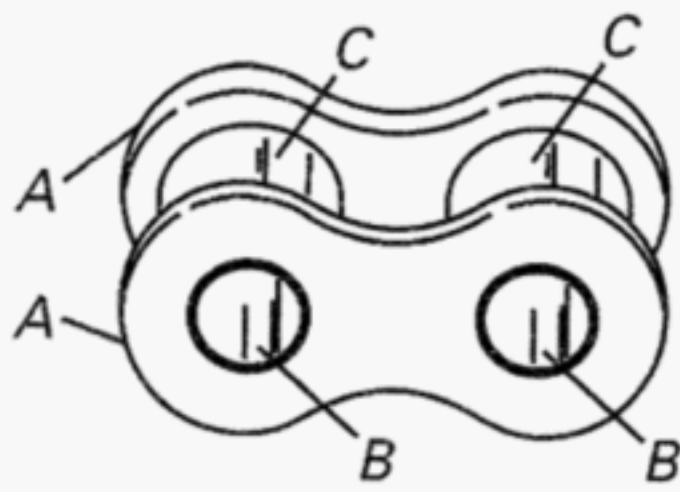
ASME A17.1, Safety Code for Elevators and Escalators  
 ASME B29.1, Precision Power Transmission Roller Chains, Attachments, and Sprockets  
 ASME B29.26, Fatigue Testing Power Transmission Roller Chain

Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990 ([www.asme.org](http://www.asme.org))

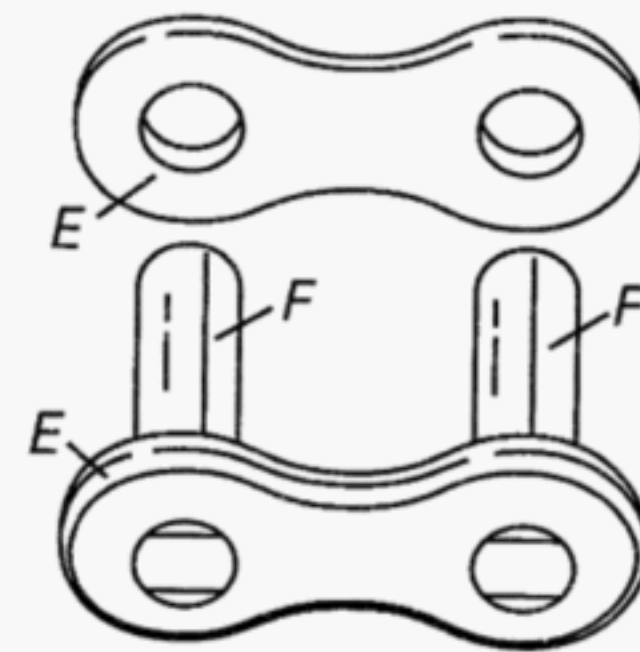
**Fig. 1 High-Strength Roller Chain and Components**



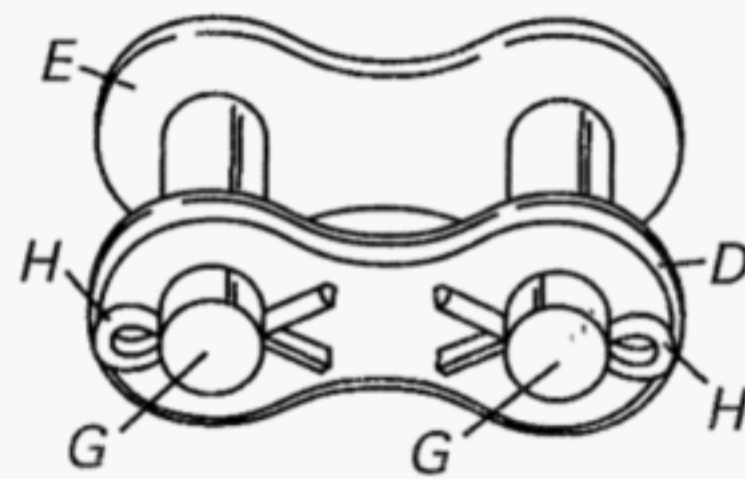
**(a) High-Strength Roller Chain**



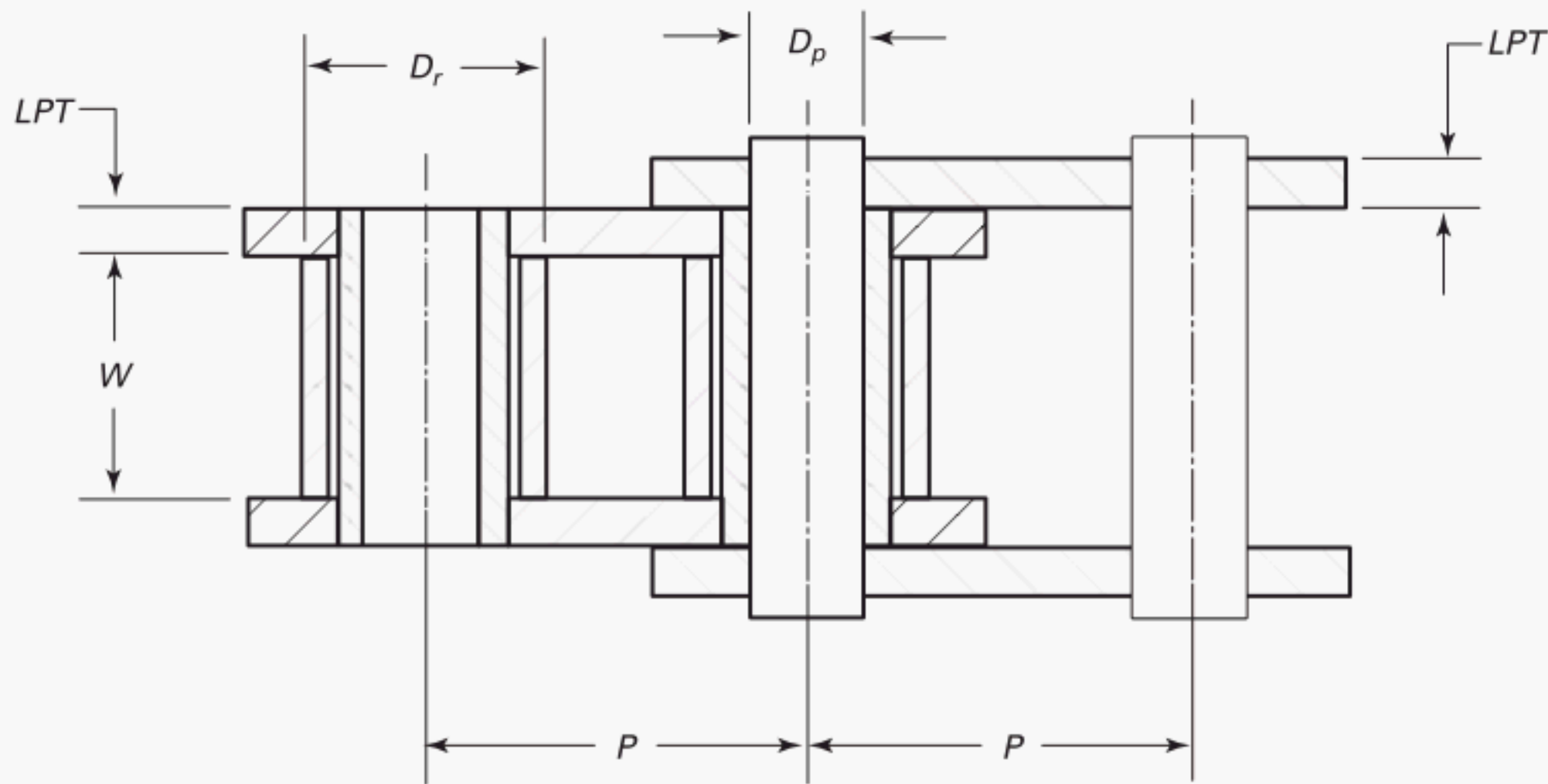
**(b) Roller Link**



**(c) Pin Link**



**(d) Cotter-Type Connecting Link**

**Table 1 General Chain Dimensions, in. and lb**

$D_p$  = pin diameter  
 $D_r$  = roller diameter  
 $LPT$  = link plate thickness  
 $P$  = chain pitch  
 $W$  = chain width between roller link plates

Chain Number	Pitch, $P$	Maximum Roller Diameter, $D_r$	Nominal Width, $W$	Nominal Pin Diameter, $D_p$	Link Plate Thickness, $LPT$	Maximum Width Over Regular Pin	Add for Connecting Pin Head	Length Tolerance, in./ft	Measuring Load, lb	M.U.T.S., lb	Minimum Dynamic Strength, lb
60HE	0.75	0.469	0.500	0.234	0.125	1.19	0.17	0.017	70	9,330	1,420
80HE	1.00	0.625	0.625	0.312	0.156	1.47	0.20	0.016	125	15,600	2,400
100HE	1.25	0.750	0.750	0.375	0.187	1.75	0.23	0.016	195	23,400	3,590
120HE	1.50	0.875	1.000	0.437	0.219	2.16	0.27	0.015	281	32,800	5,000
140HE	1.75	1.000	1.000	0.500	0.250	2.32	0.30	0.015	383	43,600	6,560
160HE	2.00	1.125	1.250	0.562	0.281	2.73	0.34	0.015	500	56,200	8,290
180HE	2.25	1.406	1.406	0.687	0.312	3.04	0.37	0.015	633	69,900	10,200
200HE	2.50	1.562	1.562	0.781	0.375	3.43	0.40	0.015	781	93,500	12,700
240HE	3.00	1.875	1.875	0.937	0.500	4.38	0.47	0.015	1,000	149,000	18,300

**Table 1M General Chain Dimensions, mm and N**

Chain Number	Pitch, $P$	Maximum Roller Diameter, $D_r$	Nominal Width, $W$	Nominal Pin Diameter, $D_p$	Link Plate Thickness, $LPT$	Maximum Width Over Regular Pin	Add for Connecting Pin Head	Length Tolerance, mm/m	Measuring Load, N	M.U.T.S., kN	Minimum Dynamic Strength, N
60HE	19.05	11.91	12.70	5.94	3.18	30.23	4.32	1.417	311	41.5	6 330
80HE	25.40	15.88	15.88	7.92	3.96	37.34	5.08	1.333	556	69.2	10 700
100HE	31.75	19.05	19.05	9.53	4.75	44.45	5.84	1.333	867	104.0	16 000
120HE	38.10	22.23	25.40	11.10	5.56	54.86	6.86	1.250	1 250	146.0	22 200
140HE	44.45	25.40	25.40	12.70	6.35	58.93	7.62	1.250	1 704	194.0	29 200
160HE	50.80	28.58	31.75	14.27	7.14	69.34	8.64	1.250	2 224	250.0	36 900
180HE	57.15	35.71	35.71	17.45	7.92	77.22	9.40	1.250	2 816	311.0	45 200
200HE	63.50	39.67	39.67	19.84	9.53	87.12	10.16	1.250	3 474	416.0	56 600
240HE	76.20	47.63	47.63	23.80	12.70	111.25	11.94	1.250	4 448	664.0	81 400

**Table 2 Dimensional Limits for Interchangeability, in.**

Chain Number Chain Pitch	60HE 0.75	80HE 1.00	100HE 1.25	120HE 1.50	140HE 1.75	160HE 2.00	180HE 2.25	200HE 2.50	240HE 3.00
Min. distance between roller link plates	0.495	0.620	0.744	0.993	0.993	1.242	1.397	1.490	1.864
Max. width of roller link	0.765	0.956	1.146	1.464	1.530	1.846	2.067	2.295	2.935
Min. distance between pin link plates	0.767	0.958	1.148	1.466	1.532	1.848	2.069	2.297	2.937
Max. pin diameter	0.2346	0.3126	0.3756	0.4374	0.5004	0.5626	0.6874	0.7815	0.9374
Min. hole in bushing	0.2354	0.3134	0.3764	0.4386	0.5016	0.5634	0.6886	0.7823	0.9386

**Table 2M Dimensional Limits for Interchangeability, mm**

Chain Number Chain Pitch	60HE 19.05	80HE 25.40	100HE 31.75	120HE 38.10	140HE 44.45	160HE 50.80	180HE 57.15	200HE 63.50	240HE 76.20
Min. distance between roller link plates	12.57	15.75	18.90	25.22	25.22	31.55	35.48	37.85	47.35
Max. width of roller link	19.43	24.28	29.11	37.19	38.86	46.89	52.50	58.29	74.55
Min. distance between pin link plates	19.48	24.33	29.16	37.24	38.91	46.94	52.55	58.34	74.60
Max. pin diameter	5.96	7.94	9.54	11.11	12.71	14.29	17.46	19.85	23.81
Min. hole in bushing	5.98	7.96	9.56	11.14	12.74	14.31	17.49	19.87	23.84

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# NONMANDATORY APPENDIX A

## SUPPLEMENTARY INFORMATION ON CHAIN SELECTION FOR DRIVES

### A-1 DESIGN FACTORS

#### A-1.1 General

The horsepower ratings in Tables A-1 through A-9 generally apply to lubricated single-pitch, single-strand roller chains for heavy series chains defined in this Standard. The horsepower ratings reflect a service factor of 1, a chain length of 100 pitches, use of interference-fit connecting links, use of recommended lubrication methods, and a drive arrangement where two aligned sprockets are mounted on parallel shafts in a horizontal plane. Under these conditions, approximately 15,000 hr of service life at full-load operation can be expected.

Substantial increases in rated speeds and loads may be utilized, as when a service life of less than 15,000 hr is satisfactory, or when full-load operation is encountered only during a portion of the required service life.

It is beyond the scope of this Standard to present selection procedures for all conditions. Consult chain manufacturers for assistance with these or any other special application requirements.

#### A-1.2 Drive Selection

The horsepower ratings relate to the speed of the smaller sprocket, and drive selections are made on this basis, whether the drive is speed reducing or speed increasing.

Drives with more than two sprockets, idlers, composite duty cycles, or other unusual conditions require special consideration. Consult chain manufacturers for selections of this nature.

Where quietness or extra smooth operation are of special importance, a small-pitch chain operating over large-diameter sprockets will minimize noise and vibration.

When making drive selections, consideration is given to the loads imposed on the chain by the type of input power and the type of equipment to be driven. Service factors are used to compensate for these loads, and the required horsepower rating of the chain is determined by the following equation:

$$\text{Required HP} = \text{HP to be transmitted} \times \text{service factor}$$

### A-2 SERVICE FACTORS

The service factors in Table A-10 are for normal chain loading. For unusual or extremely severe operating conditions not shown in this table, it is desirable to use larger service factors.

The service factors shown in Table A-10 do not account for large inertial loads imposed on the chain by starts or sudden stops when the chain is fully loaded. Consult the chain manufacturer for advice on the absolute maximum tension that may be applied to the chain. A high-strength roller chain should never be loaded to more than 50% of its M.U.T.S.

### A-3 LUBRICATION

It has been shown that a separating wedge of fluid lubricant is formed in operating chain joints, much like that formed in journal bearings. Therefore, fluid lubricant must be applied to ensure an oil supply to the joints and minimize metal-to-metal contact. Lubrication, if supplied in sufficient volume, also provides effective cooling and impact damping at the higher speeds. For this reason, it is important that the lubrication recommendations be followed.

#### NOTES:

- (1) The horsepower rating tables apply only to drives lubricated in the manner specified in the tables.
- (2) Zero values in the horsepower rating tables indicate speeds beyond the maximum recommended. Operation at these speeds might result in excessive chain joint galling, regardless of the volume of lubricant applied.

Chain drives should be protected against dirt and moisture, and the oil supply should be kept free of contamination. Periodic oil change is desirable. A good grade of nondetergent petroleum-base oil is recommended. Heavy oils and greases are generally too stiff to enter and fill the chain joints. Table A-11 indicates the proper lubricant viscosity for various surrounding temperatures.

There are three basic types of lubrication for chain drives. The recommended type shown in the horsepower rating tables is influenced by chain speed and the amount of power transmitted.

These are minimum lubrication requirements, and the use of a better type (e.g., Type C instead of Type B) is acceptable and might be beneficial. Chain life can vary

appreciably, depending upon the way the drive is lubricated. The better the lubrication, the longer the chain life. For this reason, it is important that the lubrication recommendations be followed when using the ratings given in these tables.

### A-3.1 Type A — Manual or Drip Lubrication

(a) For manual lubrication, oil is applied copiously with a brush or spout can at least once every 8 hr of operation. Volume and frequency should be sufficient to prevent overheating of the chain or discoloration in the chain joints.

(b) For drip lubrication, oil drops are directed between the link plate edges from a drip lubricator. Volume and frequency should be sufficient to prevent discoloration of lubricant in the chain joints. Precaution must be taken against misdirection of the drops by windage.

### A-3.2 Type B — Bath or Disc Lubrication

(a) For bath lubrication, the lower strand of chain runs through a sump of oil in the drive housing. The oil level should reach the pitch line of the chain at its lowest point while operating.

(b) For disc lubrication, the chain operates above the oil level. The disc picks up oil from the sump and deposits it onto the chain, usually by means of a trough. The diameter of the disc should be such as to produce rim speeds between 600 ft/min (182.9 m/min) and 8,000 ft/min (2.44 km/min).

### A-3.3 Type C — Oil Stream Lubrication

The lubricant is usually supplied by a circulating pump capable of supplying each chain drive with a continuous stream of oil. The oil should be directed at the slack strand, and applied inside the chain loop and evenly across the chain width.

Consult chain manufacturers when it appears desirable to use a type of lubrication other than that recommended.

## A-4 SPROCKETS

Sprockets should have tooth form, thickness, profile, and diameters conforming to ASME B29.1. Sprockets with fewer than 25 teeth should have an odd number of teeth to equalize wear on all of the teeth. Sprockets with 25 teeth or less should have hardened teeth. Normally, large sprockets should not exceed 120 teeth.

## A-5 CENTER DISTANCE

In general, a center distance of 30 chain pitches to 50 chain pitches is most desirable. The distance between the sprocket centers should provide at least a 120-deg chain wrap on the smaller sprocket.

Drives may be installed with either adjustable or fixed center distances. Adjustable centers simplify the control of chain slack.

For drives on fixed centers, an idler or shoe may be used to provide slack adjustment. These devices may also be used to control backlash, or to ensure a 120-deg minimum chain wrap on the smaller sprocket. Idler sprockets should have at least three teeth engaging the chain. There should be at least three free pitches of chain between engagement points on adjacent sprockets.

NOTE: Sufficient housing clearance must always be provided for the slack chain to obtain full chain life.

## A-6 ALIGNMENT

Accurate alignment of shafts and sprocket tooth faces provides uniform distribution of the load across the entire chain width and contributes substantially to optimum drive life. Shafting, bearings, and foundations should be suitable to maintain the initial alignment. Periodic maintenance should include an inspection of alignment to ensure optimum chain life.

## A-7 GUARDING

Adequate guarding should be provided to contain the chain in the event that a broken chain is thrown off a drive while operating at speed.

If the chain is used in a hoist or other lifting device (not for human passengers), a brake or other restraining device should be provided to stop and hold the load in the event of a broken chain.

## A-8 HORSEPOWER RATINGS TABLES

To use the horsepower ratings in Tables A-1 through A-9 properly, the following factors must be taken into consideration:

(a) *Service Factors.* See Table A-10.

(b) *Lubrication.* The horsepower established from the sprocket and speed combination of the drive under consideration will indicate a method of lubrication. This method or a better one must be used to obtain optimum chain life.

NOTES:

- (1) The horsepower ratings permit the use of interference-fit connecting links. Chains using slip-fit connecting links might not meet these ratings.
- (2) The horsepower ratings in Tables A-1 through A-9 are identical to those for heavy series chains in ASME B29.1. They are reprinted here for convenience.

Table A-1 Horsepower Ratings, Single-Strand Roller Chain No. 60HE (0.750 in. Pitch)

No. of Teeth	Small Sprocket Speed, Revolutions/min																								
	10	25	50	90	100	200	300	400	500	600	800	1,000	1,200	1,400	1,600	1,800	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000
11	0.22	0.53	1.02	1.80	1.99	3.87	5.72	7.53	9.33	11.12	14.66	15.58	11.85	9.41	7.70	6.45	5.51	3.94	3.00	2.38	1.95	1.63	1.39	1.21	0.00
12	0.24	0.57	1.12	1.96	2.17	4.23	6.24	8.22	10.18	12.13	15.99	17.75	13.51	10.72	8.77	7.35	6.28	4.49	3.42	2.71	2.22	1.86	1.59	0.00	
13	0.26	0.62	1.21	2.13	2.35	4.58	6.76	8.90	11.03	13.14	17.32	20.02	15.23	12.08	9.89	8.29	7.08	5.06	3.85	3.06	2.50	2.10	1.79	0.00	
14	0.28	0.67	1.30	2.29	2.53	4.93	7.27	9.59	11.88	14.15	18.65	22.37	17.02	13.51	11.05	9.26	7.91	5.66	4.31	3.42	2.80	2.34	0.00	0.00	
15	0.30	0.72	1.40	2.45	2.71	5.28	7.79	10.27	12.73	15.16	19.99	24.76	18.87	14.98	12.26	10.27	8.77	6.28	4.77	3.79	3.10	2.60	0.00	0.00	
16	0.32	0.77	1.49	2.62	2.90	5.63	8.31	10.96	13.58	16.17	21.32	26.41	20.79	16.50	13.51	11.32	9.66	6.91	5.26	4.17	3.42	0.00			
17	0.34	0.81	1.58	2.78	3.08	5.99	8.83	11.64	14.43	17.18	22.65	28.06	22.77	18.07	14.79	12.40	10.58	7.57	5.76	4.57	3.74	0.00			
18	0.36	0.86	1.67	2.94	3.26	6.34	9.35	12.33	15.27	18.20	23.98	29.71	24.81	19.69	16.11	13.51	11.53	8.25	6.28	4.98	1.06	0.00			
19	0.38	0.91	1.77	3.11	3.44	6.69	9.87	13.01	16.12	19.21	25.32	31.36	26.91	21.35	17.48	14.65	12.50	8.95	6.81	5.40	0.00				
20	0.40	0.96	1.86	3.27	3.62	7.04	10.39	13.70	16.97	20.22	26.65	33.01	29.06	23.06	18.87	15.82	13.51	9.66	7.35	5.83	0.00				
21	0.42	1.00	1.95	3.44	3.80	7.39	10.91	14.38	17.82	21.23	27.98	34.66	31.26	24.81	20.31	17.02	14.53	10.40	7.91	4.87	0.00				
22	0.44	1.05	2.05	3.60	3.98	7.75	11.43	15.07	18.67	22.24	29.31	36.32	33.52	26.60	21.77	18.25	15.58	11.15	8.48	0.00					
23	0.46	1.10	2.14	3.76	4.16	8.10	11.95	15.75	19.52	23.25	30.65	37.97	35.84	28.44	23.28	19.51	16.66	11.92	9.07	0.00					
24	0.48	1.15	2.23	3.93	4.34	8.45	12.47	16.44	20.37	24.26	31.98	39.62	38.20	30.31	24.81	20.79	17.75	12.70	9.66	0.00					
25	0.50	1.20	2.33	4.09	4.52	8.80	12.99	17.12	21.21	25.27	33.31	41.27	40.61	32.23	26.38	22.11	18.87	13.51	10.27	0.00					
26	0.52	1.24	2.42	4.25	4.71	9.15	13.51	17.81	22.06	26.28	34.64	42.92	43.07	34.18	27.98	23.44	20.02	14.32	4.17	0.00					
28	0.56	1.34	2.61	4.58	5.07	9.86	14.55	19.18	23.76	28.30	37.31	46.22	48.14	38.20	31.26	26.20	22.37	16.01	0.00						
30	0.60	1.43	2.79	4.91	5.43	10.56	15.59	20.55	25.46	30.33	39.97	49.52	53.38	42.36	34.67	29.06	24.81	17.75	0.00						
32	0.64	1.53	2.98	5.23	5.79	11.27	16.63	21.92	27.15	32.35	42.64	52.82	58.81	46.67	38.20	32.01	27.33	11.45	0.00						
35	0.69	1.67	3.26	5.73	6.33	12.32	18.19	23.97	29.70	35.38	46.63	57.77	67.27	53.38	43.69	36.62	31.26	0.00							
40	0.79	1.91	3.72	6.54	7.24	14.08	20.79	27.40	33.94	40.43	53.30	66.03	78.66	65.22	53.38	44.74	29.65	0.00							
45	0.89	2.15	4.19	7.36	8.14	15.84	23.38	30.82	38.18	45.49	59.96	74.28	88.49	77.83	63.70	37.00	0.00								
Type A [Note (1)]			Type B [Note (2)]											Type C [Note (3)]											

NOTES:

(1) Type A: Manual or drip lubrication

(2) Type B: Bath or disc lubrication

(3) Type C: Oil stream lubrication



Table A-2 Horsepower Ratings, Single-Strand Roller Chain No. 80HE (1.000 in. Pitch)

No. of Teeth	Small Sprocket Speed, Revolutions/min																											
	10	25	50	70	100	150	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000	2,200	2,400	3,000	3,300	3,600	4,000	4,500
11	0.49	1.19	2.31	3.19	4.50	6.64	8.75	12.91	17.02	21.08	25.12	29.12	27.41	22.97	19.61	17.00	14.92	11.84	9.69	8.12	6.93	6.01	5.27	3.77	3.27	2.87	2.45	0.00
12	0.54	1.30	2.52	3.48	4.91	7.24	9.54	14.09	18.57	23.00	27.40	31.77	31.23	26.17	22.35	19.37	17.00	13.49	11.04	9.25	7.90	6.85	6.01	4.30	3.73	3.27	2.79	0.00
13	0.58	1.40	2.73	3.77	5.31	7.84	10.34	15.26	20.11	24.92	29.68	34.42	35.22	29.51	25.20	21.84	19.17	15.21	12.45	10.43	8.91	7.72	6.78	4.85	4.20	3.69	0.00	
14	0.63	1.51	2.94	4.06	5.72	8.45	11.13	16.43	21.66	26.83	31.97	37.07	39.36	32.98	28.16	24.41	21.42	17.00	13.91	11.66	9.96	8.63	7.57	5.42	4.70	2.02	0.00	
15	0.67	1.62	3.15	4.35	6.13	9.05	11.93	17.61	23.21	28.75	34.25	39.71	43.65	36.58	31.23	27.07	23.76	18.85	15.43	12.93	11.04	9.57	8.40	6.01	5.21	0.00		
16	0.72	1.73	3.36	4.64	6.54	9.65	12.73	18.78	24.75	30.67	36.53	42.36	48.08	40.30	34.41	29.82	26.17	20.77	17.00	14.25	12.16	10.54	9.25	6.62	0.00			
17	0.76	1.84	3.57	4.94	6.95	10.26	13.52	19.95	26.30	32.59	38.82	45.01	51.17	44.13	37.68	32.66	28.66	22.75	18.62	15.60	13.32	11.55	10.13	7.25	0.00			
18	0.81	1.94	3.78	5.23	7.36	10.86	14.32	21.13	27.85	34.50	41.10	47.66	54.17	48.08	41.05	35.59	31.23	24.78	20.29	17.00	14.51	12.58	11.04	1.88	0.00			
19	0.85	2.05	3.99	5.52	7.77	11.46	15.11	22.30	29.40	36.42	43.38	50.30	57.18	52.15	44.52	38.59	33.87	26.88	22.00	18.44	15.74	13.64	11.97	0.00				
20	0.90	2.16	4.20	5.81	8.18	12.07	15.91	23.48	30.94	38.34	45.67	52.95	60.19	56.32	48.08	41.68	36.58	29.03	23.76	19.91	17.00	14.74	12.93	0.00				
21	0.94	2.27	4.41	6.10	8.59	12.67	16.70	24.65	32.49	40.25	47.95	55.60	63.20	60.59	51.73	44.84	39.36	31.23	25.56	21.42	18.29	15.85	13.91					
22	0.99	2.38	4.62	6.39	8.99	13.27	17.50	25.82	34.04	42.17	50.24	58.25	66.21	64.97	55.47	48.08	42.20	33.49	27.41	22.97	19.61	17.00	14.92					
23	1.03	2.48	4.83	6.68	9.40	13.88	18.29	27.00	35.58	44.09	52.52	60.89	69.22	69.45	59.30	51.40	45.11	35.80	29.30	24.55	20.97	18.17	15.95					
24	1.08	2.59	5.04	6.97	9.81	14.48	19.09	28.17	37.13	46.00	54.80	63.54	72.23	74.03	63.21	54.79	48.08	38.16	31.23	26.17	22.35	19.37	5.44					
25	1.12	2.70	5.25	7.26	10.22	15.09	19.88	29.35	38.68	47.92	57.09	66.19	75.24	78.70	67.20	58.25	51.12	40.57	33.20	27.83	23.76	20.59	0.00					
26	1.17	2.81	5.46	7.55	10.63	15.69	20.68	30.52	40.23	49.84	59.37	68.84	78.25	83.47	71.27	61.78	54.22	43.02	35.22	29.51	25.20	16.77	0.00					
28	1.26	3.03	5.88	8.13	11.45	16.90	22.27	32.87	43.32	53.67	63.94	74.13	84.27	93.29	79.65	69.04	60.59	48.08	39.36	32.98	28.16	0.00						
30	1.34	3.24	6.31	8.71	12.27	18.10	23.86	35.21	46.41	57.50	68.50	79.43	90.29	101.10	88.33	76.57	67.20	53.33	43.65	36.58	12.26	0.00						
32	1.43	3.46	6.73	9.29	13.08	19.31	25.45	37.56	49.51	61.34	73.07	84.72	96.31	107.84	97.31	84.35	74.03	58.75	48.08	39.43	0.00							
35	1.57	3.78	7.36	10.16	14.31	21.12	27.84	41.08	54.15	67.09	79.92	92.67	105.34	117.95	111.31	96.49	84.68	67.20	55.00	5.58	0.00							
40	1.79	4.32	8.41	11.61	16.35	24.14	31.81	46.95	61.89	76.67	91.34	105.90	120.39	134.80	136.00	117.88	103.46	82.10	14.36	0.00								
45	2.02	4.86	9.46	13.06	18.40	27.15	35.79	52.82	69.62	86.25	102.75	119.14	135.44	151.65	162.28	140.66	123.45	43.25	0.00									
Type A [Note (1)]				Type B [Note (2)]																			Type C [Note (3)]					

## NOTES:

- (1) Type A: Manual or drip lubrication  
 (2) Type B: Bath or disc lubrication  
 (3) Type C: Oil stream lubrication

Table A-3 Horsepower Ratings, Single-Strand Roller Chain No. 100HE (1.250 in. Pitch)

No. of Teeth	Small Sprocket Speed, Revolutions/min																								
	10	25	50	58	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,700	3,000	3,500
11	0.93	2.23	4.34	5.01	8.45	16.43	24.25	31.96	39.60	47.18	40.03	32.77	27.46	23.45	20.32	17.84	14.15	11.58	9.71	8.29	7.19	6.31	5.28	4.51	0.00
12	1.01	2.44	4.74	5.46	9.21	17.93	26.46	34.87	43.20	51.46	45.61	37.33	31.29	26.71	23.16	20.32	16.13	13.20	11.06	9.45	8.19	7.19	6.02	5.14	0.00
13	1.09	2.64	5.13	5.92	9.98	19.42	28.66	37.78	46.80	55.75	51.43	42.10	35.28	30.12	26.11	22.92	18.18	14.88	12.47	10.65	9.23	8.10	6.79	5.80	0.00
14	1.18	2.84	5.53	6.37	10.75	20.91	30.86	40.68	50.40	60.04	57.48	47.05	39.43	33.66	29.18	25.61	20.32	16.63	13.94	11.90	10.32	9.05	7.59	0.00	0.00
15	1.26	3.04	5.92	6.83	11.52	22.41	33.07	43.59	54.00	64.33	63.75	52.18	43.73	37.33	32.36	28.40	22.54	18.45	15.46	13.20	11.44	10.04	8.42	0.00	0.00
16	1.35	3.25	6.32	7.28	12.29	23.90	35.27	46.49	57.60	68.62	70.23	57.48	48.17	41.13	35.65	31.29	24.83	20.32	17.03	14.54	12.60	11.06	0.00	0.00	0.00
17	1.43	3.45	6.71	7.74	13.05	25.39	37.48	49.40	61.20	72.91	76.91	62.95	52.76	45.05	39.04	34.27	27.19	22.26	18.65	15.93	13.80	12.12	0.00	0.00	0.00
18	1.52	3.65	7.11	8.19	13.82	26.89	39.68	52.31	64.80	77.20	83.80	68.59	57.48	49.08	42.54	37.33	29.63	24.25	20.32	17.35	15.04	2.94	0.00	0.00	0.00
19	1.60	3.86	7.50	8.65	14.59	28.38	41.89	55.21	68.40	81.48	90.88	74.38	62.34	53.22	46.13	40.49	32.13	26.30	22.04	18.82	16.31	0.00	0.00	0.00	0.00
20	1.68	4.06	7.89	9.10	15.36	29.88	44.09	58.12	72.00	85.77	98.15	80.33	67.32	57.48	49.82	43.73	34.70	28.40	23.80	20.32	7.77	0.00	0.00	0.00	0.00
21	1.77	4.26	8.29	9.56	16.13	31.37	46.30	61.02	75.60	90.06	104.43	86.43	72.43	61.85	53.61	47.05	37.33	30.56	25.61	21.87	0.00	0.00	0.00	0.00	0.00
22	1.85	4.46	8.68	10.01	16.89	32.86	48.50	63.93	79.20	94.35	109.40	92.68	77.67	66.31	57.48	50.45	40.03	32.77	27.46	21.67	0.00	0.00	0.00	0.00	0.00
23	1.94	4.67	9.08	10.47	17.66	34.36	50.71	66.83	82.80	98.64	114.37	99.07	83.02	70.89	61.44	53.93	42.79	35.03	29.35	2.94	0.00	0.00	0.00	0.00	0.00
24	2.02	4.87	9.47	10.92	18.43	35.85	52.91	69.74	86.40	102.93	119.34	105.60	88.50	75.56	65.49	57.48	45.61	37.33	31.29	0.00	0.00	0.00	0.00	0.00	0.00
25	2.10	5.07	9.87	11.38	19.20	37.34	55.12	72.65	90.00	107.22	124.32	112.27	94.09	80.33	69.63	61.11	48.49	39.69	29.68	0.00	0.00	0.00	0.00	0.00	0.00
26	2.19	5.28	10.26	11.83	19.97	38.84	57.32	75.55	93.60	111.51	129.29	119.07	99.79	85.20	73.85	64.81	51.43	42.10	11.58	0.00	0.00	0.00	0.00	0.00	0.00
28	2.36	5.68	11.05	12.75	21.50	41.83	61.73	81.36	100.80	120.08	139.24	133.07	111.52	95.22	82.53	72.43	57.48	47.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	2.53	6.09	11.84	13.66	23.04	44.81	66.14	87.18	108.00	128.66	149.18	147.58	123.68	105.60	91.53	80.33	63.75	19.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	2.69	6.49	12.63	14.57	24.57	47.80	70.55	92.99	115.20	137.24	159.13	162.58	136.25	116.33	100.84	88.50	70.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	2.95	7.10	13.82	15.93	26.88	52.28	77.16	101.71	126.00	150.10	174.04	185.97	155.85	133.07	115.34	101.23	33.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	3.37	8.12	15.79	18.21	30.72	59.75	88.18	116.23	144.00	171.55	198.91	226.11	190.42	162.58	140.92	82.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	3.79	9.13	17.76	20.48	34.55	67.22	99.21	130.76	162.00	192.99	223.77	254.38	227.21	194.00	85.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Type A [Note (1)]			Type B [Note (2)]												Type C [Note (3)]										

NOTES:

(1) Type A: Manual or drip lubrication

(2) Type B: Bath or disc lubrication

(3) Type C: Oil stream lubrication



Table A-4 Horsepower Ratings, Single-Strand Roller Chain No. 120HE (1.500 in. Pitch)

No. of Teeth	Small Sprocket Speed, Revolutions/min																								Type A [Note (1)]	Type B [Note (2)]	Type C [Note (3)]
	5	10	25	50	75	100	150	200	300	400	500	600	700	800	900	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,700			
11	0.79	1.54	3.72	7.23	10.67	14.06	20.76	27.36	40.38	53.22	65.93	58.37	46.32	37.91	31.77	27.13	20.64	16.38	13.40	11.23	9.59	8.31	7.30	6.11	0.00		
12	0.86	1.68	4.05	7.89	11.64	15.34	22.64	29.85	44.05	58.06	71.93	66.51	52.78	43.20	36.20	30.91	23.51	18.66	15.27	12.80	10.93	9.47	8.31	1.06	0.00		
13	0.94	1.82	4.39	8.54	12.61	16.62	24.53	32.33	47.72	62.90	77.92	74.99	59.51	48.71	40.82	34.85	26.51	21.04	17.22	14.43	12.32	10.68	9.37	0.00			
14	1.01	1.96	4.73	9.20	13.58	17.90	26.42	34.82	51.39	67.73	83.92	83.81	66.51	54.44	45.62	38.95	29.63	23.51	19.25	16.13	13.77	11.94	4.55	0.00			
15	1.08	2.10	5.07	9.86	14.55	19.18	28.30	37.31	55.06	72.57	89.91	92.95	73.76	60.37	50.59	43.20	32.86	26.08	21.34	17.89	15.27	13.24	0.00				
16	1.15	2.24	5.41	10.52	15.52	20.46	30.19	39.79	58.73	77.41	95.90	102.39	81.26	66.51	55.74	47.59	36.20	28.73	23.51	19.71	16.83	0.00					
17	1.23	2.38	5.74	11.17	16.49	21.73	32.08	42.28	62.40	82.25	101.90	112.14	88.99	72.84	61.04	52.12	39.65	31.46	25.75	21.58	18.43	0.00					
18	1.30	2.52	6.08	11.83	17.46	23.01	33.96	44.77	66.07	87.09	107.89	122.18	96.96	79.36	66.51	56.78	43.20	34.28	28.06	23.51	4.23	0.00					
19	1.37	2.66	6.42	12.49	18.43	24.29	35.85	47.26	69.74	91.93	113.89	132.50	105.15	86.06	72.13	61.58	46.85	37.18	30.43	25.50	0.00						
20	1.44	2.80	6.76	13.14	19.40	25.57	37.74	49.74	73.41	96.76	119.88	142.81	113.56	92.95	77.89	66.51	50.59	40.15	32.86	24.58	0.00						
21	1.51	2.94	7.09	13.80	20.37	26.85	39.63	52.23	77.08	101.60	125.87	149.95	122.18	100.00	83.81	71.56	54.44	43.20	35.36	0.00							
22	1.59	3.08	7.43	14.46	21.34	28.13	41.51	54.72	80.75	106.44	131.87	157.09	131.01	107.23	89.87	76.73	58.37	46.32	37.91	0.00							
23	1.66	3.22	7.77	15.12	22.31	29.41	43.40	57.20	84.42	111.28	137.86	164.23	140.04	114.62	96.06	82.02	62.39	49.51	38.38	0.00							
24	1.73	3.36	8.11	15.77	23.28	30.68	45.29	59.69	88.10	116.12	143.86	171.37	149.28	122.18	102.39	87.43	66.51	52.78	12.24	0.00							
25	1.80	3.50	8.45	16.43	24.25	31.96	47.17	62.18	91.77	120.96	149.85	178.51	158.70	129.90	108.86	92.95	70.71	56.11	0.00								
26	1.87	3.64	8.78	17.09	25.22	33.24	49.06	64.66	95.44	125.79	155.84	185.65	168.32	137.77	115.46	98.58	74.99	59.51	0.00								
28	2.02	3.93	9.46	18.40	27.16	35.80	52.83	69.64	102.78	135.47	167.83	199.94	188.11	153.97	129.03	110.17	83.81	30.35	0.00								
30	2.16	4.21	10.14	19.72	29.10	38.36	56.61	74.61	110.12	145.15	179.82	214.22	208.62	170.75	143.10	122.18	92.95	0.00									
32	2.31	4.49	10.81	21.03	31.04	40.91	60.38	79.59	117.46	154.82	191.81	228.50	229.83	188.11	157.65	134.60	88.71	0.00									
35	2.52	4.91	11.82	23.00	33.95	44.75	66.04	87.05	128.47	169.34	209.79	249.92	262.89	215.17	180.33	153.97	12.54	0.00									
40	2.88	5.61	13.51	26.29	38.80	51.14	75.48	99.48	146.83	193.53	239.76	285.62	321.19	262.89	220.32	118.61	0.00										
45	3.24	6.31	15.20	29.58	43.65	57.53	84.91	111.92	165.18	217.72	269.73	321.32	372.57	278.98	148.03	0.00											
Type A [Note (1)]			Type B [Note (2)]																		Type C [Note (3)]						

## NOTES:

- (1) Type A: Manual or drip lubrication  
 (2) Type B: Bath or disc lubrication  
 (3) Type C: Oil stream lubrication

Table A-5 Horsepower Ratings, Single-Strand Roller Chain No. 140HE (1.750 in. Pitch)

No. of Teeth	Small Sprocket Speed, Revolutions/min																								Type A [Note (1)]	Type B [Note (2)]	Type C [Note (3)]
	5	10	25	44	50	75	100	150	200	300	400	500	600	700	800	900	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400			
11	1.21	2.36	5.69	9.79	11.07	16.34	21.54	31.79	41.90	61.84	81.50	86.80	66.03	52.40	42.89	35.94	30.69	23.35	18.53	15.16	12.71	10.85	9.40	8.25	0.00		
12	1.32	2.58	6.21	10.68	12.08	17.83	23.50	34.68	45.71	67.46	88.91	98.90	75.24	59.70	48.87	40.95	34.97	26.60	21.11	17.28	14.48	12.36	10.72	0.00			
13	1.43	2.79	6.73	11.57	13.08	19.31	25.45	37.57	49.52	73.08	96.32	111.52	84.83	67.32	55.10	46.18	39.43	29.99	23.80	19.48	16.33	13.94	0.00				
14	1.55	3.01	7.24	12.46	14.09	20.80	27.41	40.46	53.32	78.70	103.73	124.63	94.81	75.24	61.58	51.61	44.06	33.52	26.60	21.77	18.25	15.58	0.00				
15	1.66	3.22	7.76	13.35	15.10	22.28	29.37	43.35	57.13	84.32	111.14	137.69	105.15	83.44	68.29	57.23	48.87	37.17	29.50	24.15	20.24	0.00					
16	1.77	3.44	8.28	14.24	16.10	23.77	31.33	46.24	60.94	89.94	118.55	146.87	115.83	91.92	75.24	63.05	53.83	40.95	32.50	26.60	22.29	0.00					
17	1.88	3.65	8.80	15.13	17.11	25.25	33.29	49.13	64.75	95.56	125.96	156.05	126.86	100.67	82.40	69.05	58.96	44.85	35.59	29.13	0.00						
18	1.99	3.86	9.31	16.02	18.12	26.74	35.24	52.02	68.56	101.19	133.37	165.23	138.22	109.68	89.77	75.24	64.24	48.87	38.78	31.74	0.00						
19	2.10	4.08	9.83	16.92	19.12	28.22	37.20	54.90	72.37	106.81	140.78	174.41	149.89	118.95	97.36	81.59	69.66	53.00	42.06	33.55	0.00						
20	2.21	4.29	10.35	17.81	20.13	29.71	39.16	57.79	76.18	112.43	148.19	183.59	161.88	128.46	105.15	88.12	75.24	57.23	45.42	0.00							
21	2.32	4.51	10.87	18.70	21.14	31.20	41.12	60.68	79.99	118.05	155.60	192.77	174.17	138.22	113.13	94.81	80.95	61.58	48.87	0.00							
22	2.43	4.72	11.38	19.59	22.14	32.68	43.08	63.57	83.80	123.67	163.01	201.95	186.76	148.21	121.30	101.66	86.80	66.03	52.40	0.00							
23	2.54	4.94	11.90	20.48	23.15	34.17	45.03	66.46	87.60	129.29	170.42	211.13	199.64	158.43	129.67	108.67	92.78	70.58	29.48	0.00							
24	2.65	5.15	12.42	21.37	24.16	35.65	46.99	69.35	91.41	134.91	177.83	220.31	212.80	168.87	138.22	115.83	98.90	75.24	0.00								
25	2.76	5.37	12.94	22.26	25.16	37.14	48.95	72.24	95.22	140.54	185.24	229.49	226.24	179.53	146.94	123.15	105.15	79.99	0.00								
26	2.87	5.58	13.45	23.15	26.17	38.62	50.91	75.13	99.03	146.16	192.65	238.67	239.95	190.41	155.85	130.61	111.52	84.83	0.00								
28	3.09	6.01	14.49	24.93	28.18	41.59	54.82	80.91	106.65	157.40	207.47	257.03	268.16	212.80	174.17	145.97	124.63	41.32	0.00								
30	3.31	6.44	15.52	26.71	30.20	44.56	58.74	86.69	114.27	168.64	222.28	275.39	297.40	236.00	193.16	161.88	138.22	0.00									
32	3.53	6.87	16.56	28.49	32.21	47.54	62.66	92.47	121.88	179.89	237.10	293.74	327.63	259.99	212.80	178.34	152.27	0.00									
35	3.86	7.51	18.11	31.16	35.23	51.99	68.53	101.14	133.31	196.75	259.33	321.28	374.76	297.40	243.41	203.99	66.13	0.00									
40	4.41	8.59	20.70	35.61	40.26	59.42	78.32	115.59	152.36	224.86	296.38	367.18	437.42	363.35	264.26	74.76	0.00										
45	4.97	9.66	23.28	40.06	45.29	66.85	88.11	130.04	171.40	252.96	333.43	413.08	492.09	352.89	132.45	0.00											

## NOTES:

- (1) Type A: Manual or drip lubrication  
 (2) Type B: Bath or disc lubrication  
 (3) Type C: Oil stream lubrication

**Table A-6 Horsepower Ratings, Single-Strand Roller Chain No. 160HE (2.000 in. Pitch)**

No. of Teeth	Small Sprocket Speed, Revolutions/min																									Type C [Note (3)]		
	2	5	10	25	40	50	75	100	150	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000	2,200			
11	0.73	1.75	3.40	8.19	12.86	15.94	23.52	31.00	45.75	60.31	89.00	117.32	96.58	73.47	58.31	47.72	39.99	34.15	29.60	25.98	20.61	16.87	14.14	12.07	0.00			
12	0.79	1.91	3.71	8.94	14.03	17.39	25.66	33.82	49.91	65.79	97.10	127.98	110.05	83.72	66.44	54.38	45.57	38.91	33.73	29.60	23.49	19.22	16.11	12.02	0.00			
13	0.86	2.07	4.02	9.68	15.20	18.83	27.80	36.64	54.07	71.27	105.19	138.65	124.09	94.40	74.91	61.31	51.38	43.87	38.03	33.37	26.48	21.68	18.17	0.00	0.00			
14	0.92	2.22	4.33	10.43	16.37	20.28	29.93	39.46	58.23	76.75	113.28	149.31	138.68	105.50	83.72	68.52	57.43	49.03	42.50	37.30	29.60	24.23	8.08	0.00	0.00			
15	0.99	2.38	4.64	11.17	17.54	21.73	32.07	42.27	62.39	82.24	121.37	159.98	153.80	117.00	92.85	75.99	63.69	54.38	47.13	41.37	32.83	26.87	0.00	0.00	0.00			
16	1.05	2.54	4.94	11.92	18.71	23.18	34.21	45.09	66.55	87.72	129.46	170.64	169.43	128.89	102.28	83.72	70.16	59.90	51.92	45.57	36.16	29.60	0.00	0.00	0.00			
17	1.12	2.70	5.25	12.66	19.88	24.63	36.35	47.91	70.71	93.20	137.55	181.31	185.56	141.16	112.02	91.69	76.84	65.61	56.87	49.91	39.61	0.00	0.00	0.00	0.00			
18	1.19	2.86	5.56	13.41	21.05	26.08	38.49	50.73	74.87	98.68	145.64	191.97	202.17	153.80	122.05	99.90	83.72	71.48	61.96	54.38	43.15	0.00	0.00	0.00	0.00			
19	1.25	3.02	5.87	14.15	22.22	27.53	40.63	53.55	79.03	104.17	153.74	202.64	219.25	166.79	132.36	108.33	90.79	77.52	67.19	58.97	43.82	0.00	0.00	0.00	0.00			
20	1.32	3.18	6.18	14.89	23.39	28.98	42.76	56.37	83.19	109.65	161.83	213.30	236.79	180.13	142.95	117.00	98.05	83.72	72.57	63.69	0.00	0.00	0.00	0.00	0.00			
21	1.38	3.34	6.49	15.64	24.56	30.42	44.90	59.18	87.35	115.13	169.92	223.97	254.77	193.81	153.80	125.88	105.50	90.07	78.08	68.52	0.00	0.00	0.00	0.00	0.00			
22	1.45	3.49	6.80	16.38	25.73	31.87	47.04	62.00	91.51	120.61	178.01	234.63	273.18	207.82	164.91	134.98	113.12	96.58	83.72	73.47	0.00	0.00	0.00	0.00	0.00			
23	1.52	3.65	7.11	17.13	26.90	33.32	49.18	64.82	95.67	126.10	186.10	245.30	292.02	222.15	176.29	144.29	120.92	103.24	89.49	68.24	0.00	0.00	0.00	0.00	0.00			
24	1.58	3.81	7.42	17.87	28.07	34.77	51.32	67.64	99.83	131.58	194.19	255.96	311.27	236.79	187.91	153.80	128.89	110.05	95.39	21.76	0.00	0.00	0.00	0.00	0.00			
25	1.65	3.97	7.73	18.62	29.23	36.22	53.45	70.46	103.99	137.06	202.28	266.63	330.32	251.74	199.77	163.51	137.03	117.00	101.41	0.00	0.00	0.00	0.00	0.00	0.00			
26	1.71	4.13	8.03	19.36	30.40	37.67	55.59	73.28	108.14	142.54	210.37	277.29	343.53	267.00	211.88	173.42	145.33	124.09	67.09	0.00	0.00	0.00	0.00	0.00	0.00			
28	1.85	4.45	8.65	20.85	32.74	40.57	59.87	78.91	116.46	153.51	226.56	298.62	369.96	298.39	236.79	193.81	162.42	135.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
30	1.98	4.77	9.27	22.34	35.08	43.46	64.15	84.55	124.78	164.47	242.74	319.95	396.38	330.92	262.61	214.94	180.13	49.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
32	2.11	5.08	9.89	23.83	37.42	46.36	68.42	90.18	133.10	175.44	258.92	341.28	422.81	364.56	289.30	236.79	157.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
35	2.31	5.56	10.82	26.07	40.93	50.71	74.84	98.64	145.58	191.88	283.20	373.28	462.45	417.01	330.92	270.86	22.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
40	2.64	6.35	12.36	29.79	46.78	57.95	85.53	112.73	166.38	219.30	323.65	426.60	528.51	509.49	345.15	57.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
45	2.97	7.15	13.91	33.51	52.62	65.19	96.22	126.82	187.17	246.71	364.11	479.93	594.58	495.96	173.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Type A [Note (1)]				Type B [Note (2)]																		Type C [Note (3)]						

## NOTES:

- (1) Type A: Manual or drip lubrication  
 (2) Type B: Bath or disc lubrication  
 (3) Type C: Oil stream lubrication

Table A-7 Horsepower Ratings, Single-Strand Roller Chain No. 180HE (2.250 in. Pitch)

No. of Teeth	Small Sprocket Speed, Revolutions/min																							
	2	5	10	25	37	50	75	100	150	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800	2,000
11	0.99	2.40	4.66	11.24	16.38	21.87	32.27	42.54	62.78	82.75	122.13	148.32	106.13	80.73	64.07	52.44	43.95	37.52	32.52	28.54	22.65	18.54	15.54	0.00
12	1.09	2.62	5.09	12.26	17.87	23.86	35.21	46.41	68.49	90.28	133.24	169.00	120.92	91.99	73.00	59.75	50.07	42.75	37.06	32.52	25.81	21.12	2.40	0.00
13	1.18	2.83	5.51	13.29	19.36	25.84	38.14	50.28	74.20	97.80	144.34	190.25	136.35	103.72	82.31	67.37	56.46	48.21	41.79	36.67	29.10	23.82	0.00	0.00
14	1.27	3.05	5.94	14.31	20.85	27.83	41.08	54.14	79.91	105.32	155.44	204.89	152.38	115.92	91.99	75.29	63.10	53.87	46.70	40.98	32.52	10.23	0.00	0.00
15	1.36	3.27	6.36	15.33	22.33	29.82	44.01	58.01	85.61	112.85	166.55	219.52	169.00	128.56	102.02	83.50	69.98	59.75	51.79	45.45	36.07	0.00	0.00	0.00
16	1.45	3.49	6.78	16.35	23.82	31.81	46.94	61.88	91.32	120.37	177.65	234.16	186.17	141.63	112.39	91.99	77.09	65.82	57.05	50.07	39.74	0.00	0.00	0.00
17	1.54	3.71	7.21	17.37	25.31	33.80	49.88	65.74	97.03	127.89	188.75	248.79	203.90	155.11	123.09	100.75	84.43	72.09	62.49	54.84	0.00	0.00	0.00	0.00
18	1.63	3.92	7.63	18.40	26.80	35.78	52.81	69.61	102.74	135.42	199.86	263.43	222.15	169.00	134.11	109.77	91.99	78.54	68.08	59.75	0.00	0.00	0.00	0.00
19	1.72	4.14	8.06	19.42	28.29	37.77	55.75	73.48	108.45	142.94	210.96	278.06	240.92	183.27	145.44	119.04	99.76	85.18	73.83	64.80	0.00	0.00	0.00	0.00
20	1.81	4.36	8.48	20.44	29.78	39.76	58.68	77.35	114.15	150.46	222.06	292.70	260.19	197.93	157.07	128.56	107.74	91.99	79.74	55.31	0.00	0.00	0.00	0.00
21	1.90	4.58	8.90	21.46	31.27	41.75	61.62	81.21	119.86	157.99	233.17	307.33	279.94	212.96	169.00	138.32	115.92	98.97	85.79	0.00	0.00	0.00	0.00	0.00
22	1.99	4.80	9.33	22.48	32.76	43.74	64.55	85.08	125.57	165.51	244.27	321.97	300.17	228.35	181.21	148.32	124.30	106.13	87.35	0.00	0.00	0.00	0.00	0.00
23	2.08	5.01	9.75	23.50	34.25	45.72	67.48	88.95	131.28	173.03	255.37	336.60	320.87	244.10	193.70	158.54	132.87	113.45	29.32	0.00	0.00	0.00	0.00	0.00
24	2.17	5.23	10.18	24.53	35.74	47.71	70.42	92.82	136.98	180.56	266.48	351.24	342.02	260.19	206.47	169.00	141.63	120.92	0.00	0.00	0.00	0.00	0.00	0.00
25	2.26	5.45	10.60	25.55	37.22	49.70	73.35	96.68	142.69	188.08	277.58	365.87	363.62	276.62	219.51	179.67	150.57	96.16	0.00	0.00	0.00	0.00	0.00	0.00
26	2.35	5.67	11.03	26.57	38.71	51.69	76.29	100.55	148.40	195.60	288.68	380.51	385.66	293.38	232.81	190.55	159.69	37.53	0.00	0.00	0.00	0.00	0.00	0.00
28	2.53	6.10	11.87	28.61	41.69	55.66	82.15	108.28	159.81	210.65	310.89	409.77	431.00	327.87	260.19	212.96	146.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	2.71	6.54	12.72	30.66	44.67	59.64	88.02	116.02	171.23	225.69	333.09	439.04	477.99	363.62	288.56	236.18	30.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	2.89	6.98	13.57	32.70	47.65	63.62	93.89	123.75	182.64	240.74	355.30	468.31	526.58	400.58	317.89	199.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	3.17	7.63	14.84	35.77	52.11	69.58	102.69	135.36	199.77	263.31	388.61	512.22	602.34	458.22	363.62	28.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	3.62	8.72	16.96	40.88	59.56	79.52	117.36	154.69	228.31	300.93	444.13	585.39	725.24	559.83	123.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	4.07	9.81	19.08	45.99	67.00	89.46	132.03	174.03	256.84	338.54	499.64	658.57	750.00	333.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Type A [Note (1)]				Type B [Note (2)]				Type C [Note (3)]																

## NOTES:

- (1) Type A: Manual or drip lubrication  
 (2) Type B: Bath or disc lubrication  
 (3) Type C: Oil stream lubrication



**Table A-8 Horsepower Ratings, Single-Strand Roller Chain No. 200HE (2.500 in. Pitch)**

No. of Teeth	Small Sprocket Speed, Revolutions/min																							
	2	5	10	25	33	50	75	100	150	200	250	300	400	500	600	700	800	900	1,000	1,100	1,200	1,400	1,600	1,800
11	1.37	3.31	6.44	15.51	20.25	30.17	44.53	58.70	86.63	114.18	141.46	168.52	161.36	115.46	87.83	69.70	57.05	47.81	40.82	35.38	31.05	24.64	20.17	0.00
12	1.50	3.61	7.02	16.92	22.09	32.92	48.58	64.03	94.51	124.57	154.32	183.84	183.86	131.56	100.08	79.42	65.00	54.48	46.51	40.32	35.38	28.08	18.78	0.00
13	1.62	3.91	7.61	18.33	23.93	35.66	52.63	69.37	102.38	134.95	167.18	199.16	207.31	148.34	112.85	89.55	73.30	61.43	52.45	45.46	39.90	31.66	0.00	0.00
14	1.75	4.21	8.19	19.74	25.77	38.40	56.68	74.71	110.26	145.33	180.04	214.48	231.69	165.78	126.11	100.08	81.91	68.65	58.61	50.80	44.59	35.38	0.00	0.00
15	1.87	4.51	8.78	21.15	27.61	41.15	60.73	80.04	118.13	155.71	192.90	229.80	256.95	183.86	139.87	110.99	90.85	76.13	65.00	56.34	49.45	0.00		
16	2.00	4.81	9.36	22.56	29.45	43.89	64.77	85.38	126.01	166.09	205.76	245.12	283.07	202.55	154.08	122.27	100.08	83.87	71.61	62.07	54.48	0.00		
17	2.12	5.11	9.95	23.97	31.29	46.63	68.82	90.71	133.88	176.47	218.62	260.44	310.02	221.83	168.75	133.91	109.61	91.86	78.43	67.98	59.66	0.00		
18	2.25	5.41	10.53	25.38	33.13	49.38	72.87	96.05	141.76	186.85	231.48	275.76	337.77	241.69	183.86	145.90	119.42	100.08	85.45	74.07	11.75	0.00		
19	2.37	5.71	11.12	26.79	34.97	52.12	76.92	101.39	149.63	197.23	244.35	291.08	366.30	262.11	199.39	158.23	129.51	108.53	92.67	80.32	0.00			
20	2.50	6.02	11.70	28.20	36.82	54.86	80.97	106.72	157.51	207.61	257.21	306.40	395.60	283.07	215.34	170.88	139.87	117.21	100.08	31.07	0.00			
21	2.62	6.32	12.29	29.61	38.66	57.60	85.02	112.06	165.38	217.99	270.07	321.72	425.64	304.56	231.69	183.86	150.49	126.11	107.68	0.00				
22	2.75	6.62	12.87	31.02	40.50	60.35	89.07	117.40	173.26	228.37	282.93	337.04	456.40	326.57	248.43	197.15	161.36	135.23	86.70	0.00				
23	2.87	6.92	13.46	32.43	42.34	63.09	93.11	122.73	181.14	238.75	295.79	352.36	464.44	349.09	265.56	210.74	172.49	144.55	11.76	0.00				
24	3.00	7.22	14.04	33.84	44.18	65.83	97.16	128.07	189.01	249.13	308.65	367.68	484.64	372.10	283.07	224.63	183.86	154.08	0.00					
25	3.12	7.52	14.63	35.25	46.02	68.58	101.21	133.40	196.89	259.51	321.51	383.00	504.83	395.60	300.94	238.82	195.47	118.72	0.00					
26	3.24	7.82	15.21	36.66	47.86	71.32	105.26	138.74	204.76	269.89	334.37	398.32	525.02	419.57	319.18	253.29	207.31	46.33	0.00					
Type A [Note (1)]				Type B [Note (2)]										Type C [Note (3)]										

## NOTES:

- (1) Type A: Manual or drip lubrication  
 (2) Type B: Bath or disc lubrication  
 (3) Type C: Oil stream lubrication



**Table A-9 Horsepower Ratings, Single-Strand Roller Chain No. 240HE (3.000 in. Pitch)**

No. of Teeth	Small Sprocket Speed, Revolutions/min																							
	2	5	10	25	27	50	75	100	150	200	250	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500
11	2.33	5.62	10.93	26.33	28.35	51.23	75.60	99.65	147.07	193.85	240.16	286.10	186.70	133.59	101.63	80.65	66.01	55.32	47.23	40.94	35.93	31.87	28.51	0.00
12	2.54	6.13	11.92	28.73	30.93	55.88	82.48	108.71	160.44	211.48	262.00	312.11	212.73	152.22	115.80	91.89	75.21	63.03	53.82	46.65	40.94	36.31	0.00	
13	2.75	6.64	12.91	31.12	33.51	60.54	89.35	117.77	173.81	229.10	283.83	338.12	239.87	171.64	130.57	103.61	84.81	71.07	60.68	52.60	46.16	0.00		
14	2.97	7.15	13.91	33.52	36.09	65.20	96.22	126.83	187.18	246.72	305.66	364.13	268.07	191.82	145.92	115.80	94.78	79.43	67.82	58.78	18.18	0.00		
15	3.18	7.66	14.90	35.91	38.66	69.85	103.10	135.89	200.55	264.35	327.50	390.14	297.30	212.73	161.83	128.42	105.11	88.09	75.21	65.19	0.00			
16	3.39	8.17	15.89	38.30	41.24	74.51	109.97	144.95	213.92	281.97	349.33	416.15	327.52	234.35	178.28	141.47	115.80	97.04	82.86	0.00				
17	3.60	8.68	16.89	40.70	43.82	79.17	116.84	154.01	227.29	299.59	371.16	442.16	358.70	256.66	195.25	154.94	126.82	106.28	90.74	0.00				
18	3.81	9.19	17.88	43.09	46.40	83.83	123.72	163.07	240.66	317.21	392.99	468.17	390.81	279.64	212.73	168.81	138.17	115.80	16.92	0.00				
19	4.03	9.70	18.87	45.48	48.97	88.48	130.59	172.13	254.03	334.84	414.83	494.18	423.82	303.26	230.70	183.08	149.84	125.58	0.00					
20	4.24	10.21	19.87	47.88	51.55	93.14	137.46	181.18	267.40	352.46	436.66	520.19	457.72	327.52	249.15	197.72	161.83	98.33	0.00					
21	4.45	10.72	20.86	50.27	54.13	97.80	144.33	190.24	280.78	370.08	458.49	546.19	492.48	352.39	268.07	212.73	174.12	0.00						
22	4.66	11.23	21.85	52.67	56.71	102.45	151.21	199.30	294.15	387.71	480.33	572.20	528.07	377.85	287.44	228.10	186.70	0.00						
23	4.87	11.74	22.85	55.06	59.28	107.11	158.08	208.36	307.52	405.33	502.16	598.21	564.48	403.91	307.26	243.83	153.53	0.00						
24	5.09	12.26	23.84	57.45	61.86	111.77	164.95	217.42	320.89	422.95	523.99	624.22	601.69	430.53	327.52	259.91	48.97	0.00						
25	5.30	12.77	24.83	59.85	64.44	116.42	171.83	226.48	334.26	440.58	545.83	650.23	639.68	457.72	348.20	276.32	0.00							
26	5.51	13.28	25.83	62.24	67.02	121.08	178.70	235.54	347.63	458.20	567.66	676.24	678.45	485.46	369.30	293.06	0.00							
Type A [Note (1)]					Type B [Note (2)]										Type C [Note (3)]									

## NOTES:

- (1) Type A: Manual or drip lubrication  
 (2) Type B: Bath or disc lubrication  
 (3) Type C: Oil stream lubrication

**Table A-10 Service Factors**

Type of Driven Load	Internal Combustion Engine With Hydraulic Drive	Electric Motor or Turbine	Internal Combustion Engine With Mechanical Drive
Smooth	1.0	1.0	1.2
Moderate shock	1.2	1.3	1.4
Heavy shock	1.4	1.5	1.7

**Table A-11 Lubricant Viscosity**

Temperature, °F (°C)	Recommended Lubricant Viscosity Grade, SAE (ISO)
–20 to 80 (–29 to 27)	10 (46)
10 to 110 (–12 to 43)	20 (68)
20 to 130 (–7 to 54)	30 (100)
30 to 140 (–1 to 60)	40 (150)
40 to 150 (4 to 66)	50 (220)

GENERAL NOTE: When the temperature range permits a choice, the higher viscosity should be used.

# NONMANDATORY APPENDIX B

## SUPPLEMENTARY INFORMATION ON CHAIN SELECTION FOR TENSION LINKAGES

### B-1 DESIGN FACTORS

#### B-1.1 General

Tension linkage chains usually move back and forth to actuate, lift (not human passengers), pull, or position a load slowly or intermittently over a specific distance. That is opposed to drive chains that move continuously around two or more sprockets.

Tension linkage chains generally operate at slow to moderate speed. Tension linkage chains might operate only occasionally or quite frequently. Loads can range from a few to several thousand pounds.

High-strength roller chains are often used when a sprocket is required in the tension linkage system and chain tension is relatively high.

#### B-1.2 Chain Selection

Each tension linkage chain application is unique. There are no guidelines for chain selection published in this Standard. Consult the particular chain manufacturer for assistance in selecting a suitable chain for the particular application.

Carefully consider large inertial loads imposed on the chain by starts or sudden stops when the chain is fully loaded. A high-strength roller chain should never be loaded to more than 50% of its M.U.T.S.

Certain standards covering one particular type of machine contain specific static and dynamic stress limits. Those stress limits were established by the developers of the subject standards based upon long experience in the design and use of the particular type of machinery. The developers of the subject standards are solely responsible for the stress limitation factor.

### B-2 LUBRICATION

A fluid lubricant should be applied to ensure that oil is supplied to the chain joints and to minimize metal-to-metal contact.

Tension linkages should be protected against dirt and moisture, and the oil supply should be kept clean and free of contamination. A good grade of nondetergent petroleum-based oil is recommended. High-viscosity oils and greases are normally too stiff to flow into the chain joints as needed. Table B-1 indicates the proper lubricant viscosity for various surrounding temperatures.

**Table B-1 Lubricant Viscosity**

Temperature, °F (°C)	Recommended Lubricant Viscosity Grade, SAE (ISO)
–20 to 80 (–29 to 27)	10 (46)
10 to 110 (–12 to 43)	20 (68)
20 to 130 (–7 to 54)	30 (100)
30 to 140 (–1 to 60)	40 (150)
40 to 150 (4 to 66)	50 (220)

GENERAL NOTE: When the temperature range permits a choice, the higher viscosity should be used.

Only manual and drip lubrication are practical options for tension linkage chains. Bath lubrication usually is not practical because it is difficult to provide a long enough span of chain to run through the oil bath. Oil stream lubrication is only practical if the entire tension linkage is in a case that requires oil stream lubrication for other reasons.

Manual lubrication is usually adequate for tension linkages that cycle intermittently. Drip lubrication should be considered for tension linkages that cycle more frequently. Consult the chain manufacturer for advice on the type of lubrication to be used.

#### B-2.1 Manual Lubrication

For manual lubrication, oil is applied to the chain and sprockets copiously with a brush or spout can at least once every 8 hr of operation. Volume and frequency should be sufficient to prevent overheating of the chain or discoloration in the chain joints.

If the chain operates in a dusty or abrasive environment, the debris should be cleared off the chain with a rag or brush before applying fresh clean lubricant. Installing a shield above the chain can reduce the buildup of debris in operation.

#### B-2.2 Drip Lubrication

For drip lubrication, oil drops are directed between the link plate edges from a drip lubricator near the main sprocket. Volume and frequency should be sufficient to prevent overheating of the chain or discoloration in the chain joints. The lubricator should be synchronized with

the chain so that it drips lubricant only when the chain is moving.

### **B-3 SPROCKETS**

Sprockets should have tooth form, thickness, profile, and diameters conforming to ASME B29.1. Sprockets with fewer than 25 teeth should have an odd number of teeth to equalize wear on all of the teeth. Sprockets with 25 teeth or less should have hardened teeth.

Driver sprockets should have at least 120 deg of chain wrap. Idler sprockets should have at least three teeth engaging the chain. There should be at least three free pitches of chain between the engagement points of any two sprockets or sheaves. There should be at least three free pitches of chain between a terminal fitting and the engagement point of any sprocket or sheave.

### **B-4 TERMINAL FITTINGS**

Terminal fittings should meet all of the same requirements as test fixtures listed in ASME B29.26.

### **B-5 ALIGNMENT**

Accurate alignment of shafts, sprocket tooth faces, and terminal fittings provides uniform distribution of the load across the entire chain width and contributes substantially to optimum life of the tension linkage system. Shafting, bearings, and foundations should be suitable to maintain the initial alignment. Periodic maintenance should include an inspection of alignment to ensure optimum chain life.

### **B-6 GUARDING**

Adequate guarding should be provided to contain the chain in the event that a broken chain is thrown off the system while operating.

If the chain is used in a hoist or other lifting device (not for human passengers), a brake or other restraining device should be provided to stop and hold the load in the event of a broken chain.

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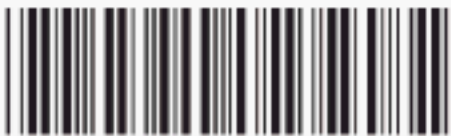
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