ASME B29.200-2001

WELDED-STEEL-TYPE MILL CHAINS, WELDED-STEEL-TYPE DRAG CHAINS, ATTACHMENTS, AND SPROCKET TEETH

Incorporating ASME B29.16M and ASME B29.18M

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FOREWORD

This Standard is a consolidation of two ASME standards, ASME B29.16M-1995 (Welded-Steel-Type Mill Chains, Attachments, and Sprocket Teeth) and ASME B29.18M-1993 (Welded-Steel-Type Drag Chains, Attachments, and Sprocket Teeth). These two standards were combined into one because of the similarity of construction and the usual applications for the two types of chains.

The welded-steel-type mill chains (B29.16M) were developed to provide a series of steel chains similar to cast chains of the detachable, mill, and combination types. Although the welded-steel-type mill chains were introduced many years ago for the forest products industries, their expanded usage in a variety of materials handling and drive applications in recent years stimulated standardization of the basic types.

In September 1967, a subcommittee of ANSI Sectional Committee B29 under the sponsorship of ASME and SAE, was appointed to develop a standard for welded-steel-type mill chains, attachments, and sprocket teeth.

The 1981 revision included updating to the current ASME Standards format and symbols covering chains and sprockets. In addition, chain number W106 was added to the Standard.

The 1995 revision included the addition of chain number W855 and the removal of attachments H1, H2, R1, and RR from the Standard due to inactivity. Also added was the minimum bolt hole diameter required for the bolt diameter given for a particular attachment. The minimum ultimate tensile strength (M.U.T.S.) definition was also modified.

The welded-steel-type drag chains (B29.18M) were developed to provide a series of steel chains similar to cast drag chains in the offset and combination types. Welded steel drag chains were originally introduced for the forest products industries and their expanded usage in recent years called for standardization of basic sizes.

In September 1967, a subcommittee of ANSI Sectional Committee B29 was appointed with American Chain Association members from the engineering steel chain industry to develop a standard for welded steel chains, attachments, and sprockets including the drag type.

The American National Standards Institute approved the first edition of ASME B29.18M in 1974.

The 1981 revision included updating to the current ANSI Standards format and symbols covering chains and sprockets. Minimum ultimate strengths were reviewed and updated, where necessary.

The 1993 revision included a modified definition of minimum ultimate tensile strength (M.U.T.S.). An optional barrel configuration was added to Table 1 and an optional wing configuration was added to Table 9.

In the 2001 revision of ASME B29.18M a correction has been made to Table 2 for M.U.T.S. kN values shown in the metric values. Also, the nomenclature for the sprocket tooth form in section 4 has been corrected and the pitch line ($C\rho$) clearance changed to more closely conform with industry standard.

Both ASME B29.16M and ASME B29.18M were developed by their respective committees to involve only those dimensions which influence interchangeability. To promote the use of each in the international market, the metric equivalents of all dimensions are given.

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The 2001 revisions of both ASME B29.16M and ASME B29.18M have been incorporated to form the ASME B29.200-2001 standard. This Standard was approved as an American National Standard on December 11, 2001.

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Secretary, B29 Main 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.

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

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

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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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ASME B29.16M

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WELDED-STEEL-TYPE MILL CHAINS, ATTACHMENTS, AND SPROCKET TEETH

1 DEFINITION

welded-steel-type mill chains: a series of identical welded offset links having barrels to contact the sprocket teeth, and pins which articulate in the barrels of the links. Pins are fixed in the sidebar pitch holes by either press fits and/or mechanical locks, such as flats, to prevent rotation of the pins in the sidebar pitch holes.

2 GENERAL CHAIN PROPORTIONS AND DESIGNATIONS

2.1 Minimum Ultimate Tensile Strength

The *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 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.

2.2 Measuring Load

Measuring load should be 5 times the weight of 10 ft of chain, rounded to the nearest 100 lbs.

2.3 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. However, due to minor variations in barrel configurations, coupling chains of different manufacture should be held to a minimum.

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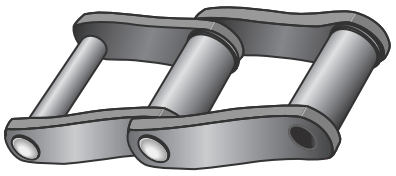


FIG. 1 ASSEMBLED CHAIN

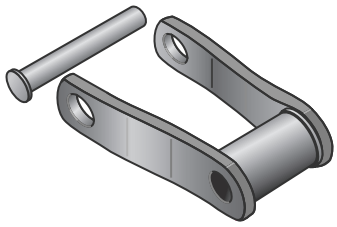


FIG. 2 DISASSEMBLED CHAIN

- A = inside width for sprocket contact
- B = inside diameter of barrel
- D = pin diameter
- F = chain height
- H = barrel outside diameter
- J = pin head to center line
- K = pin end to center line
- L = riveted head to center line
- P = chain pitch (This is a theoretical reference dimension used for basic calculations.)
- T = sidebar thickness
- V = sidebar end clearance radius: pin end
- V_a = sidebar end clearance radius: barrel end
- V_2 = attachment clearance radius (see pgs 7–14)
- X = width of length at barrel end extending to a point on the pitch line Y in. from the center line as shown
- Y = straight before bend: barrel end
- Y_a = straight before bend: pin end
- Z = width between sidebars at pin end extending to a point on the pitch line Y_a in. from the center line as shown

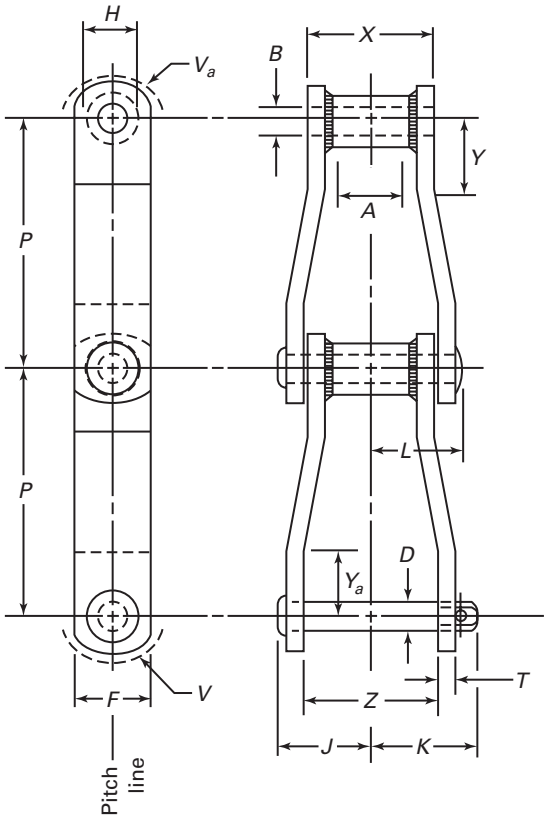


FIG. 3 DIMENSIONS OF CHAIN

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TABLE 1 GENERAL CHAIN DIMENSIONS, MINIMUM ULTIMATE TENSILE STRENGTH RATING, STRAND LENGTH, AND MEASURING LOAD FOR CHECKING CHAIN LENGTHS

CAUTION: The numerical values set forth in this Table must be read in conjunction with the definition and explanatory note appearing on pg. 1 and Tables 2 and 3. The minimum ultimate tensile strength (M.U.T.S.) values do not afford a sufficient or approximate basis for determining chain application.

	Dimensions, in. (mm)																	
	W78		W82		W106		W110		W111		W124		W124H		W132		W157	
Chain No.	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
P = chain pitch	2.609	(66.27)	3.075	(78.10)	6.000	(152.40)	6.000	(152.40)	4.760	(120.90)	4.000	(101.60)	4.063	(103.20)	6.050	(153.67)	6.050	(153.67)
D = pin diameter	0.500	(12.70)	0.562	(14.27)	0.750	(19.05)	0.750	(19.05)	0.750	(19.05)	0.750	(19.05)	0.875	(22.22)	1.000	(25.40)	1.125	(28.57)
F = overall chain height	1.12	(28.4)	1.25	(31.8)	1.50	(36.6)	1.50	(31.8)	1.50	(38.1)	1.50	(38.1)	2.00	(50.8)	2.00	(50.8)	2.50	(63.50)
H = barrel height	0.88	(22.4)	1.22	(31.0)	1.44	(36.6)	1.25	(31.8)	1.44	(36.6)	1.44	(36.6)	1.62	(41.1)	1.75	(44.4)	1.75	(44.4)
T = sidebar thickness	0.25	(6.4)	0.25	(6.4)	0.38	(9.6)	0.38	(9.6)	0.38	(9.6)	0.38	(9.6)	0.50	(12.7)	0.50	(12.7)	0.625	(15.87)
Minimum ultimate tensile strength, 16(kN) (see pg. 1)																		
Pin heat treated	21,000	(93)	22,500	(100)	38,000	(169)	38,000	(169)	38,000	(169)	38,000	(169)	62,000	(275)	62,000	(275)	. . .	. . .
All heat treated	24,000	(107)	29,500	(131)	50,500	(224)	50,500	(224)	50,500	(224)	50,500	(224)	80,000	(355)	85,000	(378)	124,000	(552)
No. of chain pitches in standard measuring length	46	(46)	39	(39)	20	(20)	20	(20)	26	(26)	30	(30)	30	(30)	20	(20)	20	(20)
Minimum length of standard measuring length	120.01	(3 084.3)	119.92	(3 046.0)	120.00	(3 048.0)	120.00	(3 048.0)	123.76	(3 143.5)	120.00	(3 048.0)	121.89	(3 096.0)	121.00	(3 073.4)	121.00	(3 073.4)
Measuring load, 16(kN)	200	(.90)	300	(1.33)	400	(1.78)	300	(1.33)	400	(1.78)	400	(1.78)	700	(3.11)	700	(3.11)	1000	(4.44)

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TABLE 2 MAXIMUM AND MINIMUM CONTROLLING DIMENSIONS FOR INTERCHANGEABLE CHAIN LINKS

	Dimensions, in. (mm)																	
	W78		W82		W106		W110		W111		W124		W124H		W132		W157	
Chain No.	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
Chain pitch (*P*)	2.609	(66.27)	3.075	(78.10)	6.000	(152.40)	6.000	(152.40)	4.760	(120.90)	4.000	(101.60)	4.063	(103.20)	6.050	(153.67)	6.050	(153.67)
Strand length — maximum	120.39	(3 057.9)	120.30	(3 055.6)	120.38	(3 057.6)	120.38	(3 057.6)	124.14	(3 153.2)	120.38	(3 057.6)	122.27	(3 105.7)	121.38	(3 083.0)	121.38	(3 083.0)
Pin diameter — maximum (*D*)	0.503	(12.78)	0.565	(14.35)	0.753	(19.13)	0.753	(19.13)	0.753	(19.13)	0.753	(19.13)	0.878	(22.30)	1.003	(25.48)	1.128	(28.65)
Inside diameter of barrel or sidebar hole — barrel end — minimum (*B*)	0.508	(12.90)	0.570	(14.48)	0.758	(19.25)	0.758	(19.25)	0.758	(19.25)	0.758	(19.25)	0.883	(22.43)	1.008	(25.60)	1.133	(28.78)
Inside width for sprocket contact — minimum (*A*)	1.12	(28.4)	1.25	(31.8)	1.62	(41.2)	1.84	(46.7)	2.25	(57.2)	1.62	(41.2)	1.62	(41.2)	2.75	(69.85)	2.75	(69.85)
Barrel diameter — maximum (*H*)	0.90	(22.9)	1.24	(31.5)	1.46	(37.1)	1.26	(32.0)	1.46	(37.1)	1.46	(37.1)	1.64	(41.7)	1.76	(44.7)	1.76	(44.7)
Straight before bend, barrel end — minimum (*Y*)	0.65	(16.5)	0.78	(19.8)	0.90	(22.9)	0.90	(22.9)	0.90	(22.9)	0.90	(22.9)	1.11	(28.2)	1.18	(30.0)	1.46	(37.1)
Straight before bend, pin end — minimum (Y_a)	0.67	(17.0)	0.83	(21.1)	1.07	(27.2)	1.07	(27.2)	1.07	(27.2)	1.07	(27.2)	1.20	(30.5)	1.20	(30.5)	1.500	(38.1)
Sidebar end clearance radius — pin end — maximum (*V*)	0.66	(16.8)	0.77	(19.6)	1.04	(26.4)	1.04	(26.4)	0.89	(22.6)	0.89	(22.6)	1.10	(27.9)	1.18	(30.0)	1.437	(36.5)
Sidebar end clearance radius — barrel end — maximum (V_a)	0.66	(16.8)	0.82	(20.8)	1.06	(26.9)	1.06	(26.9)	1.06	(26.9)	1.06	(26.9)	1.19	(30.2)	1.19	(30.2)	1.490	(37.8)
Width of link, barrel end — maximum (*X*)	2.01	(51.0)	2.26	(57.4)	2.82	(71.6)	3.01	(76.5)	3.38	(85.8)	2.82	(71.6)	3.01	(76.5)	4.40	(111.8)	4.67	(118.64)
Width between sidebars, pin end — minimum (*Z*)	2.03	(51.6)	2.28	(57.9)	2.84	(72.1)	3.03	(77.0)	3.40	(86.4)	2.84	(72.1)	3.03	(77.0)	4.42	(112.3)	4.69	(119.12)

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TABLE 3 CHAIN CLEARANCE DIMENSIONS

	Dimensions, in. (mm)																	
	W78		W82		W106		W110		W111		W124		W124H		W132		W157	
Chain No.	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
Chain height — maximum (*F*)	1.18	(30.0)	1.32	(33.5)	1.56	(39.6)	1.56	(39.6)	1.56	(39.6)	1.56	(39.6)	2.06	(52.3)	2.06	(52.3)	2.56	(65.0)
Pin head to center line of chain — maximum (*J*)	1.56	(39.6)	1.64	(41.7)	2.22	(56.4)	2.16	(54.9)	2.50	(63.5)	2.22	(56.4)	2.46	(62.5)	3.12	(79.2)	3.34	(84.8)
Pin end to center line of chain — maximum (*K*)	1.78	(45.2)	1.90	(48.3)	2.45	(62.2)	2.45	(62.2)	2.75	(69.8)	2.44	(62.0)	2.78	(70.6)	3.47	(88.1)	3.72	(94.5)
Riveted head to center line of chain — maximum (*L*)	1.68	(42.7)	1.78	(45.2)	2.34	(59.4)	2.34	(59.4)	2.53	(64.3)	2.34	(59.4)	2.59	(65.8)	3.28	(83.3)	3.50	(88.9)

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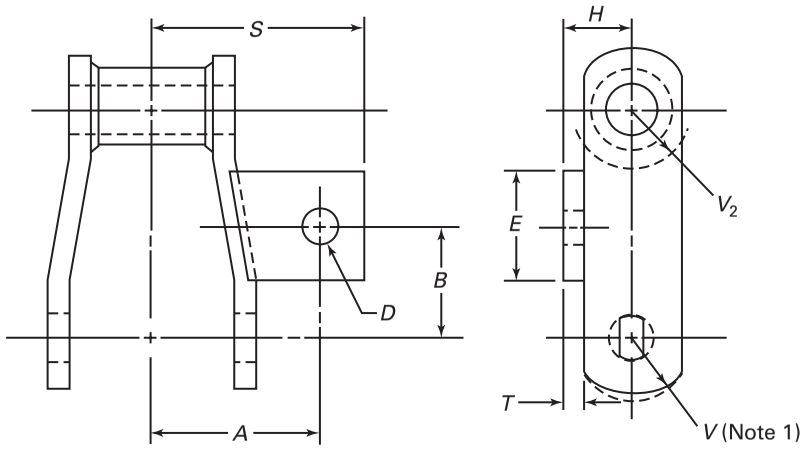


TABLE 4 A1 ATTACHMENT

Chain No.	A in.	A (mm)	B in.	B (mm)	E Max. in.	E Max. (mm)	H Max. in.	H Max. (mm)	S Max. in.	S Max. (mm)	T in.	T (mm)	V_2 in.	V_2 (mm)	D Bolt Size in.	D Bolt Size (mm)	D Min. Hole in.	D Min. Hole (mm)
	Dimensions, in. (mm)																	
W78	2.00	(50.8)	1.25	(31.8)	1.44	(36.6)	0.88	(22.4)	2.56	(65.0)	0.25	(6.4)	0.66	(16.8)	0.38	(9.7)	0.40	(10.2)
W82	2.10	(53.3)	1.50	(38.1)	1.81	(46.0)	0.94	(23.9)	2.81	(71.4)	0.25	(6.4)	0.80	(20.3)	0.38	(9.7)	0.40	(10.2)

NOTE:
(1) See Table 2 for *V* dimension.

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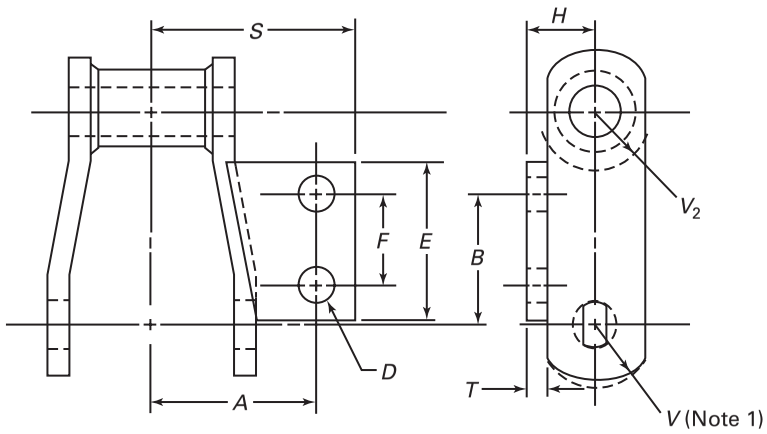


TABLE 5 A2 ATTACHMENT

Chain No.	Dimensions, in. (mm)																			
	A		*B*		*E* Max.		*F*		*H* Max.		*S* Max.		*T*		V_2		*D* Bolt Size		*D* Min. Hole	
	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
W78	2.00	(50.8)	1.53	(38.9)	2.06	(52.3)	1.12	(28.4)	0.88	(22.4)	2.56	(65.0)	0.25	(6.4)	0.66	(16.8)	0.38	(9.7)	0.40	(10.2)
W82	2.13	(54.1)	2.06	(52.3)	2.44	(62.0)	1.31	(33.3)	0.94	(23.9)	2.81	(71.4)	0.25	(6.4)	0.80	(20.3)	0.38	(9.7)	0.40	(10.2)
W110	2.66	(67.6)	3.88	(98.6)	3.31	(84.1)	1.75	(44.4)	1.18	(30.0)	3.31	(84.1)	0.38	(9.7)	0.91	(23.1)	0.38	(9.7)	0.40	(10.2)
W111	3.13	(79.5)	3.54	(89.9)	3.56	(90.4)	2.31	(58.7)	1.18	(30.0)	3.81	(96.8)	0.38	(9.7)	0.91	(23.1)	0.50	(12.7)	0.53	(13.5)
W124	2.63	(66.8)	2.81	(71.4)	3.06	(77.7)	1.94	(49.3)	1.18	(30.0)	3.56	(90.4)	0.38	(9.7)	0.91	(23.1)	0.38	(9.7)	0.40	(10.2)
W124H	2.63	(66.8)	2.88	(73.2)	3.18	(80.8)	1.94	(49.3)	1.56	(39.6)	3.26	(82.8)	0.50	(12.7)	1.12	(28.4)	0.50	(12.7)	0.53	(13.5)
W132	3.75	(95.2)	4.38	(111.3)	4.18	(106.2)	2.75	(69.8)	1.56	(39.6)	4.62	(117.3)	0.50	(12.7)	1.19	(30.2)	0.50	(12.7)	0.53	(13.5)

NOTE:
(1) See Table 2 for *V* dimension.

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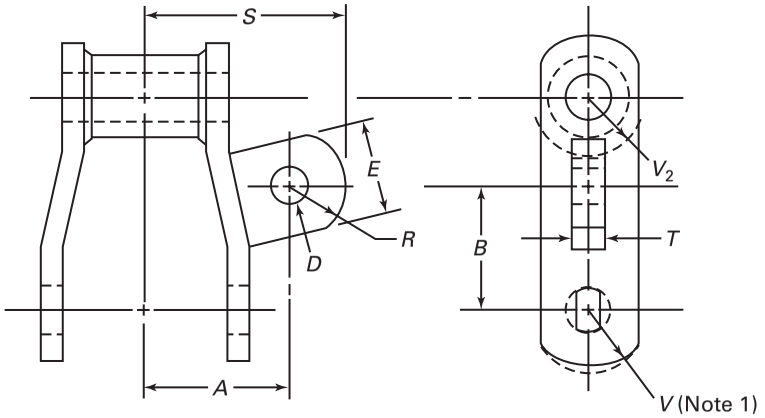


TABLE 6 A22 ATTACHMENT

Chain No.	Dimensions, in. (mm)																	
	A		*B*		*E* Max.		*T*		*S* Max.		*R* Max.		V_2		*D* Bolt Size		*D* Min. Hole	
	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
W78	1.88	(47.8)	1.31	(33.3)	1.18	(30.0)	0.38	(9.7)	2.56	(65.0)	0.72	(18.3)	0.66	(16.8)	0.38	(9.7)	0.40	(10.2)

NOTE:
(1) See Table 2 for *V* dimension.

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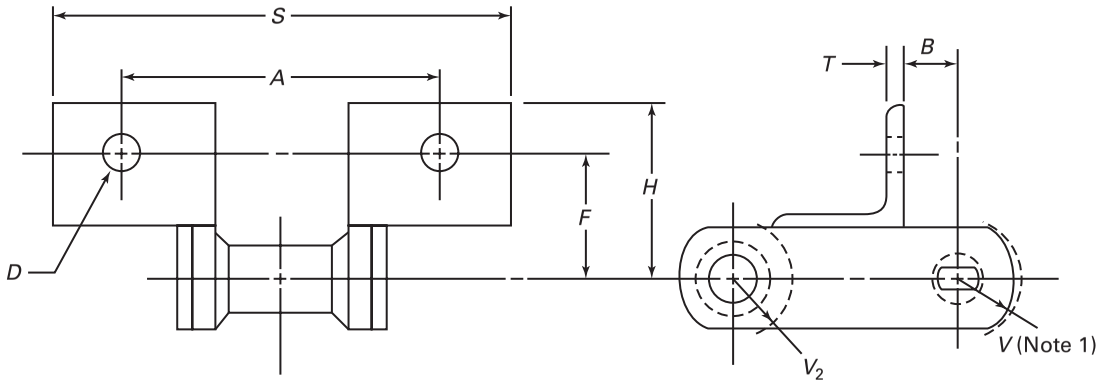


TABLE 7 F2 ATTACHMENT

Chain No.	Dimensions, in. (mm)																	
	A		*B* Max.		*F*		*H* Max.		*S* Max.		*T*		V_2		*D* Bolt Size		*D* Min. Hole	
	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
W78	3.76	(95.6)	0.62	(15.7)	1.44	(36.6)	2.38	(60.5)	5.44	(138.2)	0.25	(6.4)	0.66	(16.8)	0.38	(9.7)	0.40	(10.2)

NOTE:
(1) See Table 2 for *V* dimension.

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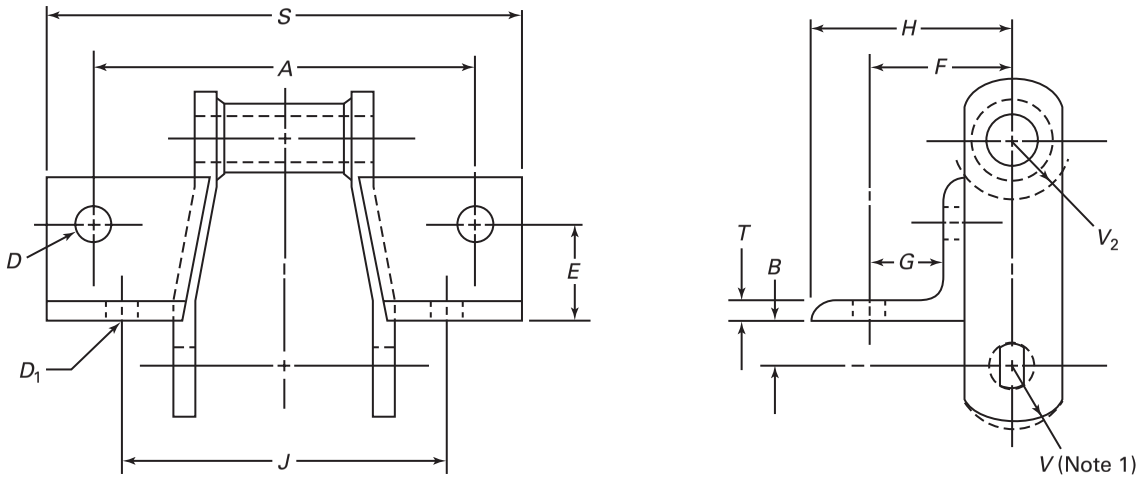


TABLE 8 F4 ATTACHMENT

Chain No.	Dimensions, in. (mm)												
	A	*B*	*E*	*F*	*G*	*H* Max.	*J*	*S* Max.	*T*	V_2	*D* Bolt Size	D_1 Bolt Size	*D* Min. Hole
W78	4.50	0.68	1.25	1.75	0.94	2.38	3.75	5.56	0.25	0.66	0.38	0.38	0.40
	(114.3)	(17.3)	(31.8)	(44.4)	(23.8)	(60.4)	(95.2)	(141.2)	(6.4)	(16.8)	(9.7)	(9.7)	(10.2)
W82	5.00	0.81	1.12	1.82	0.94	2.44	4.12	5.94	0.25	0.80	0.38	0.38	0.40
	(127.0)	(20.6)	(28.4)	(46.2)	(23.8)	(62.5)	(104.6)	(150.9)	(6.4)	(20.3)	(9.7)	(9.7)	(10.2)
W124	5.26	0.88	1.44	2.06	0.93	2.88	4.38	6.18	0.38	0.91	0.38	0.38	0.40
	(133.6)	(22.4)	(36.6)	(52.3)	(23.6)	(73.1)	(111.3)	(157.0)	(9.7)	(23.1)	(9.7)	(9.7)	(10.2)

NOTE:
(1) See Table 2 for *V* dimension.

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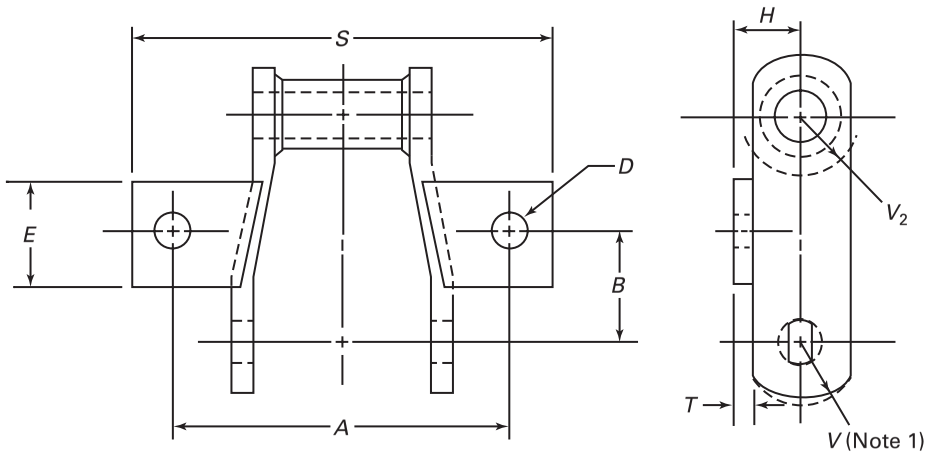


TABLE 9 K1 ATTACHMENT

Chain No.	Dimensions, in. (mm)																	
	A		*B*		*E* Max.		*H* Max.		*S* Max.		*T*		V_2		*D* Bolt Size		*D* Min. Hole	
	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
W78	4.00	(101.6)	1.25	(31.8)	1.44	(36.6)	0.88	(22.4)	5.12	(130.0)	0.25	(6.4)	0.66	(16.8)	0.38	(9.7)	0.40	(10.2)
W82	4.20	(106.7)	1.50	(38.1)	1.81	(46.0)	0.94	(23.9)	5.62	(142.7)	0.25	(6.4)	0.80	(20.3)	0.38	(9.7)	0.40	(10.2)

NOTE:
(1) See Table 2 for *V* dimension.

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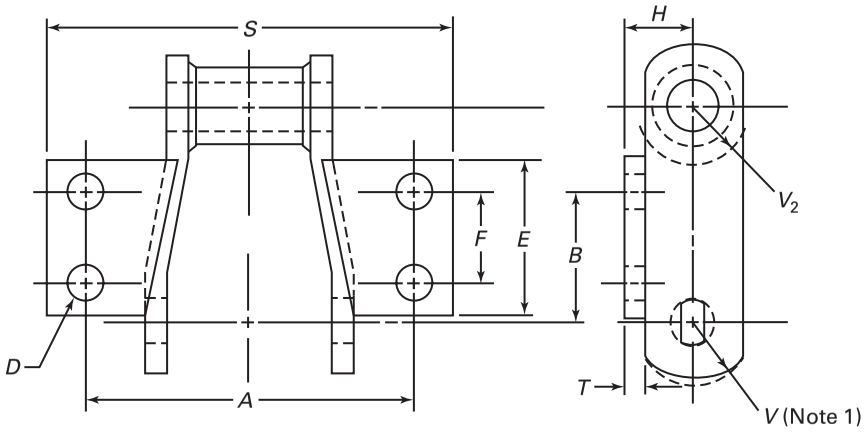


TABLE 10 K2 ATTACHMENT

Chain No.	Dimensions, in. (mm)																			
	A		*B*		*E* Max.		*F*		*H* Max.		*S* Max.		*T*		V_2		*D* Bolt Size		*D* Min. Hole	
	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
W78	4.00	(101.6)	1.53	(38.9)	2.06	(52.3)	1.12	(28.4)	0.88	(22.4)	5.12	(130.0)	0.25	(6.4)	0.66	(16.8)	0.38	(9.7)	0.40	(10.2)
W82	4.26	(108.2)	2.06	(52.3)	2.44	(62.0)	1.31	(33.3)	0.94	(23.9)	5.62	(142.7)	0.25	(6.4)	0.80	(20.3)	0.38	(9.7)	0.40	(10.2)
W110	5.32	(135.1)	3.88	(98.6)	3.31	(84.1)	1.75	(44.4)	1.18	(30.0)	6.62	(168.1)	0.38	(9.7)	0.91	(23.1)	0.38	(9.7)	0.40	(10.2)
W111	6.26	(159.0)	3.54	(89.9)	3.56	(90.4)	2.31	(58.7)	1.18	(30.0)	7.62	(193.5)	0.38	(9.7)	0.91	(23.1)	0.50	(12.7)	0.53	(13.5)
W124	5.26	(133.6)	2.81	(71.4)	3.06	(77.7)	1.94	(49.3)	1.18	(30.0)	7.12	(180.8)	0.38	(9.7)	0.91	(23.1)	0.38	(9.7)	0.40	(10.2)
W124H	5.26	(133.6)	2.88	(73.2)	3.18	(80.8)	1.94	(49.3)	1.56	(39.6)	6.52	(165.6)	0.50	(12.7)	1.12	(28.4)	0.50	(12.7)	0.53	(13.5)
W132	7.50	(190.5)	4.38	(111.2)	4.18	(106.2)	2.75	(69.8)	1.56	(39.6)	9.24	(234.7)	0.50	(12.7)	1.19	(30.2)	0.50	(12.7)	0.53	(13.5)

NOTE:
(1) See Table 2 for *V* dimension.

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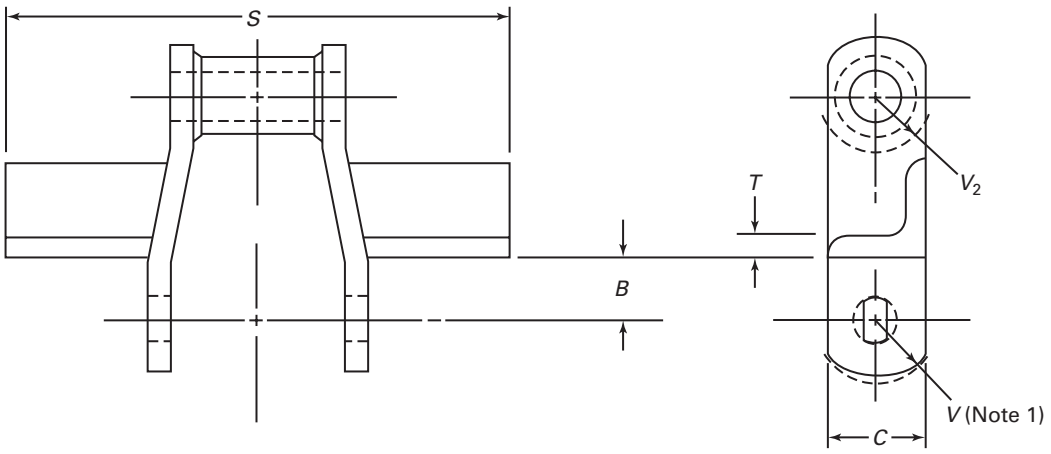


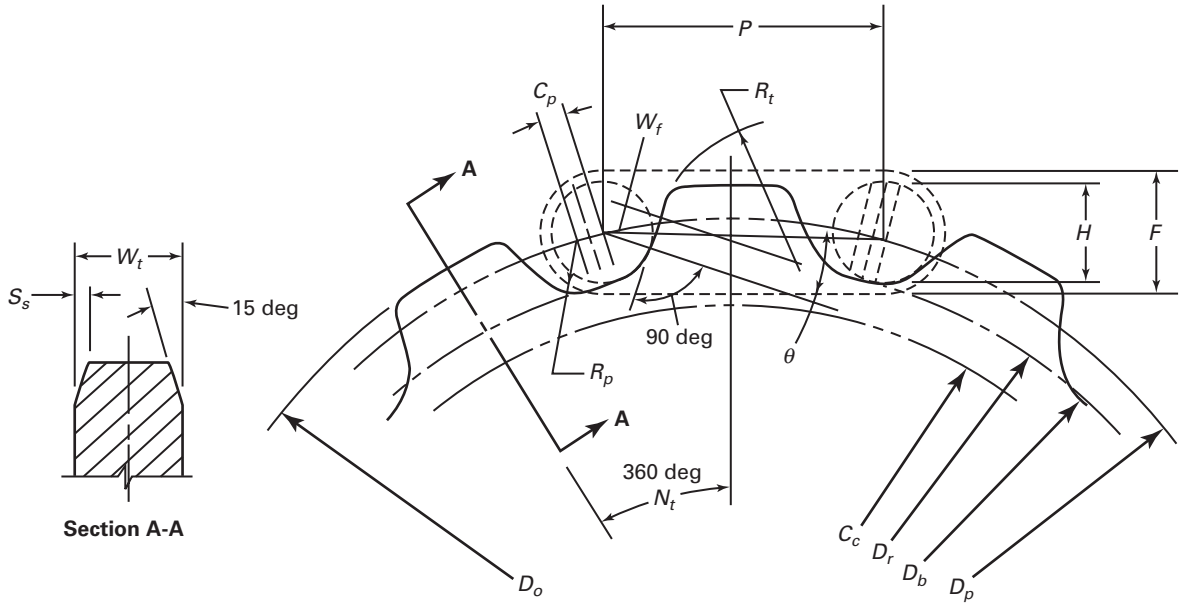
TABLE 11 W1 ATTACHMENT

Chain No.	Dimensions, in. (mm)									
	B		*C* Max.		*S* Max.		*T*		V_2	
	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
W78	0.75	(19.1)	1.06	(26.9)	6.06	(153.9)	0.25	(6.4)	0.66	(16.8)
W82	0.94	(23.9)	1.31	(33.3)	6.56	(166.6)	0.25	(6.4)	0.80	(20.3)
W124	1.18	(30.0)	1.56	(39.6)	8.56	(217.4)	0.25	(6.4)	0.91	(23.1)
W124H	1.38	(35.1)	2.06	(52.3)	8.56	(217.4)	0.38	(9.6)	1.12	(28.4)
W132	1.50	(38.1)	2.06	(52.3)	12.44	(316.0)	0.38	(9.6)	1.19	(30.2)

NOTE:
(1) See Table 2 for *V* dimension.

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

C_c = chain clearance circle [Note (1)] = $P(C_{cf} - 0.05) - F$ max.
C_p = pitch line clearance = $P \times 0.10$ to $P \times 0.15$
D_b = bottom diameter = $D_r - C_b$
D_o = outside diameter [Note (2)] = $(P \times C_{cf}) + F$ max.
D_p = pitch diameter = $P \times D_{pf}$
D_r = root diameter (max.) [Note (3)] = $(P \times D_{pf}) - H$ max.
F = chain height max. (see Table 3)
H = chain barrel height max. (see Table 2)
N_t = number of teeth
P = chain pitch
R_p = pocket radius (max.) [Note (3)] = $H/2$
R_t = topping radius = $0.5 \times P$
S_s = side slope = approx. $0.12 \times W_t$ not to exceed 0.38 in. (9.6 mm)
W_f = working face [Note (4)] = $0.01 \times P \times N_t$
W_t = tooth width (max.) = $0.95A$ min. width of chain
θ = pressure angle (see Table 13)

Additional variables not shown on drawing represent:

A = inside width for sprocket contact
C_b = undersize compensation (typically 0.06 in.)
C_{cf} = clearance circle and outside diameter factor (see Table 13) = cot $(180/N_t)$
D_{pf} = pitch diameter factor (see Table 13) = csc $(180/N_t)$

NOTES:
(1) No portion of hub, beads, lugs, or fillets shall extend beyond this circle in the sidebar zone.
(2) Limitation on the length of working face: The working face shall not extend beyond the line through the adjacent pitch point which is perpendicular to the working face.
(3) Root diameters and pocket radii must not exceed the maximums obtained from these formulae. Oversize dimensions cause improper chain and sprocket action and excessive chain loads.
(4) Outside diameter may be increased to give a full height tooth when the top of the chain is clear of flights, pans, buckets, etc. Tooth working face length provides for approximately 6% chain pitch elongation.

FIG. 4 SPROCKET TOOTH FORM

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TABLE 12 SPROCKETS: MAXIMUM ECCENTRICITY AND FACE RUNOUT TOLERANCES

Pitch Diameter ↓	Sprocket Property at Root Diameter	Maximum Face Runout TIR	Maximum Eccentricity TIR	Maximum Face Thickness
	Standard	0.06 in. for each 12 in. P.D. up to 24 in. 0.08 in. for the next 12 in. P.D. (36 in.) and 0.10 in. for the next 12 in. P.D. (48 in.). An additional 0.03 in. for each 12 in. increase in P.D. thereafter.	0.09 in. up to 12 in. P.D. with an additional 0.06 in. for each 12 in. increase in P.D. thereafter.	Maximum face thickness is equal to 0.95 times the minimum chain inside width for sprocket fit.
Up to and including 12 in.		0.06 in.	0.09 in.	
Over 12 in. up to and incl. 24 in.		0.12 in.	0.15 in.	
Over 24 in. up to and incl. 36 in.		0.20 in.	0.21 in.	
Over 36 in. up to and incl. 48 in.		0.30 in.	0.27 in.	
Over 48 in. up to and incl. 60 in.		0.33 in.	0.33 in.	
Over 60 in. up to and incl. 72 in.		0.36 in.	0.39 in.	
Over 72 in.		Consult manufacturer	Consult manufacturer	

TABLE 13 SPROCKET TOOTH FORM FACTORS

N_t	D_{pf}	θ deg	C_{cf}	N_t	N_t	D_{pf}	θ deg	C_{cf}	N_t
6	2.000	9	1.73	6	22	7.026	22	6.95	22
7	2.304	10	2.07	7	23	7.343	22	7.27	23
8	2.613	11	2.41	8	24	7.661	23	7.59	24
9	2.923	12	2.74	9	25	7.978	23	7.91	25
10	3.236	13	3.07	10	26	8.296	23	8.23	26
11	3.549	14	3.40	11	27	8.613	23	8.55	27
12	3.863	15	3.73	12	28	8.931	24	8.87	28
13	4.178	16	4.05	13	29	9.294	24	9.19	29
14	4.494	17	4.38	14	30	9.566	24	9.51	30
15	4.809	18	4.70	15	31	9.884	24	9.83	31
16	5.125	19	5.03	16	32	10.202	24	10.15	32
17	5.442	20	5.35	17	33	10.520	25	10.47	33
18	5.758	20	5.67	18	34	10.837	25	10.79	34
19	6.075	21	5.99	19	35	11.155	25	11.11	35
20	6.392	21	6.31	20	36	11.473	25	11.43	36
21	6.709	22	6.63	21					

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ASME B29.18M

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WELDED-STEEL-TYPE DRAG CHAINS, ATTACHMENTS, AND SPROCKET TEETH

1 DEFINITION

welded-steel-type drag chains: a series of identical welded offset links having barrels to contact the sprocket teeth, and pins which articulate in the barrels of the links. Chain is designed to operate closed-end of link forward for maximum push or scraping action against the material to be conveyed.

Pins are fixed in the sidebar pitch holes by either press fits and/or mechanical locks, such as flats, to prevent rotation of the pins in the sidebar pitch holes.

2 GENERAL CHAIN PROPORTIONS AND DESIGNATIONS

2.1 Minimum Ultimate Tensile Strength

The *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 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.

2.2 Measuring Load

Measuring load should be 5 times the weight of 10 ft of chain, rounded to the nearest 100 lbs.

2.3 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. However, due to minor variations in barrel configurations, coupling chains of different manufacture should be held to a minimum.

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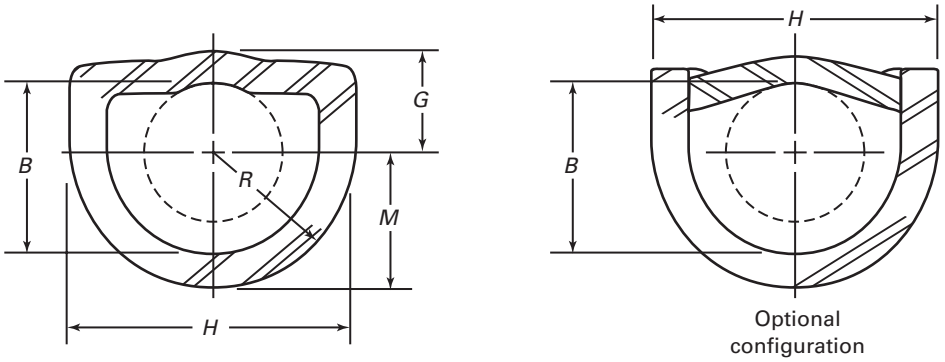


TABLE 1 BARREL CROSS SECTIONS

	Dimensions, in. (mm)							
	WD102, 104, 110, 112		WD113		WD116		W118, 122, 480	
	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
B (min.)	0.758	(19.35)	0.883	(22.43)	0.758	(19.25)	0.883	(22.43)
M	0.69	(17.5)	0.69	(17.5)	0.81	(20.6)	0.94	(23.9)
H	1.54	(39.1)	1.54	(39.1)	1.78	(45.2)	2.04	(51.8)
G	0.56	(14.2)	0.62	(15.7)	0.63	(16.0)	0.81	(20.6)
R (min.)	0.77	(19.6)	0.77	(19.6)	0.89	(22.6)	1.02	(25.9)

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D = pin diameter
B = S.B. hole or barrel I.D.
A = inside width for sprocket contact
T = sidebar thickness
F = chain height
H = barrel height
J = pin head to centerline
K = pin end to centerline
L = rivet head to centerline
P = chain pitch (This is a theoretical reference dimension used for basic calculations.)
Y = straight before bend: barrel end
Y_a = straight before bend: pin end
V = sidebar end clearance radius: pin end
V_a = sidebar end clearance radius: barrel end
X = width of link at barrel end extending to point on the pitch line Y in. from the centerline as shown
Z = width between sidebars at pin end extending to a point on the pitch line Y_a in. from the center line as shown
SS = barrel cross section: see Table 1

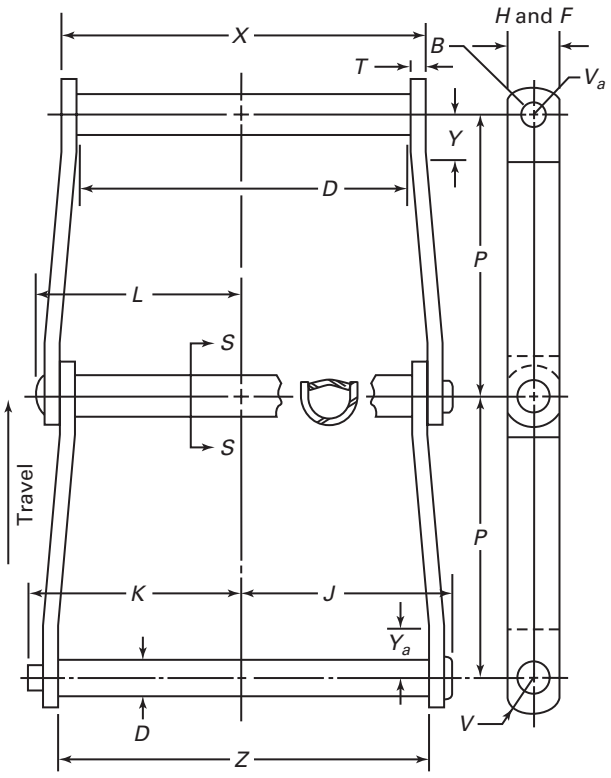


FIG. 1 DIMENSION OF CHAIN LINKS

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TABLE 2 GENERAL CHAIN DIMENSIONS, MINIMUM ULTIMATE TENSILE STRENGTH, MEASURING LENGTH AND LOAD FOR CHECKING CHAIN LENGTHS

CAUTION: The numerical values set forth in this Table must be read in conjunction with the definition and explanatory notes appearing on pg. 18. The minimum ultimate tensile strength (M.U.T.S.) values do not afford a sufficient or appropriate basis for determining chain applications.

	Dimensions, in. (mm)								
Chain No.	**WD102**	**WD104**	**WD110**	**WD112**	**WD113**	**WD116**	**WD118**	**WD122**	**WD480**
P = chain pitch	5.000 (127.00)	6.000 (152.40)	6.000 (152.40)	8.000 (203.20)	6.000 (152.40)	8.000 (203.20)	8.000 (203.20)	8.000 (203.20)	8.000 (203.20)
D = pin diameter	0.750 (19.05)	0.750 (19.05)	0.750 (19.05)	0.750 (19.05)	8.000 (22.22)	0.875 (19.05)	0.750 (22.22)	0.875 (22.22)	0.875 (22.22)
F = chain height	1.50 (38.10)	1.50 (38.10)	1.50 (38.10)	1.50 (38.10)	1.50 (38.10)	1.75 (44.45)	2.00 (50.80)	2.00 (50.80)	2.00 (50.80)
H = barrel outside diameter	1.50 (38.10)	1.50 (38.10)	1.50 (38.10)	1.50 (38.10)	1.50 (38.10)	1.75 (44.45)	2.00 (50.80)	2.00 (50.80)	2.00 (50.80)
T = sidebar thickness	0.38 (9.65)	0.38 (9.65)	0.38 (9.65)	0.38 (9.65)	0.50 (12.70)	0.38 (9.65)	0.50 (12.70)	0.50 (12.70)	0.50 (12.70)
Minimun ultimate tensile strength (M.U.T.S.) lb (kN) (see pg. 2)									
Pin heat treated	38,250 (170)	38,25 (170)	38,250 (170)	38,250 (170)	48,000 (213)	55,000 (245)	70,000 (311)	70,000 (311)	70,000 (311)
All heat treated	55,000 (245)	55,000 (245)	55,000 (245)	55,000 (245)	57,000 (253)	59,000 (262)	79,000 (351)	79,000 (351)	79,000 (351)
Number of pitches in standard measuring length	24 (24)	20 (20)	20 (20)	15 (15)	20 (20)	15 (15)	15 (15)	15 (15)	15 (15)
Standard measuring length	120.00 (3 048.00)	120.00 (3 048.00)	120.00 (3 048.00)	120.00 (3 048.00)	120.00 (3 048.00)	120.00 (3 048.00)	120.00 (3 048.00)	120.00 (3 048.00)	120.00 (3 048.00)
Measuring load lb (kN)	600 (2.7)	400 (1.8)	700 (3.1)	600 (2.7)	800 (3.6)	800 (3.6)	1300 (5.8)	900 (4.0)	1000 (4.4)

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TABLE 3 MAXIMUM AND MINIMUM CONTROLLING DIMENSIONS FOR INTERCHANGEABLE CHAIN LINKS

	Dimensions, in. (mm)								
Chain No.	**WD102**	**WD104**	**WD110**	**WD112**	**WD113**	**WD116**	**WD118**	**WD122**	**WD480**
Chain pitch (*P*)	5.000 (127.00)	6.000 (152.40)	6.000 (152.40)	8.000 (203.20)	6.000 (152.40)	8.000 (203.20)	8.000 (203.20)	8.000 (203.20)	8.000 (203.20)
Strand length — max.	120.38 (3 057.6)	120.38 (3 057.6)	120.38 (3 057.6)	120.38 (3 057.6)	120.38 (3 057.6)	120.38 (3 057.6)	120.38 (3 057.6)	120.38 (3 057.6)	120.38 (3 057.6)
Pin diameter — max. (*D*)	0.753 (19.13)	0.753 (19.13)	0.753 (19.13)	0.753 (19.13)	0.878 (22.30)	0.753 (19.13)	0.878 (22.30)	0.878 (22.30)	0.878 (22.30)
Inside diameter of barrel or sidebar hole — barrel end — min. (*B*)	0.758 (19.25)	0.758 (19.25)	0.758 (19.25)	0.758 (19.25)	0.883 (22.43)	0.758 (19.25)	0.883 (22.43)	0.883 (22.43)	0.883 (22.43)
Inside width for sprocket contact — min. (*A*)	6.38 (162.0)	4.12 (104.6)	9.00 (228.6)	9.00 (228.6)	9.00 (228.6)	13.00 (330.2)	13.25 (336.5)	8.75 (222.2)	11.12 (282.4)
Barrel height — max. (*H*)	1.54 (39.1)	1.54 (39.1)	1.54 (39.1)	1.54 (39.1)	1.54 (39.1)	1.78 (45.2)	2.04 (51.8)	2.04 (51.8)	2.04 (51.8)
Straight before bend, barrel end — min. (*Y*)	1.01 (25.6)	1.01 (25.6)	1.01 (25.6)	1.01 (25.6)	1.01 (25.6)	1.13 (28.7)	1.39 (35.3)	1.26 (32.0)	1.39 (35.3)
Straight before bend, pin end — min. (Y_a)	1.01 (25.6)	1.01 (25.6)	1.01 (25.6)	1.01 (25.6)	1.01 (25.6)	1.13 (28.7)	1.39 (35.3)	1.39 (35.3)	1.39 (35.3)
Sidebar end clearance radius — pin end — max. (*V*)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.12 (28.4)	1.38 (35.0)	1.38 (35.0)	1.25 (31.7)
Sidebar end clearance radius — barrel end — max. (V_a)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.12 (28.4)	1.38 (35.0)	1.38 (35.0)	1.38 (35.0)
Width of link barrel end — max. (*X*)	7.76 (197.1)	5.39 (136.9)	10.39 (263.9)	10.39 (263.9)	10.64 (270.2)	14.14 (359.1)	14.89 (378.2)	10.26 (260.6)	12.76 (324.1)
Width between sidebars, pin end — min. (*Z*)	7.78 (197.6)	5.41 (137.4)	10.41 (264.4)	10.41 (264.4)	10.66 (270.7)	14.16 (359.6)	14.91 (378.7)	10.28 (261.1)	12.78 (324.6)

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TABLE 4 CHAIN CLEARANCE DIMENSIONS

	Dimensions, in. (mm)																	
	WD102		WD104		WD110		WD112		WD113		WD116		WD118		WD122		WD480	
Chain No.	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
Chain height — maximum (*F*)	1.56	(39.6)	1.56	(39.6)	1.56	(39.6)	1.56	(39.6)	1.56	(39.6)	1.81	(46.0)	2.06	(52.3)	2.06	(52.3)	2.06	(52.3)
Pin head to center line of chain — maximum (*J*)	4.63	(117.6)	3.44	(87.4)	5.95	(151.1)	5.95	(151.1)	6.19	(157.2)	7.90	(200.7)	8.31	(211.1)	6.00	(152.4)	7.25	(184.1)
Pin end to center line of chain — maximum (*K*)	5.03	(127.8)	3.70	(94.0)	6.20	(157.5)	6.20	(157.5)	6.50	(165.1)	8.08	(205.2)	8.66	(220.0)	6.38	(162.1)	7.63	(193.8)
Riveted head to center line of chain — maximum (*L*)	5.00	(127.8)	3.70	(94.0)	6.20	(157.5)	6.20	(157.5)	6.50	(165.1)	8.08	(205.2)	8.66	(220.0)	6.38	(162.1)	7.63	(193.8)

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3 ATTACHMENTS

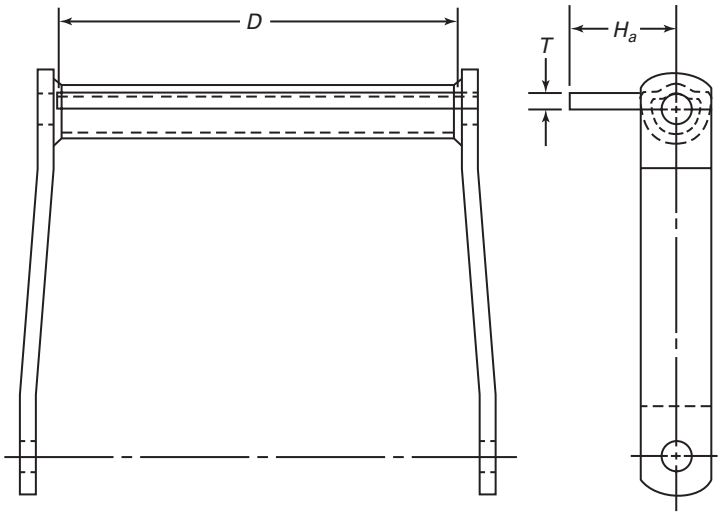


TABLE 5 C1-TYPE ATTACHMENT

Dimensions, in. (mm)						
Chain No.	*T*		*D* Max.		H_a Max.	
	in.	(mm)	in.	(mm)	in.	(mm)
WD102	0.38	(9.7)	7.76	(197.1)	2.44	(62.0)
WD104	0.38	(9.7)	5.39	(136.9)	2.44	(62.0)
WD110	0.38	(9.7)	10.39	(263.9)	2.44	(62.0)
WD112	0.38	(9.7)	10.39	(263.9)	2.44	(62.0)
WD116	0.38	(9.7)	14.14	(359.2)	2.68	(68.1)

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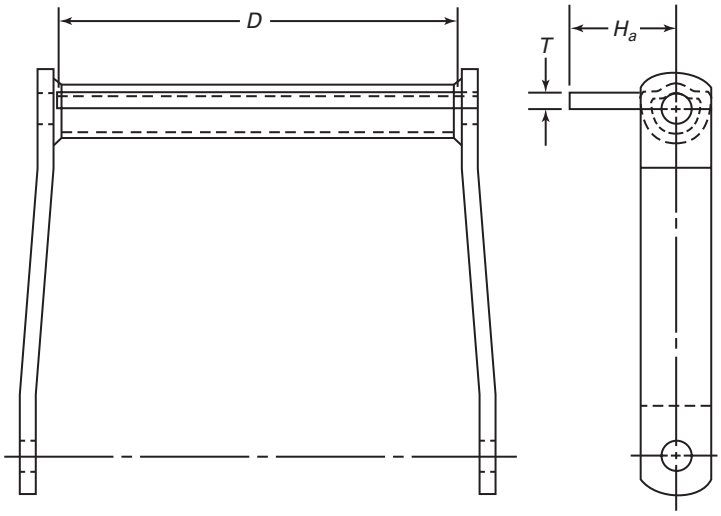


TABLE 6 C3-TYPE ATTACHMENT

Dimensions, in. (mm)						
	T		*D* Max.		H_a Max.	
Chain No.	in.	(mm)	in.	(mm)	in.	(mm)
WD110	0.50	(12.7)	10.39	(263.9)	2.31	(58.7)
WD113	0.50	(12.7)	10.64	(270.3)	2.31	(58.7)
WD118	0.50	(12.7)	14.89	(378.2)	3.06	(77.7)
WD480	0.50	(12.7)	12.76	(324.1)	3.06	(77.7)

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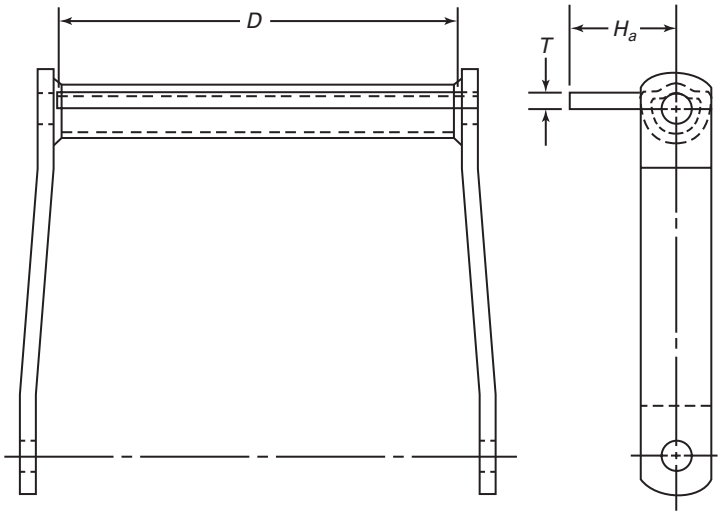


TABLE 7 C4-TYPE ATTACHMENT

Dimensions, in. (mm)						
	T		*D* Max.		H_a Max.	
Chain No.	**in.**	**(mm)**	**in.**	**(mm)**	**in.**	**(mm)**
WD102	0.38	(9.7)	7.76	(197.1)	3.81	(96.8)
WD104	0.38	(9.7)	5.39	(136.9)	3.81	(96.8)
WD110	0.38	(9.7)	10.39	(263.9)	3.81	(96.8)
WD112	0.38	(9.7)	10.39	(263.9)	3.81	(96.8)
WD113	0.50	(12.7)	10.64	(270.3)	4.81	(122.2)
WD116	0.38	(9.7)	14.14	(359.2)	4.94	(125.5)
WD480	0.50	(12.7)	12.76	(324.1)	5.06	(128.5)

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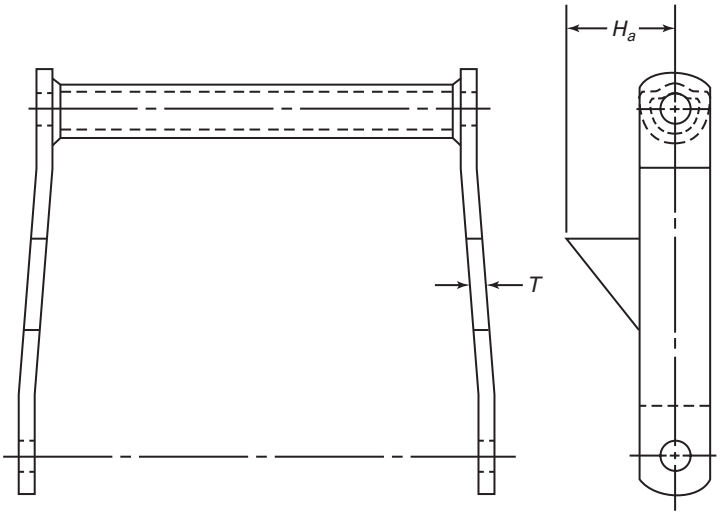


TABLE 8 RR-TYPE ATTACHMENT

Dimensions, in. (mm)				
	H_a Max.		T	
Chain No.	in.	(mm)	in.	(mm)
WD102	2.56	(65.0)	0.38	(9.7)
WD104	2.56	(65.0)	0.38	(9.7)
WD110	2.56	(65.0)	0.38	(9.7)
WD112	2.56	(65.0)	0.38	(9.7)
WD113	2.56	(65.0)	0.50	(12.7)
WD116	3.06	(77.7)	0.38	(9.7)
WD118	3.31	(79.2)	0.50	(12.7)
WD480	3.31	(84.1)	0.50	(12.7)

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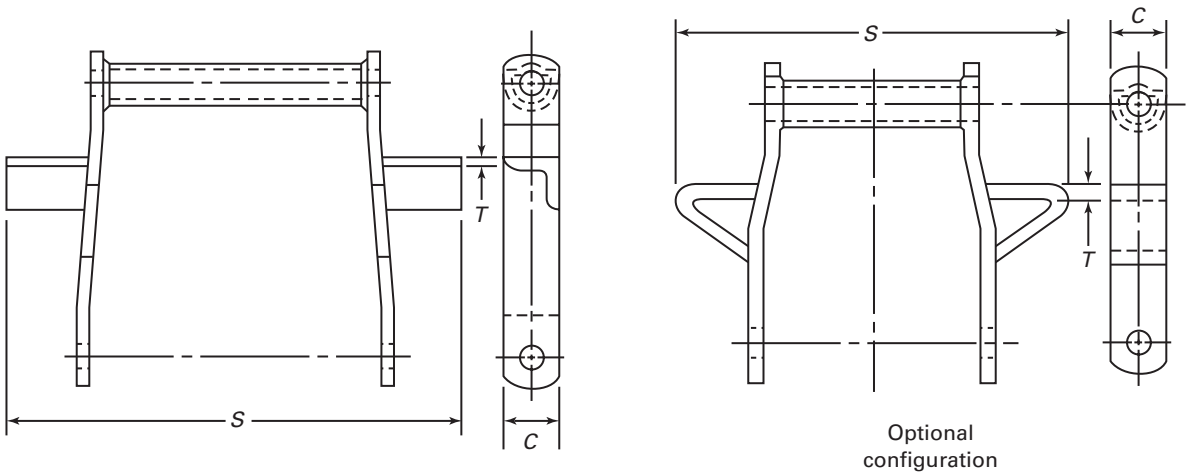
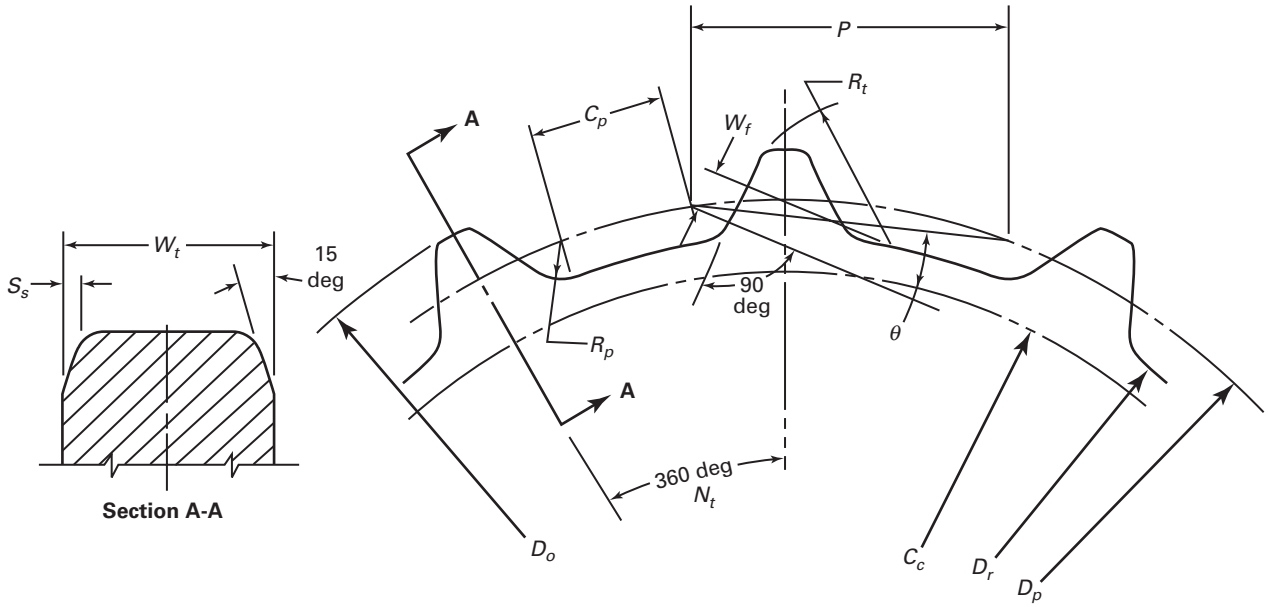


TABLE 9 WING-TYPE ATTACHMENT

Dimensions, in. (mm)						
	C **Max.**		***S*** **Max.**		***T***	
Chain No.	**in.**	**(mm)**	**in.**	**(mm)**	**in.**	**(mm)**
WD102	1.56	(39.6)	14.38	(365.3)	0.38	(9.7)
WD104	1.56	(39.6)	11.62	(295.1)	0.38	(9.7)
WD110	1.56	(39.6)	17.12	(434.8)	0.38	(9.7)
WD112	1.56	(39.6)	17.12	(434.8)	0.38	(9.7)
WD113	1.56	(39.6)	17.12	(434.8)	0.38	(9.7)
WD116	1.81	(46.0)	22.12	(561.8)	0.38	(9.7)
WD480	2.06	(52.3)	22.12	(561.8)	0.38	(9.7)

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4 SPROCKET TOOTH FORM



The elements of a chain sprocket and a tooth form may be determined by the following:
C_c = chain clearance circle [Note (1)] = $P(C_{cf} - 0.05) - F$ max.
C_p = pitch line clearance = $P \times .30$
D_b = bottom diameter = $D_r - C_p$
D_o = outside diameter [Note (4)] = $(P \times C_{cf}) + F$ max.
D_p = pitch diameter = $P \times D_{pf}$
D_r = root diameter (max.) [Note (3)] = $(P \times D_{pf}) - H$ max.
F = chain height max. (see Table 4)
H = chain barrel height max. (see Table 3)
N_t = number of teeth
P = chain pitch
R_p = pocket radius (max.) [Note (3)] = $H/2$
R_t = topping radius = $0.5 \times P$
S_s = side slope = approx. $0.12 \times W_t$ not to exceed 0.38 in. (9.6 mm)
W_f = working face [Note (2)] = $0.01 \times P \times N_t$
W_t = tooth width (max.) = $0.95A$ min. width of chain
θ = pressure angle (see Table 11)

Additional variables not shown on drawing represent:
A = inside width for sprocket contact (see Table 3)
C_b = undersize compensation (typically 0.06 in.)
C_{cf} = clearance circle and outside diameter factor (see Table 11) = cot $(180/N_t)$
D_{pf} = pitch diameter factor (see Table 11) = csc $(180/N_t)$

NOTES:
(1) No portion of hub, beads, lugs, or fillets shall extend beyond this circle in the sidebar zone.
(2) Limitation on the length of working face: The working face shall not extend beyond the line through the adjacent pitch point which is perpendicular to the working face.
(3) Root diameters and pocket radii must not exceed the maximums obtained from these formulae. Oversize dimensions cause improper chain and sprocket action and excessive chain loads.
(4) Outside diameter may be increased to give a full height tooth when the top of the chain is clear of flights, pans, buckets, etc. Tooth working face length provides for approximately 6% chain pitch elongation.

FIG. 2 SPROCKET TOOTH FORM

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5 SPROCKET DESIGN DATA

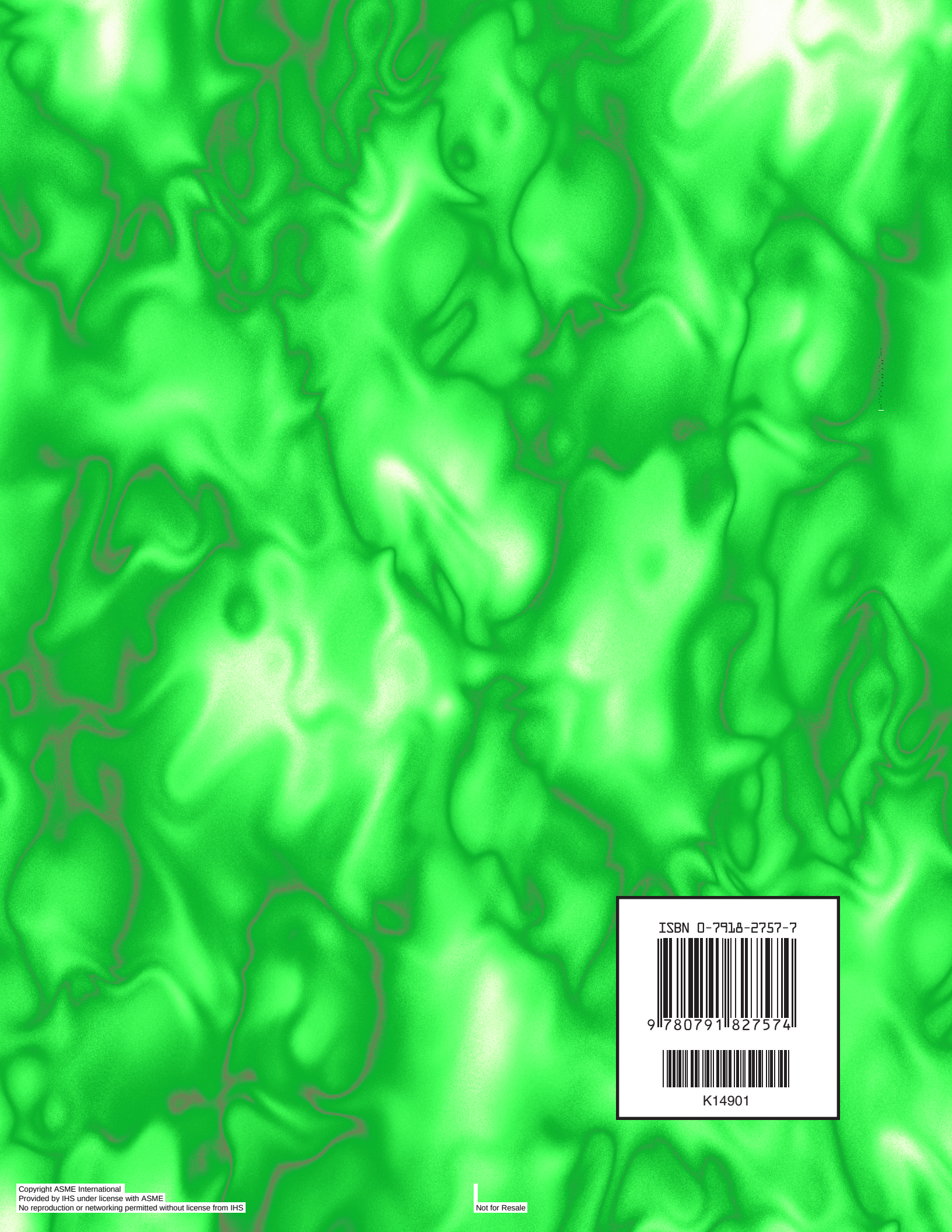
TABLE 10 SPROCKET TOOTH FORM FACTORS

N_t	D_{pf}	θ deg.	C_{cf}	N_t	D_{pf}	θ deg.	C_{cf}
5	1.701	8	1.38	13	4.178	16	4.05
6	2.000	9	1.73	14	4.494	17	4.38
7	2.304	10	2.07	15	4.809	18	4.70
8	2.613	11	2.41	16	5.125	19	5.03
9	2.923	12	2.74	17	5.442	20	5.35
10	3.235	13	3.07	18	5.758	20	5.67
11	3.549	14	3.40	19	6.075	21	5.99
12	3.863	15	3.73	20	6.392	21	6.31

TABLE 11 SPROCKETS: MAXIMUM ECCENTRICITY AND FACE RUNOUT TOLERANCES

Pitch Diameter ↓	Sprocket Property at Root Diameter	Maximum Face Runout TIR	Maximum Eccentricity TIR	Maximum Face Thickness
	Standard	0.06 in. for each 12 in. P.D. up to 24 in. 0.08 in. for the next 12 in. P.D. (36 in.) and 0.10 in. for the next 12 in. P.D. (48 in.). An additional 0.03 in. for each 12 in. increase in P.D. thereafter.	0.09 in. up to 12 in. P.D. with an additional 0.06 in. for each 12 in. increase in P.D. thereafter.	Maximum face thickness is equal to 0.95 times the minimum chain inside width for sprocket fit.
Up to and including 12 in.		0.06 in.	0.09 in.	
Over 12 in. up to and incl. 24 in.		0.12 in.	0.15 in.	
Over 24 in. up to and incl. 36 in.		0.20 in.	0.21 in.	
Over 36 in. up to and incl. 48 in.		0.30 in.	0.27 in.	
Over 48 in. up to and incl. 60 in.		0.33 in.	0.33 in.	
Over 60 in. up to and incl. 72 in.		0.36 in.	0.39 in.	
Over 72 in.		Consult manufacturer	Consult manufacturer	

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