ASME B29.10M-1997
(Revision of ASME B29.10M-1994)

HEAVY DUTY OFFSET SIDEBAR POWER TRANSMISSION ROLLER CHAINS AND SPROCKET TEETH

AN AMERICAN NATIONAL STANDARD

REAFFIRMED 2002

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The American Society of
Mechanical Engineers

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Date of Issuance: October 20, 1997

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
345 East 47th Street, New York, NY 10017

FOREWORD

(This Foreword is not part of ASME B29.10M-1997.)

Chains of the type covered by this Standard were introduced in the United States late in the 19th Century. As their popularity increased, the number of chains and manufacturers grew. As one manufacturer developed a successful size chain, or family of chains, others soon duplicated it and a large number of chains came into being.

In spite of efforts at standardization, the Corps of Engineers, United States Army, found during the Korean incident of 1950-53 that lack of adequate standardization of power transmission chains still resulted in the incapacitation of many cranes and shovels. For this reason, the Corps of Engineers requested the Society of Automotive Engineers to expand the scope of ASA Sectional Committee B29 to cover this group of chains. On May 13, 1956, the Corps of Engineers request was approved by the ASA B29 Committee and the ASA B29.10 Subcommittee was formed. Upon approval by the American Standards Association in April 1962; the first standard for ASA B29.10 chains and sprockets was published. The Standard described the physical dimensions of the chain components and sprockets, and defined the minimum static properties for the chains.

In 1970, this Standard was revised to include Drive Selection information in a Supplementary Section and to convert fractions to decimal-inch, and include metric dimensions in SI Units.

In September 1962, the Engineering Steel Chain Division of the ACA began a research program to develop ratings for the ANSI B29.10 chains. Capacity information on the smaller B29.1 chains already developed in research programs sponsored by the Roller Chain Division of the ACA was made available to the Engineering Steel Chain Division. Member companies contributed information from their own research programs. Special dynamic test equipment was built to enable obtaining wear and capacity data on very large chains. The horsepower capacities published as supplementary information in this Standard resulted from this combined research effort; they are considerably higher than previously accepted by the industry. At all speeds and for all sprocket sizes, the capabilities of ANSI B29.10 chain drives exceeded those previously accepted by the industry.

This Standard was approved as an American National Standard on December 27, 1972.

The 1981 revision included updating to the current ANSI standards format covering chains and sprockets. In the process of updating, the supplemental information (Appendices A and B) was reviewed and found to be inadequate with respect to selection information. The information was incomplete and could result in an unsatisfactory selection. Chain standards generally contained only dimensional and strength information to allow chains to be intercoupled. Therefore, the horsepower capacity information was deleted.

The American National Standards Institute approved that revision on April 3, 1981.

The 1991 revision added definitions for minimum ultimate strength (para. 2.2), measuring load (para. 2.3), and strand length tolerance (para. 2.4). M.U.T.S. values for chains 4020, 4824, and 5628 were increased. Other clarifications were made without changing the basic content.

The 1994 revision was approved by the American National Standards Institute on November 17, 1994.

This 1997 revision of ASME B29.10M was approved by the American National Standards Institute on July 22, 1997.

ASME 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.)

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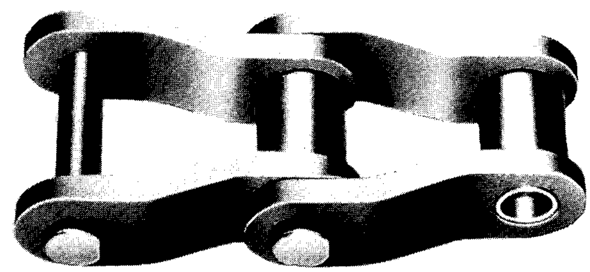
CONTENTS

HEAVY DUTY OFFSET SIDEBAR POWER TRANSMISSION ROLLER CHAINS AND SPROCKET TEETH

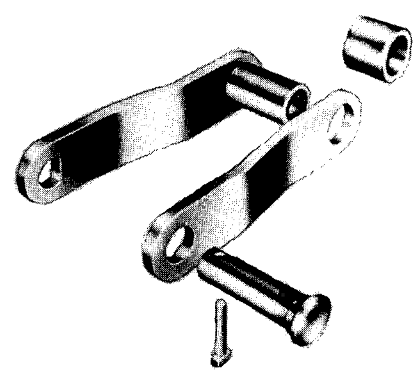
1 NOMENCLATURE

A series of identical offset links in which the pins articulate inside the bushings and the rollers are free to turn on the bushings. Pins and bushings are fixed in their respective sidebar holes [Fig. 1, sketches (a) and (b)].

In addition to press fits, other types of locks such as flats are sometimes used to prevent rotation of pins and bushings in their respective sidebar holes.



(a)



(b)

FIG. 1 HEAVY DUTY OFFSET SIDEBAR POWER TRANSMISSION ROLLER CHAINS

2 GENERAL CHAIN DESIGNATORS

2.1 Dimensions for Chain Links

To assure interchangeability of links as produced by different makers of chain, standard maximum and minimum dimensions are adopted. They are not actual dimensions used in manufacturing, but limiting dimensions, maximum or minimum, required to assure the desired interchangeability.

All dimensions are given in a decimal-inch system. The metric equivalent dimensions are for reference only.

2.2 Numbering System

The standard chain numbers were based upon the inch system. The first two, or left hand digits in the chain designation denote the number of $\frac{1}{8}$ in. in the pitch. The last two, or right hand digits, denote the number of $\frac{1}{16}$ in. in the pin diameter.

2.3 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.

WARNING:

(a) 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 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 Force," it will have been damaged and will be unfit for service.

CAUTION: This load is beyond the yield strength of the chain and would render the chain unsuitable for application. For application guidance, consult manufacturers' catalogs or the American Chain Association Handbook, "Engineering Steel Chains for Conveyors, Elevators and Drives."

2.4 Measuring Load

The measuring load, in pounds (or kilonewtons) in Table 1, is the load under which a dry or lightly lubricated chain should be measured for length.

2.5 Strand Length Tolerance

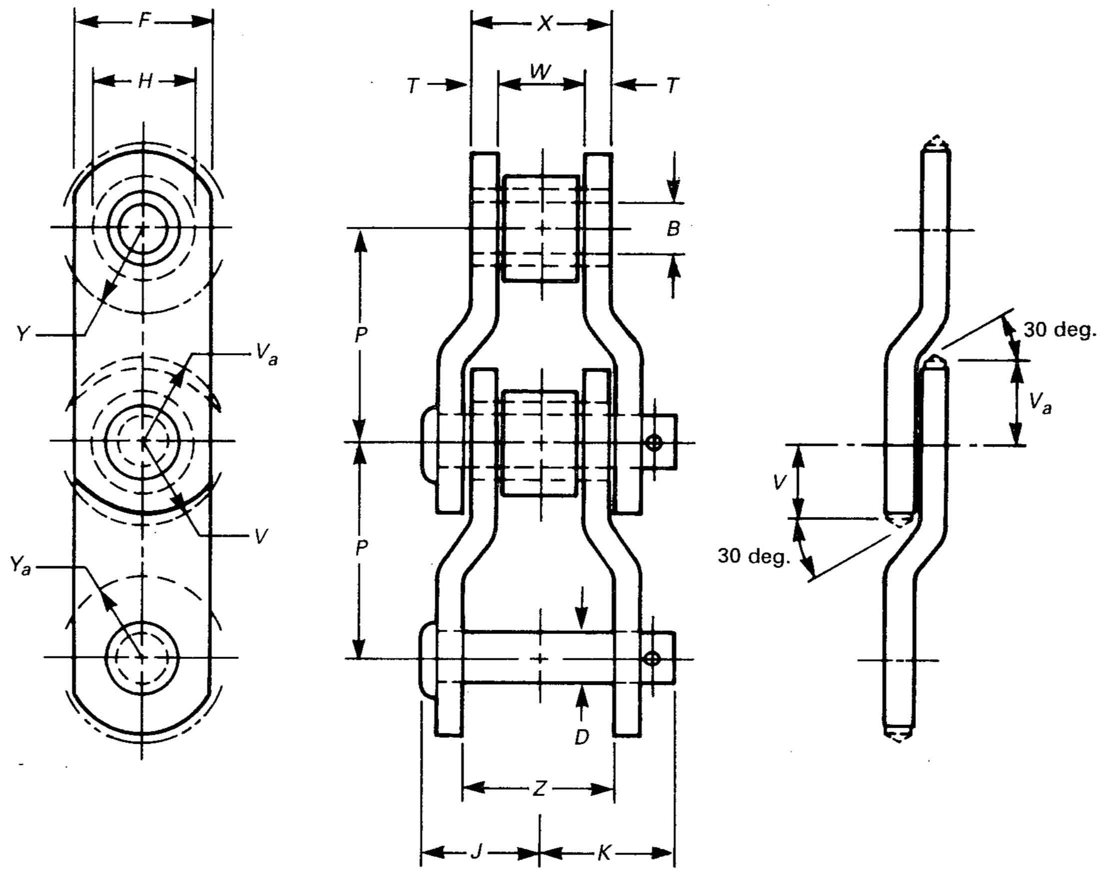
The length of new chains subject to the specified measuring load must fall within the plus and minus tolerances. *Specific maximum and minimum strand lengths are shown in Table 1, for each chain.*

3 CHAIN ASSEMBLY

See Fig. 2 and Tables 1, 2, and 3.

4 SPROCKET TOOTH FORM

See Fig. 3.



B = inside diameter of bushing
D = pin diameter
F = overall chain height
H = roller diameter
J = pin head to centerline
K = pin end to centerline
P = assembled chain pitch (this is a theoretical reference dimension used for basic calculations)
T = sidebar thickness
V = sidebar end clearance radius, open end of link
V_a = sidebar end clearance radius, closed end of link
W = inside width
X = width of link at closed end extending through end clearance zone "Y"
Y = sidebar end clearance zone, closed end of link
Y_a = sidebar end clearance zone, open end of link
Z = width between sidebars at open end of link extending through sidebar end clearance zone "Y_a"

FIG. 2 CHAIN ASSEMBLY

TABLE 1
GENERAL CHAIN DIMENSIONS, M.U.T.S., STRAND LENGTH, AND MEASURING LOAD

Dimensions, in.								
Chain No.	2010	2512	2814	3315	3618	4020	4824	5628
P	2.500	3.067	3.500	4.073	4.500	5.000	6.000	7.000
D	0.625	0.750	0.875	0.938	1.100	1.250	1.500	1.750
T	0.31	0.38	0.50	0.56	0.56	0.62	0.75	0.88
F	1.75	2.25	2.25	2.38	3.00	3.50	4.00	5.00
H	1.25	1.62	1.75	1.78	2.25	2.50	3.00	3.50
W	1.50	1.56	1.50	1.94	2.06	2.75	3.00	3.25
M.U.T.S., lb (See para. 2.2) [Note (1)]	57,000	77,000	106,000	124,000	171,000	222,000	315,000	425,000
No. of Chain Pitches in Standard Measuring Length	48	39	34	30	27	24	20	17
Standard Measuring Length, in.								
Max.	120.38	119.99	119.38	122.57	121.88	120.38	120.38	119.38
Min.	120.00	119.61	119.00	122.19	121.50	120.00	120.00	119.00
Measuring Load, lb	400	600	800	900	1300	1700	2200	3300

Dimensions, mm								
P	63.50	77.90	88.00	103.45	114.30	127.00	152.40	177.80
D	15.88	19.05	22.22	23.83	27.94	31.75	38.10	44.45
T	7.9	9.7	12.7	14.2	14.2	15.7	19.1	22.4
F	44.5	57.2	57.2	60.5	76.2	88.9	101.6	127.0
H	31.8	41.1	44.5	45.2	57.2	63.5	76.2	88.9
W	38.1	39.6	38.1	49.3	52.3	69.9	76.2	82.6
M.U.T.S., kN (See para. 2.2) [Note (1)]	254	342	471	552	761	987	1401	1890
No. of Chain Pitches in Standard Measuring Length	48	39	34	30	27	24	20	17
Standard Measuring Length, mm								
Max.	3057.7	3047.7	3032.3	3113.3	3095.8	3057.7	3057.7	3032.3
Min.	3048.0	3038.1	3022.6	3103.6	3086.1	3048.0	3048.0	3022.6
Measuring Load, kN	1.8	2.7	3.6	4.0	5.8	7.6	9.8	14.7

CAUTION: The numerical values set forth in this Table do not afford a sufficient or appropriate basis for determining chain application and must be read in conjunction with the definitions and explanatory notes on page 1.

NOTE:
(1) M.U.T.S. is a factored statistical value for standards, which does not necessarily reflect the typical ultimate strength of the chain. Manufacturer should be consulted for additional information.

TABLE 2
MAXIMUM AND MINIMUM CONTROLLING LINK DIMENSIONS FOR INTERCHANGEABLE CHAIN LINKS

		Dimensions, in.							
Chain No.		2010	2512	2814	3315	3618	4020	4824	5628
Chain Pitch	(*P*)	2.500	3.067	3.500	4.073	4.500	5.000	6.000	7.000
Pin Diameter, Max.	(*D*)	0.626	0.751	0.876	0.939	1.101	1.251	1.501	1.751
Inside Diameter of Bushing, Min.	(*B*)	0.628	0.753	0.879	0.942	1.105	1.255	1.506	1.757
Roller Diameter, Max.	(*H*)	1.250	1.625	1.750	1.781	2.250	2.500	3.000	3.500
Sidebar End Clearance Zone Closed End of Link, Min. [Note (1)]	(*Y*)	0.88	1.06	1.25	1.31	1.56	1.88	2.19	2.56
Sidebar End Clearance Zone Open End of Link, Min. [Note (1)]	(Y_a)	0.94	1.16	1.31	1.38	1.62	2.06	2.31	2.68
Sidebar End Clearance Radius Open End of Link, Max. [Note (1)]	(*V*)	0.88	1.06	1.25	1.31	1.56	1.88	2.19	2.56
Sidebar End Clearance Radius Closed End of Link, Max. [Note (1)]	(V_a)	0.94	1.16	1.31	1.38	1.62	2.06	2.31	2.68
Width of Link at Closed End, Extending Through End Clearance Zone "*Y*," Max.	(*X*)	2.141	2.328	2.520	3.082	3.207	4.031	4.531	5.031
Width Between Sidebars at Open End of Link Extending Through Sidebar End Clearance Zone "Y_a," Min.	(*Z*)	2.146	2.333	2.525	3.087	3.212	4.036	4.536	5.036
Inside Width, Min.	(*W*)	1.44	1.50	1.44	1.86	1.98	2.64	2.88	3.12

(Table 2 continues on next page)

TABLE 2 (CONT'D)
MAXIMUM AND MINIMUM CONTROLLING LINK DIMENSIONS FOR INTERCHANGEABLE CHAIN LINKS

Dimensions, mm									
Chain No.		**2010**	**2512**	**2814**	**3315**	**3618**	**4020**	**4824**	**5628**
Chain Pitch	(P)	63.50	77.00	88.90	103.45	114.30	127.00	152.40	177.80
Pin Diameter, Max.	(D)	15.90	19.08	22.25	23.85	27.97	31.78	38.13	44.48
Inside Diameter of Bushing, Min.	(B)	15.95	19.13	22.33	23.93	28.07	31.88	38.25	44.63
Roller Diameter, Max.	(H)	31.75	41.28	44.45	45.24	57.15	63.50	76.20	88.90
Sidebar End Clearance Zone Closed End of Link, Min. [Note (1)]	(Y)	22.4	26.9	31.8	33.3	39.6	47.8	55.6	65.0
Sidebar End Clearance Zone Open End of Link, Min. [Note (1)]	(Y_a)	23.9	29.5	33.3	35.1	41.1	52.3	58.7	68.1
Sidebar End Clearance Radius Open End of Link, Max. [Note (1)]	(V)	22.4	26.9	31.8	33.3	39.6	47.8	55.6	65.0
Sidebar End Clearance Radius Closed End of Link, Max. [Note (1)]	(V_a)	23.9	29.5	33.3	35.1	41.1	52.3	58.7	68.1
Width of Link at Closed End, Extending Through End Clearance Zone "Y," Max.	(X)	54.38	59.13	64.01	78.28	81.46	102.39	115.09	127.79
Width Between Sidebars at Open End of Link Extending Through Sidebar End Clearance Zone "Y_a," Min.	(Z)	54.51	59.26	64.14	78.41	81.58	102.51	115.21	127.91
Inside Width, Min.	(W)	36.6	38.1	36.6	47.2	50.3	67.1	73.2	79.2

GENERAL NOTE: Offset bend lines may be straight or curved. If curved, their radii Y and Y_a must be greater than V and V_a, respectively, so that the mating ends of links built to maximum dimensions will allow flexing around a 7-tooth sprocket.

NOTE:
(1) Sidebar ends may be extended, provided the extension is within a 30 deg. included angle with respect to the end of sidebar as shown in Chain Assembly. Whether the sidebar ends are extended or not, the offset section of the bar must provide clearance for such an extension.

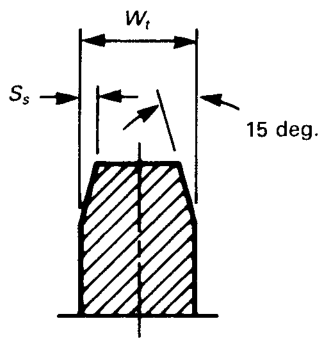
TABLE 3
CHAIN CLEARANCE DIMENSIONS

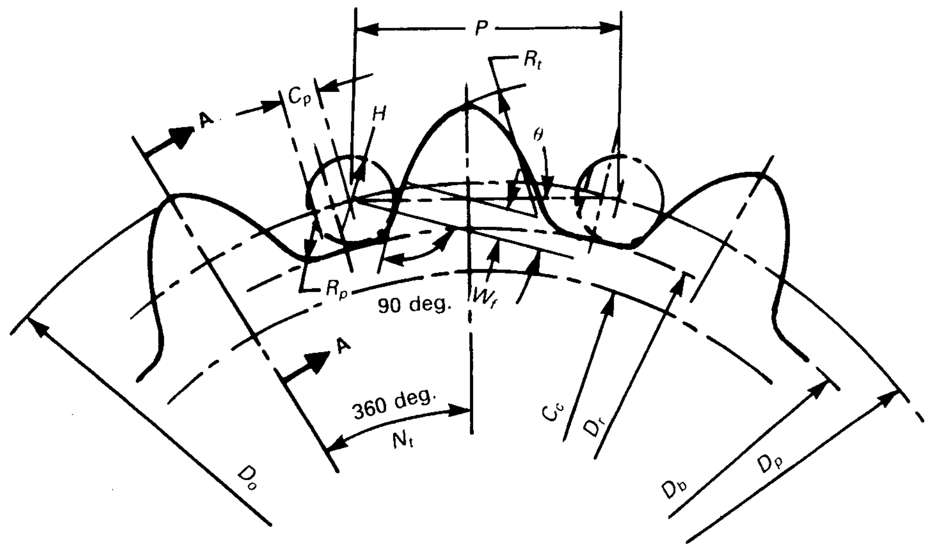
Dimensions, in.

Chain No.		2010	2512	2814	3315	3618	4020	4824	5628
Pin Head to Centerline, Max.	(*J*)	1.69	1.88	2.19	2.50	2.56	3.06	3.50	4.00
Pin End to Centerline, Max.	(*K*)	1.88	2.19	2.44	2.81	3.00	3.56	3.88	4.50
Overall Chain Height, Max.	(*F*)	1.88	2.38	2.38	2.50	3.12	3.62	4.12	5.25

Dimensions, mm

Chain No.		2010	2512	2814	3315	3618	4020	4824	5628
Pin Head to Centerline, Max.	(*J*)	42.9	47.8	55.6	63.5	65.0	77.7	88.9	101.6
Pin End to Centerline, Max.	(*K*)	47.8	55.6	62.0	71.4	76.2	90.4	98.6	114.3
Overall Chain Height, Max.	(*F*)	47.8	60.5	60.5	63.5	79.2	91.9	104.6	133.4





The elements of a chain sprocket and the tooth form may be determined by the following:

C_b = undersize compensation (typically 0.06 in.)
C_c = chain clearance circle [Note (1)] = $(P \times C_{cf}) - F$
C_{cf} = chain clearance circle factor (see Table 5) = cot $(180/N_t) - 0.05$
C_p = pitch line clearance [Note (2)] = $P \times 0.10$
D_b = bottom diameter [Note (3)] = $D_r - C_b$
D_o = outside diameter
D_p = pitch diameter = $P \times D_{pf}$
D_{pf} = pitch diameter factor (see Table 5) = csc $(180/N_t)$
D_r = maximum root diameter [Note (4)] = $(P \times D_{pf}) - H$ max.
F = maximum chain height (see Table 3)
H = barrel height or roller diameter (see Table 1)
N_t = number of teeth
R_p = maximum pocket radius = $H/2$
R_t = topping radius = $0.5 \times P$
S_s = side slope = approximately $0.12 \times W_t$, not to exceed 0.38 in. (9.6 mm)
W = inside chain width
W_f = working face [Note (5)] = $0.01 \times P \times N_t$
W_t = maximum tooth width = $0.95W$, min. of chain
θ = pressure angle

GENERAL NOTE: Tooth working face length provides for approximately 6% chain pitch elongation for sprockets having less than 40 teeth. As the number of teeth increases, the possible pitch elongation is progressively reduced to less than 2% at 100 teeth.

NOTES:
(1) No portion of hub, beads, lugs, or fillets shall extend beyond this circle in the sidebar zone.
(2) If precision cut tooth sprockets are used in clean environment, pitch line clearance can be as small as $P \times 0.003$.
(3) The bottom diameter shall be smaller than the root diameter, and the pocket radius should be smaller than $H/2$.
(4) Root diameters and pocket radii must not exceed the maximum obtained from these formulas. Oversize dimensions cause improper chain and sprocket action and excessive chain loads.
(5) Limitation on length of working face — the working face shall not extend beyond the line through the adjacent pitch which is perpendicular to the working face.

FIG. 3 SPROCKET TOOTH FORM

TABLE 4
MAXIMUM ECCENTRICITY AND FACE RUNOUT TOLERANCES

Pitch Diameter		Tolerances — Total Indicator Reading	
in.	**mm**	**in.**	**mm**
Up to 12	Up to 305	0.06	1.52
12 – 36	305 – 915	0.06 for each 12 in.	1.52 for each 305 mm
Over 36	Over 915	0.18 plus 0.03 for each additional 12 in.	4.56 plus 0.76 for each additional 305 mm

GENERAL NOTE: The above sprocket tolerances are closer than called for on current B29 standards for other Engineering Class Chains. These B29.10M chains are high precision power transmission chains and require sprockets of the highest precision possible within the realm of normal sprocket manufacturing methods.

TABLE 5
SPROCKET TOOTH FORM FACTORS

N_t	D_{pf}	θ, deg.	C_{cf}	N_t
7	2.304	10	2.02	7
8	2.613	11	2.36	8
9	2.923	12	2.69	9
10	3.236	13	3.02	10
11	3.549	14	3.35	11
12	3.863	15	3.68	12
13	4.178	16	4.00	13
14	4.494	17	4.33	14
15	4.809	18	4.65	15
16	5.125	19	4.97	16
17	5.442	20	5.29	17
18	5.758	20	5.62	18
19	6.075	21	5.94	19
20	6.392	21	6.26	20
21	6.709	22	6.58	21
22	7.026	22	6.69	22
23	7.343	22	7.22	23
24	7.661	23	7.54	24
25	7.978	23	7.86	25
26	8.296	23	8.18	26
27	8.613	23	8.50	27
28	8.931	24	8.82	28
29	9.249	24	9.14	29
30	9.566	24	9.46	30
31	9.884	24	9.78	31
32	10.202	24	10.10	32
33	10.520	25	10.42	33
34	10.837	25	10.74	34
35	11.155	25	11.07	35
36	11.473	25	11.38	36

AMERICAN NATIONAL STANDARDS — CHAINS, ATTACHMENTS, AND SPROCKETS FOR POWER TRANSMISSION AND CONVEYING

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