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FOREWORD

The original design of precision roller chain dates back to the late 1890s, although various types of drive chains have been in use for centuries. The early automobiles used roller chains extensively as the final drive. The industrial use for roller chains grew substantially, resulting in the desirability of standardization. The perfected American standard chain of today has evolved to meet the demand for ever-increasing horsepower and higher speeds, as well as accurate timing.

In 1913, the Society of Automotive Engineers (SAE) published formulas for calculating the roller chain length, sprocket tooth profiles, and other important design criteria. Recommendations from the Roller Chain Committee of the American Society of Mechanical Engineers (ASME) followed in 1917 with dimensional standards for the various components and assemblies. Early in 1920, through the cooperation of these two groups, roller chain standards were formulated and recommended for acceptance by industry. The progress was followed in 1921 by organization of a sprocket committee of the American Gear Manufacturers Association (AGMA).

ASA Sectional Committee B29, Transmission Chain, Sprockets, and Cutters, was organized in 1924 by the American Standards Association with ASME, AGMA, and SAE as sponsors. A subcommittee on roller chains was established to study modern practice of roller chain manufacture and use. Its recommendations on standards were approved by the Sectional Committee in May 1929 and approved by the American Standards Association in July 1930. They were published as B29a-1930, Roller Chain, Sprockets, and Cutters. This roller chain standard ensured interchangeability and optional sources of supply.

In 1930, the Association of Roller and Silent Chain Manufacturers (ARSCM) was founded. The objectives of the association were to cooperate in developing standards of sound engineering and manufacturing practice, to foster improvements in chain performance, and to extend the use of roller chains. This association was subsequently dissolved in 1960, and its members became part of the American Sprocket Chain Manufacturers Association (ASCMA), which was organized to bring together manufacturers of all types of sprocket-driven chains. The name of this group was changed in 1971 to the American Chain Association (ACA).

As a result of combined industry research programs sponsored by ARSCM, starting in 1946 and continuing under ASCMA, greater predictability of roller chain drive service life has been achieved. These studies provided greater knowledge of such roller chain characteristics as link plate endurance strengths, roller impact forces, dynamic tension forces, operating efficiency, wear life of well-lubricated drives at various speeds and loads, pin–bushing interaction at high speeds, and the phenomenon of chain joint galling. This scientific exploration produced such vast gains in the technical knowledge of capabilities of roller chains that increases in horsepower ratings were possible. The wear studies, for example, have shown that a separating film of lubricant is formed in chain joints in a manner similar to that found in journal bearings. These studies thus opened a region of chain application at high speeds that had previously been thought to be impractical. The direct result of this research has been the continual increase in chain horsepower ratings contained in Nonmandatory Appendix A. This Appendix also contains suggestions concerning the application and use of the chains covered by this Standard.

This Standard covers transmission roller chains, attachments, and sprockets. It is intended to facilitate fulfillment of the needs of users, distributors, and manufacturers of chain sprocket drives on a sound economic basis and in a manner consistent with sound engineering and manufacturing practices.

Control dimensions are given in this Standard to ensure interchangeability between chains, sprockets, and chain links as supplied by different manufacturers. Information for the guidance of users in the application of these drives is also included.

In addition to its customary usage as a power transmission medium, precision roller chain has also been adapted for use in conveying, elevating, indexing, and timing operations. Modifications of standard chain parts to perform these functions are known as *attachments.* To ensure interchangeability of the more commonly used attachments, standardization of certain principal dimensions was initiated in 1947. This information, formerly published as a separate standard, was incorporated into this precision roller chain Standard.

ASME/ANSI B29.1M-1986 was approved by the American National Standards Institute on January 9, 1986.

ASME B29.1M-1993 included two significant modifications. The first was a revision to the definition of minimum ultimate tensile strength that clarified the meaning and use of the term. The second was a revision to the listed values for maximum pin diameter and minimum hole in bushing. These changes did not affect the interchangeability of the chains. The values were changed to provide a rational basis for conversion between conventional (inch) and SI (metric) dimensions. With concurrent changes in the related ISO standards, a long-standing area of potential discrepancies was eliminated. ASME B29.1M-1993 was approved by the American National Standards Institute on August 10, 1993.

ASME B29.1M, Precision Power Transmission Roller Chains, Attachments, and Sprockets; ASME B29.3M, Double-Pitch Power Transmission Roller Chains and Sprockets; and ASME B29.4M, Double-Pitch Conveyor Roller Chains, Attachments, and Sprockets, were incorporated into a new standard that was designated ASME B29.100.

ASME B29.100-2002 included four significant modifications to B29.1: a revision to the minimum ultimate tensile strength definition, the addition of minimum dynamic strength and conformance test requirements for chains specified in this Standard, the addition of requirements for roller chain preloading, and a revision to the note in para. A1.8. The revision recognized the need for the user to contact the roller chain manufacturer for specific derating factors for slip-fit connecting links, offset sections, and offset links. Similar changes were being made to International Standard ISO 606 to be in close agreement with that standard. ASME B29.100-2002 was approved as an American National Standard on April 3, 2002.

In 2008, the B29 Standards Committee agreed to remove the portion of the ASME B29.100 standard formerly known as ASME B29.1 from the incorporated standard, reestablishing ASME B29.1 as a separate standard.

ASME B29.1-2011 includes significant changes to the nonmandatory appendices. Nonmandatory Appendix A was revised to use the new and improved power ratings for American National Standard (ANS) roller chains issued by the ACA in 2001. Nonmandatory Appendix B was added to show the equations on which the new ratings are based. Information on sprocket tooth cutting tools was moved to the new Nonmandatory Appendix C. ASME B29.1-2011 was approved as an American National Standard on July 15, 2011.

Dimensional limits in this Standard are presented in U.S. customary inch–pound units. Companion tabulations are included to show conversions of the final limiting values into metric (SI) units in accordance with ASME Guide SI-1, ASME Orientation and Guide for Use of SI (Metric) Units. Most formulas and relationships are intentionally presented only in customary units to preclude any ambiguity between them and the tabulated values.

In most respects, ASME B29.1-2011 is harmonized with ISO 606. However, the B29 Standards Committee decided to maintain the separate B29.1 standard for the following two reasons:

(a) ISO permits only SI units to be shown in International Standards. The ANS chains and sprockets in this Standard were originally designed in U.S. customary inch–pound units. Conversion to SI units and rounding before making critical calculations introduce deviations that can be detrimental to roller chain functioning.

(b) The ANS tooth form in ASME B29.1 fits within the ISO 606 sprocket tooth form envelope, but the tooth form in ASME B29.1 is described in much more detail. Deviations from the tooth form as defined in this Standard, but within the ISO 606 envelope, can be detrimental to chain performance.

ASME B29 STANDARDS COMMITTEE
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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R. Brandon, *Alternate,* Diamond Chain Co.
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CORRESPONDENCE WITH THE B29 COMMITTEE

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

Secretary, B29 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990
http://go.asme.org/Inquiry

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

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

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

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

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

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

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

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

PRECISION POWER TRANSMISSION ROLLER CHAINS, ATTACHMENTS, AND SPROCKETS

CAUTION: The standardized chains listed in this Standard are intended primarily for power transmission and conveying purposes, and should not be used as replacements for chains used on overhead hoists. See ASME B29.24, Roller Load Chains for Overhead Hoists, for information relating to roller chains specifically intended for overhead hoisting duty.

1 ROLLER CHAIN

1.1 Nomenclature

The following definitions are illustrated in Fig. 1.

connecting link (cotter pin type): an outside link consisting of a pin link plate *E*, two assembled pins *G–G*, a detachable pin link plate *D*, and two cotters *H–H.* The following three types of detachable pin link plates are available:

(a) with a slip fit

(b) with a degree of press fit (drive fit)

(c) with a full press fit (as in conventional chain construction)

connecting link (spring clip type): a connecting link generally as described above, except that the detachable link plate is retained by a one-piece spring clip *K* that engages grooves cut in the ends of the pins.

offset link: a link consisting of two offset link plates *I–I*, a bushing *B*, a roller *C*, a removable pin *J*, and cotter *H*.

offset section: a two-link section consisting of a roller link and an offset link, which are connected by a riveted press-fit pin.

pin link: an outside link consisting of two pin link plates *E–E* assembled with two pins *F–F.*

roller chain: a series of alternately assembled roller links and pin links in which the pins articulate inside the bushings and the rollers are free to turn on the bushings. Pins and bushings are press fit in their respective link plates. Roller chain may be *single strand*, having one row of roller links, or *multiple strand*, having more than one row of roller links, and in which center plates *L* are located between the strands of roller links. Center plates may be slip fit or press fit on the pin as agreed between the chain manufacturer and user.

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

1.2 General Proportions

(a) The roller diameter is approximately $\frac{5}{8}$ × pitch.

(b) The *chain width* is defined as the distance between roller link plates and equals approximately $\frac{5}{8}$ × chain pitch.

(c) The pin diameter is approximately $\frac{5}{16}$ × pitch or one-half of the roller diameter.

(d) The thickness of link plates for the standard series is approximately $\frac{1}{8}$ × pitch.

(e) The thickness of link plates for the heavy series chain of any pitch is approximately that of the next larger pitch standard series chain.

(f) The maximum height of roller link plates is 0.95 × pitch.

(g) The maximum height of pin link plates is 0.82 × pitch.

(h) Although chamfers are shown on the link plates illustrated, chamfering is not a requirement and is done at the option of the manufacturer.

1.3 Numbering System — Standard Chain Numbers

For the chains shown in this Standard, the right-hand digit in the chain designation is zero for roller chains of the usual proportions, 1 for a lightweight chain, and 5 for a rollerless bushing chain. The numbers to the left of the right-hand digit denote the number of $\frac{1}{8}$ in. in the pitch. The letter H following the chain number denotes the heavy series. The hyphenated number 2 suffixed to the chain number denotes a double strand, 3 denotes a triple strand, 4 denotes a quadruple strand chain, etc.

Heavy series chains made in $\frac{3}{4}$ in. (19.05 mm) and larger pitches differ from the standard series in thickness of link plates. Their value is only in the acceptance of higher loads during operation at lower speeds.

1.4 Chain Strength Requirements

1.4.1 Minimum Ultimate Tensile Strength

(a) Single-Strand Chain. Standard series single-strand chains meeting the requirements of this Standard will have a minimum ultimate tensile strength equal to or greater than the values listed in Table 1 or Table 1M.

(b) Multiple-Strand Chain. For a multiple-strand chain, the minimum ultimate tensile strength equals that of a single strand multiplied by the number of strands.