



BS 1651 : 1986

UDC 614.896.2+685.4

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British Standard Specification for **Industrial gloves**

Gants à usages industriels — Spécifications

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Foreword

This revision of BS 1651 has been prepared under the direction of the Personal Safety Equipment Standards Committee. It supersedes BS 1651 : 1966 which is withdrawn. As in the earlier revision the standard aims to minimize the unnecessarily wide variety of types and sizes of industrial gloves but still to cover all preferred types for protection against normal industrial hazards. At the time of publication of this British Standard, no corresponding international standard exists.

The standard is based on practical trials in many industries and on the combined experience of manufacturers and users of the gloves. A summary of glove types and advice on the selection of the appropriate type for particular hazards are given in appendix M. Recommendations on the storage of rubber gloves are given in BS 3574.

As before, for convenience in describing the patterns of sewn gloves and in the interests of international uniformity, the standard adopts the designations in common use in the United States, namely, the 'Clute', 'Gunn' and 'Montpelier' patterns. These patterns are defined and illustrations are provided for these and other glove patterns.

The gloves specified fall into three groups based on the materials used, i.e. leather/fabric, plastics and rubber. The dimensions for leather and fabric gloves are similar since they are based on a common background of development. Rubber and plastics gloves having been developed in a separate industry have a different sizing system. It is not yet possible to reconcile these differences without causing hardship to one industry because of the consequent changes in production machinery.

This revised standard has been so arranged that each group of gloves forms a separate section of the standard. The numbering system has been changed since several of the glove types mentioned in the previous standard are not now included and it was thought advisable to have a complete series of type numbers for the gloves specified.

The committee responsible for this standard have appreciated that, although the flexibility of leather is an important characteristic, a suitable objective test technique has not yet been fully developed and hence that this aspect remains for future consideration.

For this revision, although consideration was given to the inclusion of a chemical resistance chart, it was not considered feasible to take into account all the varied circumstances of use as well as the entirety of chemical agents. In cases when detailed information is required of the protection afforded by impermeable glove materials against particular chemical agents attention is therefore drawn to BS 4724 and to the general guidance given in appendix M.

Textile materials specified for use in gloves, both for the main fabric and for linings, now include synthetic yarns and fabrics.

This British Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Particular attention is drawn to the need to take appropriate precautions in handling the chemicals and reagents required in appendices A and J.

It has been assumed in the drafting of this British Standard that the procedures are to be carried out by appropriately qualified or experienced people.

Compliance with a British Standard does not of itself confer immunity from legal obligations. In particular, attention is drawn to the need for the fibre content to be given in accordance with Statutory Instrument 1973 No 2124 Trade Descriptions, The Textile Products (Indication of fibre content) Regulations.

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Specification. Section one

Section one. General

1 Scope

This British Standard specifies materials, manufacturing details and performance requirements for gloves that afford protection to the hands and, as appropriate, to the wrists of the wearer when carrying out manual operations that are common in the industrial work-place.

The classification system used for industrial gloves is given in table 1 and advice on the types of glove for protection against particular industrial hazards is given in appendix M.

This standard does not cover requirements for the following:

- (a) gloves made from elastomers (e.g. butyl rubber and certain polymers containing fluorine), which are recognized to have value in particular circumstances, there being insufficient experience of their use to justify inclusion in this standard;
- (b) gloves that may be used for special purposes to afford protection against flame and high temperatures, as may be made from the materials specified in clause 3 or from other materials such as aramid, carbon and inorganic (including glass) fibres;
- (c) gloves made from knitted fabrics, other than loop pile fabric, or from non-woven fabrics;
- (d) gloves made of chain mail, constructed of welded linked rings;
- (e) gloves whose use is limited to specialized areas of industry (e.g. for the handling of cryogenic liquids);
- (f) gloves specified in BS 697, BS 1884, BS 2606 and BS 4005.

NOTE. 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 definitions given in BS 1903 and BS 2780 apply together with the following.

2.1 Clute pattern. A four-finger and thumb design, having a one-piece palm, including the fronts of all four fingers,

and a separate cuff (see figure 1(a)). The back comprises three or four separate pieces of material.

2.2 cuff. The extension on a glove or mitt which covers the wrist (examples are shown in figure 2).

2.3 flock lined (rubber or PVC) gloves. Gloves which have their inner surface covered in a layer of pure cotton fibres, anchored into the rubber or PVC during manufacture. These absorb perspiration and help to keep the hands cool during use in a warm environment; conversely, they contribute to warmth when used in a cold application.

2.4 gauntlet. A type of glove which, relative to the wrist glove, provides additional protection for the wrist and part of or the whole of the arm.

2.5 Gunn pattern. A four-finger and thumb design, having the face of the thumb, the palm, and first (index) and fourth (little) fingers made of one or two pieces of material. The back is of one piece up to the cuff and includes the back of the four fingers at least. The fronts of the second and third fingers may be one piece each, jointed to the palm at the base of the appropriate fingers (see figure 1(b)). The back of the glove may be jointed.

2.6 mitt. A covering for the hand and wrist, having a separate thumb and a common covering for the fingers.

2.7 Montpelier pattern. A four-finger and thumb design, having the palm and the fronts of all four fingers in one piece, and the back of the glove and the backs of all four fingers in one piece. This pattern has a fourchette between the fingers (see figure 1(c)).

2.8 one-finger mitt. A covering for the hand and wrist, having a separate thumb and forefinger and a common covering for the remaining fingers.

2.9 wrist glove. A wrist length glove providing covering for the hand and wrist, having separate fingers.

2.10 wristing. Additional fitment attached to the main body of the glove at the open cuff end to present a close fit to the wrist of the wearer.

3 Glove types

For the purposes of this standard, industrial gloves shall be divided into the types given in table 1.

Table 1. Glove types	
Type number	Description
1	Flesh split leather inseam gloves, gauntlets, mitts and one finger mitts
2	Grain leather inseam gloves, gauntlets, mitts and one finger mitts
3	Fabric gloves with leather palms
4	Inseam gloves and gauntlets made wholly from fabric
5	Leather outseam armoured gloves and gauntlets
6	Lightweight PVC supported gloves with a rough finish
7	Lightweight PVC supported gloves with a smooth finish
8	Standard weight PVC supported gloves with a smooth finish
9	PVC gloves with a granular finish
10	Flock lined unsupported PVC gauntlets
11	Unflocked, matt finish, unsupported PVC gauntlets
12	Unlined rubber gloves or gauntlets
13	Flock lined rubber gloves or gauntlets
14	Fabric lined rubber gloves or gauntlets
15	Rubber gloves or gauntlets, fabric or flock lined or unlined with additional rubber reinforcement over the whole or part of the hand

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Section two

Section two. Leather and fabric gloves (types 1 to 5)

4 Materials

NOTE. Materials that are known to be likely to cause skin irritation or any adverse effect on health of the user should not be employed as materials of construction.

4.1 Leather

4.1.1 General requirements

4.1.1.1 The leather shall not contain cuts, holes or grain damage.

4.1.1.2 Grain leather shall not crack when subjected to a double fold grain-side outward. The second fold shall be at right-angles to the first.

4.1.1.3 The leather shall be full chrome tanned, semi-chrome tanned or combination tanned.

4.1.1.4 The tear strength of the leather shall be not less than 11.0 kgf* when tested as described in clause 6 of BS 3144 : 1968.

4.1.1.5 The grease content of the leather when a sample is dried by the method described in clause 3 of BS 1309 : 1974 and subsequently tested as described in clause 4 of BS 1309 : 1974 shall be not less than 5 % and not greater than 25 %.

4.1.1.6 The chromic oxide, zirconium oxide and aluminium oxide content of the leather, calculated on a fat-free basis, shall be in accordance with the following when a sample of the leather is dried by the method given in clause 3 of BS 1309 : 1974 and subsequently tested by the methods given in clauses 8, 13 and 15, as appropriate, of BS 1309 : 1974.

Full chrome leathers shall contain not less than 3.5 % chromic oxide (Cr_2O_3) and semi-chrome leathers not less than 2 % chromic oxide.

Combination tanned leathers not containing an organic tanning agent shall contain not less than 3.5 % of metal oxides derived from mineral tanning agents, i.e. chromic oxide, zirconium oxide and aluminium oxide. Where mineral tanning agents are used in conjunction with an organic tanning agent the leather shall contain not less than 2 % metal oxide in total.

4.1.1.7 The pH value of an aqueous extract of the ground leather, when determined as described in clause 9 of BS 1309 : 1974 shall be not lower than 3.2.

4.1.1.8 When two specimens of the leather are tested as described in clause 16 of BS 3144 : 1968 but using a test temperature of 90 °C and a test time of 1 min, neither specimen shall shrink by more than 10 % of its original area.

4.1.1.9 No chromate shall be detected when a sample of the aqueous extract of the leather, prepared in 4.1.1.7, is tested as described in appendix A.

4.2 Woven fabrics

The breaking strength of the woven fabric shall be in accordance with table 2 when tested by the method described in BS 2576.

Table 2. Breaking strength of woven fabrics

Direction	Breaking strength	
	Unraised	Raised
Warp Weft	N	N
	1100	980
	580	350

4.3 Loop pile fabric (terry fabric)

4.3.1 When tested as described in method 5 of BS 2471 the cloth shall have a minimum mass per unit area of 670 g/m² for medium weight reversible loop pile fabric gloves and mitts and 930 g/m² for heavy weight reversible loop pile fabric gloves and mitts, using the largest sample possible and adapting the procedure and the calculation of results accordingly.

4.3.2 The fabric shall be constructed with 5.5 to 7 courses per centimetre and 3 to 4 wales per centimetre.

4.3.3 When tested as described in appendix B the abrasion resistance of the fabric shall be such that the loss in mass is not greater than 0.18 g.

4.4 Sewing threads

The sewing thread for leather and fabric gloves (types 1 to 5) shall be a polyester and cotton core spun thread complying with the requirements for contractors' metric ticket number 25 (26) given in table 3 of BS 6157 : 1981 or shall be a cotton or linen thread of equivalent tensile strength.

4.5 Stitches

All stitching shall be lockstitch or double thread chain stitch, as defined in BS 3870 : Part 1, and there shall be 27 to 35 stitches per 10 cm for fabric gloves and 23 to 31 stitches per 10 cm for all-leather gloves.

5 Construction and design

NOTE. Details of certain acceptable additional design features are given in appendix C and figure 3.

5.1 Type 1. Flesh split leather inseam gloves and gauntlets, mitts and one-finger mitts

5.1.1 *Style.* Type 1 gloves and gauntlets shall be of the Clute or Gunn pattern and be inseam apart from the back, which may be either inseam or outseam.

*1 kgf = 9.806 65 N.

5.1.2 Materials. The leather shall be flesh splits complying with 4.1.

The thickness for gloves shall be not less than 1.2 mm and not more than 1.6 mm. For one-finger mitts and mitts, the thickness shall be not less than 1.4 mm. The leather of gloves, gauntlets and mitts marked 'heat resistant' (see clause 14) shall comply with 6.2.

The sewing thread shall comply with 4.4.1.

5.1.3 Design. For Clute pattern gloves and one-finger mitts, the palm and the leather covering the back of the first finger and the front of all fingers shall be cut from one piece of leather. The cuff shall be cut from not more than two pieces of leather and shall be joined to the glove by a double row of stitching.

NOTE 1. Provision for a wider opening to the gloves, if required, may, for example, be by a triangular leather gusset fitted at the side seam.

In the case of Gunn pattern gloves and inseam mitts, the palm, fronts of the first and fourth fingers and thumb shall be cut from one piece of leather. The fronts of the second and third fingers shall be cut from one or two pieces of leather. The back shall be cut from one piece of leather.

NOTE 2. Where a wing thumb (see figure 1(d)) is used, a seam wholly or partly along the join between the first finger and palm is permissible.

5.2 Type 2. Grain leather inseam gloves, gauntlets, mitts and one-finger mitts

5.2.1 Style. Type 2 gloves and gauntlets, inseam mitts and one-finger mitts, shall be of the Clute or Gunn pattern, and inseam apart from the back, which may be either inseam or outseam.

5.2.2 Materials. The leather shall comply with 4.1. In the Clute pattern the palm, the fronts of the fingers and the whole of the thumb shall be of grain leather not less than 1.2 mm and not more than 1.7 mm thick. The backs of the fingers shall be either of grain leather or of flesh split leather.

In the Gunn pattern the palm and the fronts of the fingers shall be of grain leather not less than 1.2 mm and not more than 1.7 mm thick. The back shall be of flesh split leather, cut from one piece and shall cover at least three fingers of the backs up to the cuff.

For gloves marked 'heat resistant' (see clause 14), the leather shall comply with 6.2.

The sewing thread shall comply with 4.4.

5.2.3 Design. The cuff shall be made from no more than two pieces and shall be joined to the glove by a double row of stitching.

NOTE. Provision for a wider opening to the gloves, if required, may, for example, be by a triangular leather gusset fitted at the side seam.

Where a vein patch, comprising a semi-circular piece as shown in figure 3(a) of grain leather, is fitted it shall be sewn midway in the palm of the glove at the cuff seam and sewn on to the cuff. The patch shall be not less than 75 mm in diameter.

5.3 Type 3. Fabric gloves with leather palms

5.3.1 Style. Type 3 gloves shall be of the Gunn or Clute pattern with a fabric back and cuff and be inseam sewn.

5.3.2 Materials. The leather shall be flesh splits not less than 1.0 mm thick or grain leather not less than 1.2 mm thick and shall comply with 4.1. For gloves marked 'heat resistant' (see clause 14), the leather shall comply with 6.2.

Woven fabric shall comply with 4.2. Loop pile fabric, except for knitted wristing fabric, shall comply with 4.3. The sewing thread shall comply with 4.4.

5.3.3 Design. Clute pattern gloves shall be one of the following three designs.

(a) Leather palm and thumb with all four finger backs in a textile fabric.

(b) Leather palm, thumb and part wrap around first finger. The second, third and fourth fingers to be from a textile fabric and the leather from the palm shall cover the thumb side of the first finger without seam with the remainder of the first finger to be made from fabric.

(c) Leather palm, thumb and first finger with no seam between the first finger and palm. The second, third and fourth fingers shall be made from a textile fabric. If a woven cuff is used the length after sewing shall be not less than 50 mm. The edges shall be hemmed or overlocked.

In the Gunn pattern, the back shall be of textile fabric in one piece and shall cover at least three fingers of the backs up to the cuff.

5.4 Type 4. Fabric gloves

5.4.1 Style. Type 4 gloves shall be inseam gloves and gauntlets made wholly from fabric.

5.4.2 Materials. Type 4 gloves shall be made from woven or loop pile fabric complying with 4.2 or 4.3 respectively. The sewing thread shall comply with 4.4.

5.4.3 Design. The glove shall be closed inseam and the cuff edge if of woven fabric shall be hemmed or overlocked. The cuff shall be fabricated by one of the following methods:

(a) in the same material as the glove;

(b) in a canvas material of mass per unit area not less than 320 g/m²; or

(c) by use of a fabric to produce a double rib cuff of minimum length 50 mm.

The wristing shall be of mass per unit area not less than 230 g/m².

5.5 Type 5. Leather outseam armoured gloves and gauntlets

5.5.1 Style. Type 5 gloves or gauntlets shall be of the Clute or Montpelier pattern. The seams of the fingers and thumb shall be wire-stitched.

In the Clute pattern the seams on the back of the glove shall be sewn with thread.

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NOTE 1. The fingers and thumb may additionally be sewn with thread.

NOTE 2. The seams may additionally be wire stitched.

5.5.2 Materials. The leather shall be flesh splits complying with 4.1. The thickness for the palm/finger shall be not less than 1.4 mm and not more than 2.0 mm.

The sewing thread shall comply with 4.4.

5.5.3 Design. The glove palm, fingers and working surface of thumb shall be reinforced by galvanized steel staples. The closed staples shall be not less than 2.5 mm wide, not less than 0.5 mm thick and not less than 8 mm long.

The stapling shall be applied diagonally or horizontally to the palm, finger and the front face of the thumb, and shall consist of rows of staples running from the tips of the fingers to the seam joining the cuff. There shall be 130 ± 15 staples on each glove arranged so as to give maximum protection to the wearer. All staples shall be firmly closed.

The palm shall be lined to ensure that the staples do not come into contact with the hand.

NOTE. For this purpose the lining should be of leather or heavy-weight fabric of appropriate thickness.

5.6 Sizing and dimensions

5.6.1 Sizing. Leather- and fabric-fingered gloves shall fit on a glove iron the minimum palm circumference of which is 254 mm for men's gloves and 216 mm for women's gloves.

5.6.2 Dimensions. The minimum outside dimensions of leather and fabric gloves shall be as given in tables 3, 4 and 5 and as shown in figure 4. Gauntlet cuffs shall be not less than 100 mm nor greater than 250 mm in length.

6 Performance requirements

6.1 Abrasion resistance

For gloves marked 'abrasion resistant' (see clause 14), two specimens of the material shall not be holed when tested for 5000 revolutions as described in appendix D.

6.2 Heat resistance

6.2.1 For gloves marked 'heat resistant' (see clause 14), the material shall comply with 4.1.1.1 to 4.1.1.7 and 4.1.1.9 and in addition comply with 6.2.2, 6.2.3 and 6.2.4.

6.2.2 When two specimens of the material are tested as described in clause 16 of BS 3144 : 1968, neither specimen shall shrink by more than 15 %. The results shall be calculated as described in appendix E. After drying and reconditioning as described in clause 2 of BS 3144 : 1968 the specimens shall not become more rigid in their handle to an extent that would impair their use.

6.2.3 When two specimens of the material are tested as described in appendix F, neither specimen shall shrink by more than 30 % of its original area and each shall not become more rigid in handle to an extent that would impair its use.

6.2.4 When two specimens of the material are tested as described in appendix G, neither specimen shall be charred, and neither specimen shall crack on folding through 180° .

Table 3. Minimum outside dimensions of glove types 1, 2, 3 and 4

Position where measured	Figure 4 reference	Men's size	Women's size
From tip of second finger position to top of cuff	A	mm	mm
From tip of second finger position to bottom of cuff	B	255	230
Cuff length	C*	205	185
From tip of forefinger position to crotch of thumb	D	50	45
From tip of thumb to crotch of thumb	E	125	120
Across palm at crotch of thumb	F	75	65
Across bottom of cuff	G	125	110
Across cuff opening	H*†	125	110
*Applicable only to wrist gloves.			
†Not applicable to knitted wrist cuffs.			

Table 4. Minimum outside dimensions of type 5 gloves, Clute pattern

Position where measured	Figure 4 reference	Minimum dimension
		mm
From tip of second finger to top of glove	<i>A</i>	255
From tip of forefinger to crotch of thumb	<i>D</i>	135
From tip of thumb to crotch of thumb	<i>E</i>	75
Across palm at crotch of thumb	<i>F</i>	135
Across cuff opening	<i>H*</i>	135
*Applicable only to wrist gloves.		

Table 5. Minimum outside dimensions of type 5 gloves, Montpelier pattern

Position where measured	Figure 4 reference	Minimum dimension
		mm
From tip of second finger to top of glove	<i>A</i>	255
From tip of forefinger to crotch of thumb	<i>D</i>	125
From tip of thumb to crotch of thumb	<i>E</i>	75
Across palm at crotch of thumb	<i>F</i>	135
Across opening at top of glove	<i>H*</i>	135
*Applicable only to wrist gloves.		