BRITISH STANDARD

BS 3876-1: 1990

Rope rollers, pulleys, mountings and assemblies for colliery track haulage —

Part 1: Specification for parallel barrel rollers, mountings and assemblies

Confirmed January 2011

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Mining and Quarrying Requisites Standards Policy Committee (MQE/-) to Technical Committee MQE/18, upon which the following bodies were represented:

Association of British Mining Equipment Companies
British Foundry Association
British Steel Industry
Federation of Wire Rope Manufacturers of Great Britain
Health and Safety Executive
Institution of Mining Electrical and Mining Mechanical Engineers

This British Standard, having been prepared under the direction of the Mining and Quarrying Requisites Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 30 June 1990

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Contents

Foreword

This Part of BS 3876 has been prepared under the direction of the Mining and Quarrying Requisites Standards Policy Committee (MQE/-) and is a full technical revision of both BS 3876-1:1965 and BS 3876-4:1966 both of which are withdrawn.

The other Parts in the revised edition of BS 3876 are as follows:

— *Part 2: Specification for vertical spindle pulleys, mountings and assemblies*;

— *Part 5: Specification for suspended pulley assemblies and clamps*.

In the revised Parts, the following points should be noted:

a) tapered rollers, covered in BS 3876-2:1965, are now omitted from the revised Part 2;

b) vertical rollers, which were included in the 1965 edition of Part 2, are now omitted as it is considered the parallel barrel rollers specified in Part 1 can be used in the vertical mode;

c) horizontal spindle pulleys, covered in the 1965 edition of Part 2, are relocated in Part 5 of the revised edition;

d) Part 3:1965 has been withdrawn because there is no longer any requirement for rollers with non-metallic rope bearing surfaces;

e) the requirements for mountings for parallel barrel rollers, previously specified in BS 3876-4:1966, have been revised and incorporated into this expanded edition of Part 1; there is therefore no need for retention or revision of a separate Part 4.

During the revision, all dimensions have been metricated and these are not necessarily straight conversions from the imperial dimensions previously adopted. In particular, barrel diameters have been adjusted to align with the outside diameters of metric tubes now available.

Product certification. Users of this British Standard are advised to consider the desirability of third party certification of product conformity with this British Standard based on testing and continuing surveillance, which may be coupled with assessment of a supplier's quality systems against the appropriate Part of BS 5750. Enquiries as to the availability of third party certification schemes will be forwarded by BSI to the Association of Certification Bodies. If a third party certification scheme does not exist, users should consider approaching an appropriate body from the list of Association members.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, 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 Part of BS 3876 specifies requirements for fabricated and cast steel rope rollers, mountings and roller assemblies intended for use in colliery track haulage.

This Part applies to

a) rollers, with or without incorporated wind-back facilities and supplied without mountings, for which the diameters of the roller barrels do not exceed the lengths of the rollers to the outsides of their flanges;

b) mounting, either high or low type and dependant upon roller diameters; and

c) roller assemblies that comprise both the rollers and the mountings.

NOTE 1 Appendix A gives the information which should be supplied by the purchaser, in his enquiry and/or order for rollers, mountings or assemblies in accordance with this Part of BS 3876.
NOTE 2 Appendix B gives the information that will be required by the purchaser, to be provided by the supplier, prior to the supply of rollers, mountings or assemblies in accordance with this Part of BS 3876.
NOTE 3 Appendix C gives general recommendations for the design and operating speeds for colliery track haulage rollers.
NOTE 4 No inspection requirements are specified in this Part of BS 3876. However, a typical requirement that the purchaser may choose to write into his order or contract for rollers, mountings or assemblies to this Part is given in Appendix D.
NOTE 5 The titles of the publications referred to in this Part of BS 3876 are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 3876, the following definitions apply.

2.1
barrel

that part of the roller cylinder on which the rope runs

2.2
roller

a cylinder that is free to rotate to support or guide a moving rope, having a parallel barrel, parallel or taper sided flanges, windback facilities when required, complete with spindle and bearings

2.3
roller end/end cap

a casting or fabrication at each end of the cylinder that contains the flange, bearing housing and windback facility when required

NOTE In the case of cast roller cylinders, the ends are parts of the casting.
In the case of fabricated roller cylinders, the end caps are fixed by welding or by tie-rods.

2.4
windback facility

a scrolled configuration forming part of the roller end/end cap the effect of which is to impart a lateral movement, towards the roller barrel, to any moving haulage rope in contact with the scroll in either direction of roller rotation

2.5
throw (eccentricity)

the total variation from true running of the periphery of the barrel when rotated on the spindle[1)]

2.6
mounting

the frame to which the roller is, or is to be, attached

2.7
roller assembly

the roller and its mounting

3 General

The roller components and mountings shall comply with the requirements specified in clauses **4** to **7**, as appropriate.

4 Dimensions and shape of roller components and mountings

4.1 Dimensions

The dimensions of the roller components and mountings shall be as given in Table 1 to Table 4.

NOTE For convenience, typical rollers and mountings are illustrated in Figure 1 to Figure 4 which identify the dimensions referred to in Table 1 to Table 4.

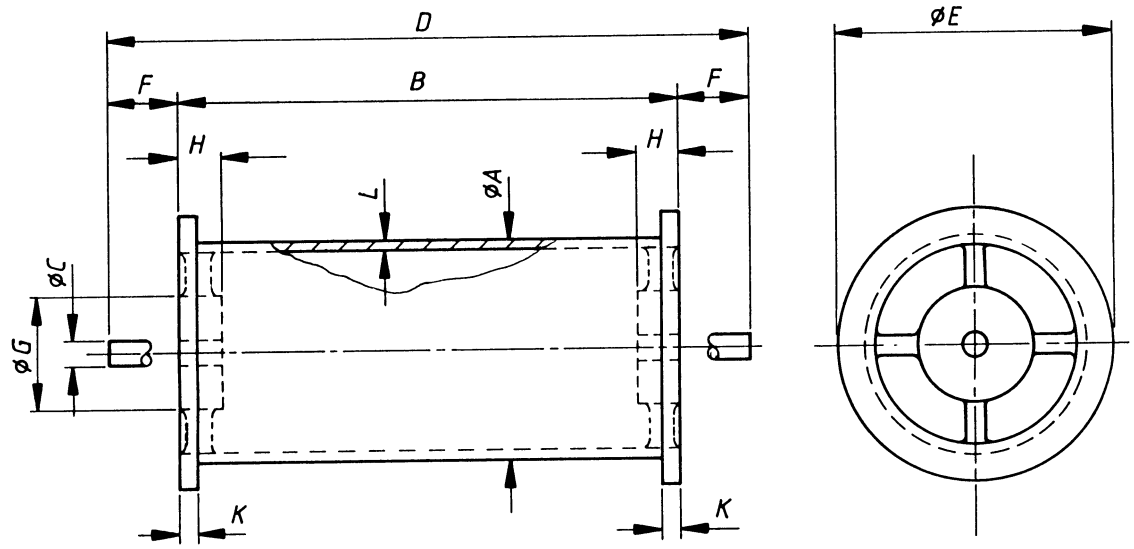
4.2 Eccentricity of the barrels

The eccentricity of the barrel when determined at the fixed points BB shown in Figure 5 (i.e. the radial run out as defined in BS 308-3), shall not exceed the following:

a) 1.5 mm, for barrels up to and including 168 mm diameter; and

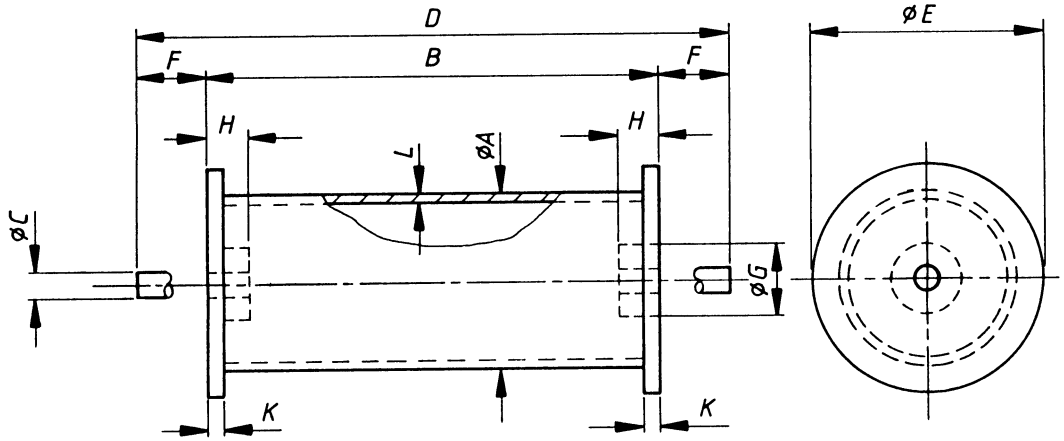
b) 2.3 mm, for barrels exceeding 168 mm diameter.

[1)] See Figure 5.



NOTE This figure does not purport to show design details.

Figure 1 — Typical cast roller



NOTE This figure does not purport to show design details.

Figure 2 — Typical fabricated roller

Table 1 — Dimensions of cast rollers (see also Figure 1)

Roller ref. no.	Diameter of barrel	Length of roller outside end caps	Spindle		Diameter end cap	Length	Minimum bearing housing diameter	Minimum bearing housing length	Flange thickness	Barrel thickness
			Diameter	Length						
	A (± 1.5 mm)	*B* (± 1.5 mm)	*C* (see NOTE)	*D* (± 1.0 mm)	*E* (± 1.5 mm)	*F* (± 1.0 mm)	*G*	*H*	*K* (± 1.0 mm)	*L* (± 1.0 mm)
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
114/230	114	230	19	330	150	50	65	30	10	10
114/300	114	300	19	400	150	50	65	30	10	10
114/600	114	600	19	700	150	50	65	30	10	10
127/150	127	150	19	250	165	50	65	30	10	10
127/230	127	230	19	330	165	50	65	30	10	10
127/300	127	300	19	400	165	50	65	30	10	10
168/200	168	200	25	300	210	50	80	30	11	11
168/250	168	250	25	350	210	50	80	30	11	11
168/300	168	300	25	400	210	50	80	30	11	11
168/450	168	450	25	550	210	50	80	30	11	11
168/600	168	600	25	700	210	50	80	30	11	11
193/200	193	200	25	300	235	50	80	30	11	11
193/250	193	250	25	350	235	50	80	30	11	11
193/300	193	300	25	400	235	50	80	30	11	11
193/450	193	450	25	550	235	50	80	30	11	11
193/600	193	600	25	700	235	50	80	30	11	11
219/300	219	300	25	400	260	50	100	35	13	13
273/300	273	300	25	400	320	50	100	35	13	13
273/450	273	450	25	550	320	50	100	35	13	13
305/305	305	305	25	405	355	50	100	35	13	13
305/450	305	450	25	550	355	50	100	35	13	13

NOTE For tolerances on the spindle diameter, see **6.3**.

Table 2 — Dimensions of fabricated rollers (see also Figure 2)

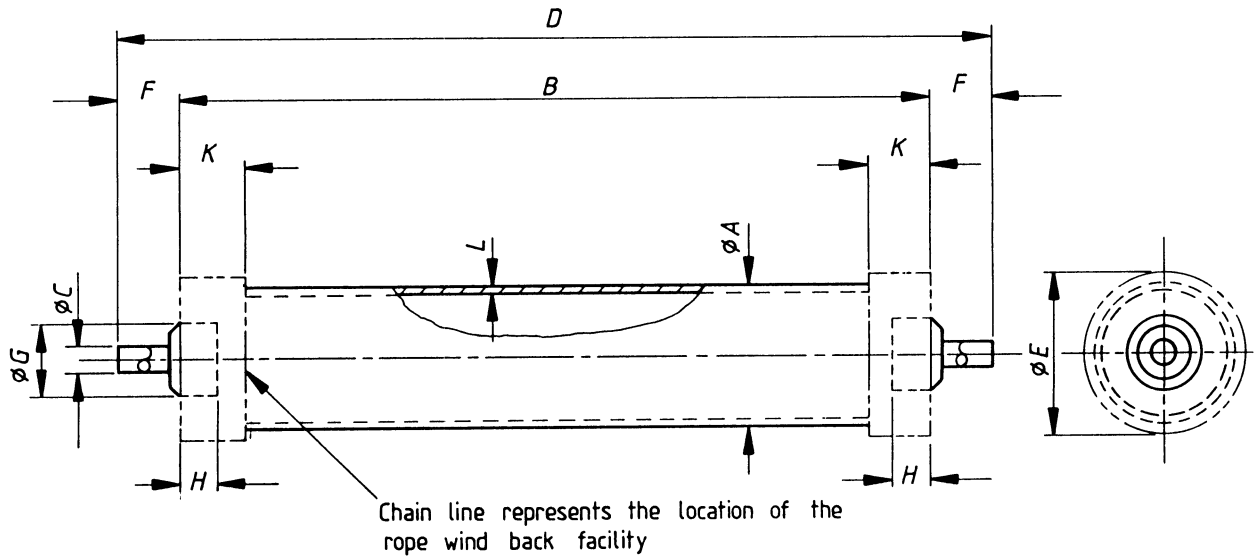
Roller ref.no.	Diameter of barrel	Length of roller outside end caps	Spindle		Diameter end cap	Length	Minimum bearing housing diameter	Minimum bearing housing length	Flange thickness	Barrel thickness
			Diameter	Length						
	A (± 1.5 mm)	*B* (± 1.5 mm)	*C* (see NOTE)	*D* (± 1.0 mm)	*E* (± 1.5 mm)	*F* (± 1.0 mm)	*G*	*H*	*K* (± 1.0 mm)	*L* (± 1.0 mm)
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
114/230	114.3	230	19	330	150	50	65	30	10	6.3
114/300	114.3	300	19	400	150	50	65	30	10	6.3
114/600	114.3	600	19	700	150	50	65	30	10	6.3
127/150	127.0	150	19	250	165	50	65	30	10	6.3
127/230	127.0	230	19	330	165	50	65	30	10	6.3
127/300	127.0	300	19	400	165	50	65	30	10	6.3
168/200	168.3	200	25	300	210	50	80	30	11	6.3
168/250	168.3	250	25	350	210	50	80	30	11	6.3
168/300	168.3	300	25	400	210	50	80	30	11	6.3
168/450	168.3	450	25	550	210	50	80	30	11	6.3
168/600	168.3	600	25	700	210	50	80	30	11	6.3
193/200	193.7	200	25	300	235	50	80	30	11	6.3
193/250	193.7	250	25	350	235	50	80	30	11	6.3
193/300	193.7	300	25	400	235	50	80	30	11	6.3
193/450	193.7	450	25	550	235	50	80	30	11	6.3
193/600	193.7	600	25	700	235	50	80	30	11	6.3
219/300	219.1	300	25	400	260	50	100	35	13	6.3
273/300	273.0	300	25	400	320	50	100	35	13	6.3
273/450	273.0	450	25	550	320	50	100	35	13	6.3
305/305	305.0	305	25	405	355	50	100	35	13	10
305/450	305.0	450	25	550	355	50	100	35	13	10

NOTE For tolerances on the spindle diameter, see **6.3**.

Table 3 — Dimensions of rollers with internal rolling bearings having rope wind back facility (see also Figure 3)

Roller ref.no.	Diameter of barrel	Length of roller outside flange	Spindle		Diameter end cap	Length	[a]Minimum bearing housing diameter	Minimum bearing housing length	Flange thickness	Barrel thickness
			Diameter	Length						
	A (± 1.5 mm)	*B* (± 1.5 mm)	*C* (see NOTE)	*D* (± 1.0 mm)	*E* min	*F* (± 1.0 mm)	*G*	*H* max	*K* (± 1.0 mm)	*L* (± 1.0 mm)
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
114/230 WB	114.3	230	19	330	130	50	45	30	50	6.3
114/300 WB	114.3	300	19	400	130	50	45	30	50	6.3
114/600 WB	114.3	600	19	700	130	50	45	30	50	6.3
168/200 WB	168.3	200	25	300	180	50	50	30	50	6.3
168/250 WB	168.3	250	25	350	180	50	50	30	50	6.3
168/300 WB	168.3	300	25	400	180	50	50	30	50	6.3
168/450 WB	168.3	450	25	550	180	50	50	30	50	6.3
168/600 WB	168.3	600	25	700	180	50	50	30	50	6.3

NOTE For tolerances on the spindle diameter, see **6.3**.
[a] Minimum internal bearing housing diameter.



NOTE This figure does not purport to show design details.

Figure 3 — Typical roller having rope wind back facility

Table 4 — Dimension of mountings

Roller reference no.	Dimension X
	mm
114/230 to 127/300	185
168/200 to 219/300	270
273/300 to 305/450	375

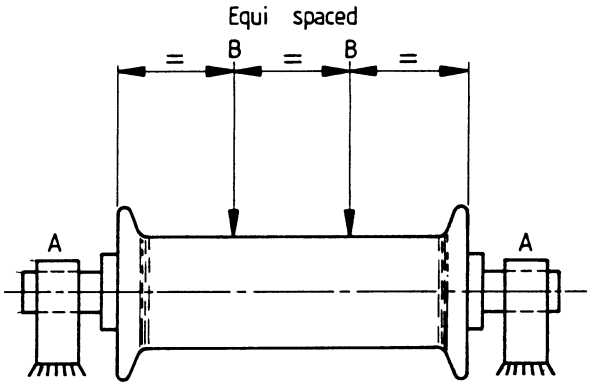


Figure 5 — Method of testing rollers for eccentricity

5 Materials

5.1 General

Subject to the requirements of **5.2**, the materials used in the construction of the rollers and mountings shall be in accordance with **5.3** and **5.4** respectively.

5.2 Light metals

In the construction of the rollers, mountings and assemblies, no metal shall be used that contains more than:

a) 15 % (*m*/*m*) in total of aluminium, magnesium and titanium; and

b) 6 % (*m*/*m*) in total of magnesium and titanium.

Paints and coatings containing any of the metals aluminium, magnesium and titanium shall not be used.

5.3 Materials for rollers

5.3.1 *Fabricated rollers*

5.3.1.1 The cylinders for fabricated rollers shall be manufactured from seamless or welded steel tube having a Brinell hardness of at least 300 BHN and not more than 400 BHN throughout the section.

5.3.1.2 The roller end caps shall be manufactured from any of the materials given in a) to c) as follows.

a) *Cast steel end caps*: from either of the cast steels specified in **5.3.2**.

b) *Malleable cast iron end caps*: from whiteheart or blackheart malleable cast iron in accordance with BS 6681.

c) *Wrought steel plate end caps*: from either of the following:

1) carbon steel in accordance with BS 970, grade 070 M20; or

2) weldable structural steel in accordance with BS 4360, grade 43 A.

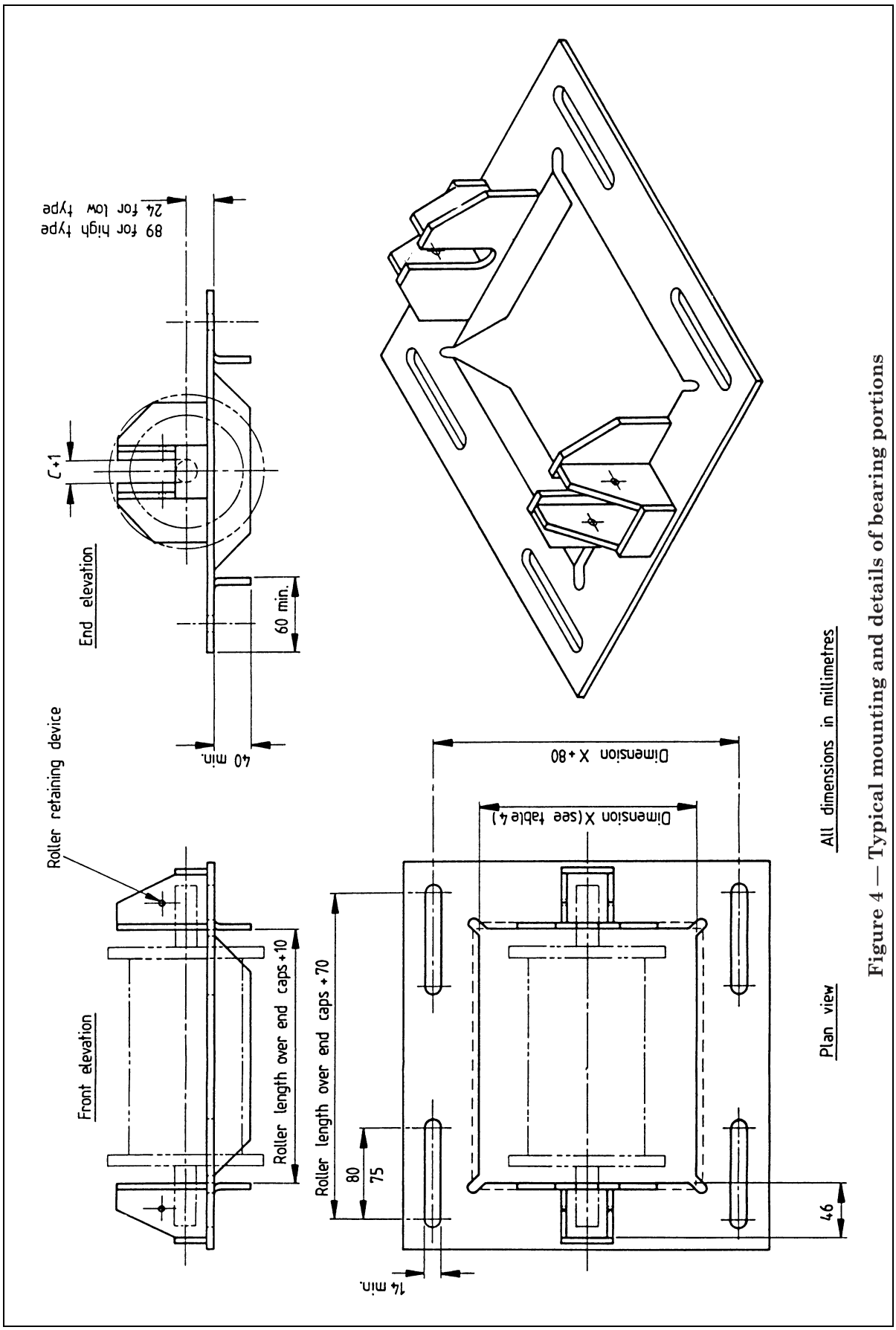


Figure 4 — Typical mounting and details of bearing portions

5.3.2 *Cast rollers*

Cast steel roller cylinders, with integral ends, shall be made from either of the following steels:

a) carbon steel in accordance with BS 3100, steel A3; or

b) low alloy (1 % chromium) steel in accordance with BS 3100, steel BW4.

5.3.3 *Spindles*

Spindles shall be made from wrought steel in accordance with BS 970, grade 070 M20, with a minimum tensile strength of 430 N/mm^2.

5.3.4 *Bearings*

Bearings shall be double sealed, grease filled, single row radial ball bearings in accordance with BS 292-1.

NOTE 1 The use of seize-resistant bearings having polyamide cages is preferred.

The types of bearings to be used for particular applications shall be as given in Table 5.

The bearings shall be sealed on both sides with an elastomeric material suitably reinforced.

NOTE 2 Plain metal covers are not sufficient.

The polyamide cages, where fitted, and the elastomeric sealing material shall meet the fire resistant requirements of BS 3790 and the antistatic requirements of BS 2050.

5.4 Materials for mountings

Mountings shall be fabricated from steel in accordance with either of the following:

a) carbon steel in accordance with BS 970, grade 070 M20; or

b) weldable structural steel in accordance with BS 4360, grade 43A.

Table 5 — Bearing characteristics and designations

Roller reference no.	Roller speed	Bearing designation (BS 292-1)
	r/min	
114/-	up to 800	6204-2RS
127/-	over 800	6304-2RS
168/-	up to 800	6206-2RS
193/-	over 800	6306-2RS
219/-	up to 800	6306-2RS
273/- 305/-	over 800	6406-2RS

6 Manufacture

6.1 General

Roller components and mountings shall comply with **6.2** and **6.3**. Mountings shall additionally comply with **6.4**.

NOTE It is important that:

a) all roller components and mountings should be free from harmful defects;

b) the barrels of rollers should be smooth and free from all projections, cross-jointing and defects that may be injurious to ropes;

c) all machined parts should be free from sharp corners, edges and undercuts, tool marks and scoring that are likely to cause excessive concentrations of stress;

d) all welds should be free from the imperfections described in Section 6 of BS 499-1:1983 and all defects (e.g. rough edges, weld spatter) likely to be injurious to persons or equipment, or to interfere with mating parts should be removed.

The attention of the supplier is drawn to the fact that the purchaser may reject rollers, mountings and assemblies as being unsatisfactory on any of these grounds, notwithstanding that the requirements of this Part of BS 3876 are complied with, subject to discussion in accordance with normal commercial practice.

6.2 Welding

Welding techniques shall be in accordance with BS 5135.

NOTE 1 Details of each welded joint should be agreed between the supplier and the purchaser and shown in detailed drawings, copies of which are held by both the supplier and the purchaser [see item f) of Appendix B].

NOTE 2 Minor defects in castings, that will not affect the mechanical strength or performance of any roller, may be rectified by welding when the manufacturer is able by so doing to provide a satisfactory casting.

When repairs to cast steel are to be undertaken then they shall be in accordance with BS 4570.

6.3 Machining tolerances

The machining tolerances for the diameter of the bearing housing bore shall be M7 and the machining tolerances on the spindle diameter shall be g6, as specified in BS 4500-1.

6.4 Mountings

The mountings shall provide means for securing the roller spindles within the mountings, in such a way that the spindle shall not be permitted to rise by more than 2 mm during normal operation of the roller and mounting.

The mounting shall be free from any projection or recess which would prevent the free running of any rope which has become inadvertently dislodged from the roller or would prevent such a rope being returned to its normal operating position on the roller.

7 Marking

Each roller and mounting supplied shall be marked[2)] with an etched, stamped or cast identity, giving the following information. Rollers shall be marked on the outside face of one roller end/end cap with the following information:

a) the manufacturer's name, identification mark or trademark;

b) the number and Part of this British Standard, i.e. BS 3876-1;

c) in the case of cast roller cylinders, an indication of the material, using the following code:

S for carbon steel

SA for low alloy steel

d) in the case of mountings, the reference number (see Table 1 to Table 3) of the roller for which the mounting is intended.

[2)] Marking BS 3876-1 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 Information supplied by the purchaser

The purchaser should supply the following items of information at the time of enquiry and/or order:

a) the number and Part of this British Standard, i.e. BS 3876-1;

b) the code reference of the roller required, as given in Table 1 to Table 3 (thus indicating whether cast steel or fabricated; the diameter and length);

c) whether castings are to be inspected and tested during manufacture (see also Appendix D);

d) details of any tests which are required to be carried out on the roller assembly during manufacture (see also Appendix D);

e) the type of mounting (i.e. type 1, type 2 or type 3, see Table 4) to be supplied, if required.

Appendix B Information to be provided by the supplier

Prior to supply, the manufacturer is to provide a detailed drawing, or drawings, including the following particulars:

a) *Roller cylinders*. Material specification and minimum nominal thickness.

b) *Spindles*. Material specification and full dimensional details of spindle.

c) *Roller ends/end caps*. General details including material specification, minimum thickness, method of fixing. If the method of fixing is by tie rods, state number of rods used, their diameter and the method of end fastening.

d) *Bearings*. Manufacturer and identification reference.

e) *Mountings*. Material and dimensional details.

f) *Welding*. Details of any welding, e.g. preparation, weld dimensions, the welding material and operation used.

Appendix C General recommendations for the design and operating speeds of rollers

The design of haulage rollers depends basically on the rope speed and the loading. Several characteristics of the roller itself affect the choice when considering a particular duty, as follows:

a) Eccentricity and ovality of roller, since eccentricity results in a hammer blow being imparted to both rope and bearing.

b) Hardness and wear resistance.

c) Type of bearing.

d) Ease of and need for maintenance.

e) Roller revolutions per minute (see Figure 6).

The system should be designed such that at the nominal speed of the haulage rope the roller revolutions do not exceed 500 r/min. This should ensure that a roller speed of 800 r/min is not exceeded due to rope surges which are usually experienced during system start up and acceleration.

Where, due to installation limitations, the recommended roller speed of 500 r/min has to be exceeded on a continuous basis then consideration should be given to the use of the appropriate bearing as given in Table 5.

No system should be designed based on roller speeds continously in excess of 800 r/min unless the heavier duty bearings given in Table 5 are utilized.

Appendix D Typical clause relating to inspection that the purchaser may choose to write into his order or contract for the supply of rollers, mountings and assemblies to this Part of BS 3876 (see also Appendix A)

For inspection purposes, the purchaser may choose to include the following clause in his order or contract:

"The purchaser or his representative shall have access at all reasonable times to those parts of the manufacturer's works or the works of sub-contractors engaged on the order; he shall be at liberty to inspect the manufacture at any stage to witness the required tests and to reject any material that does not comply with the relevant specification."

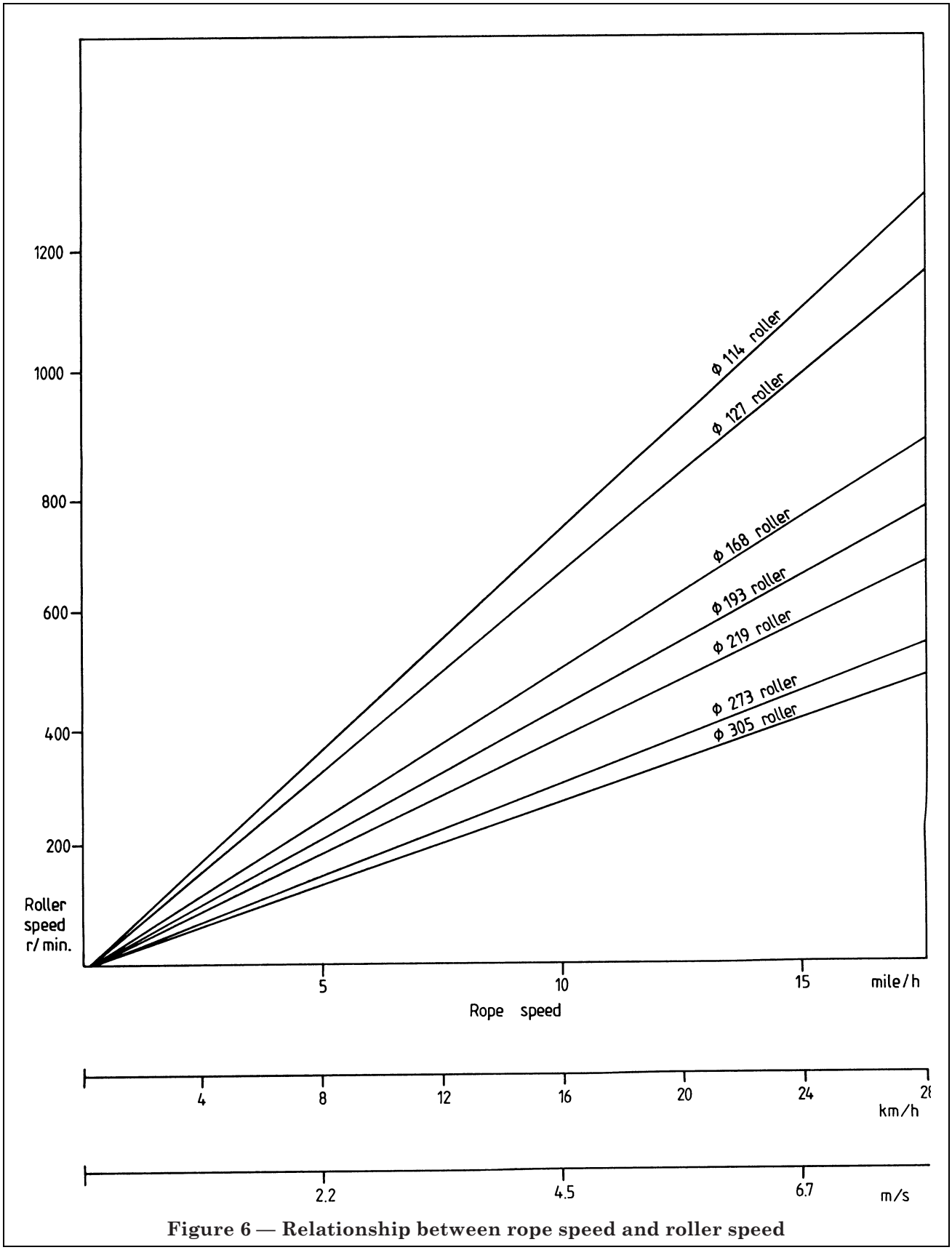


Figure 6 — Relationship between rope speed and roller speed

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Publications referred to

BS 292, *Rolling bearings: ball bearings, cylindrical and spherical roller bearings.*

BS 292-1, *Specification for dimensions of ball bearings, cylindrical and spherical roller bearings (metric series).*

BS 308, *Engineering drawing practice.*

BS 308-3, *Geometrical tolerancing.*

BS 499, *Welding terms and symbols.*

BS 499-1, *Glossary for welding, brazing and thermal cutting.*

BS 970, *Specification for wrought steels for mechanical and allied engineering purposes.*

BS 970-1, *General inspection and testing procedures and specific requirements for carbon, carbon manganese and stainless steels.*

BS 2050, *Specification for electrical resistance of conducting and antistatic products made from flexible polymeric material.*

BS 3100, *Specification for steel castings for general engineering purposes.*

BS 3790, *Specification for endless wedge belt drives and endless V-belt drives.*

BS 3876, *Rope rollers, pulleys, mountings and assemblies for colliery track haulage.*

BS 3876-2, *Specification for vertical spindle pulleys, mountings and assemblies*[3)].

BS 3876-5, *Specification for suspended pulley assemblies and clamps*[3)].

BS 4360, *Specification for weldable structural steels.*

BS 4500, *ISO limits and fits.*

BS 4500-1, *General, tolerances and deviations.*

BS 4570, *Specification for fusion welding of steel castings.*

BS 5135, *Specification for arc welding of carbon and carbon manganese steels.*

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

BS 6681, *Specification for malleable cast iron.*

[3)] Referred to in the foreword only.

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