BRITISH STANDARD

BS 3243:1990

Incorporating Amendment Nos. 1 and 2

Specification for

Hand-operated chain blocks

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Mechanical Handling Standards Policy Committee (MHE/-) to Technical Committee MHE/5, upon which the following bodies were represented:

British Chain Manufacturers' Association

British Ports Federation and the National Association of Ports Employers

Associated Offices Technical Committee

Construction Health and Safety Group

Department of Trade and Industry [Mechanical Engineering and Manufacturing Technology Division (Mmt)]

Federation of Manufacturers of Construction Equipment and Cranes

Federation of Wire Rope Manufacturers of Great Britain

Health and Safety Executive

Institution of Mechanical Engineers

Lifting Equipment Engineers' Association

Ministry of Defence

North East Coast Institution of Engineers and Shipbuilders

This British Standard, having been prepared under the direction of the Mechanical Handling Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 29 June 1990

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Contents

Foreword

This British Standard has been prepared under the direction of the Mechanical Handling Standards Policy Committee. It supersedes BS 3243:1973, which is withdrawn.

The major new requirements in this standard are as follows:

a) the introduction of a classification system broadly based on ISO 4301, published by the International Organization for Standardization (ISO);

b) the introduction of a number of new tests.

Where chain blocks are used in conjunction with runway beams, the beams should be designed and tested in accordance with BS 2853.

It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people.

Purchasers ordering chain blocks in accordance with BS 3243 are advised to confirm in their purchasing contract that the manufacturer operates a quality system in compliance with the appropriate Part of BS 5750, or suitable equivalent, to ensure themselves that products claimed to comply with BS 3243 consistently achieve the required level of quality.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

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 chain blocks that require the use of a hand chain both for hoisting and for lowering. It specifies tests and marking, together with matters relating to the construction and classification of the block.

NOTE 1 Details of block classification are given in Appendix A. Information which the purchaser should supply in an enquiry or order is given in Appendix B. Recommendations for the care and safe use of chain blocks are given in Appendix C. Details of an optional torque limiting device are given in Appendix D.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard, the following definitions apply (see also Figure 1).

2.1
hand-operated chain block

a block reeved with a short link calibrated load chain, operated by a hand chain and giving a mechanical advantage

2.2
working load limit (WLL)

the maximum mass which the block is designed to raise, lower or suspend

2.3
safe working load (SWL)

the maximum mass (as certified by a competent person) which the block may raise, lower or suspend under particular service conditions.

NOTE See clause **5** and Appendix A for selection of SWL.

2.4
suspension level

1) Where a block is suspended from a hook: the level of the suspending hook saddle.

2) Where a block is combined with a trolley: the level of the surface upon the trolley runs.

NOTE In other cases the suspension level is the appropriate level similar to those defined in 1) and 2).

2.5
drawn up dimension

the distance between the suspension level and the bottom hook saddle when the bottom hook is in the fully raised position

2.6
range of lift

the vertical distance which the bottom hook travels between extended and highest positions

2.7
extended dimension

the distance between the suspension level and the bottom hook saddle, when the bottom hook is in the extended position. It equals the sum of the drawn up dimension and the range of lift

2.8
operating level

the level on which the operator stands

2.9
representative sample block

a block representative of a production run or batch of blocks of the same type, i.e. with the same gears, brake, casing, chain, hooks, etc. but not necessarily the same range of lift

3 Construction

3.1 Brakes

Blocks shall be provided with an automatic brake capable of arresting and sustaining the load in all working positions and which permits smooth controlled lowering of all loads without serious overheating such as to impair the efficient working of the block.

3.2 Ratchet wheels and pawls

3.2.1 *General*

Where ratchet wheels and pawls are included in the design, they shall be designed so that they maintain full engagement as the brake pads wear.

3.2.2 *Pawl operating mechanism*

Either pawls shall be spring loaded or engagement with the ratchet wheel shall be ensured by other equally effective and positive means. Engagement between the pawls and ratchet wheels shall not depend either on a tension spring or on gravity alone.

3.2.3 *Position of pawls*

If the pawl operating mechanism fails during a vertical lift, the pawl shall be fully operated by gravity so that the load is sustained without damage to the mechanism.

3.2.4 *Pawl stop*

A pawl stop shall be provided and so positioned that the pawl just clears the teeth of the ratchet wheel.

3.3 Lubrication

Blocks shall be capable of being lubricated both initially and during servicing unless materials with inherent lubricating properties are used.

Advice about lubrication shall be included in the servicing instructions.

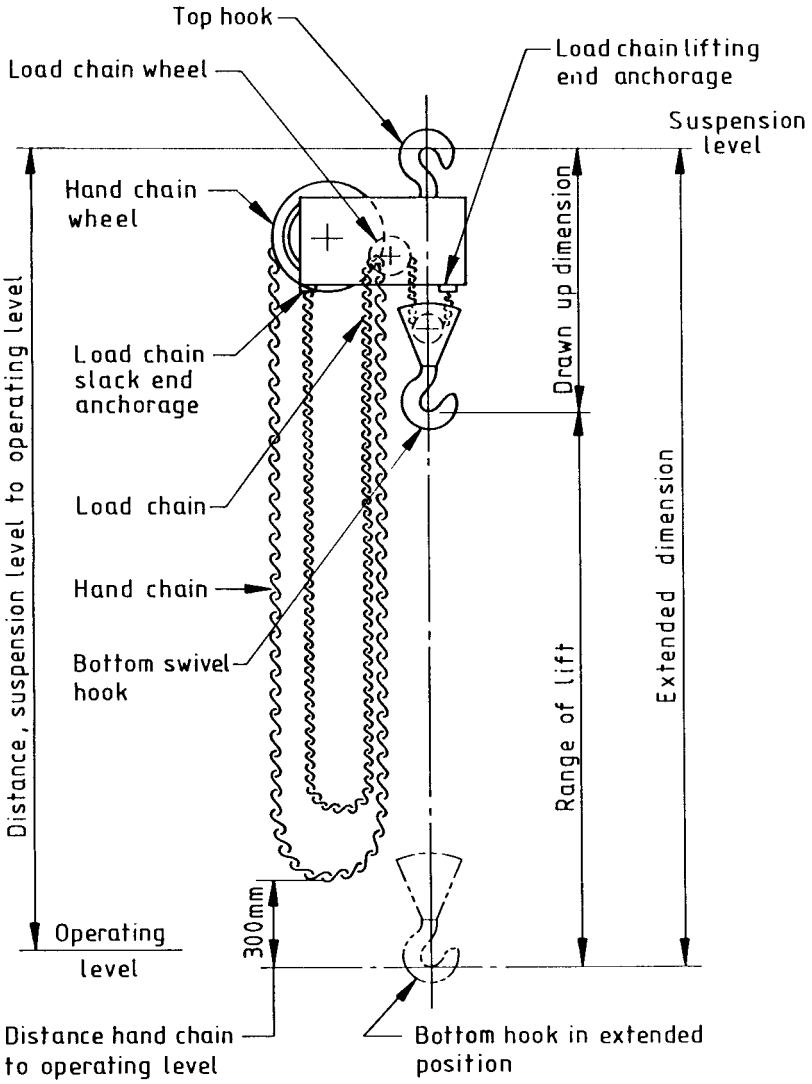

Figure 1 — Chain block components and dimensional definitions

3.4 Hooks and other suspension fittings

3.4.1 *General*

Hooks shall be forged from steel and the shank shall be either:

a) provided with a nut or screwed collar of outside diameter of at least 1.5 times the diameter of the shank, and the continuous length of shank engaged by the nut or screwed collar on the load side shall be equal to at least 0.66 times the diameter of the shank before being interrupted by drilling for pins or other fixings; or

b) so shaped from the solid as to afford the same security as though a nut were fitted as in a).

NOTE 1 Attention is drawn to the following standards:
a) BS 2903, which specifies only higher tensile steel hooks, including in detail the construction, etc. of shank hooks suitable for chain blocks;
b) ISO 7597 and ISO 8539, which respectively cover grade T(8) and grade M(4) hooks with point and eye only. However, much of the information could also be applied to shank hooks using the same materials.

NOTE 2 Safety latches are recommended but attention is drawn to the statutory regulations covering lifting operations. In some cases these requirements affect hooks, demanding safety catches, mousing or the use of C hooks.

All hooks and other suspension fittings shall be detachable for inspection of stressed parts, e.g. shanks.

The rotating parts of swivel shank hooks shall be capable of being lubricated both initially on installation and during servicing.

Advice about lubrication shall be included in the servicing instructions.

In designs which include ball bearings which are used in the shear mode, the entry hole for assembling the balls shall be firmly sealed so that the balls cannot become detached from the assembly in service.

Where the means of attachment of a shank hook is dependent on a split collar mating with an enlarged head on the shank, the means of retention shall be secure.

3.4.2 *Top hook*

Where provision is made for the top hook to swivel, it shall remain positionally stable under load.

3.4.3 *Bottom swivel hook*

Bottom hooks shall be free to rotate under load so as to prevent twisting of the load chain. If threaded components are used, they shall be sealed against ingress of moisture. Welding shall not be used as a method of retention or sealing.

3.5 Load chain

3.5.1 *Chain*

The load chain shall be of the calibrated type. Either the load chain shall comply with BS 4942-1 and BS 4942-6 or, if it is an alternative load chain, i.e. grade 100, the working load limit shall be in accordance with the manufacturer's instructions.

NOTE If a grade 100 chain is used, it is recommended that the minimum total ultimate elongation should be 10 % and the maximum mean stress at WLL should be 250 MPa.

The fitted length of the load chain shall be such as to allow the full stated range of lift to be made without imposing load on the slack end anchorage.

3.5.2 *Chain engagement*

Means shall be provided to guide the load onto the load chain wheel.

3.5.3 *Stripper*

A stripper shall be provided to ensure disengagement of the load chain from the load chain wheel.

3.5.4 *Load chain wheels*

The load chain wheel shall be accurately finished so that the chain pockets are compatible with the load chain and so that smooth operation is ensured.

The design of the chain pockets shall be such that it minimizes the bending action on the chain links.

3.5.5 *Idler wheels*

Provision shall be made to guide the load chain onto and around idler wheels so as to prevent twisting.

The design of the idler wheels shall be such that it minimizes the bending action on the chain links.

3.5.6 *Slack end anchorage*

The slack end anchorage shall be designed to withstand the test detailed in **4.2.3**.

3.5.7 *Terminal links*

Any links used for connecting the load chain to a terminal fitting shall be of the same material as the load chain, and shall be heat treated to provide mechanical properties and strength not less than those of the load chain.

3.6 Hand chain

3.6.1 *Chain*

The hand chain shall have sufficient strength to maintain compatibility with the hand chain wheel while performing the test specified in **4.3**, shall retain its shape after the test and shall be smooth and free from imperfections, e.g. sharp projecting edges, which could injure the operator's hands.

The length of the hand chain shall be such that the lowest point of its suspended loop hangs at a nominal height of 300 mm above the operating level as shown in Figure 1.

NOTE The operating level will usually be level with the extended position of the hook.

3.6.2 *Hand chain wheels*

Hand chain wheels shall be provided with flanges and shall be designed to ensure effective operation with the hand chain.

3.6.3 *Chain engagement*

Means shall be provided to guide the hand chain into the pockets of the hand chain wheel and to ensure its retention.

3.6.4 *Joining*

The hand chain shall be joined without twist. The method of joining shall ensure that there are no sharp or projecting edges capable of causing hand injury.

3.7 Design temperature

In selecting materials, lubricants, etc. for blocks, manufacturers shall assume an operating temperature range of – 10 °C to + 40 °C.

NOTE Operating temperature requirements outside this range should be by agreement between the manufacturer and the purchaser (see Appendix B).

4 Performance

4.1 General

All tests shall be carried out at room temperature. The accuracy of load measuring devices shall be within ± 2 % of the nominal test load.

4.2 Type tests

4.2.1 *General*

The manufacturer shall conduct type tests as described in **4.2.2** to **4.2.7** to prove the design, material, heat treatment and method of manufacture of each type and size of finished block.

Type tests shall be carried out on one representative sample block of each type and size.

4.2.2 *Ultimate strength test*

4.2.2.1 *Test procedure*

A representative sample block shall be subjected to at least 4 times the working load limit (WLL) for at least 5 min.

4.2.2.2 *Acceptance criteria*

There shall be no breakage of material, partial or complete, nor such distortion as could result in the release of the load.

NOTE Following this test all parts should be made unusable.

4.2.3 *Slack end anchorage/end stop test*

4.2.3.1 *Test procedure*

A representative sample block shall be subjected to at least 2.5 times the WLL such that the slack end anchorage or end stop supports the full load without restraint from other components (e.g. gearing, brake).

4.2.3.2 *Acceptance criteria*

There shall be no breakage of material, partial or complete, nor such distortion as could result in the release of the load.

4.2.4 *Endurance test*

NOTE For the purposes of this test, the block may be reeved with a single fall provided the tension in the load chain equals the actual tension imposed when the fully reeved block is raising the WLL.

4.2.4.1 *Test procedure*

A representative sample block shall be loaded with the WLL which shall be raised and lowered so that the mechanism is in notion for 100 h at an equivalent minimum hand chain speed of 20 m/min in 500 mm to 600 mm steps.

NOTE It is permissible to change brake pads and the portion of chain working over the load chain sprocket a maximum of 2 times during the test. It is also permissible to lubricate the block and chain regularly during the test.

4.2.4.2 *Acceptance criteria*

There shall be no breakage of material, partial or complete, nor such distortion as could result in the release of the load.

4.2.5 *Drive strength test*

4.2.5.1 *Test procedure*

A representative sample block shall be loaded with at least the proof load (see Table 1) and shall be operated through a height of lift which will ensure that every part of the block mechanism and each tooth of the gearing comes under load. The block shall be dismantled and the gear teeth, ratchet and pawl, etc. shall be inspected.

4.2.5.2 *Acceptance criteria*

The components shall be free from deformation, cracks, flaws or other defects and there shall be no loosening of connections.

4.2.6 *Light load test*

4.2.6.1 *Test procedure*

A representative sample block shall be loaded with a test weight of between 2 % and 5 % of WLL which shall be raised and lowered through a height of between 250 mm and 500 mm.

4.2.6.2 *Acceptance criterion*

When the hand chain is released at any point during raising and lowering, the brake shall hold the weight.

NOTE Blocks which are fitted with seals may appear to hold the load by the brake, when in fact it is being held by seal friction only. This condition does not meet the acceptance criterion.

4.2.7 *Brake lock-out test*

4.2.7.1 *Test procedure*

A representative sample block shall be subjected to a test load of between 5 % and 7 % of WLL. A restraining pin shall be inserted through the load chain on the slack side and the hand chain shall be operated in the lowering direction until the restraining pin provides a lock against a heavy pull on the hand chain.

4.2.7.2 *Acceptance criterion*

On removal of the restraining pin, the brake shall immediately engage and prevent the load from descending.

Table 1 — Proof loads

WLL	Proof load (min)
t	
up to 10	1.5 × WLL
10 to 20	WLL + 5 t
> 20	1.25 × WLL

NOTE Attention is drawn to Certificate of Exemption, F2054, made under the Shipbuilding an Ship-Repairing regulations, 1960, which requires all chain pulley blocks to be tested to 1.5 times their SWL.

4.3 Tests on each block

4.3.1 *Proof test*

4.3.1.1 *Test procedure*

The proof load specified in Table 1 shall be applied by means of weights or hydraulically or by other means which shall provide the required proof load.

Where a hydraulic testing machine or means other than weights is used, the machine shall be of such a design that the block can be operated through the required distance whilst maintaining the required proof load within an accuracy of $^{+10}_{0}$ % of the required proof load.

This test shall be carried out by operating the hand chain wheel by hand or power.

When the test is carried out by operating the hand chain wheel by power, the hand chain drive shall be interrupted a minimum of three times whilst both lifting and lowering, in a manner that does not assist the brake of the chain block to arrest or sustain the load.

All hooks and end fittings shall be regarded as having been proof tested by this test.

On completion of the test the block shall be examined by a competent person.

NOTE Examination may normally be carried out without dismantling.

4.3.1.2 *Acceptance criteria*

The block shall be free from deformation, cracks, flaws or other defects, there shall be no loosening of connections and the block shall operate satisfactorily.

4.3.2 *Light load test*

4.3.2.1 *Test procedure*

Each block shall be loaded with a test weight of between 2 % and 5 % of WLL which shall be raised and lowered through a height of between 250 mm and 500 mm.

4.3.2.2 *Acceptance criterion*

When the hand chain is released at any point during raising and lowering, the brake shall hold the weight.

NOTE Blocks which are fitted with seals may appear to hold the load by the brake, when in fact it is being held by seal friction only. This condition does not meet the acceptance criterion.

5 Classification and selection of safe working load

5.1 Classification

The classification shall take account of the state of loading and expected service life (see Appendix A) and shall be based on the information provided by the purchaser in accordance with Appendix B.

5.2 Selection of safe working load

The safe working load shall be selected in accordance with Table 2 using the classification (see **5.1**).

Table 2 — Safe working load of chain blocks

Classification	Safe working load
	% of working load limit
M1	100
M2	80
M3	63
M4	50

6 Certificate of test and examination

A certificate of test and examination shall be issued for each individual block, giving the following information:

a) alphanumeric identification;

b) make and type;

c) classification (see **5.1**);

d) safe working load (see **5.2**);

e) load chain size and grade;

f) proof load applied (see **4.3.1**)

g) date the test and examination were completed.

The certificate shall be signed by an authorized person, and shall declare that each block was submitted to the proof test described in **4.3.1** and was subsequently examined by a competent person, and that it complies with BS 3243[1)].

NOTE The certificate may be the appropriate statutory form provided that the required information is given.

7 Marking

7.1 General

The following information shall be permanently and legibly marked on a suitable part of the block:

a) alphanumeric identification;

b) classification (see **5.1**);

c) safe working load (see **5.2**);

d) grade of the load chain;

[1)] Marking BS 3243:1990 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.

e) name of the maker or supplier.

Operating and maintenance instructions shall be supplied (see also **3.3** and **3.4.1**).

7.2 Units for safe working loads [see **7.1** c)]

Safe working loads of less than 1 000 kg shall be marked in kilograms, i.e. "kg", to the nearest whole kilogram.

Safe working loads of 1 000 kg or more shall be marked in tonnes, i.e. as "tonnes" or "t". The value shall be given to a single place of decimals, except where the figure after the decimal point would be 0, in which case it shall be omitted, and except in the case of 1.25 t, which shall be given to two decimal places.

Appendix A Classification

A.1 General

In order to assure appropriate levels of reliability and service life, which are in line with the user requirements, classification takes account of the state of loading (see **A.2**) and expected service life and is based on the information provided in accordance with Appendix B.

Where the state of loading and expected service life are unknown or are not specified, a classification of M1 is assumed and is stated as "M1 assumed" on the certificate of test and block marking. In this instance the SWL is the same as the WLL.

A.2 State of loading

The state of loading is a measure of the number of times a load of a particular magnitude is lifted in relation to the WLL of the appliance and is selected from Table 3.

Table 3 — States of loading of mechanisms

States of loading	Remarks
L1 Light	Mechanisms subjected very rarely to their maximum load and normally to very light loads
L2 Moderate	Mechanisms occasionally subjected to their maximum load but normally to rather light loads
L3 Heavy	Mechanisms frequently subjected to their maximum load and normally to loads of medium magnitude
L4 Very heavy	Mechanisms regularly subjected to their maximum loads

NOTE The state of loading may be increased by one grade if justified by severe conditions of use, e.g. shock loading, dirty conditions.

A.3 Classification

The classification of the chain block is determined from the state of loading and the expected service life as given in Table 4.

Table 4 — Classification of chain blocks

State of loading	Expected service life (h)			
	100	200	400	800
L1	—	—	—	M1
L2	—	—	M1	M2
L3	—	M1	M2	M3
L4	M1	M2	M3	M4

NOTE The expected service life is used only as a design parameter and should not be taken as implying a guaranteed life.

Appendix B Information to be supplied with the enquiry or order

The enquiry and order should state the following:

a) the classification with state of loading and expected service life (see **5.1** and Appendix A);

b) the safe working load (see **5.2**);

c) the extended dimension (see Figure 1);

d) the maximum acceptable drawn up dimension, if head room is important (see Figure 1);

e) the range of lift (see Figure 1);

f) the distance from suspension level to operating level (see Figure 1);

g) environment in which the block is to be operated;

h) the operating temperature requirements (see **3.7**);

i) whether a torque limiting device is required (see Appendix D).

Appendix C Recommendations for the care and safe use of chain blocks

Chain blocks are precision made and should be treated with appropriate care. They should not be dropped and should be protected from weather, water, heat, mud, etc.

Except for testing purposes chain blocks should never be used to lift a load in excess of the safe working load marked on the block. Use of the block at any load greater than the safe working load will result in danger.

It is imperative that a load chain is never used as a sling, i.e. by back hooking. Knots should not be tied in the load chain, nor should bolts be used to join it.

It is important to examine the load chain before use to ensure that there is no twist. In the case of a block lifting on two parts of chain, twist can arise from the bottom block being turned over.

Load chains should be kept well lubricated along their whole length and especially at the contact points between the links. A dry lubricant should be used where oils and greases are not desirable. Failure to maintain correct lubrication reduces the life of the chain.

Always ensure that the slack part of the chain is free and clear of obstruction.

Dirt and hard grease should not be allowed to gather in the pockets of the load or hand chain wheels.

Chain blocks are designed for lifting loads vertically and should not be used at an angle without reference to a competent person nor without due allowances. Chain blocks should never be used for towing. Loads should never be lifted with the point of the hook.

The load chain should never be run out too far. When the bottom hook is run out beyond the extended dimension, an excessive and dangerous load is imposed at the load chain slack end anchorage. When the block is rigged, care should be taken to ensure that the load can be landed without running the load chain out beyond the extended dimension (see Figure 1).

Alterations should never be made to the load chain without reference to the block maker or to a competent person.

Swivel shank hook assemblies should be examined and serviced in accordance with the manufacturer's instructions.

If a block has been out of service for some time, the brake should be checked to ensure that it operates correctly before the block is re-used.

It is important to ensure that the suspension point for a block is strong enough to take the dynamic and static loads applied.

If a block needs more than ordinary effort to operate it, then it is likely to be either defective or overloaded.

Most chain blocks have to be subjected to statutory periodic examination by a competent person. They should be inspected frequently and cleaned and lubricated at recognized intervals and in accordance with the manufacturer's instructions.

If any of the following defects are found during in-service inspection, the block should be referred to a competent person for thorough examination:

a) wear or damage to the load chain;

NOTE This may take the form of wear at the bearing surfaces between links and damage in the form of bent links, nicks, stretching of links or corrosion. Such damage may manifest itself by the load chain jumping or being noisy or not working smoothly or by undue effort on the hand chain or by the presence of marks on the crown of the links.

b) opening out of the hooks due to overload or to point loading;

c) damage to the chain anchorages or load chain end stop (where fitted);

d) damage to the hand chain;

e) slipping of the brake;

f) damage to the frame, covers, etc., of the block body, chain guides, etc.

BS 6521 provides guidance for proper use and maintenance of calibrated round steel link lifting chains.

For further information on safe use, see section 6 of the Lifting Equipment Engineers' Association "Code of practice for the safe use of lifting equipment"[2)].

Appendix D Torque limiting device

For certain applications, the purchaser may specify a torque limiting device in the drive train adjacent to the hand chain wheel. This device should be set to limit the input torque so that the load cannot exceed the proof load. The manufacturer or supplier should demonstrate the effectiveness of this device by a suitable test on request.

NOTE This device should be rendered inoperative during the proof test. After the test, it should be reinstated.

[2)] Available from the Lifting Equipment Engineers' Association, 21–23 Woodgrange Road, London E7 8BA.

Publications referred to

BS 2853, *Specification for the design and testing of steel overhead runway beams*[3)].

[e]BS 2903, *Specification for higher tensile steelhooks for chains, slings, blocks and general engineering purposes.*

BS 4942, *Short link chain for lifting purposes.*

BS 4942-1, *Specification for general conditions of acceptance.*

BS 4942-6, *Specification for grade T(8) calibrated chain.*

BS 5750, *Quality systems*[3)].

BS 6521, *Guide for proper use and maintenance of calibrated round steel link lifting chains.*

ISO 4301, *Lifting appliances — Classification*[3)].

ISO 7597, *Forged steel lifting hooks with point and eye for use with steel chains of grade T(8).*

ISO 8539, *Forged steel lifting components for use with grade T(8) chain Code of practice for the safe use of lifting equipment*[4)].

[3)] Referred to in the foreword only.

[4)] Published by the Lifting Equipment Engineers' Association and available from Waggoners Court, The Street, Manuden, Bishop's Stortford, Hertfordshire CM23 1DW.

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