BRITISH STANDARD

BS 2837:1988

Specification for

Steel links and strap assemblies for lifting attachments for packing cases

UDC 621.86.06:621.798

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Packaging and Freight Containers Standards Committee (PKM/-) to Technical Committee PKM/553, upon which the following bodies were represented:

British Fibreboard Packaging Association
PIRA
Timber Packaging and Pallet Confederation
Timber Research and Development Association
United Kingdom Tea Association

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

British Ports Association and the National Association of Ports Employers
Health and Safety Executive
Institute of Packaging
Ministry of Defence

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Contents

Foreword

This revision of BS 2837 has been prepared under the direction of the Packaging and Freight Containers Standards Committee. It supersedes BS 2837:1970 which is withdrawn.

This revision makes changes to the material specifications for strap assemblies and increases the specified thicknesses as necessary to enable the assemblies to provide the required levels of performance. These changes have been made following investigations which confirmed that the materials previously specified were no longer available as steel stock in flat bar form.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard specifies requirements for 10 classes of drop forged or welded triangular link and its associated strap assembly for use as lifting attachments for packing cases. This British Standard deals with that part of the strap assembly which contains the turnover forming the housing for the link. When lifting on four links, these assemblies are suitable for loads up to 25 tonnes.

This British Standard also describes in Appendix A typical styles of attachment for strap assemblies.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Rating

2.1 Links

The links shall be rated according to the safe working loads given in Table 1.

2.2 Lifting on four links

When lifting on four links, the safe working load of the combined strap assemblies shall not exceed the values given in column 7 of Table 2.

2.3 Lifting on two links

Where the height of the packing case is materially the greatest dimension, a two-link assembly may be used; the safe working load of the strap assembly shall then not exceed the values given in column 8 of Table 2.

3 Material

3.1 Links

The links shall be made from wrought carbon manganese steel having the following chemical composition[1]:

Carbon	Manganese	Sulphur	Phosphorus
% min.	% min.	% max.	% max.
0.25	0.70	0.050	0.050
% max.	% max.		
0.30	0.90		

3.2 Strap assemblies

The strap assemblies shall be made from either:

a) welding quality structural steel complying with grade 50B of BS 4360; or

b) steel complying with grade 43A of BS 4360.

4 Forms and dimensions

4.1 Links

The form of the links shall be in accordance with Figure 1 and the dimensions, subject to the tolerances given in **4.1.1** and **4.1.2**, shall be in accordance with Table 1.

4.1.1 *Tolerances on drop forged links*. Tolerances on drop forged links shall be quality F as specified in BS 4114.

4.1.2 *Tolerances on welded links*. The internal dimensions of welded links shall be not less than the specified sizes and shall not exceed them by more than 5 %. The size of the material in the finished link shall be not less than the nominal diameter, and shall not exceed the nominal diameter by more than 0.8 mm.

4.2 Strap assemblies

The form of the strap assemblies shall be in accordance with Figure 2, and the dimensions of the cross sections shall be in accordance with Table 2, and appropriate to the material from which the assemblies are made (see BS 4360). There shall be provision for not less than two bolts in the turnover of each strap assembly, and the distance from the bottom lower hole to the end of the turnover shall not exceed one quarter of the breadth of the strap.

NOTE The length of the turnover and the spacing of the bolts have not been specified as these dimensions vary with the type of case (see Appendix A).

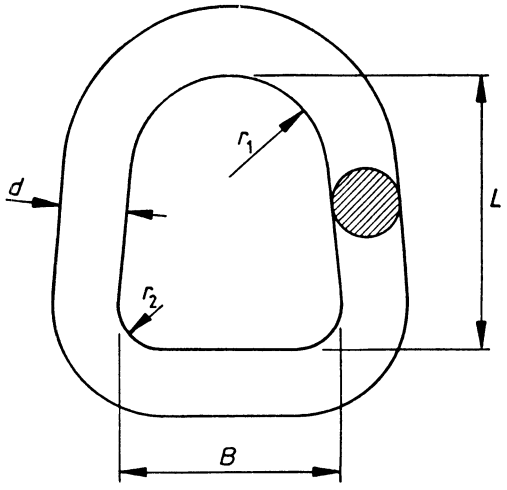

Figure 1 — Triangular link

[1] For further information in relation to this material, apply to Enquiry Section, BSI, Linford Wood, Milton Keynes MK14 6LE, enclosing a stamped addressed envelope for reply.

Table 1 — Triangular links

1	2	3	4	5	6	7	8	9
Class	Nominal size of link	Internal breadth	Internal length	Internal radius at top	Internal radius at bottom	Safe working load	Proof load	
							Mass	Force
	d	B	L	r_1	r_2			
	mm	mm	mm	mm	mm	tonnes	tonnes	kN
A	10	67	67	25	8	0.32	0.64	6.18
B	12	67	67	25	8	0.5	1	9.81
C	14	67	67	25	8	0.8	1.6	15.69
D	19	93	115	38	14	1.25	2.5	24.5
E	22	93	115	38	14	2	4	39.2
F	26	93	115	38	14	3.2	6.4	62
G	34	118	140	50	21	5	10	98
H	40	118	140	50	21	8	16	157
J	44	128	165	64	26	10	20	196
K	48	128	180	64	26	12.5	25	245

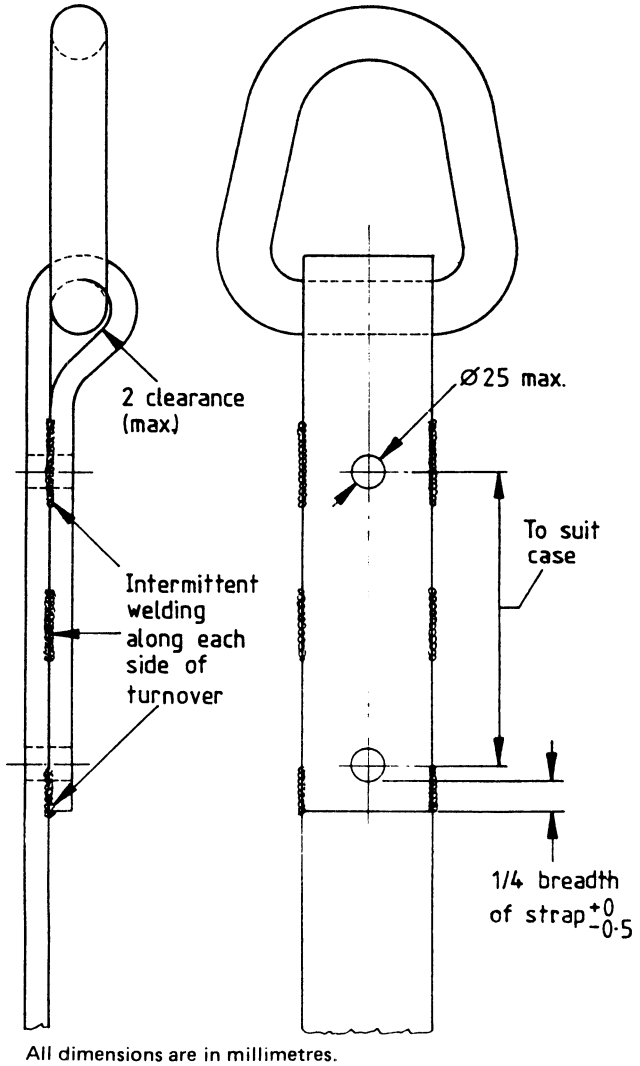

Figure 2 — Strap assembly (with intermittent welds)

Table 2 — Strap assembly and recommended loading on four links and two links

1	2	3	4	5	6	7	8
Class	Nominal size of link	Safe working load of link	Strap			Recommended maximum safe working load on four links	Recommended maximum safe working load on two links
			Breadth	Thickness			
				BS 4360 grade 50B[a]	BS 4360 grade 43A[a]		
	mm	tonnes	mm	mm	mm	tonnes	tonnes
A	10	0.32	50	5	5	0.64	0.32
B	12	0.5	50	6	8	1	0.5
C	14	0.8	50	6	8	1.6	0.8
D	19	1.25	65	10	10	2.5	1.25
E	22	2	65	10	10	4	2
F	26	3.2	65	10	12	6.4	3.2
G	34	5	75	12	15	10	5
H	40	8	75	20	20	16	8
J	44	10	75	20	25	20	10
K	48	12.5	75	25		25	12.5
Load reduction factor						0.5	0.5

NOTE The load reduction factor makes an arbitrary allowance for angular loading on sling legs, assuming that in no circumstances will the included angle between any diagonally opposite legs exceed 120°.
Recommendations for the safe use of wire rope slings are given in BS 6210.
[a] See clause **3**.

5 Bolts and nuts

The bolts securing the strap assembly to the sides of the case shall be black cup square neck bolts complying with BS 4933. The nuts shall comply with grade 4 of BS 4190.

6 Workmanship

6.1 Links

The links shall be produced by either of the following manufacturing processes:

a) drop forging; or

b) welding.

The weld should be in either of the straight sloping parts and not in any of the radii nor in the lower straight part of the link. When the links are welded, the weld shall be smoothly finished all round, and it is essential that porosity is avoided and that penetration and fusion take place throughout. Welded links shall be made by one of the following methods:

a) electric resistance butt-welding;

b) flash-butt welding;

c) atomic-hydrogen welding;

d) inert gas shielded-arc welding.

6.2 Strap assemblies

The strap assemblies shall be formed from straight bar by hot bending. The form of the bend housing the link shall be as shown in Figure 2 and the working clearance for the link shall not exceed 2 mm.

The turnover housing the link shall be welded along each side: the welds may be continuous, or intermittent at intervals that shall not exceed 1.5 times the breadth of the strap. There shall be no welding along the bottom of the turnover (see Figure 2). Sharp corners on the exposed edges of the strap shall be removed.

7 Heat treatment of the links and quality marking

7.1 Heat treatment

The links shall be subjected to one of the following heat treatments after all forging or welding operations:

a) *normalizing*, i.e. heating to a temperature between 860 °C and 890 °C, followed by cooling in still air;

b) *hardening and tempering*, i.e. heating to a temperature between 860 °C and 890 °C, followed by quenching in oil or water and tempering at a suitable temperature between 550 °C and 660 °C;

c) if necessary, an alternative heat treatment to a) or b) to ensure that links are in a uniform condition with links as previously treated.

NOTE This does not preclude the use of an alternative heat treatment which will ensure that the links are in a uniform condition with links as previously treated.

7.2 Quality marking

Each link shall be legibly and permanently marked on the side of the crown with the symbol "4" when normalized, and with the symbol "04" when hardened and tempered. The mark shall be enclosed in a circle.

NOTE Recommended maximum sizes of stamp are as follows:
classes A and B: 3.5 mm;
classes C, D, E: 5 mm;
classes F, G, H, J, K: 6.5 mm.

8 Proof loading

Each link shall, after manufacture and subsequent heat treatment, be subjected by the manufacturer to a proof load not less than twice the safe working load (see Table 1), which it shall withstand without showing any visible permanent set. The straight portion of the lower face of the link shall be uniformly loaded during the application of the proof load.

After proof loading each link shall be thoroughly examined by a competent person and shall show no visible flaw or defect.

9 Marking

Each link shall, after testing, be permanently and legibly stamped on one of the sides with the safe working load given in Table 1, and also with marks or symbols which will allow identification with the manufacturer's certificate of test and examination. Such stamping shall not be near a weld and shall be in such a position as to be visible after assembly. The stamps used shall have a concave surface and the indentation shall be neither too sharp nor excessive in depth.

NOTE For recommended maximum sizes of stamp, see the note to **7.2**.

10 Manufacturer's certificate (links)

The manufacturer shall provide a certificate with every consignment of links giving the following information for each one:

a) distinguishing mark (to enable the particular link to be identified);

b) class (see Table 1);

c) safe working load of one link (see Table 1);

d) heat treatment (i.e. normalized or hardened and tempered).

The certificate shall declare that the links comply in all aspects with BS 2837[2)]. It shall also state the address of the testing establishment and the status of the signatory.

[2)] Marking BS 2837 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Appendix A Examples of application of strap assemblies

A.1 Methods of attachment

The decision as to the best method of attaching strap assemblies will depend upon a number of factors, such as the type and construction of the case, the type of equipment being packed and the method of securing it in the case, and upon the facilities at the packer's works. It is, therefore, not practicable to give specific guidance on this subject, but Figure 3, Figure 4, Figure 5 and Figure 6 illustrate examples of commonly used methods. They should not be regarded as definite recommendations as there are many other methods that may be more appropriate to particular circumstances.

A.2 Styles

A.2.1 *Styles 1 and 1A, and styles 2 and 2A*

A.2.1.1 *General.* Styles 1 and 1A (see Figure 3) and styles 2 and 2A (see Figure 4) are suitable for export packing and, in conjunction with suitable bolts and a suitable case, are generally confined to loads not exceeding 6 tonnes and 25 tonnes respectively.

When the straps are fitted to sheath type cases, only one bolt should pass through the top frame member in order to avoid unnecessary weakening of this member where the maximum strength is needed. The turnover should be of sufficient length to house a second bolt clear of the top frame member.

When designing the case it is essential that a compression member (top bearer) be placed at the position of the top of the strap. The strap assemblies should be recessed into the skids of the wooden cases. The depth of the recesses should be twice the thickness of the strap and should be taken into account in determining the depth of the skids to prevent weakness at the point of recessing. The straps should be attached to the sides of the case by means of black cup square neck bolts (see clause **5**), the nuts being on the outside. It is not considered necessary to use bolts and nuts for the part of the strap in contact with the underside of the case. Where necessary, spring washers complying with type A of BS 4464 should be fitted under the nuts.

A.2.1.2 *Placing of straps.* There can be no hard and fast rule for the placing of the straps on account of the diverse shapes of cases, and of the possibility that the centre of gravity of the load will not be in the centre of the case.

It is important, however, to ensure that the straps are placed in the most favourable positions in relation to the centre of gravity of the load so that when the case is being lifted it will remain in a horizontal position with equal load distribution on the legs of the sling and on each strap assembly.

When adopting styles 1A and 2A, it is usual practice, on cases of regular shape with evenly distributed loads, to position the top of each strap one-third of the way from the end of the case, and the bottom of each strap one-quarter of the way from the end of the case (see Figure 5).

A.2.2 *Styles 3 and 3A*

Styles 3 and 3A (see Figure 6) may be used when the conditions of service are less arduous and the case is so constructed that it does not require support from the straps.

In conjunction with suitable bolts, styles 3 and 3A are generally confined to loads not exceeding 1 tonne.

When the straps are fitted to sheath type cases, only one bolt should pass through the top frame member in order to avoid unnecessary weakening of this member where the maximum strength is needed. The turnover should be of sufficient length to house a second bolt clear of the top frame member. When attaching the straps to the sides of the case, black cup square neck bolts (see clause **5**) should be used, the nuts being on the outside. Where necessary, spring washers complying with type A of BS 4464 should be fitted under the nuts.

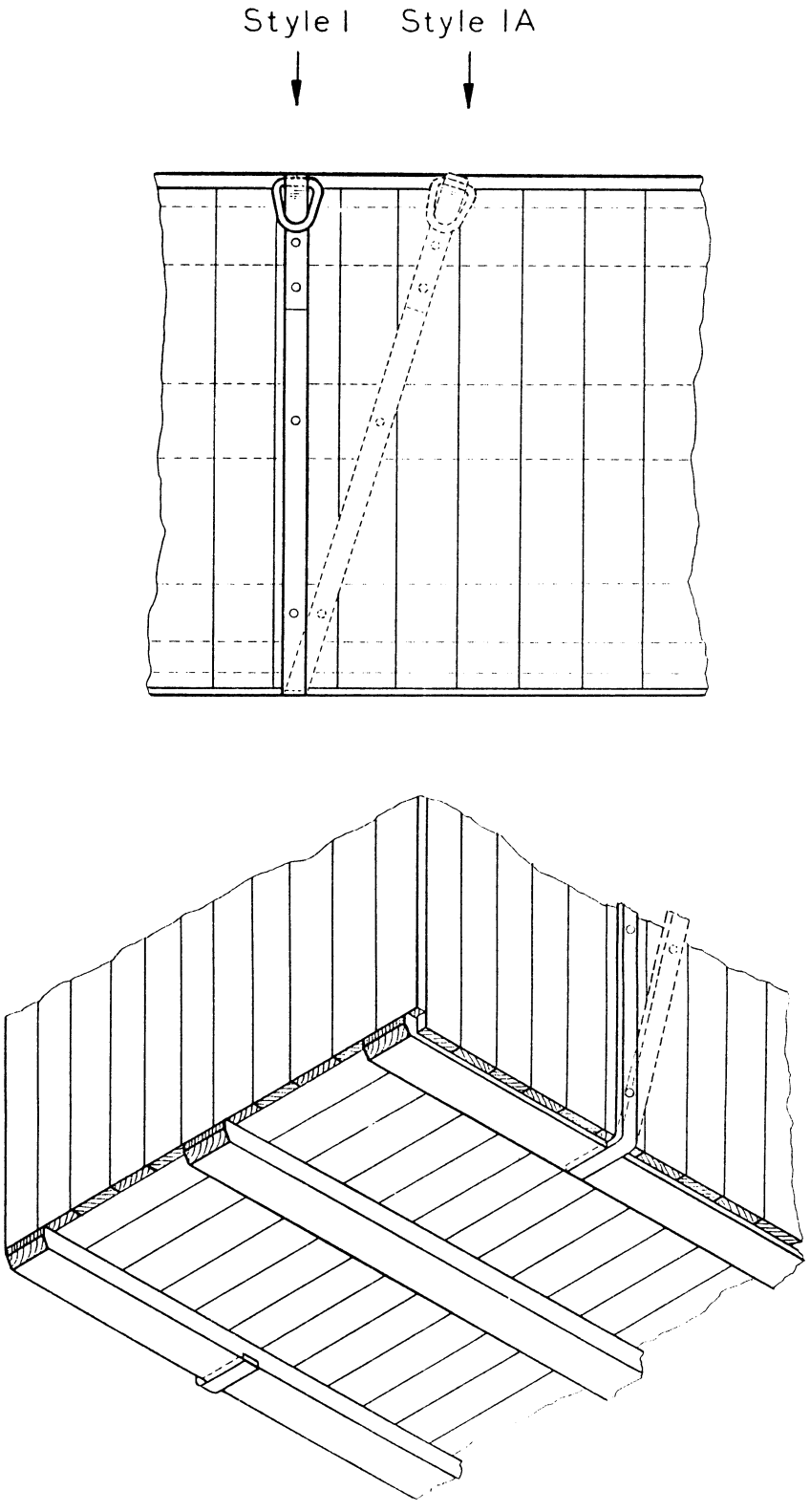

Figure 3 — Method of fitting strap assemblies: styles 1 and 1A

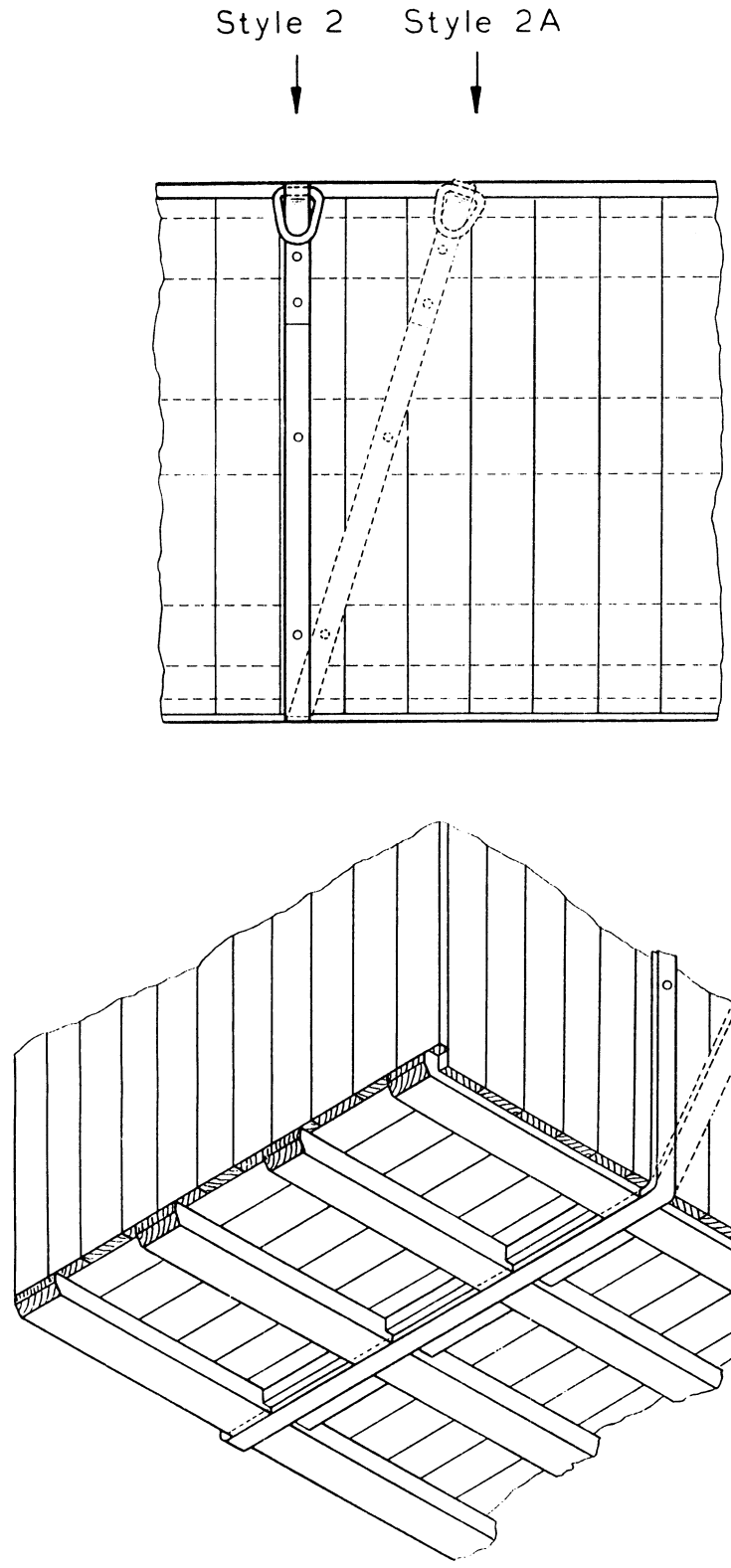

Figure 4 — Method of fitting strap assemblies: styles 2 and 2A

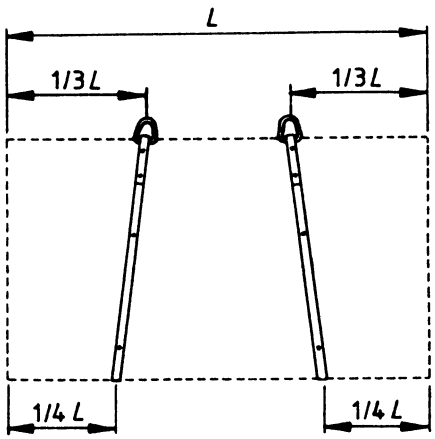

Figure 5 — Placings of straps: styles 1A and 2A

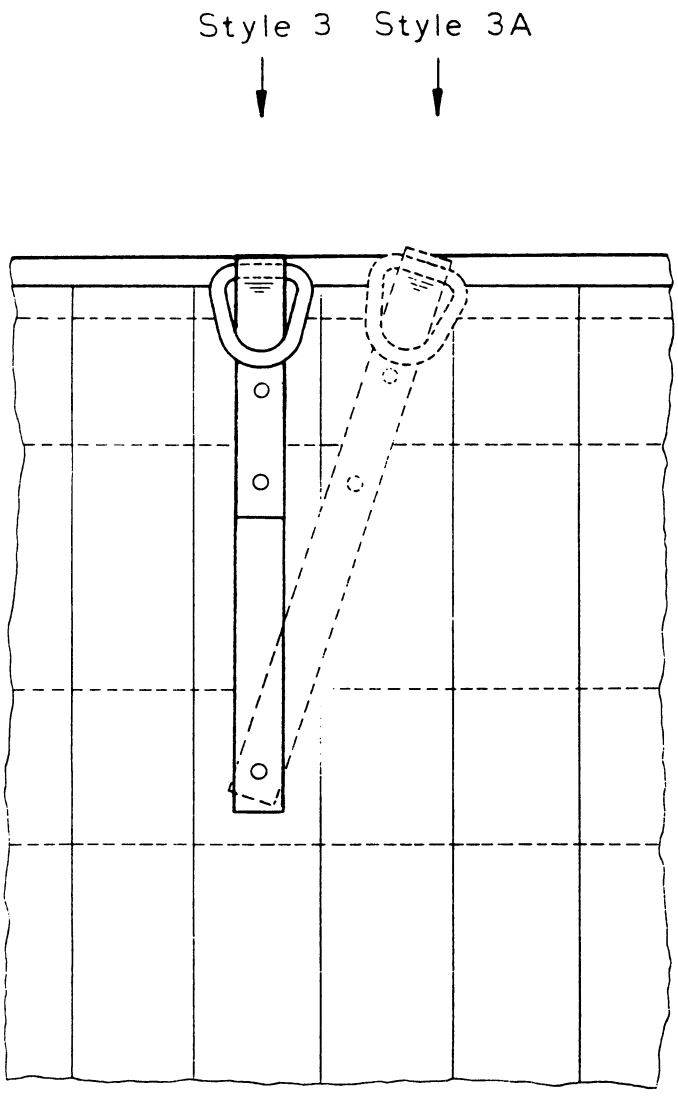

Figure 6 — Methods of fitting strap assemblies: styles 3 and 3A

Publications referred to

BS 4114, *Specification for dimensional and quantity tolerances for steel drop and press forgings and for upset forgings made in horizontal forging machines.*

BS 4190, *Specification for ISO metric black hexagon bolts, screws and nuts.*

BS 4360, *Specification for weldable structural steels.*

BS 4464, *Specification for spring washers for general engineering and automobile purposes. Metric series.*

BS 4933, *Specification for ISO metric black cup and countersunk head bolts and screws with hexagon nuts.*

BS 6210, *Code of practice for the safe use of wire rope slings for general lifting purposes.*

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