

Oil Field Chain and Sprockets

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Introduction

This specification is under the jurisdiction of the API Subcommittee on Drilling Structures and Equipment.

The purpose of this specification is to provide standards for roller chains suitable for use in oil field drilling and producing operations.

Much of the engineering material pertaining to roller chains and sprockets was base on ASME B29.1 and the book *Chains for Power Transmission and Material Handling*, published by the American Chain Association. Additionally, portions of ASME B29.1 are requirements of this specification as referenced herein.

Some of the performance related characteristics of the chains that are contained in this document are specific to oil field chains and to their application to oil field drives. This information cannot be found in other publications and imposes performance testing that goes beyond the basic requirements found in any other standards or specifications.

A section on drive design has not been included in this edition of the specification due to the great variety of applications and the complexity of the subject drives.

Conversions of U.S. Customary Units (USC) to International System (SI) metric units are provided for reference only throughout the text of this specification in parentheses, e.g., 6 in. (152.4 mm). SI equivalents have also been included in all tables. Formulas and certain relationships are intentionally presented only in U.S. Customary Units to preclude any ambiguity between them and tabulated values. Conversion factors are provided below if SI equivalents are desired for the calculated unit values.

U.S. Customary Units are in all cases preferential and shall be standard in this specification. Products are to be marked in the units in which ordered unless there is an agreement to the contrary between the Purchaser and the Manufacturer.

1 in. (in.)	=	25.4 millimeters (mm) exactly
1 foot (ft)	=	0.3048 meters (m) exactly
1 pound force (lbf)	=	4.448222 Newtons (N)
1 foot•pound force (ft•lbf) torque	=	1.355818 Newton•meters (N•m)
1 horsepower (hp) (550 ft•lbf/s)	=	0.7456999 kilowatts (kW)
1 gallon per minute (gpm)	=	0.0630920 cubic decimeters/second (dm ³ /s)

The following formula was used to convert degrees Fahrenheit (F) to degrees Celsius (C):

$$^{\circ}\text{C} = 5/9 (^{\circ}\text{F} - 32)$$

Oil Field Chain and Sprockets

1 Scope

This specification covers the manufacture of the components for, and the assembly and packaging of, single and multiple strand, number 40 through 240, standard and heavy series roller chains for oil field applications, including chain designation, chain length tolerance, tensile strength specifications, pin and bushing press-out specifications, and dynamic test requirements.

For informational purposes, Annex A provides recommendations for installation, lubrication, and maintenance of oil field chain drives and Annex B includes a basic description of roller chain sprockets.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

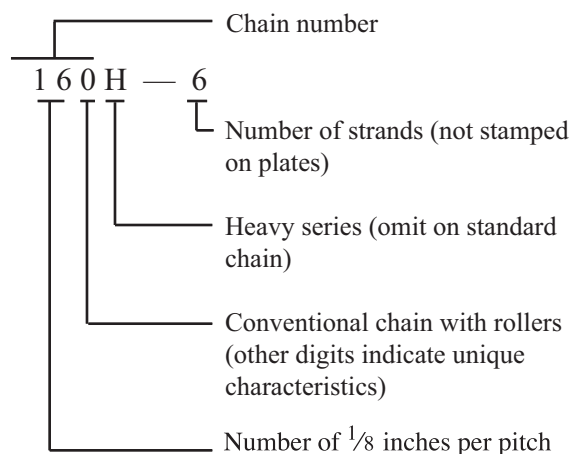
ASME¹ B29.1, *Precision Power Transmission Roller Chains, Attachments and Sprockets*

ASME B29.26, *Fatigue Testing Power Transmission Roller Chain*

3 Roller Chain

3.1 Chain Designation

Chain covered by this specification is identified by the designation shown in the following example and in more detail in ASME B29.1.



3.2 Heavy Series Chains

Heavy series chains are made in 3/4 in. (19.05 mm) and larger pitches and differ from standard series chains in thicknesses of link plates. Their value is only in the acceptance of higher loads during low-speed operation.

¹ ASME International, 3 Park Avenue, New York, NY, 10016-5990, www.asme.org.

3.3 Dimensions

The general dimensions for roller chains shown in Figure 1 and Figure 2 shall be as specified in ASME B29.1.

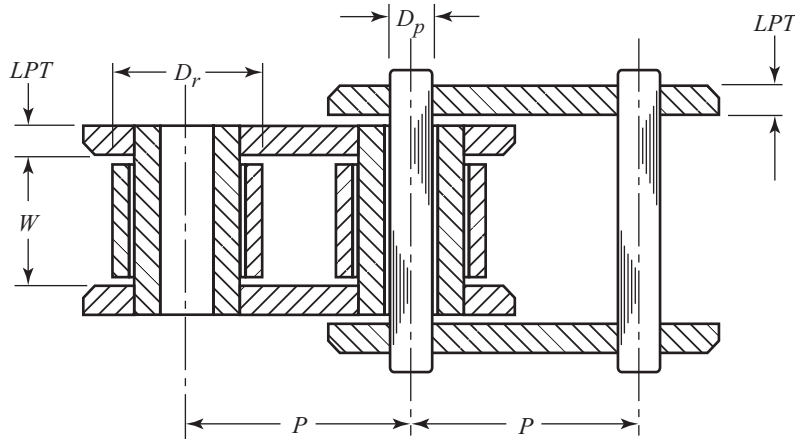


Figure 1—Chain Assembly

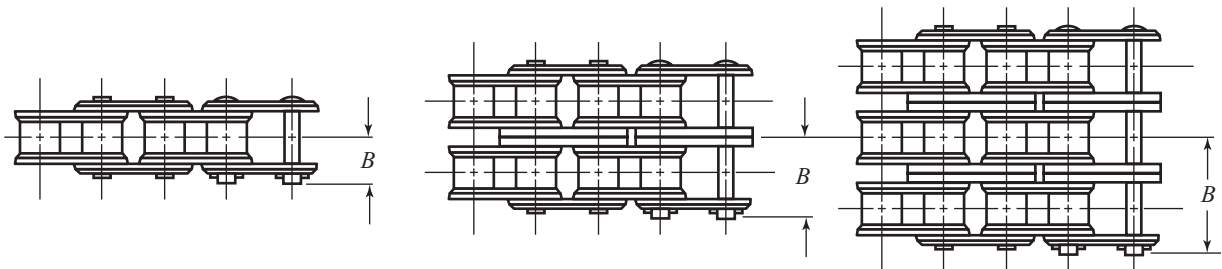


Figure 2—Single and Multiple Chain Assemblies

3.4 Chain Length Tolerance

Measuring load is the load under which a chain is to be when measured for length. It is equal to 1 % of the minimum ultimate tensile strength, with a minimum of 18 lb (80.07 N) and a maximum of 1000 lb (4.45 kN), for both single and multiple strand chains.

Chains shall be measured for chain length tolerance in accordance with Table 1 after all manufacturing processes, except final lubrication, are complete.

Length measurements are to be taken over a length of at least 12 in. (300 mm).

New chains, under standard measuring load, shall not be under-length.

3.5 Tensile Strength

3.5.1 Single Strand Chain

Standard and heavy series single strand chain meeting the requirements of this specification will have a minimum ultimate tensile strength equal to or greater than the values listed in Table 2.

Table 1—Chain Length Tolerance

Chain Number	Overlength Tolerance	
	in./ft	mm/m
40	0.019	1.58
50	0.018	1.50
60, 60H	0.017	1.42
80, 80H	0.016	1.33
100, 100H	0.016	1.33
120, 120H	0.015	1.25
140, 140H	0.015	1.25
160, 160H	0.015	1.25
180, 180H	0.015	1.25
200, 200H	0.015	1.25
240, 240H	0.015	1.25

3.5.2 Multiple Strand Chain

For multiple strand chain, the minimum ultimate tensile strength equals that of the single strand multiplied by the number of strands.

3.5.3 Minimum Ultimate Tensile Strength

Minimum ultimate tensile strength (MUTS), for chains covered by this specification, is defined in ASME B29.1. Chains covered by this specification shall have a MUTS equal to, or greater than, the values listed in Table 2.

MUTS is not a measure of the load at which a chain may be applied; it is indicative only of the tensile strength quality of the chain.

Any chain tests made to verify the MUTS set by this specification are to be considered destructive. Consequently, all chain specimens subjected to such tests, failed or otherwise, are deemed unfit for application purposes.

3.6 Preloading

Chains covered by this specification shall be preloaded during manufacture to a tensile load of at least 30% of the minimum ultimate tensile strength listed in Table 2.

3.7 Minimum Press-out Force

3.7.1 General

The values in Table 2 represent the minimum force required to start movement of a single pin or bushing in a single link plate. The purpose of these values is to provide for the testing of pin and bushing retention characteristics. This is indicative of the aperture condition in the link plates and the interference fits of the pins and bushings in their respective link plates.

Table 2—Table of Standard Chain Capacities

ANSI Number	Minimum Ultimate Tensile Strength lb (N)	Minimum Press-out Force lb (N)		Minimum Dynamic Strength lb (N)
		Pin	Bush	
40	3125 (13,900)	180 (800)	108 (480)	720 (3200)
50	4880 (21,710)	300 (1334)	180 (801)	1120 (4980)
60	7030 (31,270)	412 (1833)	247 (1099)	1600 (7120)
80	12,500 (55,600)	728 (3238)	437 (1944)	2810 (12,500)
100	19,500 (86,870)	1060 (4715)	635 (2825)	4300 (19,130)
120	28,100 (125,100)	1430 (6361)	859 (3821)	6060 (26,960)
140	38,300 (170,270)	1880 (8363)	1120 (4982)	8030 (35,720)
160	50,000 (222,400)	2370 (10,542)	1420 (6316)	10,200 (45,370)
180	63,300 (281,470)	3540 (15,747)	2120 (9430)	12,500 (55,600)
200	78,100 (347,500)	4580 (20,373)	2740 (12,188)	15,000 (66,720)
240	112,500 (500,400)	5380 (23,931)	3540 (15,747)	20,100 (89,410)
60H	7030 (31,270)	548 (2438)	329 (1463)	1850 (8230)
80H	12,500 (55,600)	910 (4048)	546 (2429)	3140 (13,970)
100H	19,500 (86,740)	1270 (5649)	762 (3390)	4710 (20,950)
120H	28,100 (125,000)	1670 (7429)	1000 (4448)	6550 (29,140)
140H	38,300 (170,370)	2150 (9564)	1280 (5694)	8580 (38,170)
160H	50,000 (222,410)	2670 (11,877)	1600 (7117)	10,800 (48,040)
180H	63,300 (281,570)	3930 (17,482)	2360 (10,498)	13,200 (58,720)
200H	78,100 (347,410)	5500 (24,465)	3290 (14,635)	16,400 (72,950)
240H	112,500 (500,420)	7170 (31,894)	4720 (20,996)	23,200 (103,200)

3.7.2 Pin and Pin-link Plates

Chain link assemblies that are assembled with riveted pinheads shall have the rivet removed, exercising care not to remove the link plate metal below the surface of the link plate. One of the link plates shall be removed carefully to avoid destroying the joint integrity between the pins and the link plates. The remaining plate shall be placed in a hydraulically or mechanically operated testing machine with the pin link level and supported to prevent movement when pressure is applied. A single axial load shall be slowly applied to the pin, pressing the pin out of the joint toward the inside of the plate. A force less than the specified press-out load, as applicable for the subject chain, shall constitute failure of the test.

3.7.3 Roller Link Plate

One of the roller link plates shall be removed using the same method as described for the pin link. Remove the two rollers from the bushings and place the plate with the two bushings in the testing machine with the plate supported to prevent movement when pressure is applied. A single axial load shall be slowly applied to the end of the bushing, pressing the bushing out of the plate. A load that is less than the specified press-out load shall constitute failure of the test.