ASME B18.21.3-2008

Double Coil Helical Spring Lock Washers for Wood Structures

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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Date of Issuance: September 19, 2008

This Standard will be revised when the Society approves the issuance of a new edition. There will be no addenda issued to this edition.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this document. Periodically, certain actions of the ASME B18 Committee may be published as Cases. Cases and interpretations are published on the ASME Web site under the Committee Pages at http://cstools.asme.org as they are issued.

The American Society of Mechanical Engineers
Three Park Avenue, New York, NY 10016-5990

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FOREWORD

On November 29, 2006, a proposed draft for a new standard to cover double coil helical spring lock washers for high voltage wood structures was presented to the members present at the ASME B18 Subcommittee meetings. The Committee agreed that Subcommittee 21 should proceed with the proposed standard, eliminating the words "high voltage" so the standard could be used by anyone looking for a lock washer for wooden structures, with the designation being B18.21.3. ASME B18.21.3-2008 was approved by B18 Subcommittee 21 and the B18 Standards Committee on December 21, 2007. This Standard was approved by the American National Standards Institute on March 28, 2008.

ASME B18 COMMITTEE
Standardization of Bolts, Nuts, Rivets, Screws, Washers, and Similar Fasteners

(The following is the roster of the Committee at the time of approval of this Standard.)

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CORRESPONDENCE WITH THE B18 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, B18 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
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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.

Proposing a Case. Cases may be issued for the purpose of providing alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee Web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the standard, the paragraph, figure or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the standard to which the proposed Case applies.

Interpretations. Upon request, the B18 Standards 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 B18 Standards Committee.

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

Requests that are not in this format may be rewritten in the appropriate 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 B18 Standards Committee regularly holds meetings, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B18 Standards Committee.

DOUBLE COIL HELICAL SPRING LOCK WASHERS FOR WOOD STRUCTURES

1 INTRODUCTORY NOTES

1.1 Scope

This Standard covers the dimensional and physical properties and methods of testing for double coil helical spring lock washers for wood structures.

NOTE: The word *lock* appearing in the name of the product in this Standard is a generic term historically associated with the product's identification and is not intended to imply an indefinite permanency of fixity in attachments where the fasteners are used.

1.2 Comparison to ISO Standards

No comparable ISO standards exist for this part.

1.3 Dimensions

All dimensions in this Standard are in inches and apply to unplated or uncoated product.

1.4 Options

Options, if required, shall be agreed upon by the purchaser and the manufacturer or distributor.

1.5 Terminology

For definitions of terminology not specifically defined in this Standard, refer to ASME B18.12.

1.6 Referenced Standards

Unless otherwise specified, the standards referenced shall be the most recent at the time of the order placement.

ASME B18.12, Glossary of Terms for Mechanical Fasteners

ASME B18.18.1, Inspection and Quality Assurance for General Purpose Fasteners

ASME B18.21.1, Lock Washers (Inch Series)

ASME B18.24, Part Identifying Number (PIN) Code System Standard for B18 Fastener Products

Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, P.O. Box 2300, Fairfield, NJ 07007-2300

ASTM B 117, Standard Practice for Operating Salt Spray (Fog) Apparatus

ASTM E 140, Standard Hardness Conversion Tables of Metals (Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Rockwell Superficial Hardness, Knoop Hardness, and Scleroscope Hardness)

Publisher: ASTM International (ASTM), 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959

SAE J403, Chemical Composition of SAE Carbon Steels

SAE J411, Carbon and Alloy Steels

SAE J419, Methods of Measuring Decarburization

Publisher: The Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001

1.7 Related Standards

Related lock washers and tests are included in ASME B18.21.1.

1.8 Designation

Nominal washer sizes are intended for use with comparable nominal screw, bolt, and/or nut sizes. Fasteners conforming to this Standard shall be designated by the following data and sequence:

(a) product name
(b) ASME document number
(c) nominal size

EXAMPLE: Double coil helical spring lock washers for wood structures, ASME B18.21.3, $\frac{5}{8}$ in.

1.9 Part Identifying Number

For a part identifying number, refer to ASME B18.24.

2 GENERAL DATA

2.1 Application

The double coil helical spring lock washers for wood structures covered in this Standard are intended to be used with a curved flat washer or the standard hardware practice of the user against the wood. While not essential, it is a good practice to use a standard round washer between the double coil helical spring lock washer and the nut, then tighten the nut in accordance with the users' standard practice, and back off the nut $\frac{1}{4}$ (90 deg) turn. This is important to maintain an acceptable pressure on the hardware and the wood fibers which may shrink or swell during varying weather conditions.

Although these washers were designed specifically for use on bolts in wooden assemblies (poles, crossarms, etc.), they can also be used for general applications where a heavy duty double coil washer is needed.

2.2 Dimensions

The dimensions of standard and extended travel double coil helical spring lock washers for wood structures are specified in Tables 1 and 2 and are before coating. Selections should be made from standard or extended travel series in Tables 1 and 2, respectively, to suit design requirements.

2.3 Material and Hardness

2.3.1 Material Composition. Washers shall be made from material meeting the chemical composition requirements of the following standards:

(a) up to and including $\frac{3}{4}$ in. carbon steel — SAE J403 1055-1065 (UNS G10550-G10650)

(b) $\frac{7}{8}$ in. and above boron steel — SAE J411 10B55-10B65

2.3.2 Hardness. All washer section hardness requirements are 38 HRC to 46 HRC, 372 HV to 458 HV. To prepare washers for checking the material hardness, cut washer approximately in half so only one coil is used. Cold (water) grind or file both sides sufficiently flat and parallel to ensure a correct reading. If applicable, be sure to remove the decarburized and coated surface. During this operation, care shall be exercised to prevent the surface temperature from exceeding 250°F. Refer to ASTM E 140 for hardness conversion.

2.3.3 Decarburization. Carbon steel and boron steel shall meet the limits for decarburization shown in Table 3. The method for testing limits shall conform to SAE J419.

2.4 Washer Section

The corners at the inner and outer peripheries of the washers shall be slightly rounded. The section of the finished washer shall be slightly trapezoidal with thickness at the inner periphery greater than the thickness at the outer periphery by a minimum of 0.0005 in. to a maximum of 0.001 in. per 0.0156 in. of the section width. The minimum section thickness specified in the dimensional tables represents the nominal mean thickness, *T*, of the trapezoid. The tolerance on the nominal mean thickness of the trapezoid shall be subject to the following:

Size	Tolerance
$\frac{3}{8}$ to $\frac{5}{8}$	±0.015
$\frac{3}{4}$ to 1	±0.025

2.5 Coiling

Washers shall be coiled so that the gap between coils shall be such as to prevent washers from linking. The severed ends of the washers are to be cut so that the ends are less then two full coils as shown in Tables 1 and 2, dimension *C*.

2.6 Workmanship

The flat surfaces (faces) of the double coil helical spring lock washers shall be free from such surface imperfections as knurling, serrations, die marks, deep scratches, loose scale, burrs, or other irregularities that would affect serviceability. Moderate feed roll marks shall be permissible on the outer periphery.

2.7 Grinding

The face on both severed ends of the washer shall be ground prior to heat treating to provide a flat surface on each side as shown in Tables 1 and 2, dimensions *D* and *F*.

2.8 Finish

All washers shall be mechanically coated and shall meet a minimum of 1,500 hr to red rust when tested in accordance with ASTM B 117.

2.9 Twist Test

To prepare washers for twist testing, cut the washer approximately in half so only one coil is used. The washer shall be gripped in vice jaws. The ends of the washer shall be free, and the axis passing through the slot shall be parallel to and slightly above the top of the vice so that less then 50% of the washer is gripped. A 90 deg maximum segment of the free end of the washer shall be gripped in wrench jaws so that at least 25% of the washer is exposed when twisting, as shown in Fig. 1. The edges of the wrench jaws shall be in a plane parallel to the vice. Twisting the wrench increasing the free height of the washer section between 85 deg and 95 deg shall show no signs of fracture.

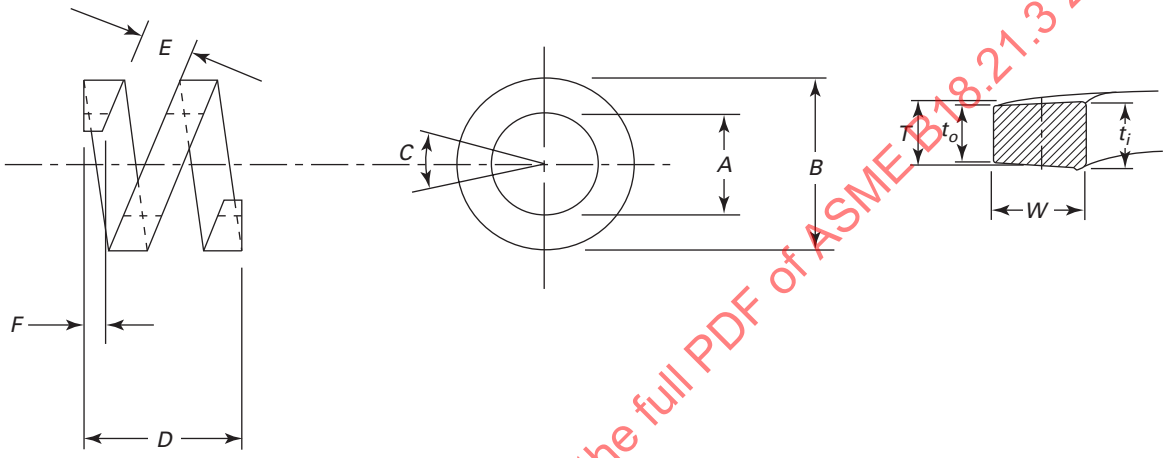
2.10 Travel

Travel shall be measured by placing the washer between hardened steel plates, one of which is moveable, until the washer is being touched by both plates. From this point, measure the distance required to completely close the washer. Minimum travel requirements are shown in Tables 4 and 5.

2.11 Inspection and Quality Assurance

Unless otherwise specified, products shall be furnished in accordance with ASME B18.18.1.

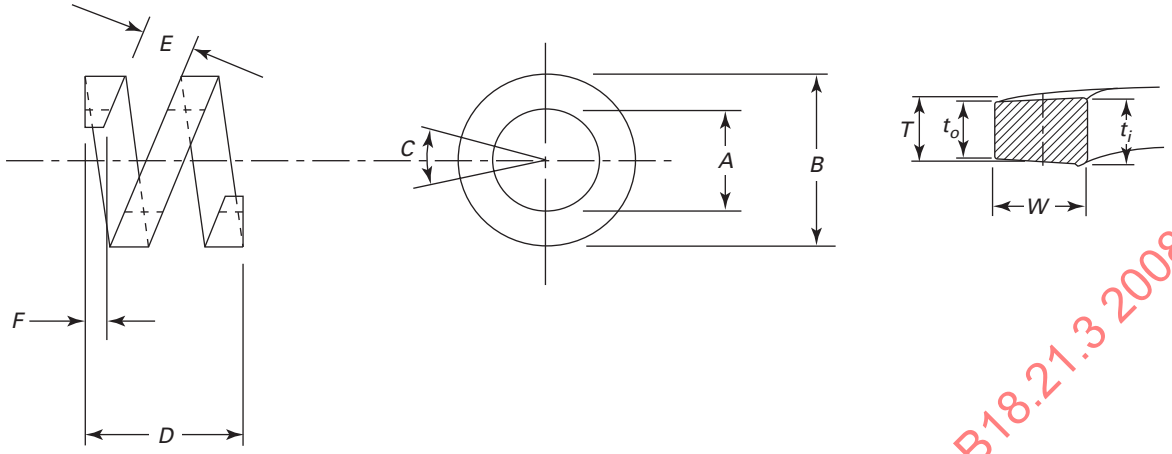
Table 1 Dimensions for Double Coil Helical Spring Lock Washers for Wood Structures



Nominal Washer Size	Inside Diameter, *A*		Maximum Outside Diameter, *B*	Cutoff Angle, *C*, deg		Minimum Height, *D*	Minimum Width, *W*	Maximum Gap Between Coils, *E*	Minimum Mean Section Thickness, *T* [Note (1)]	Minimum Ground Face, *F*
	Min.	Max.		Min.	Max.					
3/8	0.385	0.408	0.814	30	35	0.530	0.196	0.145	0.156	0.078
1/2	0.510	0.535	1.035	30	35	0.530	0.243	0.145	0.156	0.078
5/8	0.635	0.660	1.284	30	35	0.785	0.302	0.220	0.234	0.117
3/4	0.760	0.791	1.415	30	35	0.785	0.302	0.220	0.234	0.117
7/8	0.885	0.915	1.808	30	35	0.860	0.437	0.229	0.250	0.125
1	1.010	1.040	1.928	30	35	0.860	0.437	0.229	0.250	0.125

NOTE:
(1) $T = (t_i + t_o)/2$.

Table 2 Dimensions for Extended Travel Double Coil Helical Spring Lock Washers for Wood Structures



Nominal Washer Size	Inside Diameter, *A*		Maximum Outside Diameter, *B*	Cutoff Angle, *C*, deg		Minimum Height, *D*	Minimum Width, *W*	Maximum Gap Between Coils, *E*	Minimum Mean Section Thickness, *T* [Note (1)]	Minimum Ground Face, *F*
	Min.	Max.		Min.	Max.					
5/8	0.635	0.660	1.284	30	35	1.000	0.302	0.255	0.285	0.142
3/4	0.773	0.791	1.415	30	35	1.000	0.302	0.255	0.285	0.142

NOTE:
(1) $T = (t_i + t_o)/2$.

Table 3 Decarburization Limits

Diameters of Round Wire or Sections of Equivalent Area	Maximum Depth of Free Ferrite	Maximum Total Affected Depth (Free Ferrite Plus Partial Decarburization)
Up to 0.140, incl.	0.002	0.006
Over 0.140 to 0.250, incl.	0.003	0.008
Over 0.250 to 0.375, incl.	0.004	0.010
Over 0.375 to 0.500, incl.	0.006	0.015

Table 4 Standard Travel Limits

Size	Minimum
3/8	0.130
1/2	0.130
5/8	0.200
3/4	0.200
7/8	0.209
1	0.209

Table 5 Extended Travel Limits

Size	Minimum
5/8	0.250
3/4	0.250

Fig. 1 Washer Twist Test