



Standard Specification for Machine and Coil Chain¹

This standard is issued under the fixed designation A 467/A 467M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This specification covers welded carbon steel machine chain and coil chain. Although these chains are not intended for pocket wheel use, they can be used for pocket and sprocket wheel use. This chain shall never be used for overhead lifting applications.

1.2 There are two classes each of machine and coil chain:

1.2.1 *Class MS*—Machine, straight-link steel chain,

1.2.2 *Class MT*—Machine, twist-link steel chain,

1.2.3 *Class CS*—Coil, straight-link chain, and

1.2.4 *Class CT*—Coil, twist-link steel chain.

1.3 The values stated in either inch-pound units or SI units shall be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system may not be exact equivalents; therefore, each system must be used independently of the other, without combining values in any way.

2. Referenced Documents

2.1 *ASTM Standards:*

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products²

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *breaking force, minimum*—the minimum force in pounds or newtons at which the chain, in the condition it leaves the producer's plant, has been found by representative testing to break when a constantly increasing force was applied in direct tension to a straight length of chain on a standard testing machine. Breaking force values are a statistical attribute test and are not a guarantee that all chain segments per lot will endure these loads. Breaking force loads *shall not* be used as criteria for service or design purposes.

3.1.2 *lot*—for the purpose of acceptance testing, a lot shall consist of 3000 ft [1000 m], or fraction thereof, of the same grade and size chain. If a continuous length of chain exceeds 3000 ft [1000 m], it shall also be considered a lot.

3.1.3 *overhead lifting*—that process of lifting that would

elevate a freely suspended load such that dropping the load would present a possibility of bodily injury or property damage.

3.1.4 *proof test*—a quality control tensile test applied to chain for the purpose of verifying weld and material quality. It is the minimum force in pounds or newtons which the chain has withstood at the time it left the producer, under a test in which a constantly increasing force has been applied in direct tension to a straight length of chain. Proof test loads are a manufacturing integrity test and shall not be used as criteria for service or design purposes.

3.1.5 *working load limit (WLL)*—the maximum combined static and dynamic load in pounds or kilograms that shall be applied in direct tension to an undamaged, straight length of chain.

4. Ordering Information

4.1 It shall be the responsibility of the purchaser to specify all requirements that are necessary for material ordered under this specification. Such requirements to be considered include, but are not limited to, the following:

4.1.1 ASTM Specification A 467 or A 467M and year of issue,

4.1.2 Trade size of chain,

4.1.3 Class of chain,

4.1.4 Quantity of chain in feet or metres,

4.1.5 Length of each piece, if required,

4.1.6 Finish, if required,

4.1.7 Certification of test(s), if required, and

4.1.8 Acceptance of inspection by purchaser, if required.

5. Manufacture

5.1 *Melting Process*—The steel shall be made by the open-hearth, electric-furnace, or basic-oxygen process.

5.2 *Welding Process*—Classes MS, MT, CS, and CT shall be electric welded.

6. Chemical Requirements

6.1 *Product Analysis*—The material used shall conform to the following chemical requirements:

Elements, max, %	Classes MS, MT, CS, and CT
Carbon	0.37
Phosphorus	0.048
Sulfur	0.058

6.2 The analysis may be made by the purchaser from the

¹ This specification is under the jurisdiction of ASTM Committee A-1 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A01.27 on Steel Chain.

Current edition approved March 10, 1998. Published August 1998. Originally published as A 467–64. Last previous edition A 467–93.

² *Annual Book of ASTM Standards*, Vol 01.03.

bars or finished chain. Samples for analysis shall represent the full cross section of the specimen.

6.3 For referee purposes, Test Method E 30 shall be used.

7. Mechanical Properties Requirements

7.1 *Proof Test*—All chain in Classes MS and CS shall be proof tested to at least the proof load prescribed in Table 1 and Table 2 for the appropriate size and class chain. When so tested, it shall withstand these loads without loss of chain integrity. Links or chain segments not withstanding the proof test load shall be removed from the chain.

NOTE 1—Chain Classes MT and CT do not require proof testing since the twist operation is an adequate verification of link integrity.

7.2 *Breaking Force Test:*

7.2.1 The tension test specimen shall consist of a length from the lot containing at least the number of links specified in 7.3.2.

7.2.2 Fixtures for securing chain in a testing machine shall be properly designed to securely support the shoulder of the link (Note 2). The opening in the fixture shall not be more than 125 % of the stock diameter being tested. Links engaged in the testing fixture shall not be considered part of the test specimen.

NOTE 2—U-bolts of the same or larger diameter and the same or greater strength than the chain may be used to secure the chain to the jaws of the testing machine.

7.2.3 Test specimens from the finished chain shall conform to the minimum breaking force requirements as prescribed in Tables 1-4 for their respective sizes and classes.

7.3 *Elongation:*

7.3.1 All chain of Classes MS and CS should be proof tested in accordance with 7.1 before the elongation is measured.

7.3.2 Elongation is to be determined as follows:

7.3.2.1 Test samples are to consist of at least the number of links in Table 5 that constitutes the gage length. Two additional links will be required to engage the jaws of the testing machine unless this is done by half links or another method.

7.3.2.2 Place the test sample in the testing machine and load to a maximum of 10 % of the proof test force. Measure the gage length, (*L*), which does not include the links engaged in the jaws of the testing machine (see Fig. 1).

7.3.2.3 Increase the load gradually and smoothly until fracture occurs and record the maximum load applied as the breaking force. The elongation may be determined by an

autographic recorder, side scale, or, alternatively, by measuring the unbroken lengths on either side of the broken link as shown in Fig. 2.

7.4 *Calculation of Elongation:*

7.4.1 The mean pitch *p'* at 10 % proof load is

$$(L - 2d)/n \tag{1}$$

where *n* is the actual number of links in gage length, *L*.

7.4.2 Mean pitch *p''* of unbroken links after fracture is

$$[(a - 2d') + (b - 2d')]/(n - 1) \tag{2}$$

where *2d'* is the mean of all the measurements made at the junctions between adjacent links, but not including the junctions with the broken link and the fixing links.

7.4.3 The elongation in percent is $100 \times (p'' - p') / p'$.

7.4.4 Interpret autographic and side scale measurements so that any further extension of the broken link after fracture cannot contribute to the value measured.

7.4.5 The elongation as determined by 7.3 shall not be less than 10 %.

7.5 One test for breaking strength and elongation shall be made from each lot.

8. Dimensional Requirements

8.1 The chain shall conform to the dimensional requirements specified in Tables 1-4 for the appropriate class and size chain. Inside widths and lengths are not to exceed $\pm 5\%$ from the nominal dimensions.

8.2 *Diameter*—The diameter of the material from which the chain is manufactured shall not be smaller than the material diameter listed in Table 1 and Table 2 within a tolerance of -3% . Oversized wire may be used for all applications.

9. Workmanship, Finish, and Appearance

9.1 The chain at the time of shipment shall be free of discontinuities that would prevent the chain from enduring the working load limit forces.

9.2 The manufacturer may apply a surface treatment or coating of his own choice for identification or corrosion resistance unless the customer specifies otherwise.

10. Retests

10.1 If the original test specimen fails to conform to the requirements of 7.2.3 and 7.4.5, two additional test specimens from the same lot may be tested. If both additional tests are satisfactory, the chain will be considered acceptable.

TABLE 1 Machine Chain—Straight Link
(Not to be used in overhead lifting applications)

Trade Size		Material Diameter		Working Load Limit, max		Proof Test, ^A min		Breaking Force, ^A min		Nominal Inside Length ^B		Nominal Inside Width ^B	
						lb	kN	lb	kN	in.	mm	in.	mm
mm		in.	mm	lb	kg	lb	kN	lb	kN	in.	mm	in.	mm
3.0	4	0.120	3.0	215	98	430	1.91	860	3.82	0.55	14.0	0.21	5.3
3.4	3	0.135	3.4	270	122	540	2.40	1080	4.80	0.59	15.0	0.24	6.1
3.8	2	0.148	3.8	325	147	650	2.89	1300	5.78	0.61	15.5	0.26	6.6
4.1	1	0.162	4.1	390	177	780	3.47	1560	6.93	0.63	16.0	0.28	7.1
4.5	1/0	0.177	4.5	465	211	930	4.14	1860	8.27	0.74	18.8	0.31	7.9
4.9	2/0	0.192	4.9	545	247	1090	4.85	2180	9.69	0.78	19.8	0.34	8.6
5.3	3/0	0.207	5.3	635	288	1270	5.65	2540	11.29	0.85	21.6	0.36	9.1
5.5	4/0	0.218	5.5	700	318	1400	6.23	2800	12.44	0.99	25.1	0.38	9.6
6.4	5/0	0.250	6.4	925	420	1850	8.23	3700	16.44	1.07	27.2	0.44	11.2

^A The Proof Test and Minimum Breaking Force shall not be used as criteria for service or design purposes. See Section 3.

^B Actual inside lengths and widths should not vary more than $\pm 5\%$ from nominal dimensions.