Designation: A 952/A 952M – 02

An American National Standard

Standard Specification for Forged Grade 80 and Grade 100 Steel Lifting Components and Welded Attachment Links[1]

This standard is issued under the fixed designation A 952/A 952M; 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 reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope *

1.1 This specification covers the requirements for forged alloy steel lifting components and welded coupling and master links for Grade 80 and Grade 100 alloy chain slings as described in Specification A 906/A 906M.

1.2 Two grades of components and welded links are covered:

1.2.1 Grade 80.

1.2.2 Grade 100.

1.3 This specification is a performance standard. Other standards apply to use of these products. Some of these standards are: OSHA 1910.184, ASME B30.10, and ASME B30.9.

1.4 The values stated in either inch-pound or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

2. Referenced Documents

2.1 *ASTM Standards:*

A 29/A 29M Specification for Steel Bars, Carbon and Alloy, Hot-Wrought and Cold-Finished, General Requirements for[2]

A 391/A 391M Specification for Grade 80 Alloy Steel Chain[2]

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products[3]

A 906 Specification for Alloy Steel Chain Slings for Overhead Lifting[2]

A 973/A 973M Specification for Grade 100 Alloy Steel Chain[2]

E 4 Practices for Force Verification of Testing Machines[4]

E 44 Definitions of Terms Relating to Heat Treatment of Metals[5]

E 165 Test Method for Liquid Penetrant Examination[6]

E 709 Guide for Magnetic Particle Examination[6]

2.2 *Other Standards:*

OSHA 1910.184 Slings[7]

ASME B30.9 Slings[8]

ASME B30.10 Hooks[8]

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 component has been found by verification testing to break when a constantly increasing force was applied in direct tension. This test is a manufacturer's design verification test and shall not be used as criteria for service.

3.1.2 *chain sling*—an assembly consisting of alloy steel chain joined to upper and lower end components for attaching loads to be lifted by a crane or lifting machine.

3.1.3 *coupling link*—a link fitted to the end of the chain to connect to another component of the sling. See Fig. 1.

3.1.4 *master link*—a link used as an upper end component of a chain sling and by means of which the sling may be attached to a crane or other device. See Fig. 1.

3.1.5 *master coupling link (secondary or intermediate link)*—a link used on three and four leg slings to connect the legs to a master link. See Fig. 1.

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

3.1.7 *traceability code*—a series of letters, or numbers, or both, marked on a component which enables its manufacturing history, including identity of the steel heat, to be traced.

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

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[2] *Annual Book of ASTM Standards*, Vol 01.05.

[3] *Annual Book of ASTM Standards*, Vol 01.03.

[4] *Annual Book of ASTM Standards*, Vol 03.01.

[5] *Annual Book of ASTM Standards*, Vol 01.02.

[6] *Annual Book of ASTM Standards*, Vol 03.03.

[7] Available from OSHA.

[8] Available from ASME, 345 E. 47th Street, New York, NY 10017.

***A Summary of Changes section appears at the end of this standard.**

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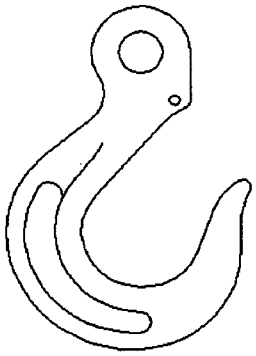
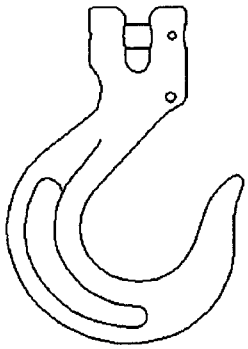
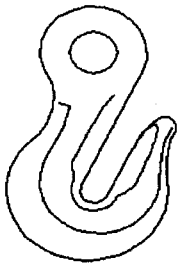


Class ESH
Eye Sling Hook



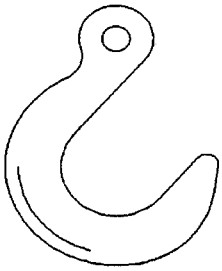
Class CSH
Clevis Sling Hook



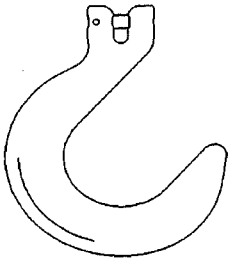
Class EGH
Eye Grab Hook



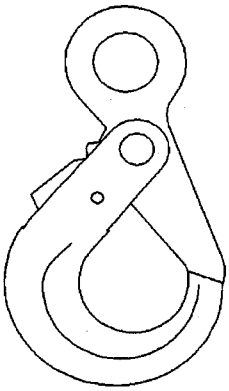
Class CGH
Clevis Grab Hook



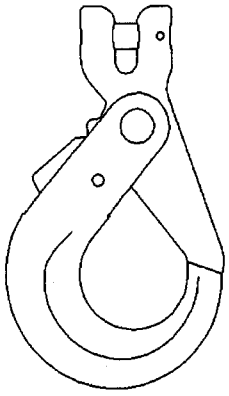
Class EFH
Eye Foundry Hook



Class CFH
Clevis Foundry Hook



Class ESLH
Eye Self-Locking Hook



Class CSLH
Clevis Self-Locking Hook

FIG. 1 General Component Configuration

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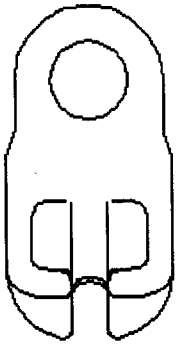
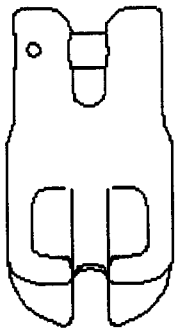
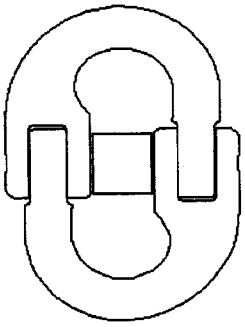


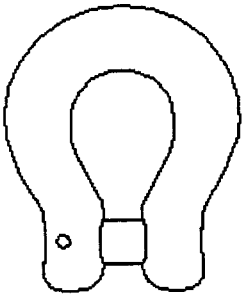
Class ECGH
Eye Claw Grab Hook



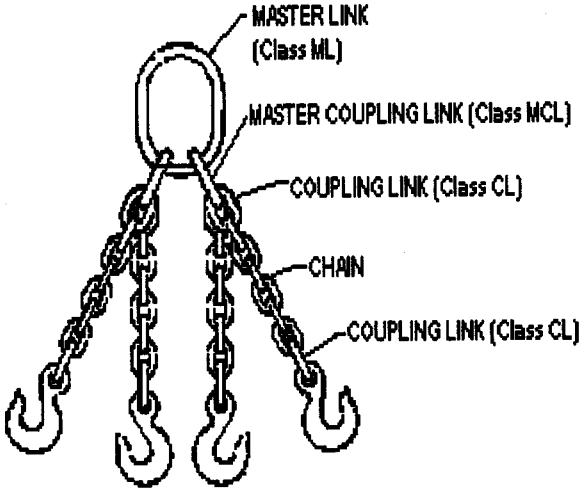
Class CCGH
Clevis Claw Grab Hook



Class CLM
Coupling Link, Mechanical



Class CCL
Clevis Coupling Link



Class ML, MCL, CL
Master Link, Master Coupling Link, Coupling Link

FIG. 1 General Component Configuration *(continued)*

3.1.8 *working load limit (WLL)*—the maximum combined static and dynamic load in pounds or kilograms that shall be applied in direct tension to the component.

4. Classification

4.1 Only Grade 80 and Grade 100 components are covered

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under this specification.

4.2 Sixteen classes of components are covered under this specification. The general configuration on these components are shown in Fig. 1.

4.2.1 *Class EGH*—Eye Grab Hook.
4.2.2 *Class CGH*—Clevis Grab Hook.
4.2.3 *Class ESH*—Eye Sling Hook.
4.2.4 *Class CSH*—Clevis Sling Hook.
4.2.5 *Class EFH*—Eye Foundry Hook.
4.2.6 *Class CFH*—Clevis Foundry Hook.
4.2.7 *Class CLM*—Coupling Link, Mechanical.
4.2.8 *Class ESLH*—Eye Self-Locking Hook.
4.2.9 *Class CSLH*—Clevis Self-Locking Hook.
4.2.10 *Class ECGH*—Eye Claw Grab Hook.
4.2.11 *Class CCGH*—Clevis Claw Grab Hook.
4.2.12 *Class ML*—Master Link.
4.2.13 *Class MCL*—Master Coupling Link.
4.2.14 *Class CL*—Coupling Link.
4.2.15 *Class CCL*—Clevis Coupling Link.
4.2.16 *Class OTH*—Specialty components may be required for certain applications.

4.3 For the classes listed in 4.2, an "S" prefix denotes a component with a swivel joint.

5. Ordering Information

5.1 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:

5.1.1 Product to conform to Specification A 952 or Specification A 952M and year of issue.
5.1.2 Nominal size of component, in. [mm] (see Note 1).
5.1.3 Grade of component.
5.1.4 Class of component.
5.1.5 Quantity of components.
5.1.6 Finish, if required.
5.1.7 Certification, if required.
5.1.8 Acceptance of inspection by purchaser, if required.
5.1.9 Supplementary requirements, if required.

NOTE 1—Component size and working load limits are based on Grade 80 and Grade 100 alloy steel chain nominal sizes. See Specification A 391/A 391M and A 973/A 973M.

6. Materials

6.1 *Quality*—The selection of the type of steel is left to the judgment of the manufacturer provided the material meets the requirements set forth in 6.2 and 6.3.

6.2 *Melting Process*—The steel used shall be produced by an electric process or by an oxygen blown process. The steel shall be fully killed and have an austenitic grain size of 5 or finer.

6.3 *Chemical Requirements*:

6.3.1 The alloy steel used shall contain at least two of the three alloying agents in the minimum percentages as listed below:

Nickel	0.40 % minimum
Chromium	0.40 % minimum
Molybdenum	0.15 % minimum

6.3.2 The phosphorous and sulfur content of the steel shall not exceed 0.025 % for each element.

6.3.3 *Product Analysis*—The steel used may be analyzed by the purchaser and shall conform to the requirements of 6.3.1 and 6.3.2 subject to the product analysis tolerances specified in Specification A 29/A 29M. Test samples may be taken from rods, bars, or finished product.

6.3.4 Chemical analysis of material covered by this specification for referee purposes shall be in accordance with Test Methods, Practices, and Terminology A 751.

7. Manufacture

7.1 The body of all components shall be forged hot in one piece, with the exception of Class ML, MCL and CL link components.

7.2 Excess metal flash shall be cleanly removed, leaving the surface free from sharp edges.

7.3 Class ML, MCL, and CL link components may be manufactured using the electric welding, gas welding, or forging process.

7.4 Ancillary components such as load pins, latches, bearings, and springs need not be forged components.

7.5 Welding shall not be used to repair forged components. Grinding of surface discontinuities may be carefully performed as long as no dimension is altered outside of the manufacturer's dimensions and tolerances for that component. All ground areas must blend in smoothly with the surface.

7.6 *Heat Treatment*—After forging or welding is completed, each load bearing component shall be heat treated before applying the proof test. Heat treatment shall include quenching and tempering as defined in Definitions E 44.

7.7 After heat treatment, furnace scale shall be removed from the component.

8. Performance Requirements

8.1 *Proof Test*—All components shall be proof tested as required per 8.1.1 through 8.1.5. All tests shall be performed on equipment certifiable to Practices E 4.

8.1.1 All components used on single legs of slings shall be tested to at least the proof test load prescribed in Table 1 for Grade 80 components and Table 2 for Grade 100 components.

8.1.2 All components to which two legs of a sling are attached shall be proof tested to at least a load equal to four times the working load limit of the relevant size single leg

TABLE 1 Mechanical Requirements for Grade 80 Single Leg Components

Nominal Size		Working Load Limit, max		Proof Test[A], min		Minimum Breaking Force[A]	
in.	mm	lb	kg	lb	kN	lb	kN
7/32	5.5	2100	970	4200	19.0	8400	38.0
9/32	7.0	3500	1570	7000	30.8	14 000	61.6
5/16	8.0	4500	2000	9000	40.3	18 000	80.6
3/8	10.0	7100	3200	14 200	63.0	28 400	126.0
1/2	13.0	12 000	5400	24 000	107.0	48 000	214.0
5/8	16.0	18 000	8200	36 200	161.0	72 400	322.0
3/4	20.0	28 300	12 800	56 600	252.0	113 200	504.0
7/8	22.0	34 200	15 500	68 400	305.0	136 800	610.0
1	26.0	47 700	21 600	95 400	425.0	190 800	850.0
1 1/4	32.0	72 300	32 800	144 600	644.0	289 200	1288.0

[A] The proof test and minimum breaking force loads shall not be used as criteria for service (See Section 3).

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TABLE 2 Mechanical Requirements for Grade 100 Single Leg Components

Nominal Size		Working Load Limit, max		Proof Test, min		Breaking Force, min	
in.	mm	lb	kg	lb	kN	lb	kN
7/32	5.5	2700	1220	5400	23.8	10 800	47.6
9/32	7.0	4300	1950	8600	38.5	17 200	77
5/16	8.0	5700	2600	11 400	51	22 800	102
3/8	10.0	8800	4000	17 600	79	35 200	158
1/2	13.0	15 000	6800	30 000	134	60 000	268
5/8	16.0	22 600	10 300	45 200	201	90 400	402
3/4	20.0	35 300	16 000	70 600	315	141 200	630
7/8	22.0	42 700	19 400	85 400	381	170 800	762

component shown in Table 1 for Grade 80 components and Table 2 for Grade 100 components.

8.1.3 All components to which three or four legs of a sling are attached shall be proof tested to at least a load equal to six times the working load limit of the relevant size single leg component shown in Table 1 for Grade 80 components and Table 2 for Grade 100 components.

8.1.4 The fixture over which Class ML, MCL, and CL components are proof tested shall be a maximum of 60% of the inside width and suitably large to prevent localized point loading and deformation of the links.

8.1.5 All components shall withstand the proof test load without loss of integrity or detrimental dimensional changes as defined in 8.3.1. Components that do not withstand the proof test shall be discarded.

8.2 *Design Verification Requirements*:

8.2.1 The purpose of the verification tests is to prove the design, material, heat treatment, and method of manufacture of each size of component. Any change of design, material, heat treatment, method of manufacture or in any dimension outside normal manufacturing tolerances shall require that verification be performed on the modified components.

8.2.2 The tests specified in 8.3 shall be performed on at least three samples of each size of component of each design, material, heat treatment, and method of manufacture. During testing, the force shall be applied to the component axially without shock.

8.3 *Design Verification Tests*:

8.3.1 *Deformation Test*—Three samples shall be tested and each shall withstand the proof test load as prescribed in 8.1. No dimension shall be altered after the proof test by more than 1 % of the initial dimension. Class ML, MCL, and CL components are exempt from the deformation requirement test.

8.3.2 *Breaking Force Test*:

8.3.2.1 For single leg components, three samples shall be tested and be capable of withstanding the relevant minimum breaking force as prescribed in Table 1 for Grade 80 components and Table 2 for Grade 100 components.

8.3.2.2 For components to which two sling legs will be attached, the minimum breaking force is twice the minimum breaking force shown in Table 1 for Grade 80 components and Table 2 for Grade 100 components.

8.3.2.3 For components to which three or four sling legs will be attached, the minimum breaking force is three times the minimum breaking force shown in Table 1 for Grade 80 components and Table 2 for Grade 100 components.

8.3.2.4 The component shall show evidence of ductility prior to failure. Ductility is defined as the altering of a dimension by more than 15 % from its original condition. Class CLM components are exempted from this minimum ductility requirement.

NOTE 2—It is not necessary to test the component to its actual breaking force as long as the minimum breaking force loads and deformation requirements are obtained.

NOTE 3—The breaking force tests may be conducted on the samples used for the deformation tests.

8.3.3 *Fatigue Test*:

8.3.3.1 Three samples shall be tested and each shall be capable of withstanding at least 20 000 cycles of the force range without failure.

8.3.3.2 The force range applied during each cycle shall be at least equivalent to 1.5 times the working load limit specified in Table 1 for Grade 80 and Table 2 for Grade 100 for that size component. The minimum force in each cycle shall be positive.

8.3.3.3 The frequency of force applications shall not be greater than 25 Hz.

8.3.3.4 The fixtures used in fatigue testing shall be suitably large to prevent localized point loading or deformation of the component. The fixture shall be a maximum of 60% of the inside width for Class ML, MCL, and CL components.

9. Dimensional Requirements

9.1 The dimensions of the components are left to the judgment of the component manufacturer provided that the dimensions are sufficient to meet the requirements set forth in this specification.

10. Workmanship, Finish, and Appearance

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

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

11. Retests

11.1 If one of the verification test samples fails to meet the requirements of 8.3.1, 8.3.2, or 8.3.3, two additional samples shall be tested. If both additional tests meet or exceed the requirements, the component is considered in compliance with this specification. If two or more of the original samples or one of the retests fail to meet the requirements of 8.3.1, 8.3.2, or 8.3.3, the component does not comply with this specification.

12. Inspection

12.1 When requested on the purchase order or contract, the component shall be free of paint or other coatings which could mask surface discontinuities at the time of inspection.

12.2 The manufacturer shall afford the purchaser's inspector all reasonable facilities necessary to verify that the component produced is being furnished in accordance with this specification. Inspection by the purchaser shall not interfere unnecessarily with the manufacturer's operations. All tests and inspection shall be made at the place of manufacture, unless otherwise agreed upon.

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12.3 The purchaser may perform the tests to govern acceptance or rejection of the component at their own laboratory or elsewhere. Tests and acceptance criteria shall conform to the requirements contained in this specification unless otherwise stated in the purchase order. Tests at the purchaser's laboratory or elsewhere shall be made at the expense of the purchaser.

13. Rejection and Rehearing

13.1 Material that fails to conform to the requirements of this specification may be rejected. Rejection shall be reported to the producer or supplier promptly and in writing.

13.2 In the case of dissatisfaction with the results of the test in 12.3, the manufacturer may make claim for a rehearing.

14. Certification

14.1 When specified on the purchase order or contract, a certification shall be issued by the manufacturer. The certificate shall include at least the following:

14.1.1 Name of the manufacturer.

14.1.2 Conformance to Specification A 952 or Specification A 952M and year of issue.

14.1.3 Size of component, in. [mm].

14.1.4 Grade of component.

14.1.5 Class of component.

14.1.6 Quantity and description of the component.

14.1.7 Proof test force applied, lb [kN].

14.1.8 Working load limit of the component, lb [kg].

15. Product Marking

15.1 *Forged Components*—Each component shall be legibly and indelibly marked in a manner which will not impair the mechanical properties of the component. This marking shall include at least the following:

15.1.1 Component size, in. [mm]. Class ML, MCL, and CL components are exempt from this marking requirement.

15.1.2 *Grade*—The marking for Grade 80 shall be at least 8, 80 or 800, or any combination. The marking for Grade 100 shall be at least 10, 100, or 1000, or any combination. Class ML, MCL, and CL components are exempt from this marking requirement.

15.1.3 The manufacturer's symbol, mark, or code.

15.1.4 The traceability code.

15.2 *Welded Components*—Each Class ML component shall be legibly and indelibly marked in a manner which will not impair the mechanical properties of the component. This marking shall include at least the following:

15.2.1 The manufacturer's symbol, mark, or code.

15.2.2 The traceability code.

16. Keywords

16.1 alloy steel—chain; chain slings; steel chain; steel chain—components

SUPPLEMENTARY REQUIREMENTS

The following Supplementary Requirements shall apply only when specified in the purchasing contract or order.

S1. Non-Destructive Inspection

S1.1 When specified by the purchaser in the contract or order, components shall be inspected by magnetic particle inspection per Practice E 709, by die penetrant inspection per Practice E 165, or by other means stated in the contract or order.

S1.2 The acceptance/rejection criteria shall be specified in the purchase order or contract. If no criteria is specified, indications greater than 0.08 in. [2 mm] occurring in areas of the components which are subject to tensile stresses are cause for rejection.

S1.3 The percentage of components to be inspected shall be specified in the purchase order or contract. If no criteria is specified, inspection shall be performed on 100 % of the components.

S1.4 Rework by grinding to remove indications is permitted provided the requirements of 7.5 are maintained.

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SUMMARY OF CHANGES

(1) Changed “branch” and “branches” to “leg” and “legs,” respectively; changed “fitting” and “fittings” to “component” and “components,” respectively throughout.
(2) Deleted defintions for “end fitting” and “overhead lifting” and previous section 9.2.
(3) Revised 1.1, 3.1.1–3.1.5, 7.6, 8.1, 8.3.1, 8.3.2.1–8.3.2.3, 13.1, 15.1.1, 15.1.2, Fig. 1,Table 1, and Table 2.
(4) Added 8.1.4, 8.3.3.4, and 15.2.

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