

Specification for

# Non-powered roller conveyors

ICS 53.040.10

Confirmed  
December 2012

# Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee MHE/9, Continuous mechanical handling equipment, upon which the following bodies were represented:

Association of Consulting Engineers  
 Automated Material Handling Systems Association  
 British Aggregate Construction Materials Industries  
 British Coal Corporation  
 British Rubber Manufacturers' Association Ltd.  
 Coke Oven Managers' Association  
 Cranfield University  
 Electrical, Electronic, Telecommunications and Plumbing Union  
 Electricity Association  
 Health and Safety Executive  
 Institution of Mechanical Engineers  
 Mechanical Handling Engineers' Association  
 Solids Handling and Processing Association Ltd.

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 October 1997

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First published January 1955  
 Second edition January 1962  
 Third edition March 1972  
 Fourth edition October 1997

The following BSI references relate to the work on this standard:  
 Committee reference MHE/9  
 Draft for comment 87/72593 DC

ISBN 0 580 28325 9

## Amendments issued since publication

Amd. No.	Date	Comments

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## Foreword

This British Standard has been prepared by Technical Committee MHE/9, Continuous mechanical handling equipment, and is a revision of BS 2567:1972 which is withdrawn.

This revision was undertaken as a general updating of the standard to bring into it advances in non-powered roller conveyor design since the last edition. A wider range of roller sizes and roller materials have been incorporated including (acrylonitrile-butadiene-styrene) (ABS). Skate wheels as an alternative to rollers have also been added.

All dimensions are now specified in metric units.

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 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 British Standard specifies the main dimensions and materials for the rollers, skate wheels and supporting frames for straight and curved sections of fixed and portable non-powered roller conveyors for industrial use.

Normative Annex A lists the information that shall be obtained from the purchaser and normative Annex B lists the information that shall be obtained from the manufacturer.

Guidance on the design of a conveyor is given in informative Annex C.

The standard only covers the sections that are used to make a conveyor system. The maximum permissible loading of any section of a conveyor is dependent on the installation arrangements, which are not standardized. The actual performance requirements of sections or conveyor systems do not form part of this standard.

This standard does not cover the safety of roller conveyors.

**NOTE** A series of European Standards is being prepared to give recommendations on the safety of conveyors. Reference should be made to these standards when a conveyor system is being designed, manufactured or installed.

## 2 Normative references

This British Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on the inside back cover. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this British Standard only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

## 3 Definitions

**3.1** For the purposes of this British Standard the following definitions apply.

### 3.1.1

#### **frame section**

a fabricated framework of straight or curved form constructed to mount the spindles for the rollers or skate wheels

**NOTE** Typical frame members and frames are shown in Figure 1, Figure 2, Figure 3 and Figure 4.

### 3.1.2

#### **stand**

a fabricated steel frame to support the conveyor frame section(s) and to raise the conveyor bed to the required working height above floor level

### 3.1.3

#### **roller conveyor**

a frame section(s), fitted with rollers, which may be mounted on a stand. The unpowered rollers extend to the width of the frame section(s) and are freely rotatable by the passage of loads on the conveyor

### 3.1.4

#### **skate wheel conveyor**

a frame section(s), fitted with skate wheels, which may be mounted on a stand. The unpowered skate wheels mounted on fixed shafts are freely rotatable by the passage of loads on the conveyor

### 3.1.5

#### **pitch**

the pitch,  $p$ , is the distance between centres of rollers or skate wheel spindles

### 3.1.6

#### **spindle**

a round or hexagonal bar about which the roller or skate wheel rotates. This is also called an axle

### 3.1.7

#### **radius of a curved section**

the radius measured to the inside face of the inner frame rail

## 4 Dimensions and loading

### 4.1 Roller dimension and loads

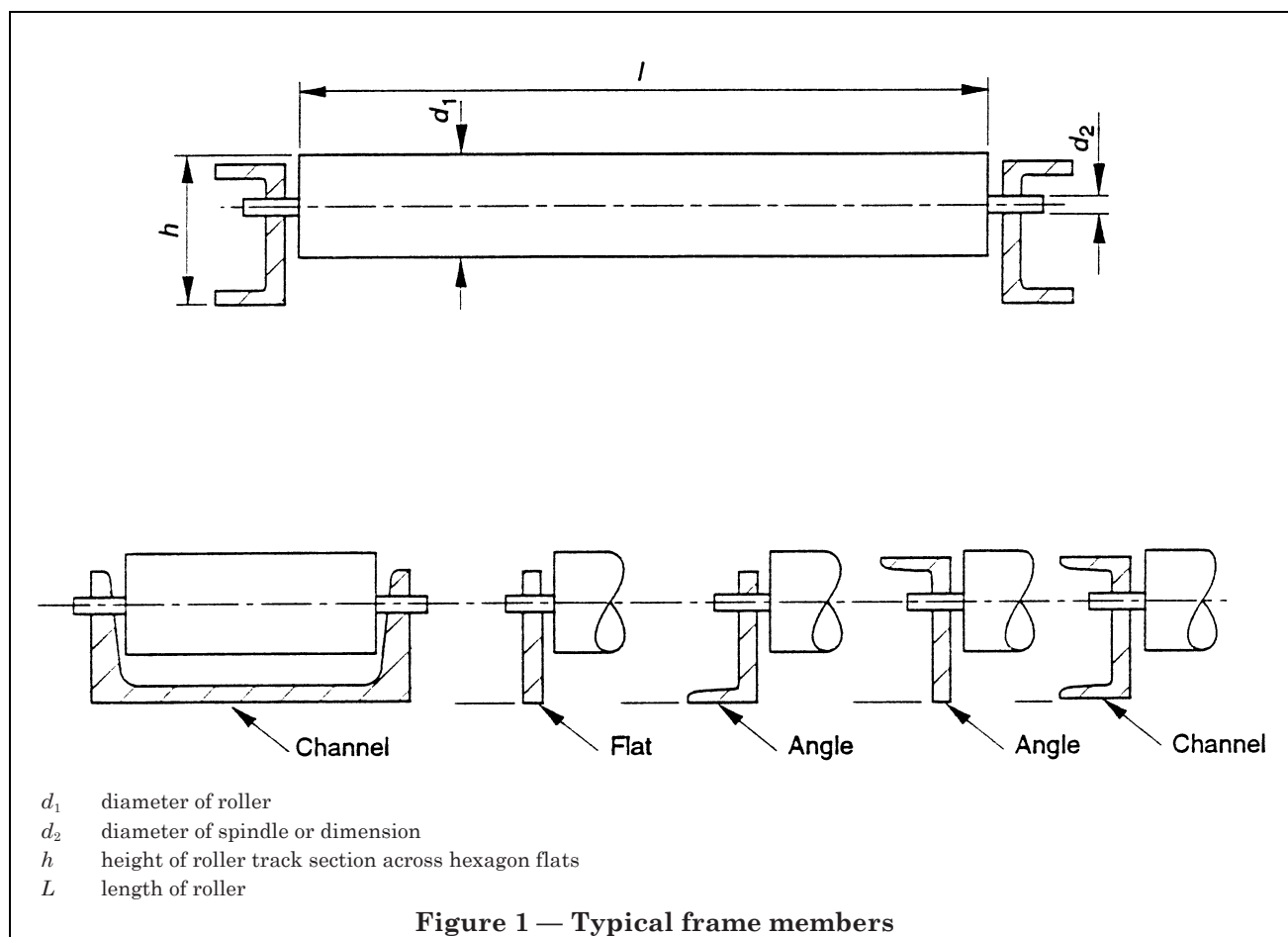
#### 4.1.1 *Steel rollers*

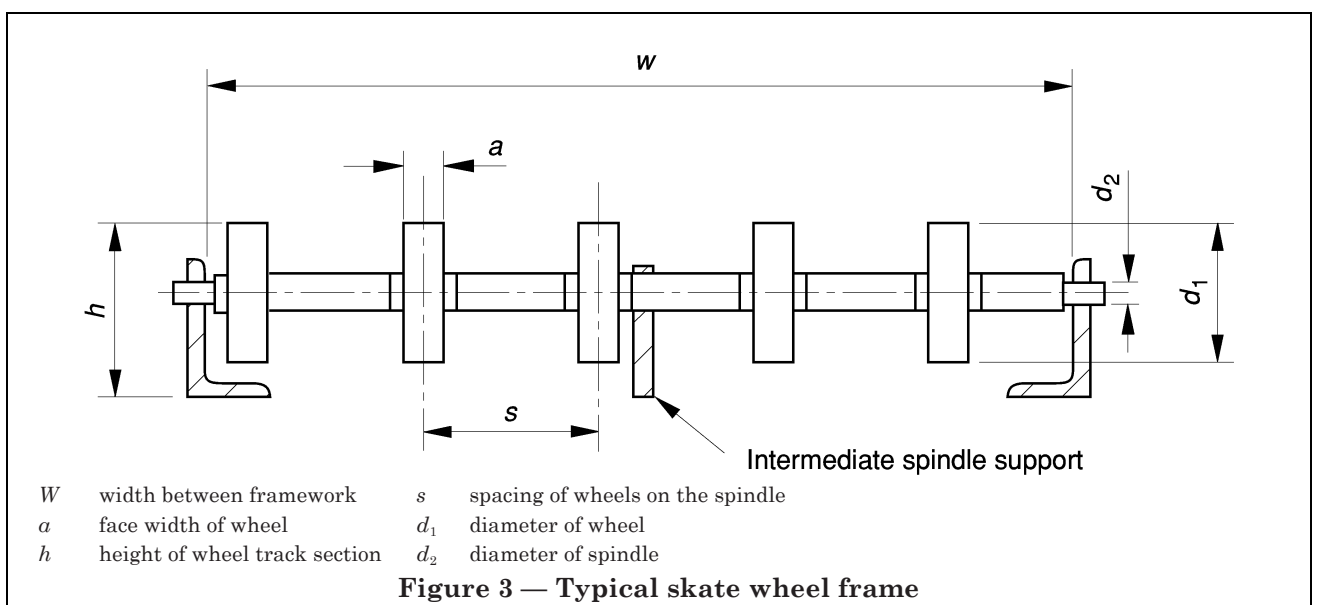
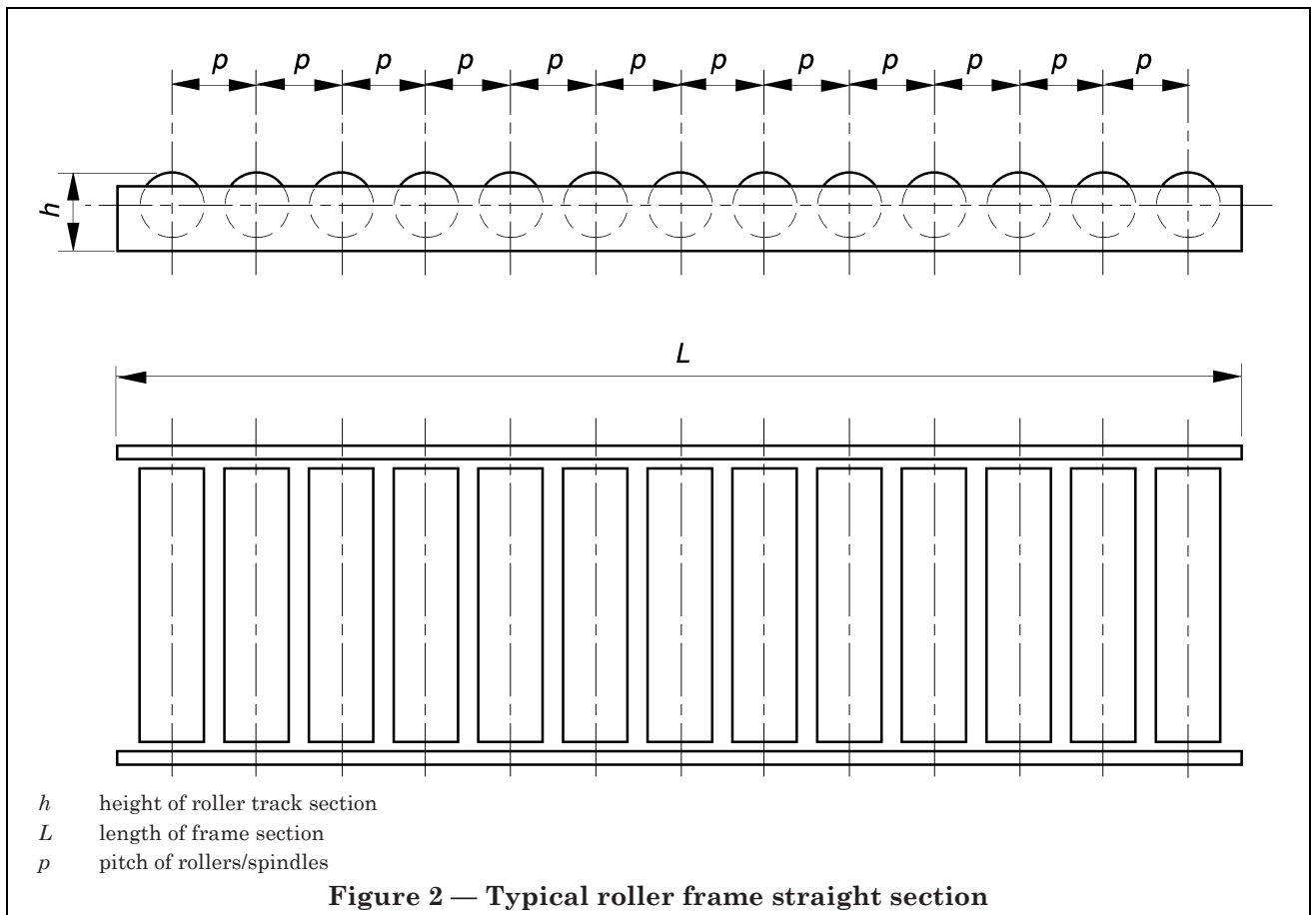
The nominal roller diameters, tube thicknesses and spindle dimensions for steel rollers shall be in accordance with Table 1 and Table 2.

**NOTE** The ranges of loadings given in Table 1, Table 2, Table 3 and Table 4 are for guidance in the selection of rollers for a particular duty. The allowable loading for a particular installation depends on the bearings fitted and the roller length as well as the factors in Table 1, Table 2, Table 3 and Table 4.

#### 4.1.2 *Aluminium rollers*

The nominal roller diameters, tube thicknesses and spindle dimensions for aluminium rollers shall be in accordance with Table 3.





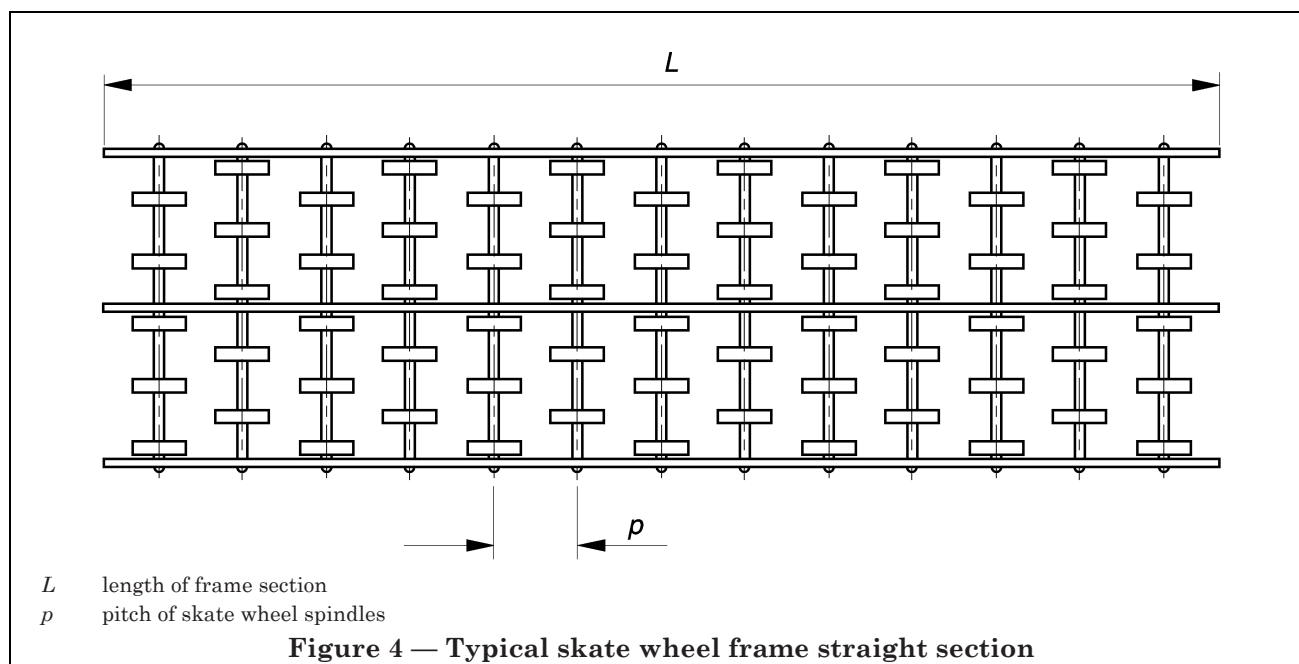


Table 1 — Dimensions and loadings for steel rollers for standard loading

Nominal roller diameter $d_1$ mm	Nominal thickness of tubing mm	Spindle dimensions $d_2$		Typical range of loads per roller kg
		Nominal diameter of spindle mm	Nominal dimension across hexagonal spindle flats mm	
25 <sup>a</sup>	1.0 or 1.2	6 or 8	8	10–20
30	1.0	8	8	15–20
35 <sup>a</sup>	1.0 or 1.5	8	8	30–35
38 <sup>a</sup>	1.2	11	11	20–60
40	1.0 or 1.5	10	11	20–80
50 <sup>a</sup>	1.6 or 2.0	10 or 11	11	40–90
57 <sup>a</sup>	1.6 or 2.6	11	11	40–160
60	1.5, 2.0 or 3.0	11 or 16	11	100–150
63	3.2	11 or 16	11 or 16	75–270
76	3.2	11 or 19	16 or 19	90–450

<sup>a</sup> Preferred sizes.

Table 2 — Dimensions and loadings for steel rollers for high loading

Nominal roller diameter $d_1$ mm	Nominal thickness of tubing mm	Spindle dimensions $d_2$		Typical range of loads per roller kg
		Minimum diameter of spindle mm	Minimum dimension across hexagonal spindle flats mm	
89	6	—	27	900–1 140
102	12	35	—	2 000–2 500
108	11.2	30	32	900–1 800
140	19	43	—	2 700–3 400
194	22.2	43	—	2 700–3 400



**Table 3 — Dimensions and maximum loadings for aluminium rollers and spindles**

Nominal roller diameter $d_1$ mm	Nominal thickness of tubing mm	Spindle dimensions $d_2$		Typical range of loads per roller kg
		Minimum diameter of spindle mm	Minimum dimension across hexagonal spindle flats mm	
25	1.2	6	—	10
38	1.2	11	11	15
50	1.6	11	11	20
57	1.6	11	11	25

**4.1.3 ABS rollers**

The nominal roller dimensions and spindle dimensions for ABS rollers shall be in accordance with Table 4.

**Table 4 — Dimensions and maximum loadings for acrylonitrile-butadiene-styrene (ABS) rollers**

Nominal roller diameter $d_1$ mm	Nominal thickness of tubing mm	Minimum spindle diameter $d_2$ mm	Typical maximum load per roller kg
25	1.7	8	24
30	1.5	10	22
40	2.4	10	32
50	2.8	10	40
60	3.3	10	100

**4.2 Skate wheels**

The nominal diameter and width of skate wheels and the appropriate spindle diameters shall be in accordance with Table 5.

NOTE 1 The typical loading given in Table 5 is for guidance only and depends on the bearing fitted as well as the factors in Table 5.

NOTE 2 A typical skate wheel profile is shown in Figure 5.

**Table 5 — Dimensions and maximum loads for skate wheels**

Nominal diameter of wheel $d_1$ mm	Nominal width of wheel $a$ mm	Minimum diameter of spindle $d_2$ mm	Typical maximum load per wheel kg
30	14	6	12
38	14	6	16
48 <sup>a</sup>	16	8	16
50	18	8	20
55	18	8	22

<sup>a</sup> Preferred size.

**4.3 Roller length**

The nominal roller lengths for straight and curved sections shall be in accordance with Table 6, Table 7 and Table 8.

NOTE The roller length is less than the width between the inside faces of the frame section (width of the conveyor) because of the clearance provided.

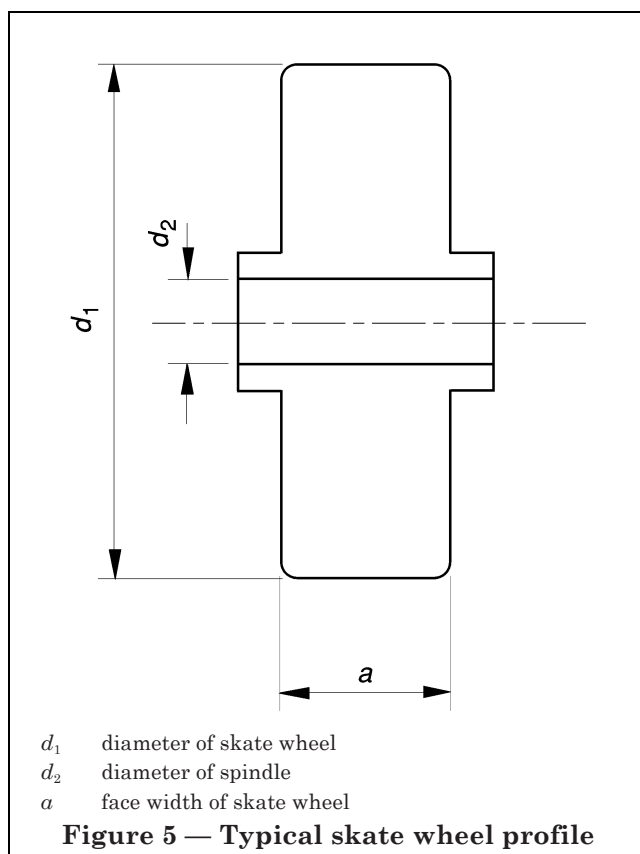


Table 6 — Nominal length of steel rollers

Nominal roller diameter $d_1$ mm	Nominal length of rollers											
	$L$ mm											
25	150	200	300	350	400	450	500	550	600	—	—	—
30	150	200	300	350	400	450	500	550	600	—	—	—
35–76	150	200	300	350	400	450	500	550	600	750	800	900

Table 7 — Nominal length of aluminium rollers

Nominal roller diameter $d_1$ mm	Nominal length of rollers									
	$L$ mm									
25	150	200	300	400	450	—	—	—	—	—
38	150	200	300	400	450	500	600	—	—	—
50	150	200	300	400	450	450	600	750	—	—
57	150	200	300	400	450	500	600	750	—	—

Table 8 — Nominal length of acrylonitrile-butadiene-styrene (ABS) rollers

Nominal roller diameter $d_1$ mm	Nominal length of rollers									
	$L$ mm									
25	150	200	300	—	—	—	—	—	—	—
30	150	200	300	400	—	—	—	—	—	—
40	150	200	300	400	450	500	—	—	—	—
50	150	200	300	400	450	500	600	—	—	—
60	150	200	300	400	450	500	600	750	—	—

#### 4.4 Pitch of rollers and skate wheels

Rollers shall be mounted on a round bar or hexagonal bar spindle.

The nominal pitch of the rollers and skate wheels shall be in accordance with Table 9.

The pitch of the abutting sections shall not be exceeded at the frame section joints.

NOTE The pitch on the centreline of curved sections is not necessarily the same as the adjacent straight track.

Table 9 — Nominal pitch of rollers and skate wheels

Nominal pitch $p$ mm							
37.5	50	75	100	150	200	250	—
41.7	83.3	125.0	166.7	250.0	—	—	—

NOTE The two series of nominal pitches are designed to give two schemes of evenly spaced rollers over 3 m lengths of track. The first series is based on multiples of the pitch dimension and the second is based on multiples of 6 rollers.

#### 4.5 Conveyor width

The minimum width of the conveyor shall take into account the passage of the load round any curved sections that may be required on the conveyor system, as the diagonal dimension of the load could then become critical. The nominal width of conveyor for 90° bends shall be calculated according to the following equation:

$$W = \sqrt{\left(\frac{c}{2}\right)^2 + (b+r)^2} - r + 100$$

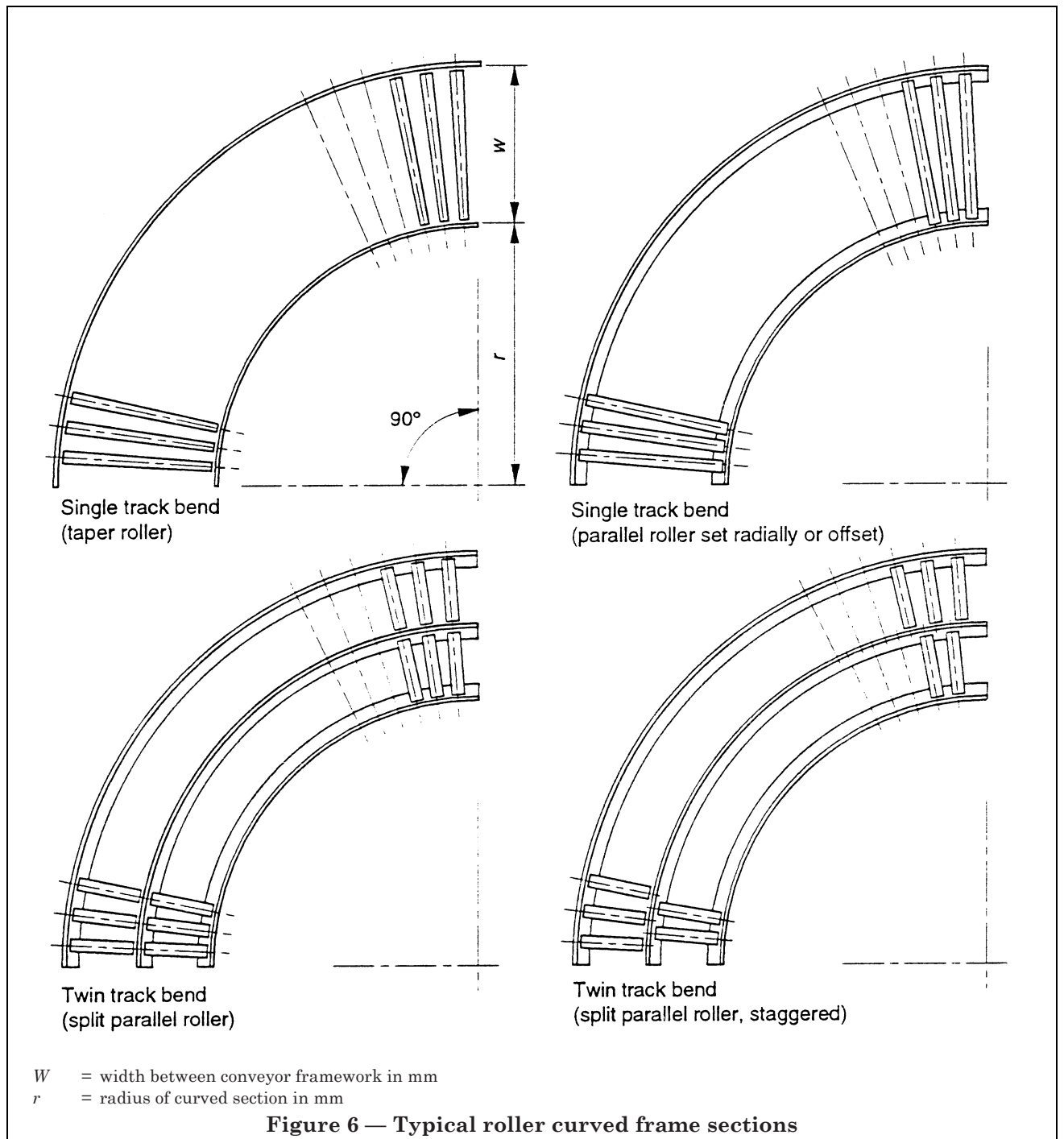
where

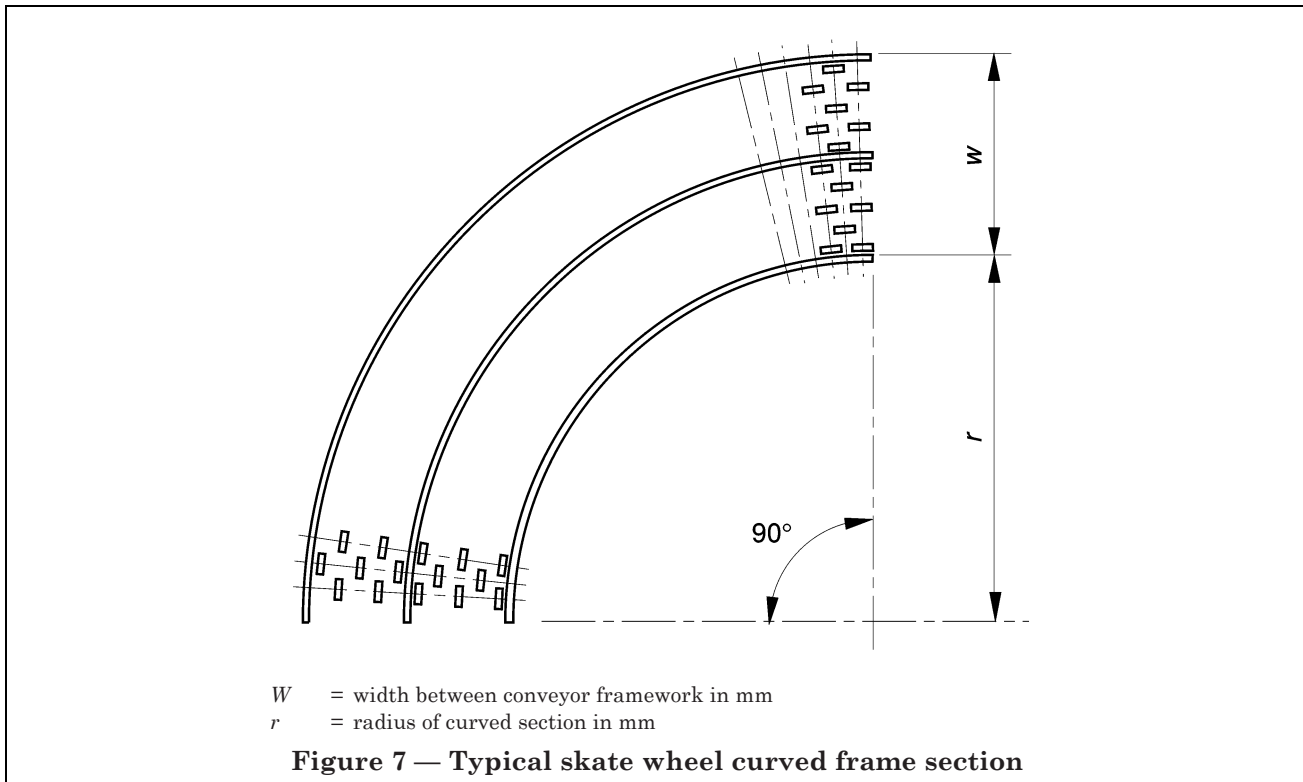
$c$  is the length of load in mm;

$b$  is the width of load in mm;

$r$  is the internal radius of curve in mm;

$W$  is the nominal width of conveyor in mm.  
(See Figure 6 and Figure 7.)





#### 4.6 Gradient

The maximum gradient of a conveyor section transporting flat bottomed loads shall be  $7^\circ$  from the horizontal on any straight section of conveyor.

NOTE 1 The most satisfactory gradients and transition gradients vary according to the type and weight of the load to be carried.

NOTE 2 The presence of curved sections, junctions and guide rails in the system reduces the effect of the slope, thus requiring a greater angle of gradient than a straight conveyor of equivalent duty.

#### 4.7 Frame section supports

Stands shall be positioned under or immediately adjacent to frame section joints and additional intermediate supports shall be provided if required to ensure that no frame section deflection under load shall exceed  $1/400$  of the span under all operating conditions.

### 5 Construction

#### 5.1 Roller materials

##### 5.1.1 Carbon steel rollers

Steel rollers shall be made from electric resistance welded (ERW) steel tube conforming to BS 6323-5, and the spindles shall be manufactured from bright bar low carbon steel conforming to the requirements of BS 970-1.

NOTE 1 Steel rollers are available coated to suit particular environmental conditions, e.g. rubber or plastic coated or zinc plated.

NOTE 2 For high loading the rollers may be externally machined to give uniform diameters.

##### 5.1.2 Stainless steel rollers

Stainless steel rollers shall be manufactured from stainless steel tube conforming to the requirements of BS 6323-8, and the spindles shall be manufactured from material conforming to BS EN 10088-3.

NOTE The grade of stainless steel should be selected according to the environmental conditions.

##### 5.1.3 Acrylonitrile-butadiene-styrene (ABS) rollers

Acrylonitrile-butadiene-styrene (ABS) rollers shall be manufactured from ABS plastics tube conforming to the requirements of BS 5391-1, and the spindles shall be manufactured from stainless steel conforming to BS EN 10088-3.

NOTE ABS rollers are used where good hygiene is of prime importance, for example in the food industry.

##### 5.1.4 Aluminium rollers

Aluminium rollers shall be manufactured from aluminium tube conforming to the requirements of BS 1474:1972, and the spindles shall conform to BS 970-1.

#### 5.2 Skate wheel materials

Skate wheels shall be manufactured from steel in accordance with BS 1449-1 or from acetal co-polymer.

### 5.3 Bearings

Bearings shall be positively located into the tubes of rollers or the bodies of skate wheels.

#### 5.3.1 Standard loading rollers

The ball bearings fitted to steel or aluminium rollers for standard loading (see Table 1) shall be of the single row deep grooved journal type with a pressed steel outer race and machined steel inner race.

NOTE Hardened components and anti-corrosion protection should be applied where the duty warrants this treatment and external seals should be fitted where environmental conditions deem it necessary, for example, where the conveyor is exposed to harsh weather conditions, corrosive liquids or gases, or used in clean areas (food processing, electronic production etc.).

#### 5.3.2 High loading rollers

The ball bearings fitted to steel rollers for high loading (see Table 2) shall be precision bearings of the single row type. The precision bearing shall have machined steel inner and outer races and shall be grease packed and sealed.

NOTE Hardened components and anti-corrosion protection should be applied where the duty warrants this treatment and external seals should be fitted where environmental conditions deem it necessary, for example, where the conveyor is exposed to harsh weather conditions, corrosive liquids or gases, or used in clean areas (food processing, electronic production etc.).

#### 5.3.3 ABS rollers

Bearings fitted to ABS rollers shall be constructed from acetal copolymer with ball bearings manufactured from stainless steel in accordance with BS EN 10088-3, grades 316 S11, 316 S13, 316 S31 or 316 S33.

#### 5.3.4 Carbon steel skate wheels

The ball bearings fitted to carbon steel skate wheels shall be of the single row deep grooved journal type with a pressed steel outer race and machined steel inner race.

NOTE Hardened components and anti-corrosion protection should be applied where the duty warrants this treatment and external seals should be fitted where environmental conditions deem it necessary, for example, where the conveyor is exposed to harsh weather conditions, corrosive liquids or gases, or used in clean areas (food processing, electronic production etc.).

#### 5.3.5 Acetal co-polymer skate wheels

The bearings fitted to acetal co-polymer skate wheels shall be constructed from acetal co-polymer with ball bearings manufactured from stainless steel in accordance with BS EN 10088-3, grades 316 S11, 316 S13, 316 S31 or 316 S33 or carbon steel to BS 1449-1.

### 5.4 Frame section

#### 5.4.1 Construction

A frame section shall be constructed to ensure alignment of rollers and spindles and shall be of sufficient strength to meet the deflection requirement of 4.7.

NOTE Typical arrangements of frame sections are shown in Figure 1.

Coupling between frame sections shall be by means of bolted joint plates or by hook connections.

#### 5.4.2 Dimensions

Straight frame sections shall be manufactured in nominal lengths ( $L$ ) of 3 m.

NOTE 1 It may be necessary to make shorter conveyor sections to suit specific installations.

NOTE 2 A typical roller frame straight section is shown in Figure 2 and a typical skate wheel frame straight section is shown in Figure 4.

### 5.5 Curved frame sections

Curved frame sections for both rollers and skate wheels shall be supplied in sections of 30°, 45°, 60° or 90°.

NOTE 1 It may be necessary to make conveyor sections with other angles to suit specific installations.

NOTE 2 Typical roller curved frame sections are shown in Figure 6 and a typical skate wheel curved frame section is shown in Figure 7.

NOTE 3 The pitch of rollers on curved sections depends upon the duty and application of the plant.

The rollers used in curved frame sections shall be parallel tube rollers or shall be taper tube rollers.

Where parallel tube rollers are used the values for the radius shall be selected from those given in Table 10.

### 5.6 Assembly

Within each straight section of conveyor, rollers and skate wheel spindles shall be nominally parallel to each other and shall not deviate from the normal to the direction of travel of the conveyor by more than 1/300 of the roller length.

On a conveyor the maximum difference between the tops of any two rollers or skate wheels when measured on a line along the length of the conveyor shall not exceed 2 mm anywhere across the width of the conveyor.

Spindles shall be solid through spindles, spring loaded or mounted on stub axles fitted to the framework.

To prevent independent rotation of the roller spindles either restraining wires shall be fitted through the spindles or hexagonal ends to the spindles shall be fitted into corresponding holes in the framework.

## 6 Marking

Conveyor sections shall carry the following information:

- a) the number and date of this British Standard, i.e. BS 2567:1997<sup>1)</sup>;
- b) the manufacturer's name or trademark;
- c) the maximum loading of the section of the conveyor in kg/m for supports at the ends only and with end and central supports;
- d) the maximum load per roller in kg.

**Table 10 — Nominal radii of curved sections using parallel rollers**

Nominal roller diameter  $d_1$ mm	Minimum radius of curve to inside face of inner frame rail  $r$ mm
25	600
30	600
35	600
38	800
40	800
50	800
57	1 000
60	1 000
63	1 000
76	1 000

<sup>1)</sup> Marking BS 2567:1997 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.

## Annex A (normative) Information to be obtained from the purchaser

The following information should be obtained from the purchaser to enable the manufacturer to select the most suitable equipment from his production range for the proposed application:

- a) maximum and minimum dimensions in mm of conveyed load<sup>2)</sup>;
- b) maximum and minimum masses of loads in kg;
- c) particulars of the running surface of the load e.g. is it flat and rigid, what is the material, is it a sack, is the running face two parallel strips carrying the load?;
- d) particulars of any attachment to the load, e.g. binding, strapping, labels, etc;
- e) any special environmental conditions (e.g. such as high or low temperatures, or in dusty, corrosive or abrasive atmospheres, or wet conditions, or exposed sites);
- f) any special hygiene requirements, e.g. ability to be steam cleaned;
- g) whether adjustable or non-adjustable height supporting stands are required;
- h) whether stands are to be fixed or mobile;
- i) maximum accumulating load per 3 m length in kg;
- j) conditions of loading, i.e. single load travel or batching;
- k) details of any impact loading, including its location, i.e. locally or continuously along the conveyor;
- l) details of whether the loading and take off is carried out manually or by powered means;
- m) details of any feeder or take off conveyors of which the required equipment may form part;
- n) intensity of use in h/day;
- o) peak throughput required of the conveyor in kg/h and packs/h;
- p) a sketch of the proposed layout with such details as are available e.g. clearance heights, areas where personnel will work in close proximity to the conveyor and personnel access requirements.

## Annex B (normative) Information to be obtained from the manufacturer

**B.1** The maximum and minimum sizes in mm of loads<sup>2)</sup> that can be carried related to the customer's specified requirements shall be obtained.

**B.2** The maximum and minimum masses of loads in kg related to the customer's specified requirements shall be obtained.

**B.3** The maximum accumulating load capacity/3 m length in kg shall be obtained.

### B.4 Rollers

The information shall include:

- a) length in mm;
- b) diameter in mm;
- c) pitch in mm;
- d) thickness of tube in mm;
- e) spindle type and size in mm;
- f) method of retaining spindle in side frame;
- g) type of bearing (including sealing arrangement if applicable);
- h) material of roller construction;
- i) material of spindle;
- j) permissible load per roller in kg.

### B.5 Skate wheels

The information shall include:

- a) size of wheels in mm (diameter × width);
- b) diameter of spindles in mm;
- c) pitch of spindles in mm;
- d) pitch of wheels on spindle;
- e) number of wheels per spindle;
- f) load per wheel;
- g) load per spindle;
- h) effective width of conveyor;
- i) spindle type and size;
- j) method of retaining spindle in side frame;
- k) type of wheel bearing (including sealing arrangement if applicable);
- l) material of wheel construction;
- m) material of spindle;
- n) number of intermediate spindle supports in width of conveyor.

<sup>2)</sup> The first dimension should be the leading edge normal to the direction of travel, the second the length of the side in the direction of travel and the third the height of the load above the conveyor surface.

## **B.6 Frame section**

The information shall include:

- a) type, material and arrangement of frame members;
- b) length in m;
- c) overall width in mm;
- d) height from bottom of track to top of roller/wheel in mm;
- e) make up section details.

## **B.7 Connections**

Details of coupling between frame sections shall be obtained.

## **B.8 Stands**

The information shall include:

- a) type and material;
- b) whether fixed (with fixing details), free standing or on wheels;
- c) pitch of stands in m;
- d) imposed loading on the floor from the foot of each stand assuming the customer's stated loading.

## **B.9 Guard rails**

The information shall include:

- a) type;
- b) overall height from top of rollers/wheels in mm.

**B.10** The location and details of any safeguards shall be obtained.

## **Annex C (informative) Guidance on design**

### **C.1 Roller pitch**

The pitch of the rollers throughout the conveyor should be such that under any rigid based load there should always be a minimum of three rollers in contact with the load. For example, a 300 mm running surface requires rollers at 100 mm pitch; a 275 mm running surface requires rollers at 75 mm pitch.

**NOTE 1** At loading points the roller pitch may have to be reduced or special rollers provided that are capable of withstanding the shock loads.

**NOTE 2** Flexible loads such as thin, cold or damp cardboard cartons may need more rollers in contact with the load than the minimum requirement to provide extra support and prevent sagging.

### **C.2 Roller width**

**NOTE** Rigid flat based loads and pallets can be carried on rollers of less width than the load.

Cardboard rim based containers or flexible based loads not including sacks should be carried on rollers wider than the load.

### **C.3 Carriage of sacks**

Only firm sacking loads (such as cement and sugar) should be carried on standard roller conveyors.

The manufacturer should be consulted before ordering such equipment for the transportation of sacks.

### **C.4 Wheel spacing on a skate wheel conveyor**

The spacing of the skate wheels, *S*, should be such that under any load there shall be a minimum of three spindles and at least three wheels on each spindle in contact with the load at any one time, for example, a load with a running surface of 400 mm requires a maximum spindle pitch of 130 mm and a load width of 300 mm requires a maximum wheel spacing of 100 mm.

**NOTE** Light loads with a rigid base may be transported on skate wheel conveyors.

### **C.5 Load surface**

Projections on the runway surface of the load (such as binding wire, staples, straps or seams, adhesive tapes or shrink wrap film envelope) impair the free travel of the load and may impose higher loads on the rollers/wheels such that the full load mass may be carried on an individual roller/wheel.

### **C.6 Special sections**

A successful roller conveyor system frequently depends on the proper component sections and accessories such as spur sections, converging sections, hinged sections, gate sections, switch sections, herringbone sections, disappearing roller sections, transfer cars, turntables, rollovers, ball and castor tables and roller spirals. These may require manual assistance at a special section or accessory.



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## List of references (see clause 2)

### Normative references

#### BSI publications

BRITISH STANDARDS INSTITUTION, London

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

BS 970-1:1983, *General inspection and testing procedures and specific requirements for carbon, carbon-manganese, alloy and stainless steel.*

BS 1449, *Steel plate, sheet and strip.*

BS 1449-1:1991, *Carbon and carbon-manganese plate, sheet and strip.*

BS 1474:1987, *Specification for wrought aluminium and aluminium alloys for general engineering purposes: bars, extruded round tubes and sections.*

BS 5304:1988, *Code of practice for safety of machinery.*

BS 5391, *Specification for acrylonitrile-butadiene-styrene (ABS) pressure pipe.*

BS 5391-1:1976, *Pipes for industrial purposes.*

BS 6323, *Specification for seamless and welded steel tubes for automobile, mechanical and general engineering purposes.*

BS 6323-5:1982, *Specific requirements for electric resistance welded (including induction welded) steel tubes.*

BS 6323-8:1982, *Specific requirements for longitudinally welded stainless steel tubes.*

BS EN 10088:, *Stainless steels.*

BS EN 10088-3:19, *Technical delivery conditions for semi-finished products, bars, rods and sections for general purposes.*

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## BSI — British Standards Institution

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