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Australian/New Zealand Standard™

**Motor vehicles—Cargo restraint
systems—Transport webbing and
components**



AS/NZS 4380:2001

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee ME-048, Restraint Systems in Vehicles. It was approved on behalf of the Council of Standards Australia on 21 September 2001 and on behalf of the Council of Standards New Zealand on 19 October 2001. It was published on 21 November 2001.

The following interests are represented on Committee ME-048:

Australian Automobile Association
Australian Chamber of Commerce and Industry
Australian Industry Group
Commercial Vehicle Industry Association of Australia
Consumers Federation of Australia
Federation of Automotive Products Manufacturers, Australia
Land Transport Safety Authority, New Zealand
Roads and Traffic Authority of New South Wales

Additional interests participating in the preparation of this Standard:

Vehicle transport industries
Webbing manufacturers and suppliers

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Australian/New Zealand Standard™

Motor vehicles—Cargo restraint systems—Transport webbing and components

Originated as AS/NZS 4380:1996.
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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME-048, Restraint Systems in Vehicles to supersede AS/NZS 4380:1996, *Cargo restraint systems—Webbing load restraint systems*.

The objective of the Standard is to provide requirements for webbing restraint systems used in the transport industry for restraining cargo on vehicles, and manufactured from the following fibres:

- (a) Polyester (PES).
- (b) Polyamide (PA).
- (c) Polypropylene (PP).

These fibres are described in AS/NZS 2450, *Textiles—Natural and man-made fibres—Generic names*.

This Standard does not preclude the introduction of new fibres in the future.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

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FOREWORD

In any webbing restraint system, the lashing capacity (LC) of each system must take account of the conditions of use and be compatible with any loads inherent in and applied to the system, and each component should readily connect with each adjacent component. Therefore, it is important that restraint systems be quickly and positively identified in service for size, capacity and if applicable, quality grade.

Where applicable, the quality grading system used in this Standard is based on the system incorporated in other Australian/New Zealand Standards covering components in lifting, tensioning and restraining systems. This is intended to promote positive identification and easy selection because it relates to the mechanical properties of the finished product and not simply to the strength of the material. In some countries lashing capacity (LC) may be referred to as 'rated assembly strength' (RAS) and it is normally expressed in kilograms (kg) for ease of understanding in use rather than kilograms force (kgf).

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**Motor vehicles—Cargo restraint systems—Transport webbing and components**SECTION 1 SCOPE AND GENERAL
REQUIREMENTS**1.1 SCOPE**

This Standard specifies requirements for webbing restraint systems for use in the transportation of cargo under normal operating conditions.

The Standard is not intended to apply to either load restraint nets or vehicle curtain sidewalls or their tensioners. Vehicle curtain single walls and their tensioners are not considered to be general cargo restraint systems.

NOTE: Guidelines on information to be supplied with enquiries and orders are given in Appendix B and the means for demonstrating compliance with this Standard are given in Appendix C. Appendix D gives advice on the selection and use of webbing restraint systems. Appendix E sets out the requirements and recommendations on the care and maintenance of webbing restraint systems.

1.2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS	
1199	Sampling procedures and tables for inspection by attributes
1399	Guide to AS 1199—Sampling procedures and tables for inspection by attributes
2193	Methods for calibration and grading of force-measuring systems of testing machines
AS/NZS	
2450	Textiles—Natural and man-made fibres—Generic names
4344	Motor vehicles—Cargo restraint systems—Transport chain and components
AS/NZS ISO	
9000	Quality management systems—Fundamentals and vocabulary
9004	Quality management systems—Guidelines for performance improvements
HB 18	Guidelines for third-party certification and accreditation
HB 18.44	Guide 44—General rules for ISO or IEC international third-party certification schemes for products (SANZ HB 18.44)

1.3 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

1.3.1 Acceptable quality level (AQL)

A quality level which corresponds to a relatively high probability of acceptance. It is the maximum percent defective or the maximum number of defects per one hundred items that, for purposes of sampling inspection, can be considered satisfactory as a process average.

1.3.2 Accreditation

Certification by a duly recognized body with the facilities, capability, objectivity, competence and integrity of an agency, service or operational group or individual to provide the specified service and/or required operation.

1.3.3 Batch

A quantity of some commodity produced under conditions which are considered uniform.

NOTE: Each batch is assumed, as far as practicable, to consist of materials or items of a single type, grade, class, size and composition and to have been manufactured under essentially the same conditions at essentially the same time.

1.3.4 Certification

The authoritative act of documenting compliance with requirements.

NOTE: The requirements can relate to personnel, processes, products, organizations and services.

1.3.5 Combined lashing

A device for securing a load, consisting of a tensioning device and textile webbing combined with chains, steel wire ropes, or the like, with or without end fittings.

1.3.6 Component

Any fitting, tensioning, clamping or joining device for webbing restraint systems.

1.3.7 Competent person

A person having practical and theoretical knowledge and relevant experience, sufficient to enable that person to detect and evaluate any defects and any weakness that may affect the intended performance of the equipment.

1.3.8 Elongation

The percentage increase in the length of a restraint between two defined points.

1.3.9 End fitting

A component used to terminate any part of the webbing restraint system.

1.3.10 Flat woven textile webbing

Conventional or shuttleless narrow woven webbing, the prime function of which is load-bearing.

1.3.11 Inspection

The activity of measuring, testing or otherwise examining components and assemblies for determining conformity with the specified requirements.

1.3.12 Lashing capacity (LC)

One half of the minimum braking strength of the system which is designed to sustain in use in straight pull normally expressed in kilograms (kg) rather than kilogram force (kgf).

1.3.13 Length of a multiple-piece load restraint system

1.3.13.1 Fixed end length (L_{gf})

The fixed end length is measured between tensioning device and load-bearing point of end fitting to the outer turning radius of the connection of the webbing (refer to Figure 1).

1.3.13.2 Adjustable end length (L_{gl})

The adjustable end length is measured between the end of the webbing to the load-bearing point of the end fitting or formed eye in the case where no fitting is supplied (refer to Figure 1).

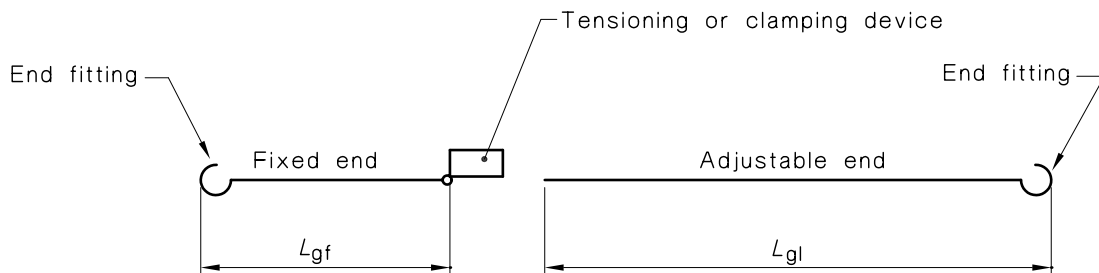


FIGURE 1 MULTIPLE-PIECE LOAD RESTRAINT SYSTEM

1.3.14 Performance test

A test for assessing the behaviour of the product in use directly or through simulation of the influencing factors, sometimes under more severe conditions.

1.3.15 Quality

Fitness for purpose.

NOTE: It includes quality of design, the degree of conformance to design, and may include such factors as economic and perceived values.

1.3.16 Shall

Indicates that a statement is mandatory.

1.3.17 Should

Indicates a recommendation.

1.3.18 Tensile force indicator

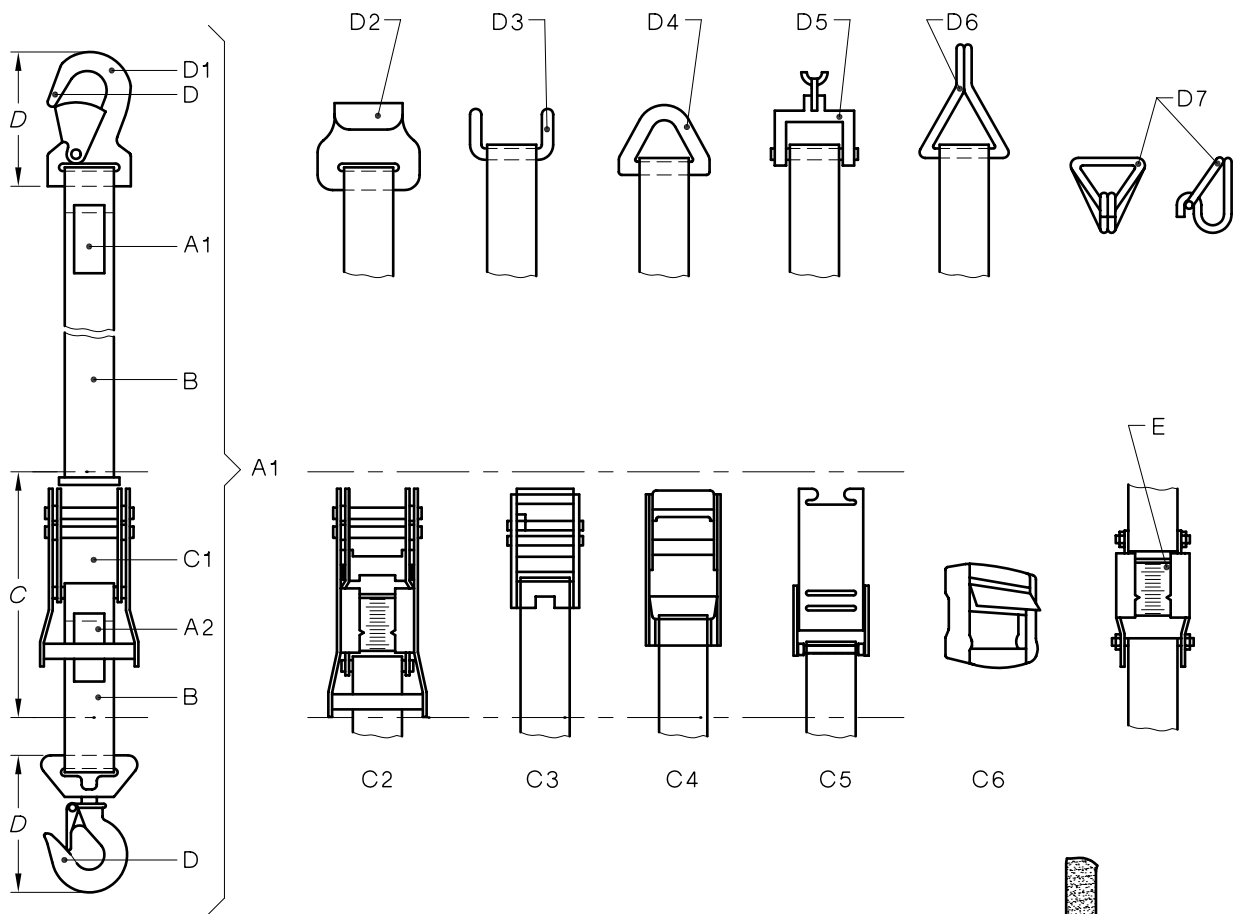
A device which indicates the force applied by means of the tensioning device to the webbing restraint system.

1.3.19 Type test

A test or series of tests directed towards approval of design, conducted to determine whether a product is capable of meeting the requirements of the product specification.

1.3.20 Webbing restraint system

A system consisting of webbing and components with or without end fittings, used for securing the load on vehicles (refer to Figure 2).



LEGEND:

A = WEBBING LOAD RESTRAINT SYSTEM
 A1, A2 = Space for marking (label)

B = Webbing

C = Tensioning or clamping device,
 C1 = Ratchet tensioner
 C2 = Ratchet tensioner with tension force indicator (see also E)
 C3 = Sliding bar buckles
 C4, C5 = Lever tensioning buckles
 C6 = Cambuckle

D = END FITTINGS
 D1 = Snap hook
 D2 = Flat hook
 D3 = Claw hooks or rave hooks
 D4 = Delta fittings
 D5 = Connector fitting, e.g. an end fitting used to combine webbing lashing with chain or wire rope lashings
 D6 = Double wire claw hook
 D7 = Hook and keeper

E = Tension force indicator (see also C2)
 F = Underbody winch

FIGURE 2 TYPICAL EXAMPLES OF WEBBING RESTRAINT SYSTEMS

1.4 MARKING

1.4.1 Complete assembly

The fixed end and adjustable end (refer to Figure 1) of the webbing components of lashing assembly shall be permanently and legibly marked with the following information:

- (a) Lashing capacity (LC) in kilograms (kg).
- (b) Length, in metres.
- (c) Caution statement, as follows:
CAUTION: MUST NOT BE USED FOR LIFTING
- (d) Material from which the webbing is manufactured.
- (e) Name of manufacturer or supplier.
- (f) Manufacturer’s traceability code.
- (g) A compliance statement referring to this Standard, i.e. AS/NZS 4380.

A space shall be reserved on each lashing, or complete system, for the certification mark and year of manufacture (if required).

1.4.2 Label

Labels or printing shall be one of the following colours, which will indicate the type of webbing material (refer to Figure 3 for a typical label format):

- (a) Blue polyester (PES) webbing.
- (b) Green polyamide (PA) webbing.
- (c) Brown polypropylene (PP) webbing.

Lashing capacity (LC) in kilograms	
Webbing material	
Length	
Manufacturer’s or supplier’s symbol or trade marking	
Manufacturer’s traceability code	
This Standard (AS/NZS 4380)	

(a) Front Label

Lashing capacity (LC) in kilograms (kg)	
Webbing material	
Manufacturer’s or supplier’s symbol or trade marking	
Manufacturer’s traceability code	
This Standard (AS/NZS 4380)	

NOTE: Concealed under the cover overlap for future validation.

(b) Concealed Label

FIGURE 3 TYPICAL LABEL FORMAT

1.4.3 Tensioning device

Mountable tensioning devices shall be marked with at least the manufacturer's or supplier's name or trademark and the lashing capacity (LC).

1.5 PACKAGING

Webbing restraint systems shall be suitably protected to prevent damage during transit. The packaging shall include the following:

- (a) Manufacturer's name and address or trademark, or all three.
- (b) Generic type of fibre and filaments from which the webbing is made.
- (c) A user instruction label or leaflet which shall be provided with each webbing restraint system and which shall contain advice on safe use and precautions necessary during use, covering at least—
 - (i) information and warnings on risks; and
 - (ii) particular information on the type of webbing restraint system and its intended use.

NOTES:

- 1 Appropriate information to be included in the instruction label or leaflet should be selected from Appendix D.
- 2 Manufacturers making a statement of compliance with this Australian/New Zealand Standard on a product, packaging, or promotional material related to that product are advised to ensure that such compliance is capable of being verified.

SECTION 2 MANUFACTURING REQUIREMENTS

2.1 MATERIAL

2.1.1 Webbing

The webbing shall be produced from high tenacity continuous filament yarn, uniformly woven and free from any significant defects. The edges shall have non-fraying characteristics and should be of the following materials in accordance with AS/NZS 2450:

- (a) Polyester (PES).
- (b) Polyamide (PA).
- (c) Polypropylene (PP).

Polyamide and polyester webbing shall be heat set.

NOTE: Attention is drawn to the differing resistance of man-made fibres to chemicals as summarized in Appendix D.

For composite material where the portion of the added material exceeds 15% of base material, the material shall be identified on the label.

2.1.2 Components

Steel components shall be manufactured from material that does not exceed 0.45% carbon content and after processing shall comply with minimum breaking strength and deformation requirements.

2.2 DESIGN AND MANUFACTURE

2.2.1 Sewing on webbing

All seams shall be sewn from the same continuous filament as that used to manufacture the webbing. The sewing shall be done by a lock-stitch or similar machine and the stitching shall be evenly embedded into both surfaces of the webbing joint. Lock sewing shall not be visible from either side of the joint.

NOTE: To facilitate inspection, the sewing thread may be of a different colour from that of the webbing.

2.2.2 Webbing attachment without sewing

Where a tensioning device is designed for use with webbing in a lashing assembly without sewing, then the information as to strength, width and type of webbing to be used shall be supplied with the device.

2.2.3 Components

2.2.3.1 End fittings

In the design of end fittings, sharp outside edges and corners should be avoided. In particular, those edges which are in contact with webbing shall be rounded off.

2.2.3.2 Tensioning devices

When a force of 500 N is applied to the handle, a tensioning device shall generate a tensile force in a webbing restraint system of at least 15 per cent of the lashing capacity (LC) or a tensile force of at least 3000 N in a single strap, when a minimum of 2½ turns are applied to the spool. Where removable handles are used, if any component of the applied force can act in the direction of removal of the handle, the handle should be secured against accidental detachment. The maximum possible recoil travel of the end of the handle of the tensioning device shall not exceed 150 mm when released.

SECTION 3 PERFORMANCE REQUIREMENTS

3.1 GENERAL

The performance of the webbing restraint system shall be determined in accordance with the requirements of this Section.

3.2 TEXTILE WEBBING

Load restraint webbing which shall not elongate by more than 12% when 50% of the mean breaking strength is applied and tested in accordance with Appendix A.

3.3 LOAD-BEARING COMPONENTS

All load-bearing components excluding the webbing of the complete load restraint system shall show no indication of permanent deformation affecting the function at 1.25 times the lashing capacity (LC) and shall afterwards withstand a force of at least twice the lashing capacity (LC) when tested in accordance with Appendix A.

3.4 TESTING THE ABILITY TO RELEASE UNDER TENSION

The force required to release the tension in the webbing restraint system shall be equal to or less than 500 N when tested in accordance with Appendix A.

APPENDIX A PERFORMANCE TESTING

(Normative)

A1 SCOPE

This Appendix sets out methods for determining the strength of webbing restraint systems and their components.

A2 APPARATUS

A testing machine is required which complies with the requirements of Grade B machines as specified in AS 2193 and which is—

- (a) a device clearly indicating the applied load to the test specimen continuously on a scale or chart;
- (b) capable of extending or loading the specimen at a continuous rate;
- (c) designed with suitable attachment devices;
- (d) constructed so that there is little or no movement of the fixed attachment device of the force-measuring mechanism in the direction of the applied force; and
- (e) constructed so that the attachment devices do not damage the specimen.

NOTE: It is desirable that the capacity of the machine or the range selected be such that the force required to break the test specimen is not less than 20% of the selected range of the machine.

Where a chain component is included in a system, it shall comply with AS/NZS 4344.

A3 PROCEDURES

A3.1 Testing elongation of textile webbing

The procedure for the elongation testing of textile webbing in accordance with Clause 2.2.3.2 shall be as follows:

- (a) Carry out the test in ambient atmosphere except in cases of dispute when conditioning and testing shall be carried out in the standard temperate atmosphere for testing textiles, i.e. an atmosphere of relative humidity $65 \pm 2\%$ and a temperature of $20 \pm 2^\circ\text{C}$.
- (b) Determine the mean breaking strength by breaking a minimum of three unsewn webbing samples and calculating the mean value. The load shall be gradually applied to the webbing at a rate of not less than 50 and not more than 250 mm/min per 1000 mm testing length of the specimen.
- (c) Load an untested webbing sample to a pre-tension of 1% of the mean breaking strength, setting off a measuring section of a minimum 0.2 m to maximum 1.0 m in the middle of the free webbing. Accuracy of length measurement shall be $\pm 0.5\%$.
- (d) Increase the load to 50% of the mean breaking strength and measure the elongation of the webbing. The load shall be gradually applied to the webbing at a rate of not less than 50 and not more than 250 mm/min per 1000 mm testing length of the specimen.

A3.2 Testing a complete webbing restraint device

The procedure for testing a complete webbing restraint device in accordance with Clause 3.3 shall be as follows:

- (a) Assemble the webbing restraint system with its end fittings and mount on the testing machine.
- (b) Apply a force equal to 1.25 times the lashing capacity (LC).
- (c) Remove test force and inspect to confirm that—
 - (i) the components have not permanently distorted such as to be detrimental to their intended functions;
 - (ii) the tensioning device or components with moving parts have fully retained their function;
 - (iii) no stitch failure has occurred; and
 - (iv) no slippage of the webbing through the tensioning device has occurred.

NOTE: Elongation of the material of the webbing and circumferential settling in the tensioning device should not be confused with slippage of the webbing in the tensioning device.

- (d) Apply a load of at least twice the lashing capacity (LC) and the load may then be increased to determine breaking load if required.

A3.3 Testing of pre-tension ability

The procedure for testing of the pre-tension ability for hand-operated devices in accordance with Clause 3.3 shall be as follows:

- (a) Mount system onto the tensile testing machine with at least 2 m between the two test points. When a tensioning device with rotating axis is tested, the axis with the slotted webbing shall be turned $2\frac{1}{2}$ times at the start of the testing, including the loose end (refer to Figure A1).
- (b) Apply a force of 500 N to the tension device manufacturer approved handle of the tensioning device when the handle is at 90° to the line of action of the webbing strap and activate the locking device. Measure the remaining force that the tensioning device generates in the lashing 10 s after the locking device has been activated. Repeat this procedure 4 times after repositioning the webbing in the slot, and calculate the mean value.

A3.4 Testing ability to release under tension

The procedure for testing for the ability to release under tension in accordance with Clause 3.4 shall be to load and maintain a 4 m length (sum of $L_{gf} + L_{gl}$) of web lashing at 30% of the lashing capacity (LC) before performing a release ability test.

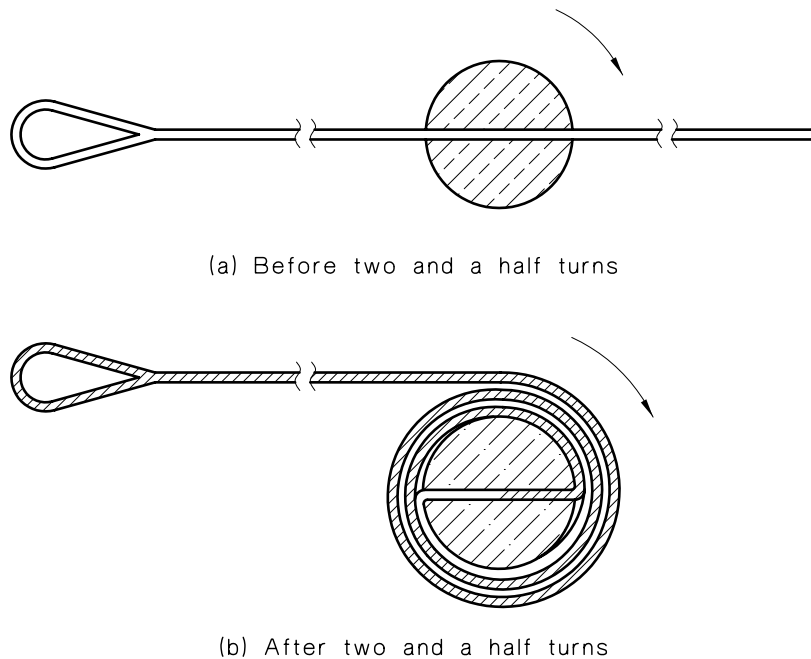


FIGURE A1 WEBBING ATTACHMENT TO TENSIONING DEVICE

A4 REPORT

The following information shall be reported:

- (a) For elongation of textile webbing:
 - (i) Applied force.
 - (ii) Percentage of elongation achieved.
 - (iii) Pass or fail in accordance with Section 3.
 - (iv) Webbing description.
 - (v) Batch number.
 - (vi) A compliance statement referring to this Standard i.e. AS/NZS 4380, Appendix A.
- (b) For testing of complete systems:
 - (i) Report on webbing in accordance with Appendix A4(a).
 - (ii) Lashing capacity (LC).
 - (iii) Pass or fail in accordance with Section 3.
 - (iv) Batch or serial number.
 - (v) A compliance statement referring to this Standard i.e. AS/NZS 4380, Appendix A.

APPENDIX B
INFORMATION TO BE SUPPLIED ON REQUEST
(Informative)

B1 SCOPE

This Appendix sets out the information to be supplied by the manufacturer/supplier on request.

B2 INFORMATION

The following information should be supplied on request:

- (a) *Webbing*
 - (i) Webbing material and width.
 - (ii) Length, in metres.
 - (iii) Lashing capacity (LC).
 - (iv) Copy of test report as per Paragraph A4(a) should be supplied.
 - (v) Copy of compliance statement referring to this Standard i.e. AS/NZS 4380, Appendix A.
- (b) *Webbing restraint systems or part thereof*
 - (i) Effective length, in metres.
 - (ii) Lashing capacity (LC).
 - (iii) Copy of test report as per Paragraph A4(b) should be supplied.
 - (iv) Copy of compliance statement referring to this Standard i.e. AS/NZS 4380, Appendix A.

APPENDIX C
MEANS FOR DEMONSTRATING COMPLIANCE WITH THIS STANDARD
 (Informative)

C1 SCOPE

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

- (a) Assessment 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.

C2 STATISTICAL SAMPLING

Statistical sampling is a procedure which 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 must be drawn randomly from a population of product of known history. The history must 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.

C3 PRODUCT CERTIFICATION

The purpose of product certification is to provide independent assurance of the claim by the manufacturer that products comply with the stated Australian, New Zealand or international Standard.

The certification scheme should meet the criteria of an ISO Type 5 scheme as specified by HB 18.44 (SANZ HB18.44) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain an effective quality plan to control production to ensure conformance with the relevant Standard.

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

C4 SUPPLIER'S QUALITY 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 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.

Guidance in determining the appropriate quality management system is given in AS/NZS ISO 9000:2000 and AS/NZS ISO 9004:2000.

C5 OTHER MEANS OF ASSESSMENT

If the above methods are considered inappropriate, determination of compliance with the requirements of this Standard may be assessed by being based on 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 with the full requirements of the Standard.

NOTE: When a consumer designates some specific value of AQL for a certain defect or group of defects, he indicates to the vendor that this (the consumer's) acceptance sampling plan will accept the great majority of the batches that the vendor submits, provided the process average level of percent defective, or defects per one hundred items, in these batches is no greater than the designated value of AQL. Thus, the AQL is a designated value of percent defective, or defects per one hundred items, that the consumer indicates will be accepted most of the time by the acceptance sampling procedure to be used.

Sampling plans are usually so arranged that the probability of acceptance at the designated AQL value depends upon the sample size for a given AQL. The probability of acceptance is therefore generally higher for large samples than for small ones. The AQL alone does not describe the protection to the consumer for individual batches but more directly relates to what might be expected from a series of batches. It is necessary to refer to the operating characteristic curve of a plan to determine what protection the consumer will have.

APPENDIX D
SELECTION AND USE OF WEBBING RESTRAINT SYSTEMS
(Informative)

D1 SELECTION

In selecting a webbing restraint system, consideration should be given to the required lashing capacity (LC), taking into account the mode of use and the nature of the load to be secured. The size, shape and weight of the load, together with the intended method of use, transport environment and the nature of the load, will affect the correct selection.

D2 USE

The selected webbing restraint system should be both strong enough and of the correct length for the mode of use. Good lashing practice should always be followed such as fitting and removal operations of lashings should be planned before starting a journey. The lashings should be suitably pre-tensioned and regularly checked during the journey.

D3 FITTINGS

Consideration should be given to ancillary fittings and anchorage points which should be compatible with the webbing restraint system.

D4 SUPPLIER'S INSTRUCTIONS

The webbing restraint system should be used in accordance with the supplier's instructions (this information will be formulated by the supplier).

D5 STABILITY OF LOAD

Care should be taken to ensure that the stability of the load is independent of the webbing restraint system and that the release of the webbing restraint system will not cause the load to fall off the vehicle, thus endangering personnel. If necessary, attach lifting equipment for further support to the load before releasing the tensioning device in order to prevent accidental falling.

D6 MATERIALS

The materials from which webbings are manufactured have a selective resistance to chemical attack. The advice of the manufacturer or supplier should be sought if exposure to chemicals is likely. It should be noted that the effects of chemicals may increase with rising temperature. The resistance of man-made fibres to chemicals is as follows:

- (a) Polyester (PES) is resistant to mineral acids but is damaged by alkalis.
- (b) Polyamides (PA) are virtually immune to the effects of alkalis. However, they are attacked by mineral acids.
- (c) Polypropylene (PP) is little affected by acids and alkalis and is suitable for applications where high resistance to chemicals (other than certain organic solvents) is required.
- (d) Solutions of acids or alkalis which are deemed harmless may become sufficiently concentrated by evaporation to cause damage. Contaminated webbings should be taken out of service at once, thoroughly soaked in cold water, and dried naturally.

- (e) If there is any contamination from chemical products, a web lashing should be removed from service and the manufacturer or supplier should be consulted.
- (f) Polyamide (PA) and polypropylene (PP) are more sensitive to UV degradation than polyester.

D7 OPERATING TEMPERATURES

The webbing restraint systems complying with this Standard are suitable for use in the following temperature ranges:

- (a) -40°C to $+80^{\circ}\text{C}$ for polypropylene (PP).
- (b) -40°C to $+100^{\circ}\text{C}$ for polyester (PES) and polyamide (PA).

These ranges may vary in a chemical environment, in which case the advice of the manufacturer or supplier should be sought.

Changes in environmental temperature during transport may affect the force in the webbing. The tension force should be checked after entering warm areas.

D8 OVERLOADING

Webbing restraint systems should not be overloaded, by using mechanical aids such as levers or bars (cheater bars) unless they are designed for use with the webbing restraint system.

D9 LIMIT OF TWIST

Webbing restraint system should not be used when knotted, and twisting of the webbing is prohibited; however, a half turn is allowable to prevent vibration and flapping.

D10 PROTECTION

The webbing restraint system should be protected against friction, abrasion and damage from loads with edge radius less than twice the webbing material thickness, using protective sleeves or corner protectors.

D11 WITHDRAWAL AND REPAIR

Webbing restraint systems should be withdrawn from service and replaced or returned to the manufacturer for repair if they show the following signs of damage (refer to Paragraph E3):

- (a) *Webbings* Tears, cuts, nicks and abrasions in load-bearing fibres and retaining stitches exceeding 10%, and deformations resulting from exposure to heat.
- (b) *End fittings and tensioning devices* Deformations, cracks and pronounced signs of wear or corrosion.

Only the manufacturer should carry out repairs on webbing restraint systems and on the webbing any identification labels should be repaired.

APPENDIX E CARE AND MAINTENANCE OF WEBBING RESTRAINT SYSTEMS

(Normative)

E1 SCOPE

This Appendix sets out the requirements and recommendations on the care and maintenance of webbing restraint systems.

E2 EXTENDING THE USEFUL LIFE

The life of lashing webbing and components can be extended by observing the following:

- (a) *Care and maintenance*
 - (i) Never heat or heat-treat the lashing components.
 - (ii) Lightly oil the lashing components prior to prolonged storage.
 - (iii) Store the lashing webbing and components in a clean dry place.
 - (iv) Keep the tie-down as clean as possible and the ratchet free from dirt.
 - (v) If contaminated with oil, fuel or acid remove with hot soapy water.
 - (vi) If contaminated with alkali, rinse thoroughly in cold water as soon as possible, do not allow the webbing to dry out before rinsing in water.
 - (vii) If the ratchet mechanism becomes stiff in use, a small amount of lubricant applied to the moving parts will ease operation.
- (b) *Use*
 - (i) Ensure that the lashing webbing or components are free of any significant damage or wear.
 - (ii) Avoid throwing from heights or leaving on the ground where vehicles may damage the metal fittings.
 - (iii) Do not twist or knot the webbing.
 - (iv) Use the protective sleeves or other packing material to protect the webbing if it passes over sharp edges or rough surfaces. A corner is considered to be sharp when the corner radii is less than twice the thickness of the webbing.
 - (v) Ensure the lashing webbing is evenly loaded in use.
 - (vi) When the lashing webbing is tensioned ensure the force applied does not exceed the manufacturer's or supplier's recommendations.
 - (vii) Ensure that there is a minimum of 1½ turns of webbing on the ratchet spindle.
 - (viii) Do not allow modifications or repairs to the webbing to be carried out, except by the manufacturer or supplier.

E3 MAINTENANCE

It is important that all components in the webbing restraint should be examined regularly by the users prior to use. If there is any doubt about serviceability of the system it should be withdrawn from use and examined by a competent person. Take note of the following for guidance:

- (a) If necessary, the lashing webbing and components should be cleaned before they are inspected.
- (b) Complete webbing restraint system should be individually inspected for any signs of wear, twisting or stretching.
- (c) Clearly mark the defaults on all webbing restraint systems that have been withdrawn from service for evaluation.
- (d) Any damaged webbing restraint system which cannot be repaired should be destroyed.

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