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Data entry – draft starts next page

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2	4/06/2024	Minor changes to align with styles and voice

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Preface

This standard was prepared by the Railway Track Material – Part 7: Spring Washers Development Group, overseen by the RISSB Infrastructure Standing Committee.

Objective

The objective of this Standard is to provide manufacturers and users of spring washers with performance requirements for spring washers for use in railway track.

The context and purpose of use describes the performance that the requirements and tests of the Standard are intended to verify.

Major alterations to the previous edition are as follows:

(a) Change of title of the AS 1085 series (previously *Railway permanent way material*).

(b) Performance-based format adopted (function and action of washers described).

(c) A new spring washer type (Type 2) has been included to cover the shaped single, double and triple coil spring washers used with screw spikes.

(d) Steel specified by reference to one Standard.

(e) Test requirements for Type 1 washers increased.

Compliance

There are four types of provisions contained within Australian Standards developed by RISSB:

(f) Requirements.

(g) Recommendations.

(h) Permissions.

(i) Constraints.

Requirements – it is mandatory to follow all requirements to claim full compliance with the Standard. Requirements are identified within the text by the term ‘shall’.

Recommendations – do not mention or exclude other possibilities but do offer the one that is preferred.
Recommendations are identified within the text by the term ‘should’.

Recommendations recognize that there could be limitations to the universal application of the control, i.e. the identified control is not able to be applied or other controls are more appropriate or better.

Permissions – conveys consent by providing an allowable option. Permissions are identified within the text by the term ‘may’.

Constraints – provided by an external source such as legislation. Constraints are identified within the text by the term ‘must’.

For compliance purposes, where a recommended control is not applied as written in the standard it could be incumbent on the adopter of the standard to demonstrate their actual method of controlling the risk as part of their WHS or Rail Safety National Law obligations. Similarly, it could also be incumbent on an adopter of the standard to demonstrate their method of controlling the risk to contracting entities or interfacing organisations where the risk may be shared.

RISSB Standards address known hazards within the railway industry. Hazards, and clauses within this Standard that address those hazards, are listed in Appendix A.

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Appendices in RISSB Standards may be designated either “normative” or “informative”. A "normative" appendix is an integral part of a Standard and compliance with it is a requirement, whereas an "informative" appendix is only for information and guidance.

Commentary

Commentary *C Preface*

This Standard includes a commentary on some of the clauses. The commentary directly follows the relevant clause, is designated by ‘C’ preceding the clause number and is printed in italics in a box. The commentary is for information and guidance and does not form part of the Standard.

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Section 1 Scope and general

1.1 Scope

This Standard sets out the requirements for spring washers for use in railway track.

Type 1 single coil spring washers as per Section 2 are used with fishbolts and nuts as detailed in AS 1085.4. Type 2 single, double and triple coil spring washers as per Section 3 are used with screw spikes as detailed in AS 1085.18.

Double- and triple-turn spring washers are sometimes referred to as 'helical'; however, they are not helical in shape.

1.2 Normative references

The following documents are referred to in the text in such a way that *some* or all of their content constitutes requirements of this document:

- AS 1085.4, *Railway track materials Part 4: Fishbolts and nuts*
- AS 1085.18, *Railway track materials Part 18: Screw spikes and threaded inserts*
- AS 1199, *Sampling procedures and tables for inspection by attributes*
- AS 1399, *Guide to AS 1199 - Sampling procedures and tables for inspection by attributes*
- AS 1442, *Carbon steels and carbon-manganese steels - Hot-rolled bars and semifinished products*
- AS 1815, *Metallic materials - Rockwell hardness test*
- AS 1815.1, *Metallic materials - Rockwell hardness test Part 1: Test method scales*
- AS 1815.2, *Metallic materials - Rockwell hardness test Part 2: Verification and calibration of testing machines (scales A, B, C, D, E, F, G, H, K, N, T).*
- AS 1815.3, *Metallic materials - Rockwell hardness test Part 3: Calibration of reference blocks (scales (scales A, B, C, D, E, F, G, H, K, N, T).*
- AS/NZS 4680, *Hot-dip galvanized (zinc) coatings on fabricated ferrous articles*
- ISO 9001, *Quality management systems – Requirements*
- ISO 9004, *Quality management systems - Guidelines for performance improvements*
- HB18, *Guidelines for third-party certification and accreditation*
- HB18.28, *Guidelines for third-party certification and accreditation Guide 28 - General rules for a model third-party certification scheme for products.*

NOTE:
Documents for informative purposes are listed in a Bibliography at the back of the Standard.

1.3 Defined terms and abbreviations

For the purposes of this document, the following terms and definitions apply:

1.1.1
HRC
the C-scale of the Rockwell scale for measuring the indentation hardness of a material

General rail industry terms and definitions are maintained in the RISSB Glossary. Refer to: https://www.rissb.com.au/products/glossary/

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1.4 Context and purpose of use

1.4.1 Function

Spring washers provide force against the nut of a bolt or head of a screw spike in order to maintain tension and prevent loosening. They are also used to provide consistent force against materials held in place by the bolt or screw spike.

1.4.2 Action

Spring washers are compressed to induce tension in the bolt or screw with which they are used.

Spring washers are subjected to compression, fatigue and corrosion.

1.5 Designation

Spring washers shall be designated by:

(a) the number of this Standard (i.e. AS 1085.7);

(b) the nominal diameter of the spring washer;

(c) the number of coils, where relevant; and

(d) the type of washer:

  (i) Type 1 - normal duty spring washers for fishbolts; or

  (ii) Type 2 - high tension shaped spring washers for screw spikes.

For example, ’24 mm double coil Type 2 spring washers in accordance with AS 1085.7’.

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Section 2 Type 1 spring washers (for fishbolts)

2.1 General

Type 1 spring washers (normal duty spring washers for fishbolts) shall be as given in this Section.

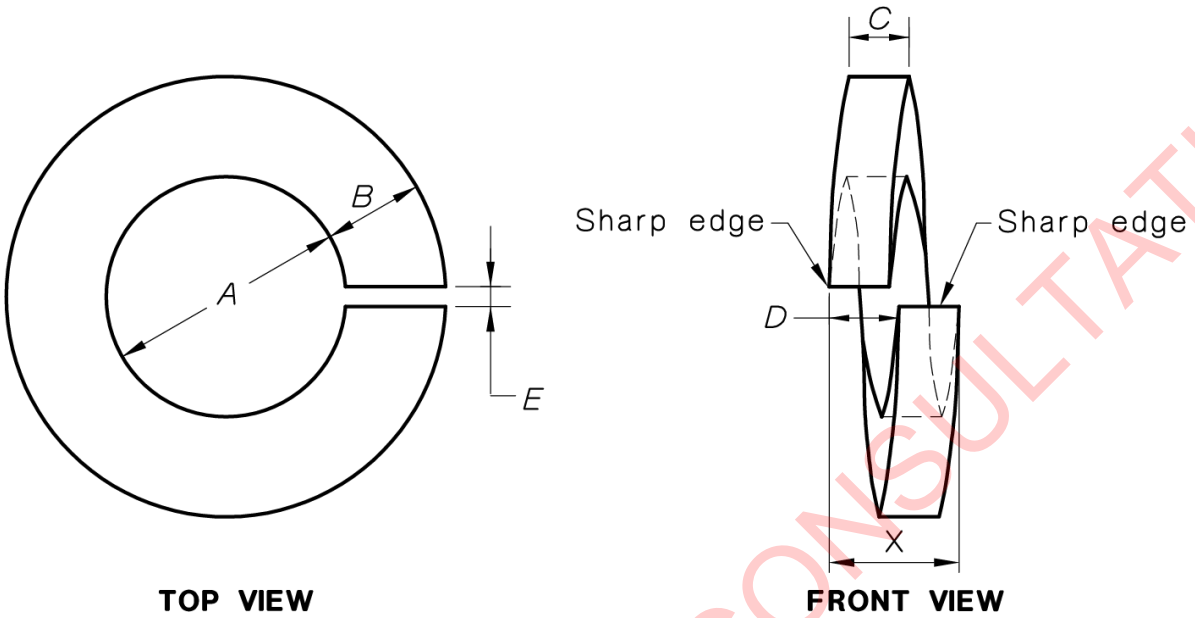

Figure 2.1-1 Dimensions for type 1 spring washers

2.2 Dimensions and tolerances

Type 1 spring washers shall conform to the dimensions and tolerances set out in Table 2-1 (see Figure 1).

2.3 Tests for type 1 spring washers

2.3.1 General

Testing shall be carried out within the temperature range 4°C to 40°C.

2.3.2 Hardness test

When tested in accordance with AS 1815, the hardness of the spring washers shall be between 43 HRC and 50 HRC.

2.3.3 Mechanical tests

2.3.3.1 Permanent set

The measured unloaded height, X, of the spring washer, after a load sufficient to compress them to a solid state has been applied and released three times in quick succession, shall not reduce by more than 25%.

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2.3.3.2 Twist test

When tested in accordance with Appendix D, spring washers shall not fracture when bent through 90° and when taken to failure the fracture surface shall be fine grained, homogeneous or of uniform silky appearance.

Table 2-1 Type 2 Spring Washers Dimensions

Dimensions and tolerances for type 1 spring washers (for Fishbolts)					
			millimetres		
Dimension (See figure 1)	Nominal size of washer (see note)				Tolerance
	20	22	24	27	
Inside diameter A					
Minimum	21	24	27	30	-
Maximum	22	25	28	31	-
Section width B	10	10	10	10	±0.25
Section thickness C	6	6	10	10	±0.25
Pitch					
Minimum	6	6	10	10	-
Maximum	8	8	14	14	-
Gap, E	1.5	1.5	1.5	1.5	±0.5
Un-loaded height, X ($X = C + D$)	13	13	-	-	±1
	-	-	22	22	±2
Note: Washer designation is equivalent to the nominal shank diameter of the bolt					

2.4 Materials

The steel used for manufacture of spring washers shall comply with AS 1442 and shall be capable of meeting the requirements of this Standard.

2.5 Finish

Washers shall be of uniform size and free from roughness, burrs, notches, seams and other defects detrimental to handling, manual installation and their end use.

2.6 Corrosion resistance

Washers shall be as made, with no corrosion protection coating or hot dip galvanized in accordance with AS/NZS 4680, except that the spring washers are not required to be centrifuged or other equivalent corrosion protection.

Other methods may be used when agreed between the purchaser and supplier.

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Section 3 Type 2 spring washers (for screw spikes)

3.1 General

Type 2 spring washers as defined in section 2.2 shall be as given in this Section.

Type 2 spring washers shall be formed with a wave or corrugation in the steel in addition to the spiral shape. This provides a secondary spring action following the torsional action of the spiral shape under compression.

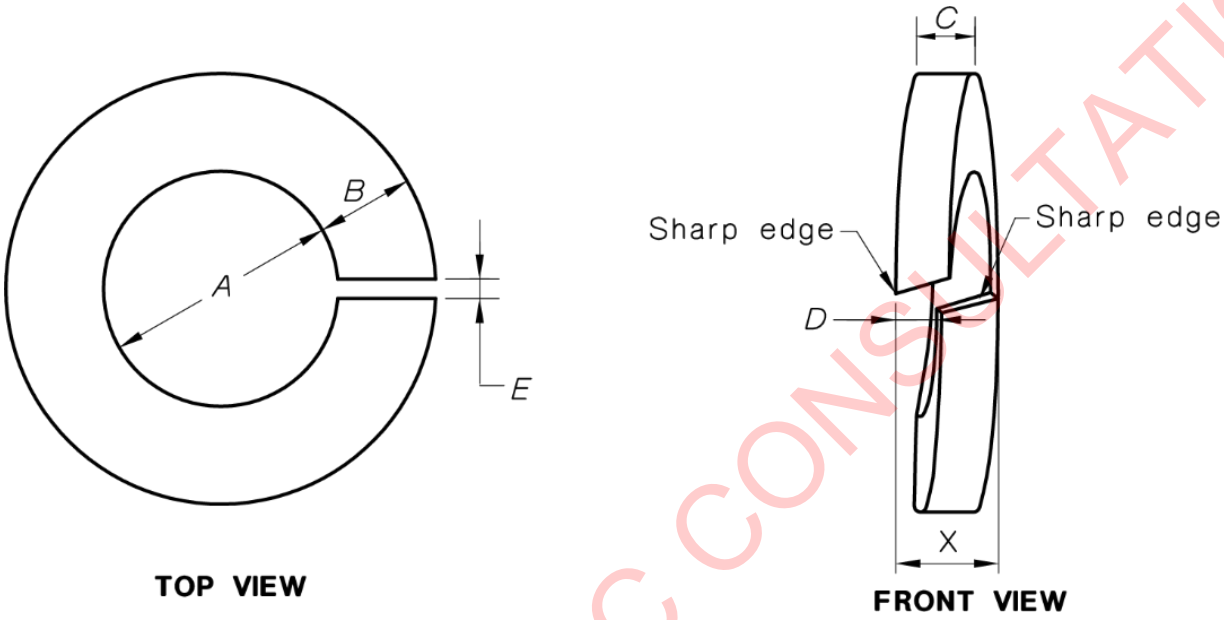

Figure 3.1-1 Dimensions for Type 2 spring washers

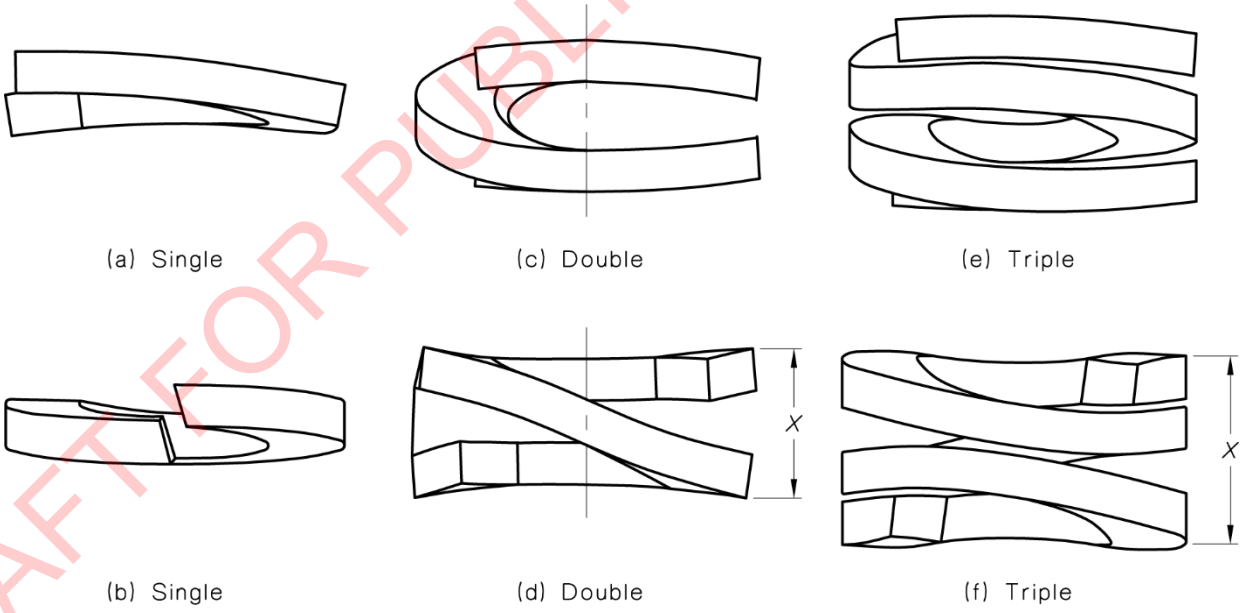

Figure 3.1-2 Shape of Type 2 spring washers

3.2 Dimensions and tolerances

Type 2 spring washers shall conform to the dimensions and tolerances set out in in Table 3-1 and Figure 3.1-1 and Figure 3.1-2.

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Table 3-1 Type 2 Spring Washer Dimensions

Nominal dimensions of Type 2 spring washers					
					millimetres
Number of coils	Dimension (See Figure 3.1-1)	Washer designation (See Note 2)			
		20	22	24	26
Single coil	Inside diameter A	-	-	25	28
	Section width B	-	-	10	12
	Section thickness C	-	-	6	6
Double coil	Inside diameter A	21	-	25	28
	Section width B	9	-	10	12
	Section thickness C	5	-	6	6
Triple coil	Inside diameter A	-	-	26	-
	Section width B	-	-	10	-
	Section thickness C	-	-	6	-

NOTES:

1 Dimensions are typical only and other dimensions may be used by agreement.

2 Washer designation is equivalent to the nominal shank diameter of the screw.

3.3 Materials

The steel used for manufacture of spring washers shall comply with AS 1442 and shall be capable of meeting the requirements of this Standard.

3.4 Finish

Washers shall be of uniform size and free from roughness, burrs, notches, seams and other defects detrimental to handling, manual installation and their end use.

3.5 Corrosion resistance

Washers shall be as made, with no corrosion protection coating or hot dip galvanized in accordance with AS/NZS 4680 (except that the spring washers are not required to be centrifuged) or other equivalent corrosion protection.

Other methods may be used when agreed between the purchaser and supplier.

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Appendix A Hazard register (Informative)

Hazard number	Hazard	Heading number(s)

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Appendix B Information to be provided by the purchaser (Informative)

The following information should be supplied by the purchaser:

(a) The relevant designation of the washer required as per section 2.2, including the number of this Australian Standard, i.e. AS 1085.7.

(b) Quantity.

(c) Packaging requirements.

(d) Any exceptions to the requirements specified in this Standard, and any special or supplementary requirements.

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Appendix C Means for demonstrating compliance with this standard (Informative)

C.1 Scope

This Appendix sets out the following different means by which compliance with this Standard can be demonstrated by the manufacturer or supplier:

(a) Evaluation by means of statistical sampling.

(b) The use of a product certification scheme.

(c) Assurance using the acceptability of the supplier's quality system.

(d) Other such means proposed by the manufacturer or supplier and acceptable to the customer.

C.2 Statistical sampling

Statistical sampling is a procedure that enables decisions to be made about the quality of batches of items after inspecting or testing only a portion of those items. This procedure will only be valid if the sampling plan has been determined on a statistical basis and the following requirements are met:

(a) The sample needs to be drawn randomly from a population of product of known history. The history needs to enable verification that the product was made from known materials at essentially the same time, by essentially the same processes and under essentially the same system of control.

(b) For each different situation, a suitable sampling plan needs to be defined. A sampling plan for one manufacturer of given capability and product throughput may not be relevant to another manufacturer producing the same items.

In order for statistical sampling to be meaningful to the customer, the manufacturer or supplier needs to demonstrate how the above conditions have been satisfied. Sampling and the establishment of a sampling plan should be carried out in accordance with AS 1199, guidance to which is given in AS 1399.

C.3 Production certification

The purpose of product certification is to provide independent assurance of the claim by the manufacturer that products comply with the stated Standard.

The certification scheme should meet the criteria described in HB 18.28 in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective quality planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard.

C.4 Supplier's quality management system

Where the manufacturer or supplier can demonstrate an audited and registered quality management system complying with the requirements of the appropriate or stipulated Australian or international Standard for a supplier's quality management system or systems, this may provide the necessary confidence that the specified requirements will be met. The quality assurance requirements need to be agreed between the customer and supplier and should include a quality or inspection and test plan to ensure product conformity.

Information on establishing a quality management system is set out in AS/NZS ISO 9001 and AS/NZS ISO 9004.

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C.5 Other means of assessment

If the above methods are considered inappropriate, compliance with the requirements of this Standard may be assessed from the results of testing coupled with the manufacturer's guarantee of product conformance.

Irrespective of acceptable quality levels (AQLs) or test frequencies, the responsibility remains with the manufacturer or supplier to supply products that conform to the full requirements of the Standard.

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Appendix D Twist test (Normative)

D.1 Scope

This Appendix sets out the method for the twist test for spring washers and is intended to establish the material properties of the spring washers.

D.2 Apparatus

The following apparatus is required:

(a) Saw for cutting down double and triple spring washers.

(b) Vice with sharp-edged jaws.

(c) Wrench or shifting spanner having sharp edges.

(d) Test assembly as shown in Appendix Figure D.5-3.

D.3 Preparation of the specimens

For double and triple spring washers, prepare the test specimens by cutting the spring washer down to a portion just under 360°.

D.4 Procedure

The procedure shall be as follows:

(a) Place a 90° segment of the spring washer in the vice, so that the ends of the spring washer are free and an axis passing through the slot is parallel to and slightly above the top of the vice. Where double or triple spring washers are to be tested, place the spring washer so that at least 225° of the washer is free of the vice.

(b) Grip the free end of the spring washer with the wrench so that the edges of the wrench are in a plane parallel to the vice.

(c) Move the wrench through 90°, in a direction that increases the free height of the spring washer and check for signs of fracture (see Appendix Figure D.5-3).

(d) Continue to move the wrench until the spring washer breaks and observe the texture of the fracture surface.

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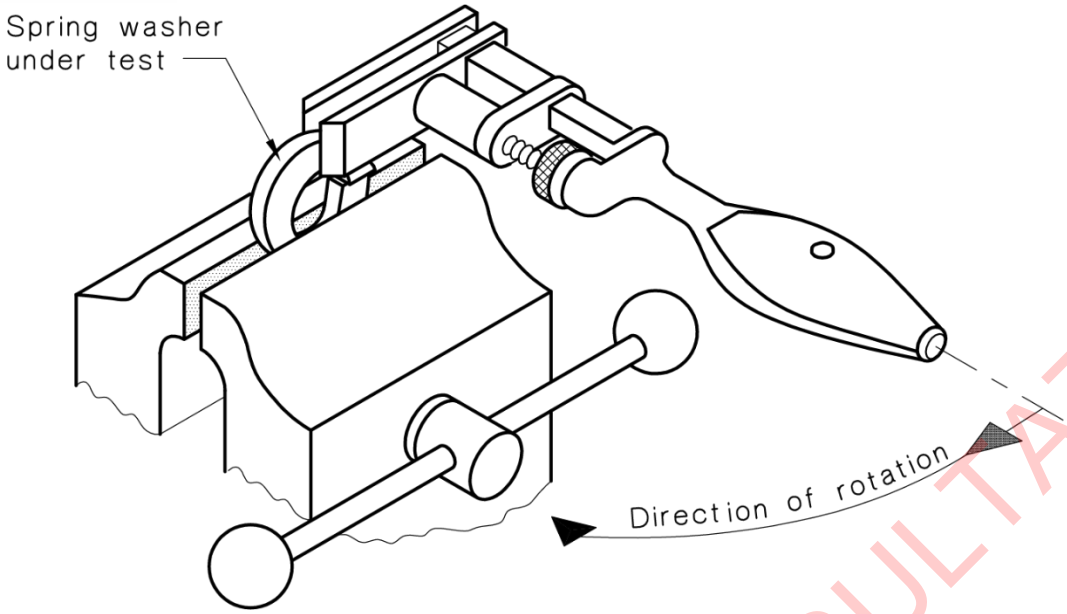

Appendix Figure D.5-3 Washer twist test

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