



Chain slings for lifting purposes—Grade T(80) and V(100)

Part 2: Care and use



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Australian Standard[®]

Chain slings for lifting purposes—Grade T(80) and V(100)

Part 2: Care and use

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PREFACE

This Standard was prepared by the Standards Australia Committee ME-025, Lifting Tackle, to supersede AS 3775.2—2004, *Chain slings—Grade T, Part 2: Care and use*.

This Standard incorporates Amendment No. 1 (August 2015). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

The objective of this Standard is to promote the correct use of Grade T and V chain slings.

This Standard is Part two of a series that consists of the following:

AS

3775 Chain slings for lifting purposes—Grade T(80) and V(100)

3775.1 Part 1: Product specification

3775.2 Part 2: Care and use (this Standard)

This edition includes the following changes from the previous edition:

- (a) Introduction of requirements for a ‘competent person’.
- (b) It is expanded to include requirements for Grade V.
- (c) Extra clarification of WLL for some multi leg slings.
- (d) Additional clarification and explanation on the correct assembly and use of slings with connecting links.
- (e) Mandating of periodic inspection record has been incorporated.
- (f) Expanded specification for inspection of self-locking hooks.
- (g) Application of inline shortening devices is included.
- (h) Maximum included angles reduced to 60° for two leg reeved and two leg basket slings.
- (i) Detailed explanation of symmetry of sling assemblies is included.

Statements expressed in mandatory terms in notes to tables are deemed to be requirements of this Standard.

The term ‘informative’ has been used in this Standard to define the application of the appendix to which it applies. An ‘informative’ appendix is only for information and guidance.

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STANDARDS AUSTRALIA

Australian Standard**Chain slings for lifting purposes—Grade T(80) and V(100)****Part 2: Care and use****1 SCOPE**

This Standard sets out requirements and recommendations on practices for the care and use of Grade T(80) and V(100) chain slings, which are specified in AS 3775.1. It does not cover the use of such slings for the lifting of personnel.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

NOTE: Documents that provide additional information are listed in the Bibliography in Appendix E.

AS

1418 Cranes, hoists and winches

1418.1 Part 1: General requirements

2317 Collared eyebolts

3775 Chain slings for lifting purposes—Grade T(80) and V(100)

3775.1 Part 1: Product specification

AS/NZS ISO

31000 Risk management—Principles and guidelines

AS EN

12079 Offshore containers and associated lifting sets

12079.2 Part 2: Lifting sets—Design, manufacture and marking (EN 12079-2:2006, MOD)

3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 3775.1, and those below apply.

3.1 Chain grade T(8, 80 or 800)

Grade to designate chain used for chain slings with a specified nominal stress at breaking force of 800 MPa.

3.2 Chain grade V(10, 100 or 1000)

Grade to designate chain used for chain slings with a specified nominal stress at breaking force of 1000 MPa.

Grade V(100) chain can be produced by using materials that are suitable for 200°C or 380°C operating ranges. Each temperature range has specific minimum alloying elements requirements. V200 refers to Grade V(100) chain that has a maximum operating temperature of 200°C, V400 refers to Grade V(100) chain that has a maximum operating temperature of 380°C.

3.3 Competent person

A person who has, through a combination of training, education and experience, acquired knowledge and skills enabling that person to correctly perform a specific task.

NOTE: Requirements for competent persons are specified in Clause 4.

3.4 Lifting points

Eyebolts, lifting lugs, swivels, clevises, concrete anchorages, clutches, pad eyes, trunions and the like used to secure chain slings for lifting purposes.

3.5 Shall

Indicates that a statement is mandatory.

3.6 Should

Indicates a recommendation.

3.7 Working load limit (WLL)

The maximum load that is permitted to be applied to the chain sling, as set out in Clause 7 and Tables 1 and 2.

NOTE: The WLL may be changed for the particular conditions of use or the particular chain sling configuration in use.

4 COMPETENT PERSON REQUIREMENTS

4.1 General

Competent persons shall be suitably trained, qualified by knowledge and practical experience, and with the necessary instruction to correctly use or make assessments of Grade T(80) and V(100) chain slings. They shall be able to detect and evaluate defects and weaknesses that may affect the intended performance of the equipment and carry out work as specified in this Clause 4.

4.2 Use of chain slings

A competent person shall be able to demonstrate the ability to choose the correct lifting chain sling(s) and inspect them based on the following:

- (a) Assess the mass of the load to be lifted as accurately as possible.
- (b) Ensure the load, inclusive of any lifting points and any applicable derations, will withstand the lifting operation.
- (c) Check that the lifting machine or lifting appliance is rated to lift the load.
- (d) Select a suitable sling, taking into account the following:
 - (i) The condition of the sling as per Clause 9.1.
 - (ii) The geometry of the sling, including the number of sling legs, the angles of each leg to the vertical and the disposition of the legs in plan view.
 - (iii) That each joining device has no more than one load-bearing component in use at any time.
 - (iv) The manner in which the load is attached (i.e. straight, reeved or basket configuration). This includes the angle in the reeving and the de-rating effect due to the higher stresses caused by reeving on the links of the chain.
 - (v) The shape of the load, the centre of gravity and load distribution on the sling legs. Uneven loading may cause a reduction of the lifting capacity of the sling. It may also cause instability and tilting of the load.

- (vi) The determination of WLL.
 - (vii) Protection of the chain sling from sharp corners of the load using packing material as appropriate to prevent bending or damage to the chain links and/or load shall be used wherever practical.
 - (viii) That the site where the load is to be landed, is prepared in advance of the lifting operation.
 - (ix) Taking into account environment conditions such as temperature and corrosive atmospheres etc.
- (e) Ability to identify the hazards associated with the task and apply controls that will mitigate the risk.

4.3 Inspection of chain slings

A competent person shall be suitably trained, qualified by knowledge and practical experience to be competent to interpret and implement the requirements of Clause 9 covering the following:

- (a) Periodic inspections.
- (b) Defects requiring withdrawal from service.
- (c) Discard criteria.

For repairs, the person shall be competent to interpret and implement the requirements of Clause 10.

4.4 Competency standards and procedures

Competency standards and procedures relating to the respective role and duties of competent persons shall include the requirements of this Standard. They shall incorporate an established competency-based training course. Documentation of competency standards and procedures shall be maintained.

4.5 Visual acuity

The competent person shall have satisfactory near and medium range vision. The visual acuity of a competent person shall be tested periodically, with a maximum duration of 2 years between each test, by an optometrist or suitably trained person. The competent person shall be able to demonstrate clear near vision. Near vision acuity (Jaeger No. 1) shall permit reading a minimum of Times Roman 4.5 points vertical height at not less than 300 mm with one or both eyes, either corrected or uncorrected.

NOTE: AS 3978 gives guidance on visual acuity for visual inspections.

5 STORAGE AND HANDLING

Chain slings should be stored on a properly designed rack, such as an A-frame or wall rack. They should not be left lying on the ground after use, where they could be damaged or lost.

Users shall ensure the following minimum precautions are applied:

- (a) Never heat or heat-treat chain.
- (b) Lightly oil chain prior to prolonged storage.
- (c) Store chain in clean, dry, non-corrosive places.
- (d) Protect from any weld spatter and arc strikes.
- (e) Care shall be taken with chain slings which are left on crane hooks to ensure that they do not present a danger to persons or property and do not become accidentally engaged.

NOTE: When being handled, chain slings should not be dropped or thrown down and when being transported they should not be dragged across the floor surface.

6 SELECTION

6.1 Planning

The slinging and lifting operation shall be planned by a competent person (refer to Clause 4.1), before any attempt is made to sling the load. Planning shall include the following considerations:

- (a) Assessing the mass of the load to be lifted. Care shall be taken not to underestimate this mass. If there is any doubt about the mass of the load, the lift shall not proceed.
NOTE: A risk assessment may result in the use of a calibrated load cell to verify the mass to be lifted.
- (b) Ensuring that the load itself, including any lifting points and other lifting devices, will withstand the lifting operation. Refer to Clause 3.4. Care shall be taken for non-axial lifts as derations may apply. Refer to AS 2317 for eyebolts.
- (c) Ensuring that the lifting machine or lifting appliance is rated to lift the load.
- (d) Selecting a suitable sling, taking into account the following:
 - (i) The geometry of the sling, that is, the number of legs, the angles of each leg to the vertical and the disposition of the legs in plan view.
 - (ii) The shape of the load and the load distribution on the sling legs. Uneven loading may cause a reduction of the lifting capacity of the sling. It may also cause instability and tilting of the load.
 - (iii) The manner in which the load is attached (i.e. straight, reeved or basket configuration). Consider the angle in the reeving and the derating effect due to the higher stresses caused by reeving on the links of the chain.
 - (iv) The determination of WLL as prescribed in Clause 7.
- (e) Preparing the site where the load is to be landed, in advance of the lifting operation.

6.2 Specification

Grade T(80) and Grade V(100) chain slings shall comply with AS 3775.1.

NOTE: For typical chain sling configurations, see Appendix B.

A single sling or an arrangement of multiple slings with a WLL that is less than the mass of the load shall not be used. The WLL for chain slings is specified in Clause 7, and Tables 1 and 2.

6.3 Compatibility

Several different grades of material are used for lifting equipment, which results in slings, crane hooks, shackles, and other lifting components varying considerably in size for a given capacity. Care shall be taken to ensure the compatibility of the ancillary equipment used to sling the load, both in size and capacity. An intermediate link or shackle may be required to allow for a suitable compatibility between components.

NOTES:

- 1 Commonly used chain assemblies are illustrated in Appendix B. Other special assemblies may be devised for lifting specific unusually shaped loads.
- 2 Incompatibility of different types of components may lead to failure. This is particularly relevant to shortening clutches, grab hooks, pins. Verification of compatibility may be obtainable from the suppliers and the designer of any other equipment to be used.

6.4 Assembly configuration and limitation of use

6.4.1 General

Each upper terminal link and each intermediate link shall not carry more than two load-bearing components. Where more than one component is connected by the one connecting link, care should be taken while constructing the sling to avoid overcrowding of components. Overcrowding is considered to occur where an angle of 60° cannot be accommodated. See Figure 1(a).

Each end of each joining device shall not have in use more than one load bearing component, unless specifically designed to do so by the manufacturer of the joining device. See Figure 1(b).

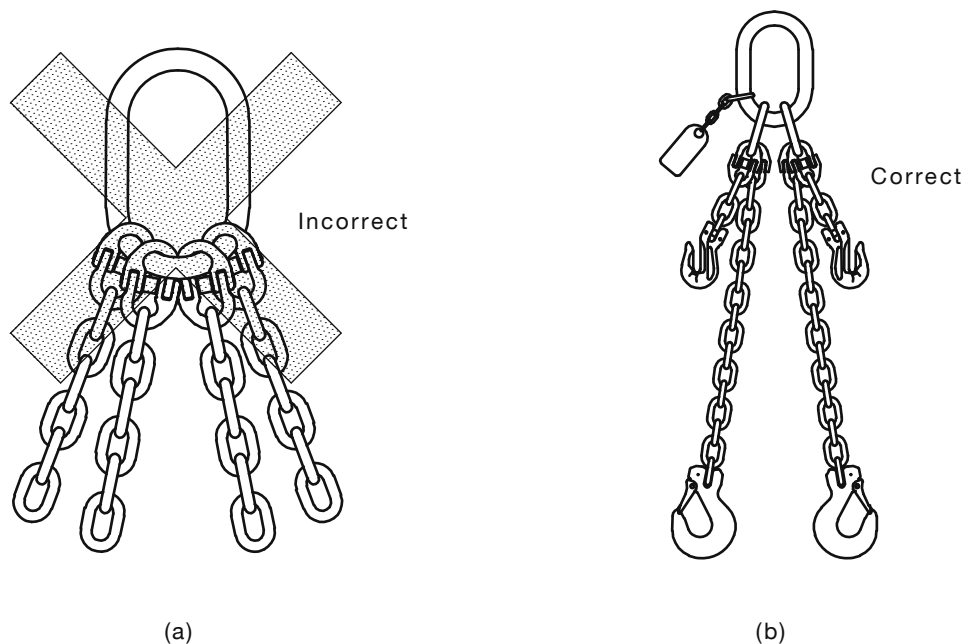


FIGURE 1 OVERCROWDING AND LOAD BEARING

6.4.2 Loading of connecting links

Each end of each connecting link shall not have in use more than one load bearing component, unless specially designed to do so by the manufacturer of the connecting links. See Figure 2 (a) to (f).

6.4.3 Application of shortening clutches and shortening hooks

Slings may be fitted with shortening devices, to adjust the length of the sling legs. See Figure 3.

6.4.4 Loading of connecting links to form a basket sling

Figure 4 illustrates the loading of connecting links to form a basket sling.

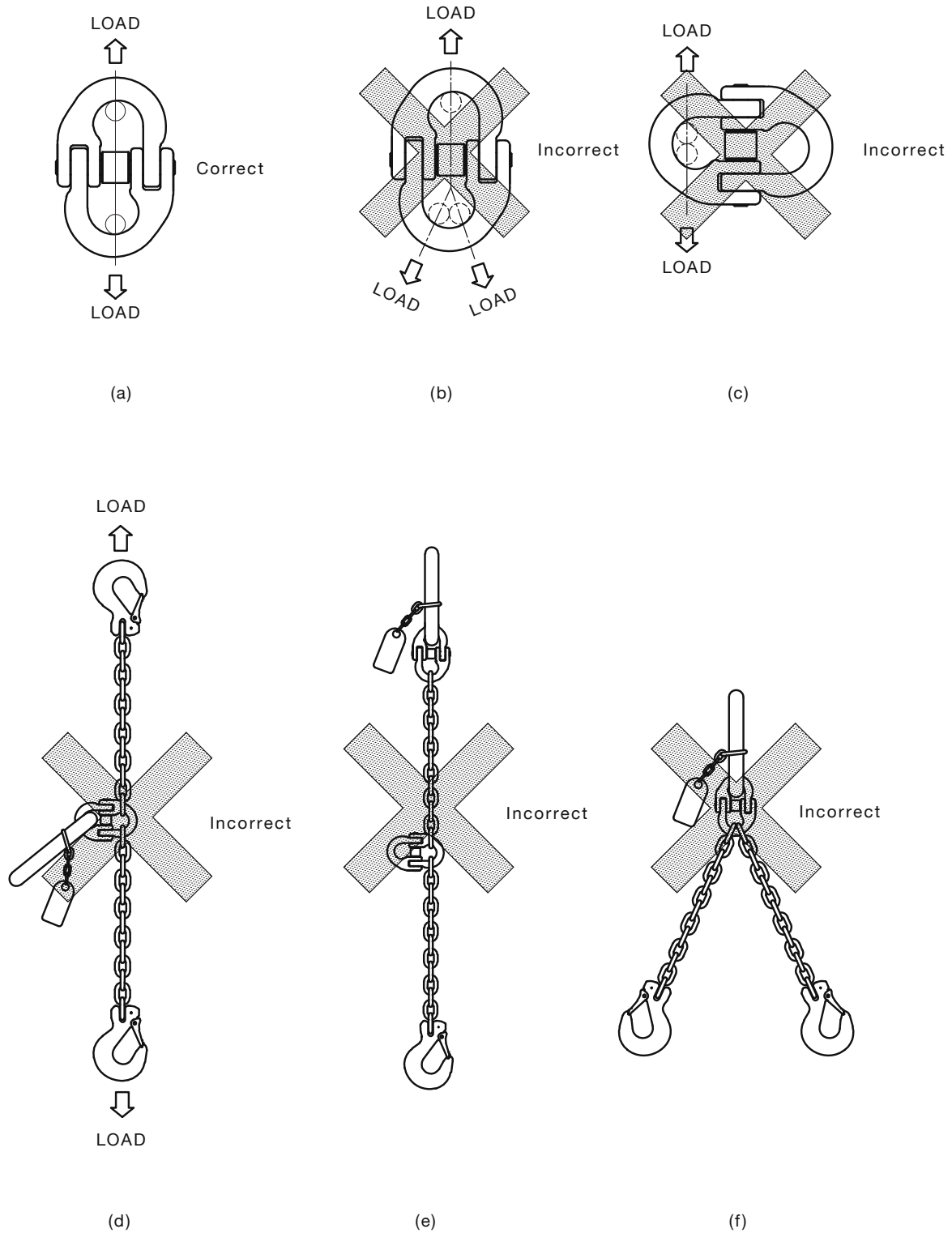
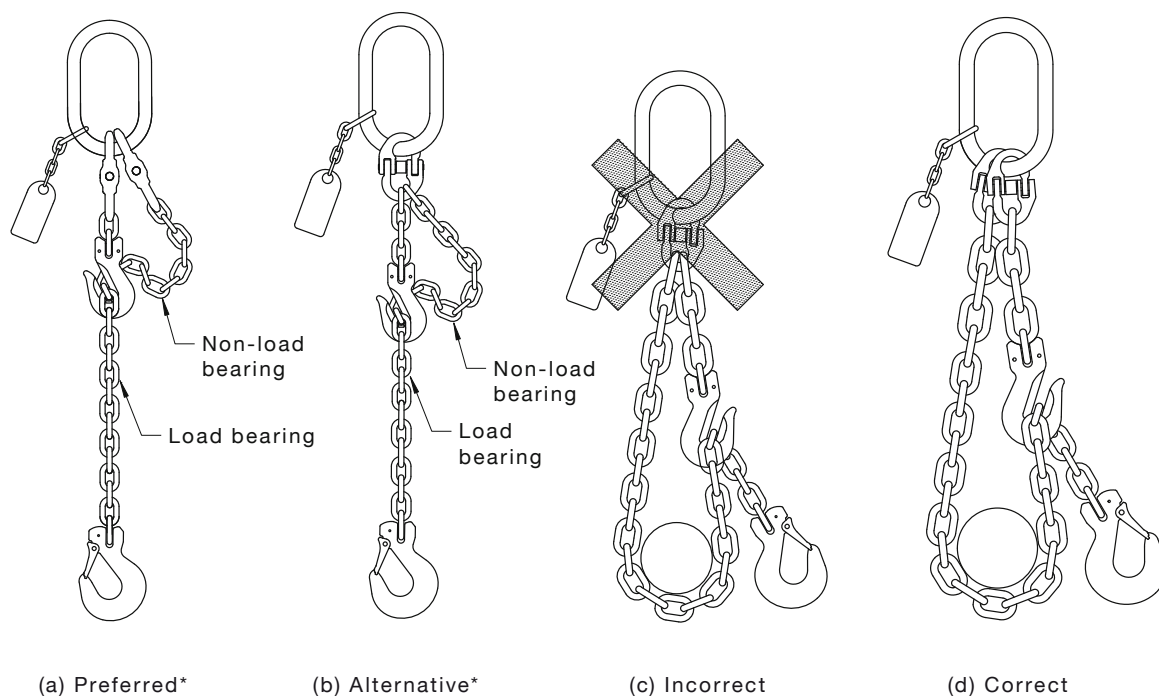


FIGURE 2 LOADING OF CONNECTING LINKS



- * It is preferable for no more than one load-bearing device to be attached to one side of a joining device. See Clause 6.4.3. However where large size chain is used or when multi-leg chain slings are required the alternative (b) may be required to ensure loads are transmitted axially and weight is reduced for manual handling.

FIGURE 3 CONNECTING LINKS WHERE SHORTENING DEVICES ARE USED

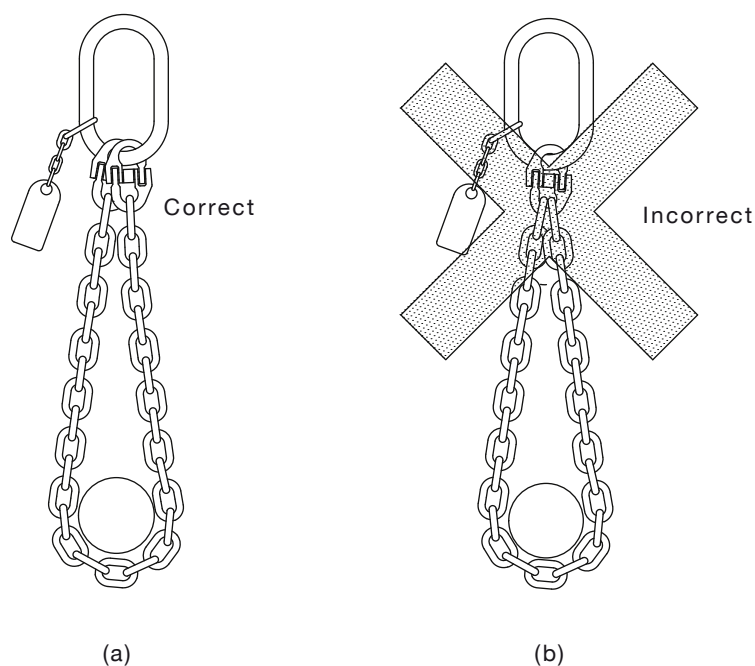


FIGURE 4 LOADING OF CONNECTING LINKS TO FORM A BASKET SLING

6.4.5 Sling modifications

Sling legs for general use shall not be lengthened (e.g. by use of a connector).

Sling legs may be shortened, provided—

- (a) they are inspected by a competent person (see Clauses 3.3 and 4) to ensure integrity;
- (b) in a multi-leg sling, the resultant lengths of the sling legs are equal, unless specified otherwise;
- (c) the added chain and components comply with the Standards to which they have been manufactured; and
- (d) after completion of the assembly, the entire sling is proof tested.

7 DETERMINATION OF WORKING LOAD LIMIT

7.1 General purpose conditions of use

General purpose conditions of use are equivalent to a group classification of crane mechanisms of M3 as specified in AS 1418.1.

The WLL for a chain sling under general purpose conditions of use shall comply with Tables 1 and 2 and the following, as appropriate:

- (a) *Basket slings* The WLL for a basket sling shall be not more than 1.3 times the WLL for the chain. The included angle of a single-leg basket sling shall not exceed 60°.

Where a sling leg is made into a basket hitch by returning the hook to the upper terminal link, the WLL for the upper terminal link shall be sufficient for such an application, i.e. 1.3 times the WLL of the chain [see Figure 6(a)].

- (b) *Adjustable slings* The WLL for an adjustable sling shall be as follows:
 - (i) Where a special purpose hook (e.g. a shortening clutch or grab hook, see Note 3 below) that fully supports the chain link and attains a 100% efficiency is used, the WLL shall be not more than the WLL for the chain to which it is attached.
 - (ii) Where Item (i) does not apply, the WLL shall be not more than 0.75 times the WLL for the chain to which it is attached.
- (c) *Reeved slings* The WLL for a reeved sling shall be not more than 0.75 times the WLL for the chain used for the sling (see Figure 7).
- (d) *Non-vertically oriented leg of a sling* The WLL for a non-vertically oriented leg of a sling shall allow for its inclination to the vertical.
- (e) *Multi-leg slings*:
 - (i) The WLL for a multi-leg sling assembly with more than two legs shall not exceed that for the sling with only two of its legs used with an included angle of 60° between these two legs. That is, the WLL of multi-leg slings comprising more than two legs shall be not more than the WLL for the sling used as a two-leg sling.
 - (ii) The maximum included angle for a multi-leg basket sling assembly, or a multi-leg reeved assembly shall not exceed 60° between the legs (see Figure 12).
 - (iii) The largest included angle between any two legs, at the apex, shall be the basis for calculations determining the WLL of a multi-leg sling with more than two legs. See Figure 5 below.

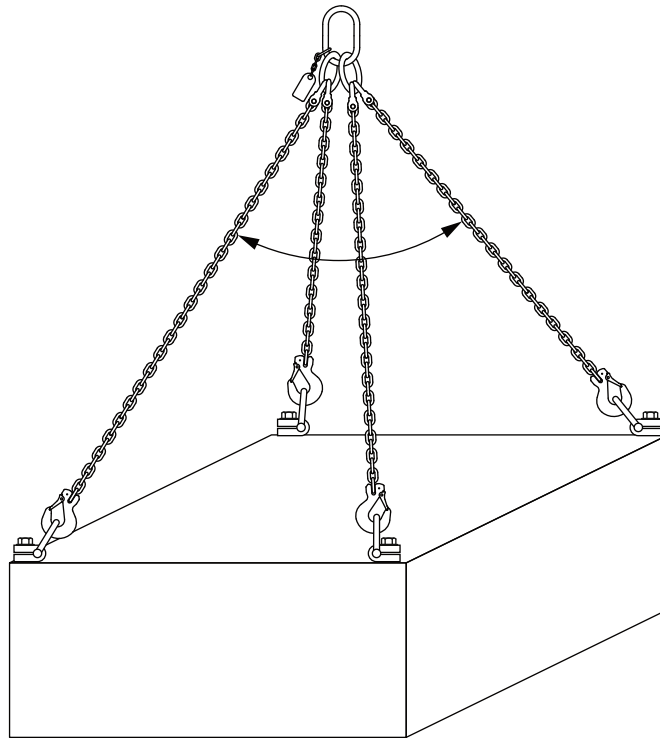


FIGURE 5 ASSESSING LARGEST ANGLE BETWEEN TWO LEGS ON A SYMMETRIC LOAD

Where a sling is not symmetrically loaded, each leg and lifting point shall be rated to the full load which is to be lifted or it is to be considered as an engineered lift to assess the lifting arrangement. Refer to Appendix D for guidance on symmetry of loading.

For two leg slings where the sling leg angles to the vertical are not visibly identical (i.e. within 2° of each other) but where the sling leg angles are within 15° of each other the sling assembly shall be no more than 80% of its rated capacity.

The WLL for a multi-leg sling having an included angle of 60° between the legs is the maximum WLL for the sling and shall not be exceeded, even where the included angle between the legs is less than 60° .

The included angle between the legs of a multi-leg sling shall not exceed 120° . See Figure 8.

Where two individual two leg assemblies are used on a ramshorn hook they shall be classed as a (one) four leg sling and the WLL should be rated as one four leg sling. See Figure 9(a). Equalization may apply in this application. Refer to Clause 7.2.2.

NOTES:

- 1 This method of rating general purpose multi-leg slings follows the principle that loads are supported by only two legs, with the other legs only balancing the load. It makes allowance for obvious variables, such as unequal leg lengths, the shape of the load, the degree of rigidity of the load, the centre of gravity of the load being off-centre, and other unpredictable factors. For non-general purpose lifts, refer to Clause 7.2.2.
- 2 The WLL of lifting components of a sling has a bearing on the permitted maximum WLL of the sling.
- 3 Some shortening devices, such as grab hooks, derate the WLL for the sling by 25%. Other devices, such as shortening hooks and grab hooks (with cradle configuration), may not derate the WLL for the sling. Advice regarding the appropriate deration should be sought from the manufacturer.
- 4 Where using only one leg of a multi-leg sling, WLLs on the metal tag may not apply.

- (f) Using components of different grades. When using slings assembled from different graded components, for example a Grade V chain with Grade T components, the grade with the greatest reduction in WLL is to be applied to the sling.

7.2 Non-general purpose conditions of use

7.2.1 *Non-general conditions of use*

Under other than general conditions of use (e.g. severe conditions, hazardous conditions, conditions directly involving the safety of personnel and where the group classification of the crane mechanism is greater than M3 as defined by AS 1418.1), the applicable group classification of the crane mechanism under such conditions of use shall be used to determine the WLL (also, see Note). Where the chain sling or chain is an integral part of a crane mechanism, the derating for the chain sling or chain shall be the same as that for the crane mechanism.

NOTE: Under specified or unusual conditions of use (e.g. high temperature environment, handling dangerous substances), the use of derating that is greater than the relevant derating as specified in AS 1418.1 may be required.

7.2.2 *Engineered lifts*

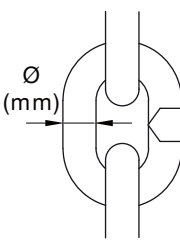
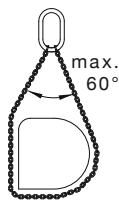
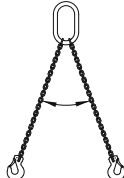
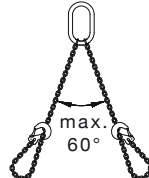
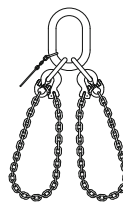
Where an engineered lifting situation exists that uses slings that are designed for a special purpose, it may be appropriate to use lower design factors than those specified for general use. See Figure 9(a) and (b).

NOTE: A guide for the design of engineered lifts is given in Appendix A.

In such cases, an appraisal shall be undertaken by a competent person with appropriate qualifications, who shall consider both the lifting apparatus and the lifting procedure that is proposed.

Where a design factor has been reduced, the chain sling shall not be used for a general purpose lift.

TABLE 1
WORKING LOAD LIMIT (GRADE T)*

Chain size mm 	Working load limit under general conditions of use, t								
	Single leg slings				Slings of 2, 3 or 4 legs			2 leg slings	
									
	Straight sling or adjustable sling with no deration	Adjustable sling with deration see Note 1	Reeved sling	Basket sling Max 60°	60°	90°	120°	Max angle 60°	Max angle 60°
Loading factors	1	0.75	0.75	1.3	1.73	1.41	1	1.3	2.25
Chain size, mm									
6	1.1	0.8	0.8	1.4	1.9	1.6	1.1	1.4	2.5
7	1.5	1.1	1.1	2	2.6	2.1	1.5	2	3.4
8	2	1.5	1.5	2.6	3.5	2.8	2	2.6	4.5
10	3.2	2.4	2.4	4.2	5.5	4.5	3.2	4.2	7.2
13	5.3	4.0	4.0	6.9	9.2	7.5	5.3	6.9	11.9
16	8	6.0	6.0	10.4	13.8	11.3	8	10.4	18.0
19	11.2	8.4	8.4	14.6	19.4	15.8	11.2	14.6	25.2
20	12.5	9.4	9.4	16.3	21.6	17.6	12.5	16.3	28.1
22	15	11.3	11.3	19.5	26.0	21.2	15	19.5	33.8
26	21.2	15.9	15.9	27.6	36.7	29.9	21.2	27.6	47.7
32	31.5	23.6	23.6	41	54.5	44.4	31.5	41	70.9

* See notes on following page.