IS 1323 (1982): Code of practice for oxy-acetylene welding for structural work in mild steels [MTD 12: Welding Applications]

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Indian Standard

CODE OF PRACTICE FOR OXY-ACETYLENE WELDING FOR STRUCTURAL WORK IN MILD STEEL

(Second Revision)

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Indian Standard

CODE OF PRACTICE FOR OXY-ACETYLENE WELDING FOR STRUCTURAL WORK IN MILD STEEL

(Second Revision)

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Indian Standard

CODE OF PRACTICE FOR OXY-ACETYLENE WELDING FOR STRUCTURAL WORK IN MILD STEEL

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 1 June 1982, after the draft finalized by the Welding General Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard, first published in 1959, was revised in 1966. In this revision, the following major modifications have been effected:

a) The allowable stresses have been aligned with those for parent metal given in IS : 800-1962*;

b) Wherever possible the design provisions have been aligned with IS : 816-1969†; and

c) Considering the decline in application of oxy-acetylene welding process for welding of mild steels of thickness above 6·3 mm, this standard has been modified suitably.

0.3 In the preparation of this standard, assistance has been derived from BS : 693-1960 'General requirements for oxy-acetylene welding of mild steel' issued by the British Standards Institution, London.

0.4 This standard does not cover specific information for welding of structural tubes. However, it is considered that this standard is applicable to all forms of structural steel.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960‡. The number of significant places retained in the rounded

*Code of practice for use of structural steel in general building constructino (*revised*).

†Code of practice for use of metal arc welding for general construction in mild steel (*first revision*).

‡Rules for rounding off numerical values (*revised*).

off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard covers the use of oxy-acetylene welding of structural steel work in mild steel of thickness up to and including 6·3 mm.

1.2 This code does not apply to welding of pressure vessels, pipelines and pipe assemblies for fluids under pressure.

1.3 This standard is a supplement to IS : 800-1962* and a complement to IS : 816-1969†.

2. DEFINITIONS

2.1 All terms relating to gas-welded construction shall have, unless specifically defined in this code, the meaning assigned to them in IS : 812-1957‡.

3. MATERIAL

3.1 Parent Metal — Mild steel used for structural members and connections shall conform to IS : 2_6-1975§ or IS : 2062-1969|| or equivalent.

3.2 Filler Rods — Filler rods shall conform to IS : 1278-1972¶.

4. WELDING EQUIPMENT

4.1 Pressure Regulators — Pressure regulators shall conform to IS : 6901-1981**.

4.2 Hose — Welding hose shall conform to IS : 447-1980††.

4.3 Hose Connections — Hose connections shall conform to IS : 6016-1970‡‡.

4.4 Blow Pipes — Blow pipes shall conform to IS : 7653-1975§§.

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*Code of practice for use of structural steel in general building construction (*revised*).

†Code of practice for use of metal arc welding for general construction in mild steel (*first revision*).

‡Glossary of terms relating to welding and cutting of metals.

§Structural steel (standard quality) (*fifth revision*).

||Structural steel (fusion welding quality) (*first revision*).

¶Filler rods and wires for gas welding (*second revision*).

**Pressure regulators for gas cylinders used in welding, cutting and related processes (*first revision*).

††Specification for rubber hose for welding (*third revision*).

‡‡Hose connection for welding and cutting equipment.

§§Manual blowpipes for welding and cutting.

4.5 Other equipment used in oxy-acetylene welding shall conform to relevant Indian Standards, where available.

5. DESIGN

5.1 General Requirements

5.1.1 In designing structures for oxy-acetylene welding, it is recommended that fillet welds be avoided and butt welds be employed as far as possible. Fillet welds should not be used for structures subject to dynamic load.

5.1.2 The arrangement of welds shall be such that uncertainty as to the distribution of stress is minimized. Where an eccentric connection cannot be avoided, the bending effect shall be computed and adequate provision made.

5.1.3 In structures subjected to dynamic load, only complete penetration butt welds shall be used.

5.1.4 In all cases, the location of the weld and the form and dimensions of the weld surfaces shall be such as will provide access for the filler rod and the blow pipe to the surfaces to be welded, and enable the welder to see clearly the work in progress.

5.1.5 Adequate provisions shall be made for controlling the ultimate dimensions and configuration to offset the effects of distortions due to welding. Some general guidelines on distortion control are given in Appendix B.

5.2 Butt Weld

5.2.1 *Size* — The size of butt welds shall be specified by the effective throat thickness.

5.2.2 *Effective Throat Thickness*

5.2.2.1 The effective throat thickness of a complete penetration butt weld shall be taken as the thickness of the thinner member joined. Rein forcement shall be provided to ensure full cross sectional area, but shall not be considered as part of the effective throat thickness.

5.2.2.2 The effective throat thickness of an incomplete penetration butt weld shall be taken as the minimum thickness of the weld metal common to the members joined, excluding the reinforcement.

5.2.3 *Effective Length* — The effective length of a butt weld shall be taken as the length of the continuous weld having minimum effective throat thickness.

5.2.3.1 *Intermittent butt welds* — The effective length of intermittent butt welds shall be not less than four times the longitudinal space between the effective length of welds nor more than 16 times the thinner part joined. Such welds should be used for shear load only.

5.2.3.2 *Transverse skewed butt weld* — Such weld shall not be assumed in computations to be longer than the width of the joint or member perpendicular to the direction of stress.

5.2.4 *Effective Area of Butt Welds* — The effective area of a butt weld shall be considered as the effective length multiplied by the effective throat thickness for the purposes of design calculations for load.

5.2.4.1 *Load carrying butt welds* — Butt welds shall be considered as the parent metal for purpose of design calculation.

5.2.4.2 *Non-load carrying butt welds* — Incomplete penetration butt welds due to non-accessibility, shall be considered as non-load carrying for the purposes of design calculations.

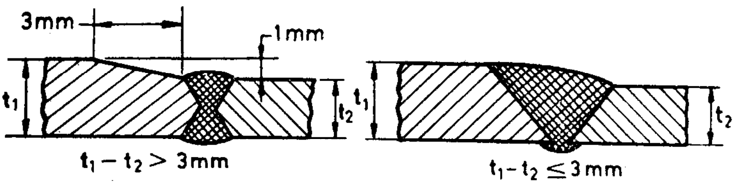
5.2.5 *Sealing* — In all cases, where welded joints are liable to be exposed to detrimental conditions, the joining edges of the contact surfaces shall be sealed by welding; or the parts shall be effectively connected by welding, so that the contact surfaces are securely held in contact to prevent the entry of moisture or other deleterious substances.

5.2.6 *Reinforcement* — Only sufficient surface convexity shall be provided by reinforcement to ensure full cross-sectional area at the joint. The reinforcement shall not be considered as part of the effective throat thickness and may be removed to provide a flush surface, if desired. For a butt weld of parts of equal thickness, the reinforcement shall be as follows:

Plate Thickness	*Reinforcement* mm
Upto and including 6 mm	1·5 to 3·0
Above 6 mm up to and including 10 mm	1·5 to 4·5
Above 10 mm	1·5 to 6

5.2.7 *Butt Welding of Members of Unequal Thickness* — Where members of different thicknesses are butt welded and the surfaces of the members are out of plane by more than 3 mm, the thicker member shall be tapered down so that the slope of the surface from the thinner part shall not be steeper than one in three before butt welded to the thinner members of equal thickness (*see* Fig. 1A).

5.2.7.1 Where the differential thickness is less than or equal to 3 mm, the weld metal shall be built up between the two members to the thickness of the thicker part (*see* Fig. 1B).



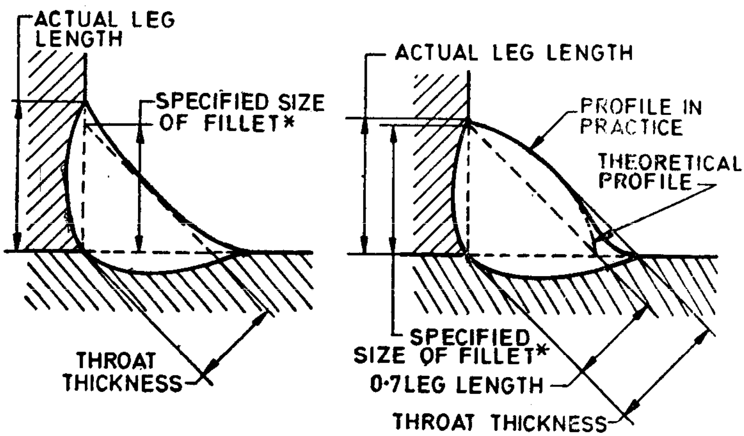
1A Bevelling of Parts of Unequal Thickness

1B Building up of Parts of Unequal Thickness

Fig. 1 Butt Welding of Parts of Unequal Thickness

5.3 Fillet Weld

5.3.1 The size of a fillet weld shall be determined by the minimum leg length (*see* Fig. 2).



*Minimum leg length required.

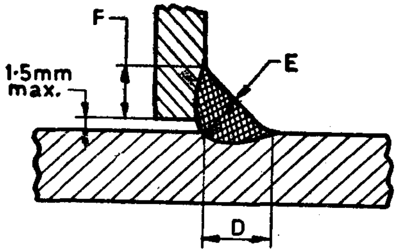
Fig. 2 Dimensions of Fillet Weld

5.3.2 *Effective Throat Thickness* — The effective throat thickness of a fillet weld shall not be less than 3 mm and shall generally be not less than 0·7 times or not more than 0·9 times of the specified size of the fillet weld.

5.3.2.1 *Size of concave fillet welds* — For concave fillet welds, the minimum effective throat thickness shall be specified.

5.3.2.2 For the purpose of design calculations, the effective throat thickness shall be taken as not more than 0·7 times the specified size of fillet welds.

5.3.2.3 *Gap in fillet welds* — In the case of T-fillet and corner welds, the gap between the surfaces of the parts to be joined (*see* Fig. 3) shall be kept to a minimum and shall generally not exceed 1·5 mm at any point before welding.



E = Throat thickness, not less than 0·707 *D* or *F* (whichever is shorter).

FIG. 3 T-FILLET WELD

5.3.3 *Angle Between Fusion Faces* — Fillet weld connecting parts, the fusion faces of which form an angle more than 120° or less than that specified below, according to the position of welding, shall not be relied upon to transmit load :

Flat or downhand welding	60°
Vertical and horizontal vertical welding	70°
Overhead welding	80°

5.3.4 *Effective Length* — The effective length of a fillet weld shall be taken as that length only which is of the specified size and required throat thickness. In practice the actual length of weld shall be the effective length shown on the drawing plus twice the weld size.

5.3.4.1 *Minimum Length* — The effective length of a fillet weld designed to transmit load, shall not be less than four times the size of the weld.

5.3.5 *Intermittent Fillet Weld* — Intermittent fillet welds may be used to transfer calculated stress across a joint when the strength required is less than that developed by a continuous fillet weld of the smallest size for the thickness of the members joined. Intermittent welds are not recommended to be used in the case of main members of structures directly exposed to weather. However, if such intermittent welds are preferred for reasons of economy or otherwise, the welds shall be turned around the corners and edges or ends.

5.3.5.1 The clear spacing between the effective lengths of intermittent fillet welds carrying calculated stress shall not exceed the following number of times the thickness of the thinner plate joined and shall in no case be more than 20 cm:

12 times for compression, and

16 times for tension.

Longitudinal fillet welds at the ends of built-up members shall have an effective length of not less than the width of the component part joined; unless end transverse welds are used, in which case, the sum of the end longitudinal and end transverse welds shall be not less than twice the width of the component part.

Chain intermittent welding is to be preferred to staggered intermittent welding. Where staggered intermittent welding is used, the ends of the component part shall be welded on both sides.

5.3.5.2 In a line of intermittent filler welds, the welding shall extend to the ends of the parts connected; for welds staggered about two edges, this applies generally to both edgs, but need not apply to subsidiary fittings or components, such as intermediate web stiffeners.

5.3.6 *Fillet Welds Applied to the Edge of a Plate or Section*

5.3.6.1 Where the fillet weld is applied to the rounded toe of a rolled section or square edge of a part, the specified size of the fillet weld should generally not exceed three-fourths of the thickness of the section at the toe, unless the leg length is specifically built up to make it equal to the thickness of the section or the plate.

5.3.7 In lap joints, the minimum amount of lap shall be at least five times the thickness of the thinner part and welds shall be provided at the end of each part.

5.3.7.1 A side fillet weld is a fillet weld stressed in longitudinal shear, that is, a fillet weld the axis of which is parallel to the direction of the applied load (*see* Fig. 4).

5.3.7.2 An end fillet weld is a fillet weld stressed in transverse shear, that is, a fillet weld the axis of which is at right angles to the direction of the applied load (*see* Fig. 4).

5.3.7.3 A diagonal fillet weld is a fillet weld of which the axis is inclined to the direction of the applied load.

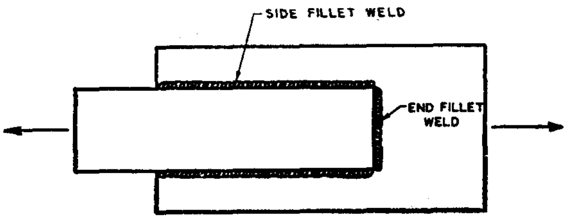


FIG. 4 JOINT SHOWING SIDE AND END FILLET WELDS

5.3.7.4 If side fillet welds alone are used in end connections, the length of each side fillet weld shall be not less than the distance between them.

5.3.7.5 End fillets shall be so arranged that the weld is subjected to either tension or compression.

5.3.7.6 A T-fillet weld is a fillet weld joining two parts, the end or edge of one part butting on a surface of the other part (*see* Fig. 3).

5.3.8 *Plug Welds* — The effective area of a plug weld shall be considered as the nominal area of the hole in the plane of faying surface. Plug welds shall not be designed to carry stresses.

5.3.8.1 Where plug welds are used in holes through one or more of the parts being joined, the total thickness of assembly shall not exceed 6·3 mm. The diameter of the hole shall be $2 \times t$ or 12 mm whichever is smaller. Centre to centre distance between adjacent holes shall not be less than 25 mm and distance from the nearest edges shall not be less than $3 \times t$, where 't' is the aggregate thickness of the parts to be joined by plug weld.

5.3.9 *Bending About Single Fillet Weld* — A single fillet weld shall not be subjected to a bending moment about the longitudinal axis of the fillet.

5.3.10 *End Returns* — Fillet welds terminating at the ends or sides of parts or members shall, wherever practicable, be turned continuously around the corners in the same plane for a distance not less than twice the size of the weld. This provision shall, in particular, apply to side and top fillet welds in tension which connect brackets, beam seatings and similar parts.

5.3.11 *Combinations of Welds* — If two or more of the general types of weld (butt, fillet, plug and slot) are combined in a single joint, the effective capacity of each shall be separately computed with reference to the axis of the group, in order to determine the allowable capacity of the combination.

6. PERMISSIBLE WORKING STRESSES

6.1 Shop Welds

6.1.1 *Butt Welds* — Butt welds shall be treated as parent metal with a thickness equal to the effective throat thickness, and the working stress shall not exceed those permitted in the parent metal (*see* **10** of IS : 800-1962*).

6.1.2 *Fillet Welds* — The permissible working stress in fillet welds based on the effective throat thickness area shall be 108 MPa (1 100 kgf/cm^2).

6.1.3 The permissible shear stress on plug welds, based on the nominal area of the hole in the plane of the faying surface, shall be 108 MPa (1 100 kg/cm^2).

6.2 Site Welds

6.2.1 Site welds made during the erection of structural members shall be reduced to 80 percent of the permissible working stresses of those given in **6.1** for tension and shear.

6.3 Increased Permissible Stresses — Where design calculations take into consideration the effects of wind or earthquake, or both, the permissible stresses given in **6.1** may be increased by 25 percent. In no case shall the welds thus provided be less than those needed if the effects of wind or earthquake or both are neglected.

7. WELDING PROCEDURE

7.1 Butt joints between members of equal thickness shall be welded in accordance with the procedure laid down in Table 1, regarding the following:

a) Edge preparation for thickness range,
b) Assembly,
c) Welding positions, and
d) Welding technique.

7.2 Welding Technique — Welding shall be carried out by one of the two techniques of oxy-accetylene gas welding process as described in Appendix A.

7.2.1 It is recommended that rightward (or backward) welding technique be used only when thickness of the plate is around 6 mm for butt joints and in case of fillet welds, where the aggregate thickness is more than 10 mm.

NOTE — For general recommendation regarding the method of welding reference may be made to SP : 12-1975†.

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*Code of practice for use of structural steel in general building construction (*revised*).
†ISI handbook for gas welders.

7.3 Flame Conditions

7.3.1 For ensuring metallurgical integrity of weld deposit, flame conditions need to be adjusted and maintained at desired level. General guidance has been outlined in Appendix C.

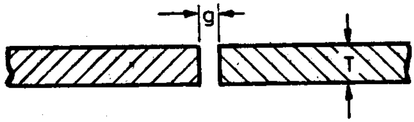
TABLE 1 PROCEDURE FOR OXY-ACETYLENE WELDING FOR BUTT WELDS

(*Clause* 7.1 *and* A-5.1)

i) *Type of Joint:* Square Edge Butt Joint

Thickness Range: 1·6 to 6·3 mm

Assembly:

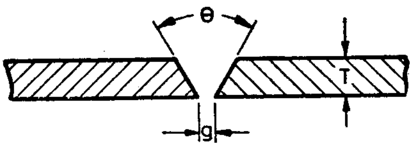


Thickness Range, T, mm	Gap, g, mm	Position	Welding Technique
1·6 to 3·15	T	Flat	Forward
3·15 to 6·3	T/2	Flat	Backward
1·6 to 5·0	T	Vertical	Forward One operator
5·0 to 6·3	T/2	Vertical	Forward Two operators
3·15 to 6·3	T/2	All positions	Backward

ii) *Type of Joint:* Single Vee Groove Butt Joint

Thickness Range: 3·15 to 6·3 mm

Assembly:



Thickness Range, T, mm	Gap, g, mm	Included Angle, θ	Position	Welding Technique
3·15 to 6·3	3·15	80°–90°	Flat	Forward
Above 6·0	T/4	60°–70°	Flat	Backward
5·0 to 6·3	4·0 *Max*	50°–60°	All positions	Backward

8. WORKMANSHIP

8.1 For general recommendations regarding workmanship reference may be made to SP : 12*.

8.2 The surfaces to be welded and the surrounding material for a distance of at least 12 mm from the weld shall be freed from scale and cleaned so as to remove dirt, grease, paint, heavy rust or other surface deposit, wire brushing shall be used if necessary. A coating of linseed oil applied for the purpose of preventing corrosion may be disregarded.

8.3 Fusion faces may be cut by shearing, chipping, machining or machine gas cutting. Hand cutting by gas may be substituted for machine gas

*ISI handbook for gas welders.

cutting only if the latter is impracticable, and in such a case the cutter shall be adequately guided so that the cut edge is clean and uniform.

8.3.1 If the prepared fusion face is irregular, it shall be dressed by chipping, filling or grinding to the satisfaction of the engineer or the purchaser.

8.4 The piece to be welded shall be securely held in their correct relative positions during welding, so as to ensure that the gap is maintained uniformly and the distortion is controlled to a minimum.

8.4.1 The welding sequence adopted shall be such that distortion is reduced to a minimum (*see* Appendix B).

8.5 The deposition of the weld metal shall be carried out, so as to ensure that:

a) welds are of good clean metal deposited by a procedure which will ensure uniformity and continuity of the weld, and
b) the surfaces of the weld have an even contour and regular finish and indicate proper fusion with the parent metal.

8.6 Care shall be taken to ensure that full penetration and fusion is obtained up to the root of welds.

8.6.1 The bottom or underside of a butt weld shall be characterized by an even bead of penetrated weld metal (*see* Fig. 5).

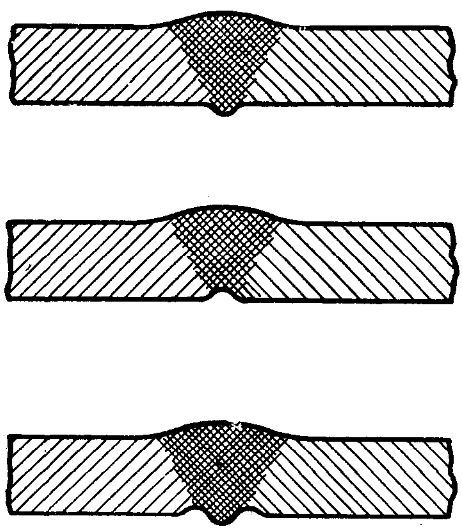


FIG. 5 GOOD BUTT WELDS

8.6.2 A defective weld without a bead of penetrated weld metal is shown in Fig. 6.

NOTE — The penetration bead should join with the surface of the parent metal in a smooth continuous contour indicating fusion between penetrated weld metal and parent metal. A hard or sharp line along the edge of the weld metal penetration bead is likely to indicate lack of fusion between penetrated weld metal and parent metal.

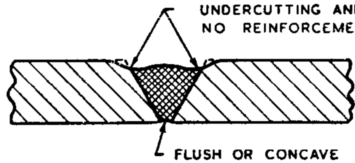


FIG. 6 DEFECTIVE BUTT WELD

8.7 Welds showing cavities or lack of proper fusion shall be cut out and re-welded to the satisfaction of the engineer or the purchaser.

8.8 Care shall be taken to avoid undercutting and, where serious undercutting occurs, the reduction shall be made good by additional weld metal to the satisfaction of the engineer or the purchaser.

8.9 Welds and adjacent parts shall not be painted until approved by the engineer or purchaser. If a protective coating is required, then clean linseed oil may be used.

8.10 Welders shall be provided with such staging and, if necessary, protection as will enable them to perform the welding operations properly.

8.11 All welding equipment shall be in good condition and capable of enabling the welder to provide and maintain the correct flame at all times.

8.12 Flame Conditions

8.12.1 Flame conditions shall be as given in Appendix C.

9. INSPECTION AND TESTING

9.1 For purposes of inspection and testing, reference should be made to IS : 822-1970* and SP : 12†.

*Code of procedure for inspection of weld.
†ISI handbook for gas welders.

10. OPERATOR QUALIFICATION

10.1 For details on operator qualification, reference should be made to IS : 1393-1961*. They shall also be subjected to appropriate qualifying tests specified in IS : 7307 (Part I)-1974†, IS : 7310 (Part I)-1974‡ and IS : 7318(Part I)-1974§.

11. SAFETY REQUIREMENTS AND HEALTH PROVISIONS

11.1 For purposes of safety requirements and health provisions, reference should be made to IS : 818-1968|| and IS : 3016-1965¶.

APPENDIX A

(*Clause* 7.2)

METHOD OF OXY-ACETYLENE WELDING

A-1. RIGHTWARD (OR BACKWARD) METHOD

A-1.1 In the rightward method, welding blowpipe and welding rod are so disposed that the flame points back at the completed weld while the rod is interposed in between and is constantly in the molten puddle (*see* Fig. 7). The welding rod is given an elongated elliptical motion on the surface of the weld puddle.

A-2. ALL-POSITION RIGHTWARD METHOD

A-2.1 The all-position rightward technique is a modification of rightward (or backward) method, whereby the flame precedes the rod (*see* Fig. 8). This method is particularly suitable for the welding of mild steel plate and pipe in vertical, horizontal-vertical and overhead positions.

A-3. LEFTWARD (OR FORWARD) METHOD

A-3.1 In the leftward method, welding blowpipe and welding rod are so disposed that the flame points away from the complete weld and the rod is followed by the flame (*see* Fig. 9).

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*Code of practice for training and testing of oxy-acetylene welders.

†Approval tests of welding procedures: Part I Fusion welding of steel.

‡Approval testing of welders working to approval welding procedures: Part I Fusion welding of steel.

§Approval tests for welders when welding procedure approval is not required: Part I Fusion welding of steel.

||Code of practice for safety and health requirements in electric and gas welding and cutting operations (*first revision*).

¶Code of practice for fire precautions in welding and cutting operations.

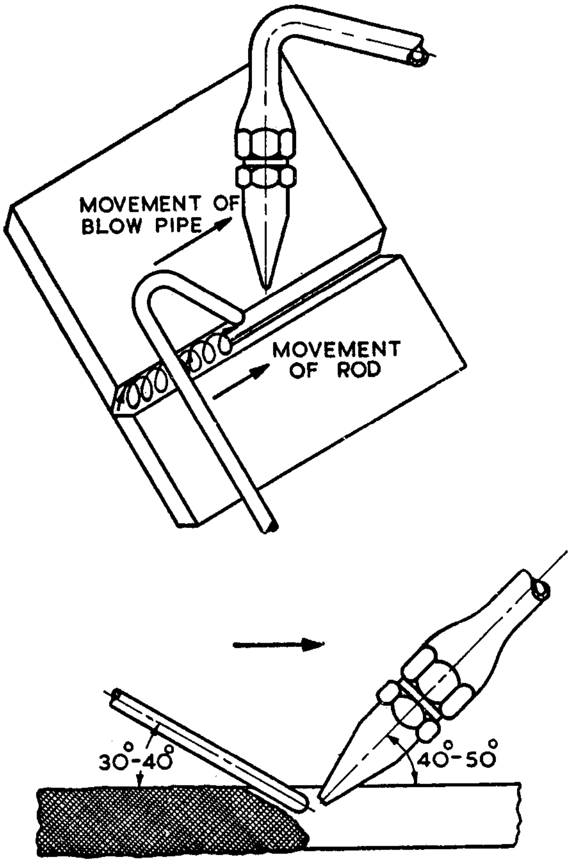


FIG. 7 RIGHTWARD OR BACKWARD WELDING

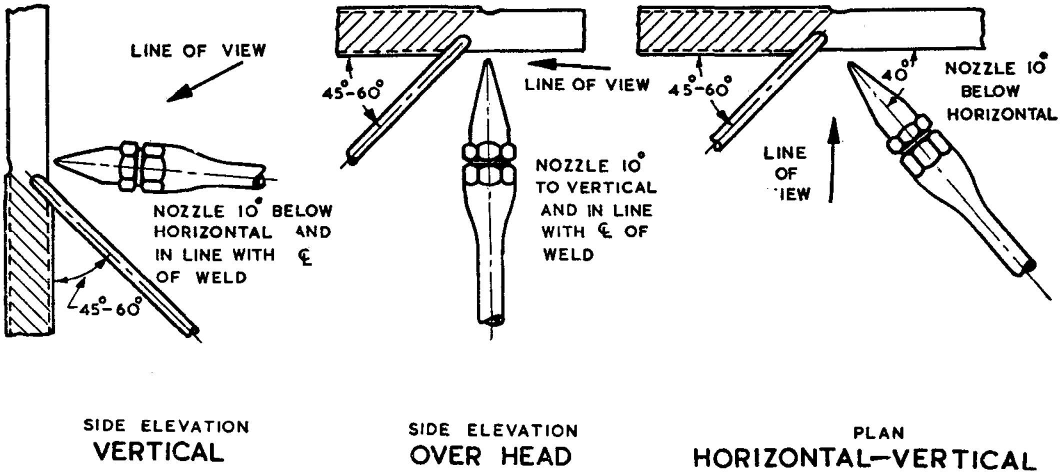


FIG. 8 ALL-POSITION RIGHTWARD WELDING

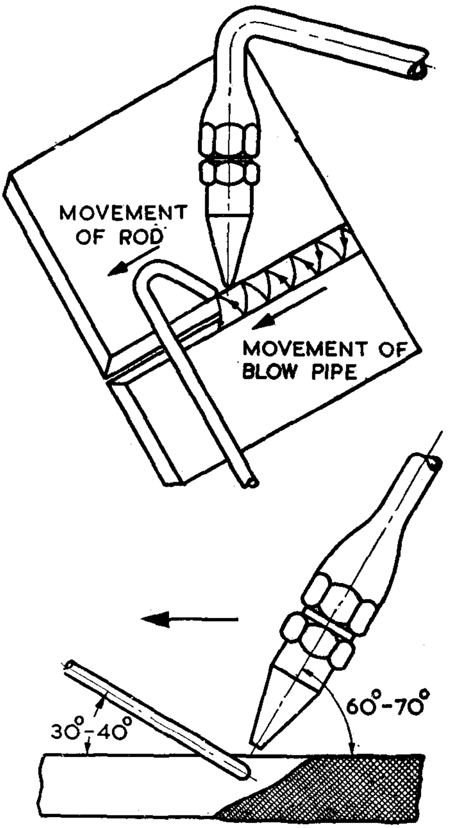


FIG. 9 LEFTWARD OR FORWARD WELDING

A-4. VERTICAL UPWARD WELDING, SINGLE OPERATOR

A-4.1 In this method, the welding is done by a single operator and the welding proceeds upwards, using the technique where the welding rod precedes the flame along the joint (*see* Fig. 10).

A-5. VERTICAL UPWARD WELDING, TWO OPERATORS WORKING SIMULTANEOUSLY

A-5.1 In this technique, the two operators face each other on opposite sides of the joint. The operators use blowpipes of the same power, welding proceeds upwards, using the technique where the welding rod

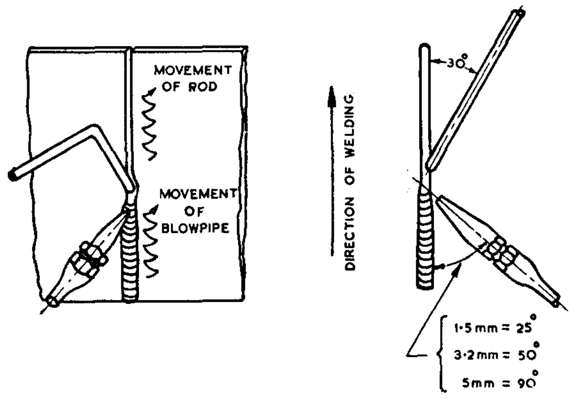


Fig. 10 Vertical Upward Welding Single Operator

precedes the flame along the joint (*see* Fig. 11). Butt welds only are possible by this technique. Steel plates up to 6·3 mm thick need not be bevelled, and the gap between the abutting edges shall be as given in Table 1.

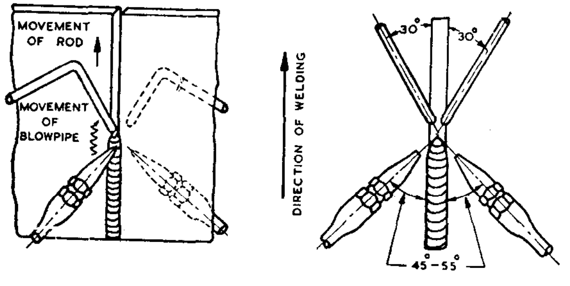


Fig. 11 Vertical Upward Welding, Two Operators

APPENDIX B

(*Clauses* 5.1.5 *and* 8.4.1)

DISTORTION CONTROL

B-1. Distortion is likely to be present in assemblies requiring the application of heat. In oxy-acetylene welding of sheet metal in particular, this problem may be quite serious.

B-1.1 Distortion may be minimized and in some cases completely overcome if suitable precautions are taken. The following guiding principles are useful:

a) The recommendations with regard to plate edge precaution, gap-settings, etc, should be followed properly.
b) Tacks should be equally spaced and the sizes of tacks should be minimum and commensurate with holding the weld seam in correct alignment.
c) Back-step or skip welding should be done in case of relatively long seams; the idea is to keep the distribution of heat uniform as far as practicable.
d) Use of welding jigs and chills is very helpful and where these are used, care should be taken to see that the welder finds easy access to the seam and is able to perform the welding comfortably.
e) Pre-setting of parts to be joined to nullify distortion due to contraction of the work may also be used.

APPENDIX C

(*Clauses* 7.3.1 *and* 8.12)

FLAME CONDITIONS

C-1. WELDING FLAME

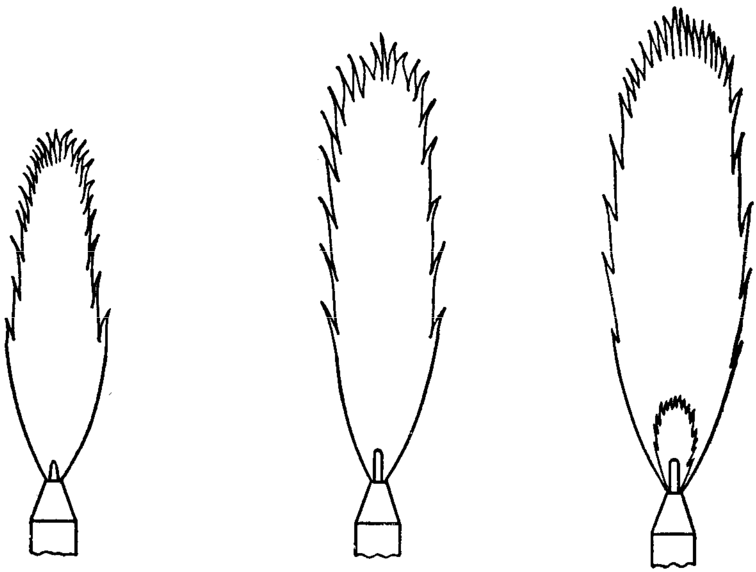
C-1.1 The maintenance of a constant flame at the desired adjustment is most important. Generally, for steel the flame should be neutral, that is, the inner cone should be sharply defined with a very slight haze or flicker at the end of it. This haze or flicker provides an 'indicator', which by its disappearance will show when the flame is tending to become oxidizing (*see* Fig. 12).

C-2. WELDING NOZZLE

C-2.1 The orifice of the welding nozzle shall be kept clean at all times during the welding operation, so that a regular and symmetrical inner cone may be maintained.

C-3. SIZE OF INNER CONE

C-3.1 The size of the inner cone shall be regulated by changing the nozzle and adjusting the gas pressure for different thicknesses of parent metal so that the proper amount of heat is obtained to perform the welding operation.



12A Oxidizing Flame (Excess of Oxygen) (An oxidizing flame is necessary for welding brass)

12B Neutral Flame (Equal quantities of Oxygen and Acetylene) (For steel, stainless steel, cast iron, copper, aluminium, etc)

12C Carburizing flame (Excess of Acetylene) (A small excess of acetylene is necessary for stelliting, hard-facing, etc)

FIG. 12 FLAME CONDITIONS

Adjustment of the flame size is preferably made by changing the nozzle rather than by altering the gas pressure.

C-4. GAS PRESSURE

C-4.1 The gas pressure, shall be substantial as recommended by the manufacturers for the nozzle being used.

C-5. MANUAL OPERATION OF WELDING FLAME

C-5.1 The flame shall be manipulated, so as to maintain a puddle of molten metal of sufficient size without overheating either the parent metal or the deposited metal. Excessive or unnecessary manipulation which agitates the weld metal and exposes it to atmospheric contamination shall be avoided. Impurities encountered or produced during the welding operation, usually appearing as small white specks, globules or flakes, shall be floated to the surface of the weld metal by melting below their lodgement.

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