

SPECIFICATION FOR
H-SECTION
STEEL ARCHES
FOR USE IN MINES

BS 227 : 1970

Confirmed

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THIS BRITISH STANDARD, having been approved by the Mining and Quarrying Requisites Industry Standards Committee, was published under the authority of the Executive Board on 11 December, 1970.

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The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

A complete list of British Standards, numbering over 5000, fully indexed and with a note of the contents of each, will be found in the British Standards Yearbook, The BS Yearbook may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

BS 18. Methods for tensile testing of metals.

BS 84. Parallel screw threads of Whitworth form.

BS 916. Black bolts, screws and nuts.

BS 3643. ISO metric screw threads.

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

BS Handbook No. 19. Methods for the sampling and analysis of iron, steel and other ferrous metals.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following BSI references relate to the work on this standard:
Committee reference MQE/2 Draft for comment 69/15074.

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CO-OPERATING ORGANIZATIONS

The Mining and Quarrying Requisites Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government department and scientific and industrial organizations:

Association of Mining Electrical and Mechanical Engineers

British Electrical and Allied Manufacturers' Association

*British Steel Industry

Engineering Equipment Users' Association

Federation of Associations of Mining Equipment Manufacturers

Federation of Manufacturers of Construction Equipment and Cranes

Institute of Quarrying

Institution of Mechanical Engineers

*Institution of Mining Engineers

Mechanical Handling Engineers' Association

*Ministry of Technology

*National Coal Board

The Government department and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

British Bolt, Nut, Screw and Rivet Federation.

BRITISH STANDARD SPECIFICATION FOR H-SECTION STEEL ARCHES FOR USE IN MINES

FOREWORD

This British Standard, prepared under the authority of the Mining and Quarrying Requisites Industry Standards Committee, was first issued in 1926 and later revised in 1934, 1959 and 1966. This new edition takes into account experience that has currently been gained in the use of steel arches, and includes size rationalization within the acceptable range of steel sections.

There has been no deviation from the basis of the type A 4-hole arch joint and fishplate previously standardized and the splay-legged arch is retained.

The use of metric units for ordering purposes is preferred, although corresponding imperial units are shown for reference.

SPECIFICATION

1. SCOPE

This British Standard specifies requirements for steel arches of H-section and splayed-H section for underground roadway support.

2. MATERIAL

2.1 Material of sections. The material shall be steel, made by the open hearth process (acid or basic), the acid Bessemer process, the electric process, or any of the oxygen processes*. If required, the purchaser may select and specify any one of these processes. In the case of the oxygen processes the nitrogen content

* This term includes both top and bottom blown oxygen processes.

of the steel shall not exceed 0.008 %. The use of rimming steel is not permitted.
The material shall comply with the following requirements:

	Sections listed in Tables 3 and 4 Figs 3 to 12		
	Grade A	Grade B	Grade C
Chemical composition:			
Sulphur maximum (per cent)	0.060	0.060	0.060
Phosphorus maximum (per cent)	0.060	0.060	0.060
Mechanical properties			
* Tensile strength, N/mm ² (tonf/in ²)	430 to 510 (28 to 33)	540 to 670 (35 to 43)	650 to 800 (42 to 52)
Elongation per cent minimum:			
(1) with test piece of 200 mm (8 in) gauge length in accordance with BS 18†	20	15	12
(2) with proportional test piece of $5.65 \sqrt{S_0}$ gauge length in accordance with BS 18‡	22	16	13
Cold bend test, doubled over through 180°	Internal radius of $1\frac{1}{2}$ times the thickness of the test piece	Internal radius of $1\frac{1}{2}$ times the thickness of the test piece	Internal radius of $2\frac{3}{4}$ times the thickness of the test piece

NOTE. In cases of dispute regarding the chemical composition of a steel, it is recommended that check analyses should be carried out in accordance with the appropriate method specified in BS Handbook No. 19, 'Methods for the sampling and analysis of iron, steel and other ferrous metals'.

The test pieces for the tensile and cold bend tests shall be taken longitudinally from the web of the section and shall not include the root radii. The width of the test piece for the cold bend test shall, wherever practicable, be not less than 40 mm ($1\frac{1}{2}$ in).

2.2 Material of fishplates. The quality of material of the fishplate shall be in accordance with the requirements for Grade A of 2.1.

* 10 N/mm² = 0.64749 tonf/in².

† BS 18, 'Methods for tensile testing of metals', Table 3.

‡ BS 18, Table 2.

3. IDENTIFICATION MARKING

3.1 Grade A arches shall be unmarked.

3.2 Grade B arches shall be marked on the ends with green paint.

3.3 Grade C, arches of re-rolled rail steel shall be marked in the rolling with the symbol 'RR' at intervals of approximately 600 mm (2 ft). All arches shall be marked in the rolling with the maker's name or identification mark.

4. SECTIONS

The dimensions and mass of the sections used in the manufacture of arches shall be as specified in Tables 3 and 4 and Figs. 3 to 12, subject to the tolerances specified in 6.1.

5. SHAPES OF ARCHES

5.1 Unless otherwise specified by the purchaser (see Appendix A), the arches shall be of the following shapes:

- (1) Straight-legged arch consisting of a semi-circular span with straight legs, of two-piece or three-piece construction (Fig. 1).
- (2) Splay-legged arch consisting of a semi-circular span with legs splayed at approximately 7° to the vertical, of two-piece or three-piece construction (Fig. 2).

5.2 Tables 1 and 2 list the preferred dimensions of two- and three-piece arches, respectively, formed from the sections listed in Tables 3 and 4. The sizes listed do not apply to manhole arches.

5.3 The tolerances on the profiles shall be in accordance with 6.2.

6. MANUFACTURING TOLERANCES

6.1 **Section.** The section as rolled shall comply with the relevant dimensions and mass specified in Tables 3 and 4, and shall be within a tolerance of $\pm 2\frac{1}{2}\%$ of the mass per unit length, and within $+3.2$ mm ($\frac{1}{8}$ in), -0.8 mm ($\frac{1}{32}$ in) of the depth indicated in Figs. 3 to 12, as appropriate.

6.2 **Shape.** The maximum permitted variation from the shape specified in 5.1 and Tables 1 and 2 is ± 25 mm (± 1 in).

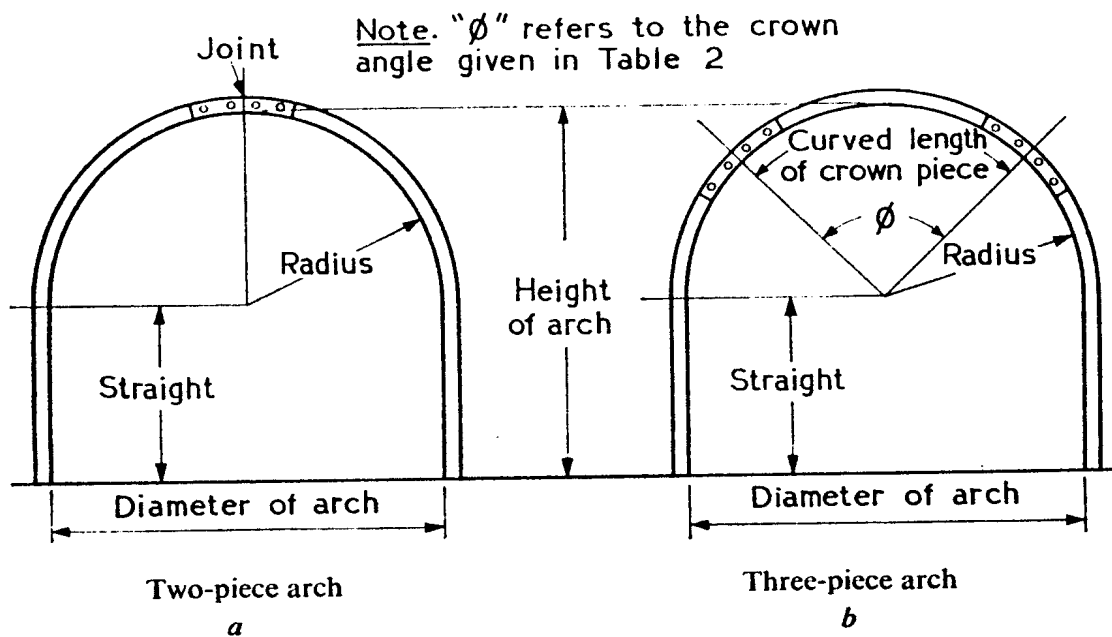


Fig. 1. Straight-legged arches

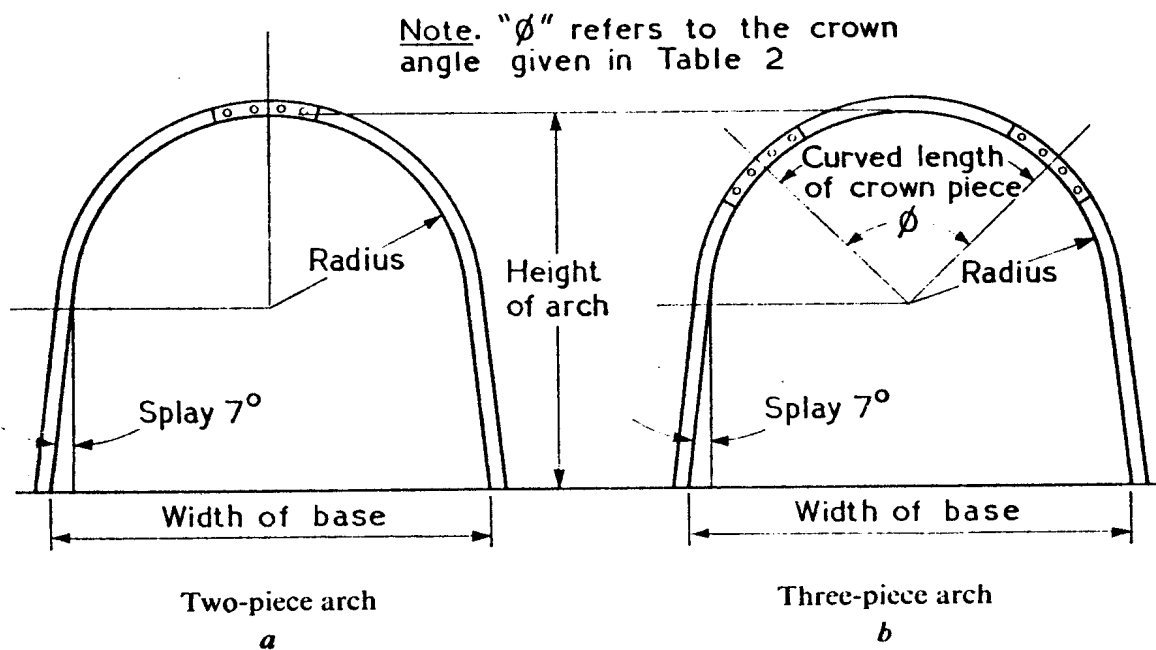


Fig. 2. Splay-legged arches