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Components of air duct

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Federation of Duct industry Associations (JFDA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS A 4009**:1997 is replaced with this Standard.

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Components of air duct

1 Scope

This Japanese Industrial Standard specifies components of air duct (hereafter referred to as duct) used for air conditioning and ventilation system (including gas exhausting system).

The comparison table between previous and current editions of this Standard on technically significant revisions is given in Annex A.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

- JIS A 6517 *Steel furrings for wall and ceiling in buildings*
- JIS A 9504 *Man made mineral fibre thermal insulation materials*
- JIS B 1180 *Hexagon head bolts and hexagon head screws*
- JIS B 1181 *Hexagon nuts and hexagon thin nuts*
- JIS B 1213 *Cold headed rivets*
- JIS C 8305 *Rigid steel conduits*
- JIS G 3101 *Rolled steels for general structure*
- JIS G 3191 *Dimensions, mass and permissible variations of hot rolled steel bars and bar in coil*
- JIS G 3192 *Dimensions, mass and permissible variations of hot rolled steel sections*
- JIS G 3193 *Dimensions, mass and permissible variations of hot rolled steel plates, sheets and strips*
- JIS G 3194 *Dimensions, mass and permissible variations of hot rolled flat steel*
- JIS G 3302 *Hot-dip zinc-coated steel sheet and strip*
- JIS G 3317 *Hot-dip zinc—5 % aluminium alloy-coated steel sheet and strip*
- JIS G 3321 *Hot-dip 55 % aluminium-zinc alloy-coated steel sheet and strip*
- JIS G 3323 *Hot-dip zinc-aluminium-magnesium alloy-coated steel sheet and strip*
- JIS G 3350 *Light gauge steel sections for general structure*
- JIS G 3452 *Carbon steel pipes for ordinary piping*
- JIS G 4304 *Hot-rolled stainless steel plate, sheet and strip*
- JIS G 4305 *Cold-rolled stainless steel plate, sheet and strip*
- JIS H 4160 *Aluminium and aluminium alloy foils*
- JIS K 6741 *Unplasticized poly (vinyl chloride) (PVC-U) pipes*
- JIS K 6744 *Polyvinyl chloride prepainted and laminated metal sheet and strip*

JIS K 6745 *Plastics—Unplasticized poly (vinyl chloride) sheets*

JIS K 6771 *Flexible vinyl tube*

JIS K 6804 *Poly(vinylacetate) emulsion adhesives for woods*

JIS Z 1525 *Pressure sensitive adhesive polyvinyl chloride tapes for packaging*

3 Terms and definitions

For the purposes of this Standard, the following terms and definitions shall apply.

3.1 standard dimensions

dimensions specified in consideration for the production, usage and distribution, etc. over the long period

3.2 recommended dimensions

dimensions that should be adopted wherever possible for the efficient production, usage and distribution, etc.

3.3 limit pressure

the maximum pressure at which the duct can maintain the structural safety when the duct internal pressure temporarily increases due to the closing of a damper in the duct, except when the instant pressure change occurs due to the quick closing

4 Classification

Ducts shall be classified according to the material, cross-sectional shape, jointing method and internal pressure and as follows.

a) Classification by duct material

- 1) Hot-dip zinc-coated steel sheet duct (including polyvinyl chloride lined steel sheet duct)
- 2) Stainless steel sheet duct
- 3) Rigid polyvinyl chloride duct
- 4) Glass wool duct

b) Classification by cross-sectional shape

- 1) Rectangular duct
- 2) Circular duct and circular spiral duct

c) Classification by jointing method of hot-dip zinc-coated steel sheet and stainless steel sheet rectangular duct

- 1) Angle flange technique duct
- 2) Corner bolt technique duct
 - 2.1) Transverse flange technique duct
 - 2.2) Slide-on flange technique duct

- d) **Classification by duct internal pressure** The classification and pressure range shall be as given in Table 1. However, the low pressure duct shall be applied for glass wool duct.

Table 1 Classification and pressure range by duct internal pressure

Unit: Pa

Classification by duct internal pressure	Working pressure ^{a)}		Limit pressure	
	Positive pressure ^{b)}	Negative pressure ^{b)}	Positive pressure ^{b)}	Negative pressure ^{b)}
Low pressure duct	+500 or under	within -500	+1 000	-750
High pressure duct 1	Over +500 up to and incl. +1 000	Over -500 up to and incl. -1 000	+1 500	-1 500
High pressure duct 2	Over +1 000 up to and incl. +2 500	Over -1 000 up to and incl. -2 000	+3 000	-2 500
Notes ^{a)} Working pressure means the duct internal pressure during normal operation and is expressed by the difference from atmospheric pressure outside the duct. The working pressure of rigid polyvinyl chloride duct shall be 2 000 Pa or under. ^{b)} Positive pressure and negative pressure mean the condition in which the internal pressure of duct is higher or lower than the atmospheric pressure outside the duct, respectively.				

5 Dimensions and structure

5.1 Duct dimensions

The dimensions of duct shall be the inside dimensions of duct as shown in Figure 1. The rectangular duct dimensions shall be expressed by lateral dimension × vertical dimension, and circular duct and circular spiral duct dimensions by internal diameter.

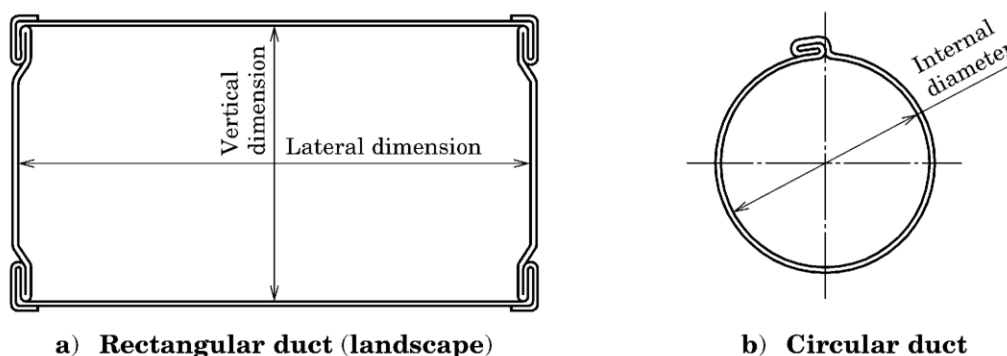


Figure 1 Duct cross-sectional dimensions

5.1.1 Rectangular duct dimensions

The longer side and shorter side dimensions of rectangular duct shall be as given in Table 2.

Table 2 Longer side and shorter side dimensions of rectangular duct

Unit: mm

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Shorter side	Longer side																																
	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	900	1 000	1 100	1 200	1 300	1 400	1 500	1 600	1 700	1 800	1 900	2 000	2 100	2 200	2 300	2 400	2 500	
100		○	○	○	○		○																										
150		○	○	○	○		○		○		○																						
200			○	○	○		○		○		○		○		○																		
250				○	○		○		○		○		○		○		○																
300					○		○		○		○		○		○		○		○														
350																																	
400							○		○		○		○		○		○		○		○		○		○								
450																																	
500									○		○		○		○		○		○		○		○		○		○		○				
550																																	
600											○		○		○		○		○		○		○		○		○						
650																																	
700													○		○		○		○		○		○		○		○						
750																																	
800															○		○		○		○		○		○		○						
900																																	
1 000																	○		○		○		○		○		○						
1 100																																	
1 200																			○		○		○		○		○						
1 300																																	
1 400																																	
1 500																																	

○ shows the standard dimensions. The recommended dimensions are shown within the broad frames.

The maximum value of aspect ratio in recommended dimensions shall be 1:4.

The longer side of duct in transverse flange technique shall be a maximum of 2 200 mm.

5.1.2 Dimensional tolerances of cross section of rectangular duct

The dimensional tolerances of cross section of rectangular duct shall be a maximum of +2 mm and a minimum of 0 mm for both longer and shorter sides.

5.1.3 Internal diameters of circular duct and circular spiral duct

The internal diameters of circular duct and circular spiral duct shall be as given in Table 3.

Table 3 Internal diameters of circular duct and circular spiral duct

Unit: mm

75	250	550	900
100	300	600	1 000
125	350	650	1 100
150	400	700	1 200
175	450	710	1 250
200	500	800	

5.1.4 Tolerances on internal diameters of circular duct and circular spiral duct, and on external diameter of socket joint

The tolerances on internal diameters of circular duct and circular spiral duct, and on external diameter of socket joint shall be as given in Table 4.

Table 4 Tolerances on internal diameters of circular duct and circular spiral duct, and on external diameter of socket joint

Unit: mm

Internal diameter of duct	Tolerances on internal diameter of duct		Tolerances on external diameter of socket joint	
	Minimum	Maximum	Minimum	Maximum
75	0	+2.0	− 1.2	− 1.9
100				
125				
150				
175				
200				
250				
300				
350				
400				
450				
500				
550				
600				
650				
700				
710			− 2.0	− 2.2
800				
900				
1 000				
1 100				
1 200				
1 250				
The dimensional tolerances of circular glass wool duct shall be a maximum of +3 mm and a minimum of −3 mm.				

5.2 Sheet thickness

The sheet thickness shall be selected based on the duct internal pressure. The shorter and longer sides of rectangular duct shall be of equal thickness.

5.2.1 Rectangular duct

The sheet thickness of rectangular duct shall be as follows. If vertical or lateral dimension is susceptible to change, it shall be the sheet thickness for the maximum dimension of the changed vertical or lateral dimension.

- a) **Hot-dip zinc-coated steel sheet duct** The sheet thickness shall be as given in Table 5.

Table 5 Sheet thickness of hot-dip zinc-coated steel sheet duct

Unit: mm

Longer side of duct		Sheet thickness
Low pressure duct	High pressure ducts 1 and 2	
450 or under	—	0.5
Over 450 up to and incl. 750	—	0.6
Over 750 up to and incl. 1 500	450 or under	0.8
Over 1 500 up to and incl. 2 200	Over 450 up to and incl. 1 200	1.0
Over 2 200	Over 1 200	1.2

- b) **Stainless steel sheet duct** The sheet thickness shall be as given in Table 6.

Table 6 Sheet thickness of stainless steel sheet duct

Unit: mm

Longer side of duct		Sheet thickness
Low pressure duct	High pressure ducts 1 and 2	
750 or under	—	0.5
Over 750 up to and incl. 1 500	—	0.6
Over 1 500 up to and incl. 2 200	450 or under	0.8
Over 2 200	Over 450 up to and incl. 1 200	1.0
—	Over 1 200	1.2

- c) **Rigid polyvinyl chloride duct** The sheet thickness shall be as given in Table 7.

Table 7 Sheet thickness of rigid polyvinyl chloride duct

Unit: mm

Longer side of duct			Sheet thickness
Low pressure duct and high pressure duct 1	High pressure duct 2		
1 000 (Pa) or under	Over 1 000 (Pa) up to and incl. 1 500 (Pa)	Over 1 500 (Pa) up to and incl. 2 000 (Pa)	
500 or under	500 or under	—	3
Over 500 up to and incl. 1 000	—	500 or under	4
Over 1 000 up to and incl. 2 000	Over 500 up to and incl. 2 000		5
Over 2 000	Over 2 000		6

- d) **Glass wool duct** The sheet thickness shall be 25 mm.

5.2.2 Circular duct

The circular duct shall be as follows.

- a) **Hot-dip zinc-coated steel sheet and stainless steel sheet ducts** The sheet thickness shall be as given in Table 8.

Table 8 Sheet thickness of hot-dip zinc-coated steel sheet and stainless steel sheet ducts

Unit: mm

Internal diameter of duct		Sheet thickness
Low pressure duct	High pressure ducts 1 and 2	
500 or under	—	0.5
Over 500 up to and incl. 630	—	0.6
—	450 or under	0.8
—	Over 450 up to and incl. 630	1.0

- b) **Glass wool duct** The sheet thickness shall be 25 mm.

5.2.3 Circular spiral duct

The circular spiral duct shall be as follows.

- a) **Hot-dip zinc-coated steel sheet duct** The sheet thickness shall be as given in Table 9.

Table 9 Sheet thickness of hot-dip zinc-coated steel sheet duct

Unit: mm

Internal diameter of duct		Sheet thickness
Low pressure duct	High pressure ducts 1 and 2	
450 or under	200 or under	0.5
Over 450 up to and incl. 710	Over 200 up to and incl. 560	0.6
Over 710 up to and incl. 1 000	Over 560 up to and incl. 800	0.8
Over 1 000 up to and incl. 1 250	Over 800 up to and incl. 1 000	1.0
—	Over 1 000 up to and incl. 1 250	1.2

- b) **Stainless steel sheet duct** The sheet thickness shall be as given in Table 10.

Table 10 Sheet thickness of stainless steel sheet duct

Unit: mm

Internal diameter of duct		Sheet thickness
Low pressure duct	High pressure ducts 1 and 2	
560 or under	250 or under	0.5
Over 560 up to and incl. 800	Over 250 up to and incl. 560	0.6
Over 800 up to and incl. 1 000	Over 560 up to and incl. 800	0.8
Over 1 000 up to and incl. 1 250	Over 800 up to and incl. 1 000	1.0
—	Over 1 000 up to and incl. 1 250	1.2

5.3 Seam

5.3.1 Structure of seam

The structure of seam shall be as follows.

- a) **Seam structures of hot-dip zinc-coated steel sheet and stainless steel sheet ducts** The seam structures and the application shall be as shown in Figure 2.

Unit: mm

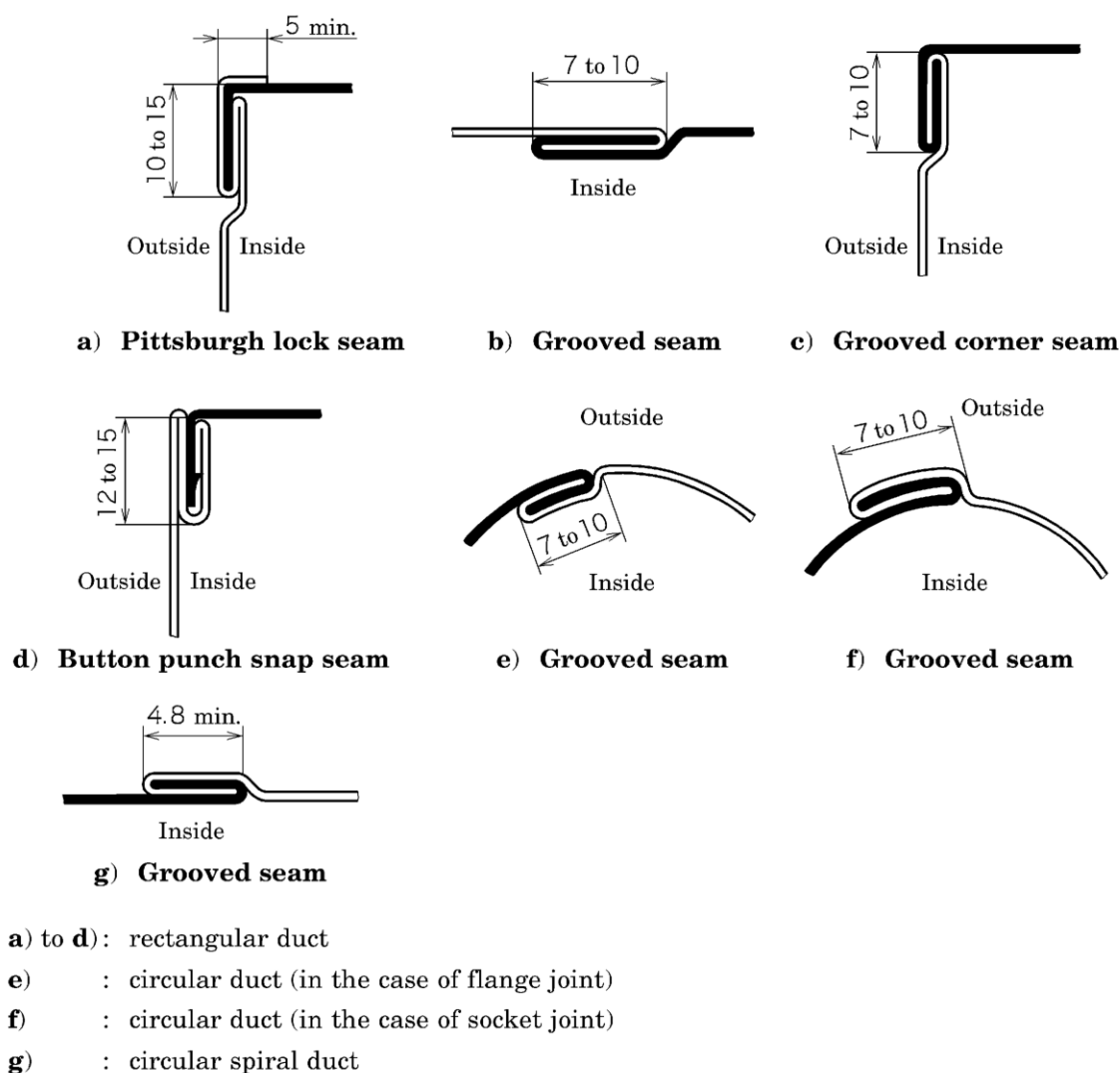


Figure 2 Seam structures and application

- b) **Seam structure in glass wool duct** The seam structure shall be as follows.

- 1) **Seam in rectangular duct** The junction at corner is formed into rectangular duct, leaving not less than 35 mm of aluminum foil (flap). The duct is placed on the adjacent board and fixed temporarily by a staple at intervals of not more than 50 mm. The aluminum tape not more than 75 mm in width is pressure-bonded by a spatula on the duct. The staple shall be 12 mm in shoulder width and 13 mm to 15 mm in leg length. An example of seam structure is shown in Figure 3.

Unit: mm

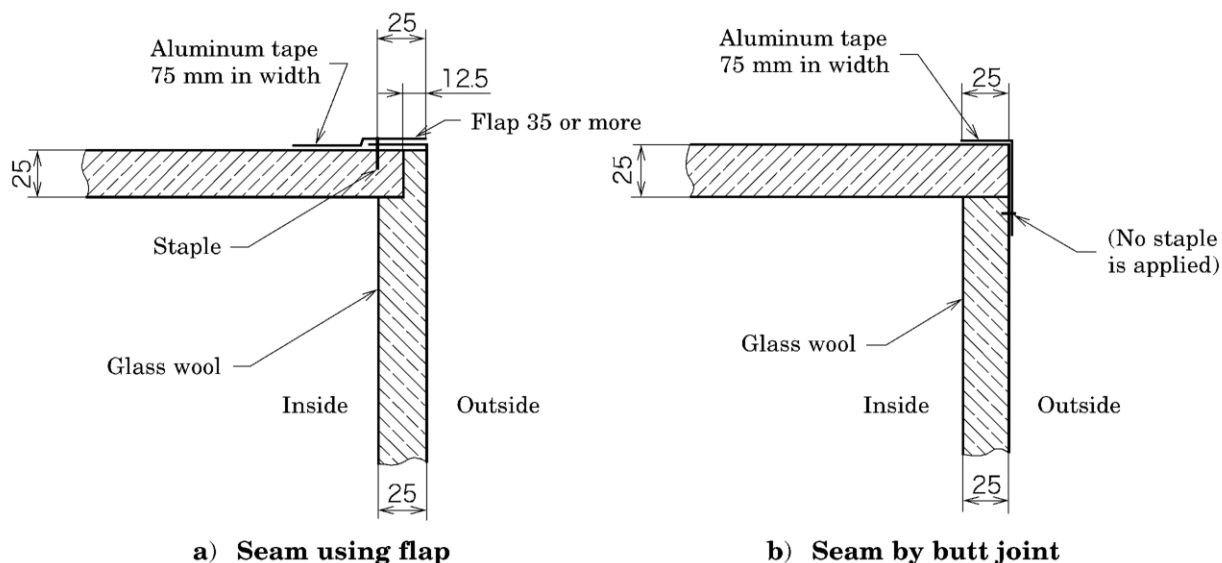


Figure 3 Examples of seam structure in glass wool rectangular duct

- 2) **Seam in circular duct** The adhesive is applied to the junction to form a circular duct. The aluminum tape not less than 50 mm in width is pressure-bonded by a spatula on the outer surface of seam. An example of seam structure is shown in Figure 4.

Unit: mm

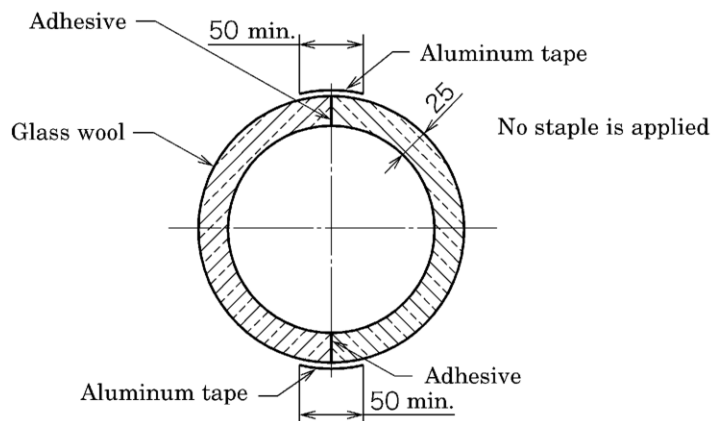


Figure 4 Example of seam structure in glass wool circular duct

- c) **Seam structure in rigid polyvinyl chloride duct** In general, the straight duct part is bended at four corners, and butt-welded by hot gas at the position other than bended part. Examples of seam structure are shown in Figure 5. The ends of sheet to be welded are chamfered at an angle of 60° to 90° by a file, grinder, etc.

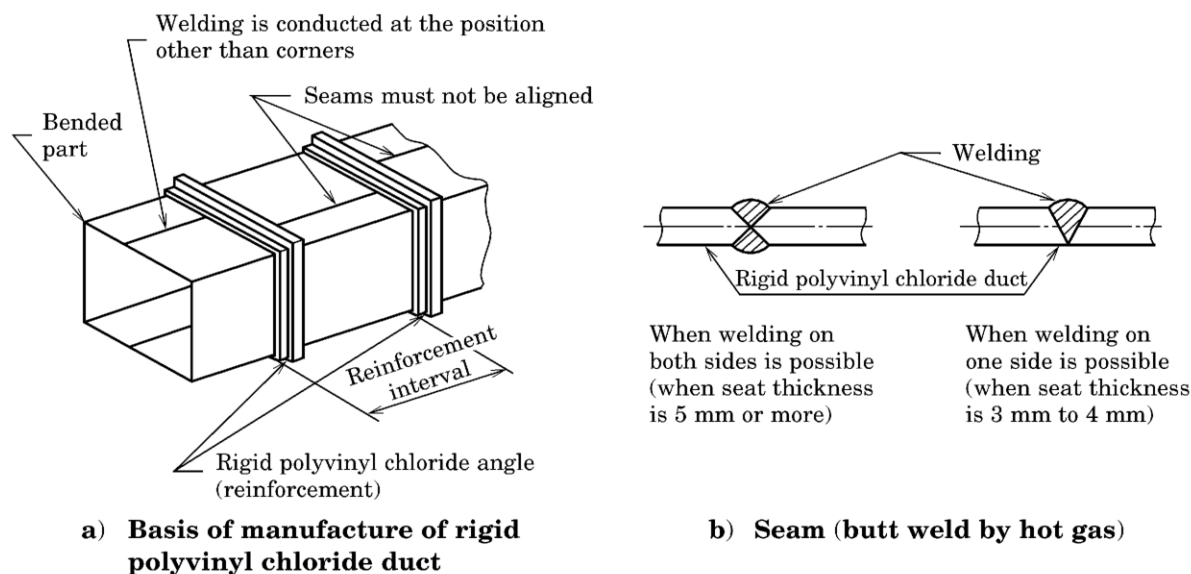


Figure 5 Examples of seam structure in rigid polyvinyl chloride duct

5.3.2 Position of seam

The position of seam shall be as follows.

a) Longitudinal seam position in rectangular duct

- 1) There are six types of longitudinal seams in rectangular duct as shown in a) to f) of Figure 6.
- 2) For hot-dip zinc-coated steel sheet and stainless steel sheet ducts, two or more seams shall generally be made to maintain the duct strength.
- 3) For glass wool duct, the positions in c) and f) of Figure 6 are not used.
- 4) For rigid polyvinyl chloride duct, the corner of straight duct part shall not be the seam.

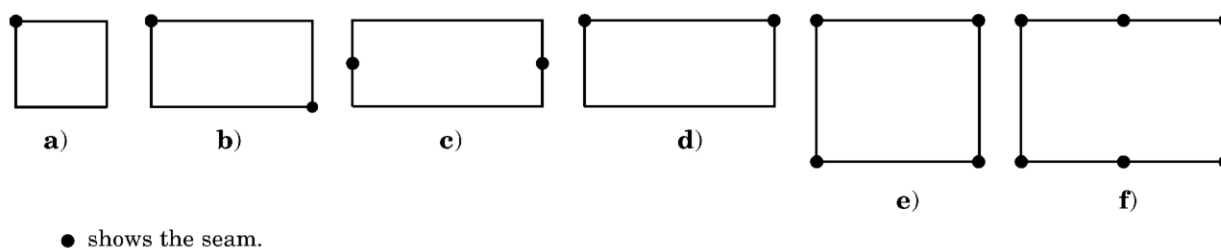


Figure 6 Longitudinal seam position in rectangular duct (type)

b) Longitudinal seam position in circular duct

- 1) The longitudinal seam in circular duct shall be of two types as shown in Figure 7.
- 2) For hot-dip zinc-coated steel sheet and stainless steel sheet ducts, the seam position shall be as shown in Figure 7 a).
- 3) For glass wool duct, the seam position shall be as given in Figure 7 b), or the seam shall be integrated in the duct.

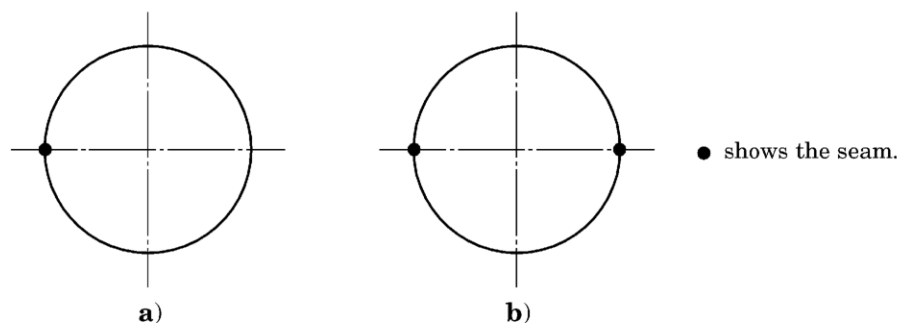


Figure 7 Longitudinal seam position in circular duct

5.3.3 Seam pitch in circular spiral duct

The seam pitch in circular spiral duct shall be as given in Table 11.

Table 11 Seam pitch in circular spiral duct

Unit: mm

Internal diameter	Seam pitch
100 or under	125 or under
Over 100 up to and incl. 1 250	150 or under

5.4 Structure of joint

5.4.1 Joint of hot-dip zinc-coated steel sheet ducts and stainless steel sheet ducts

5.4.1.1 Joint of rectangular duct

The joint of rectangular duct shall be as follows.

a) Angle flange technique duct

- 1) In the angle flange technique, the duct is welded by tightening the angle flanges attached to both duct ends with bolts and nuts.

The gasket is inserted between the jointing faces of angle to keep the air tightness. An example of construction is shown in Figure 8 a).

- 2) The outer surfaces at four corners of angle are welded. The angle flange is assembled so that the flange contacting surface becomes flat and smooth, and is drilled.
- 3) The folded part of duct end shall be at least 5 mm.
- 4) The bolt hole dimensions at the corner of angle flange shall be as shown in Figure 8 c). The angle flange dimensions shall be as given in Table 12.
- 5) The joint materials of low pressure duct shall be as given in Table 13, and the joint materials of high pressure ducts 1 and 2 shall be as given in Table 14.