WELDING POSITIONS

(ASME SEC IX,AWS)

P.ARCHUNAN .M.E

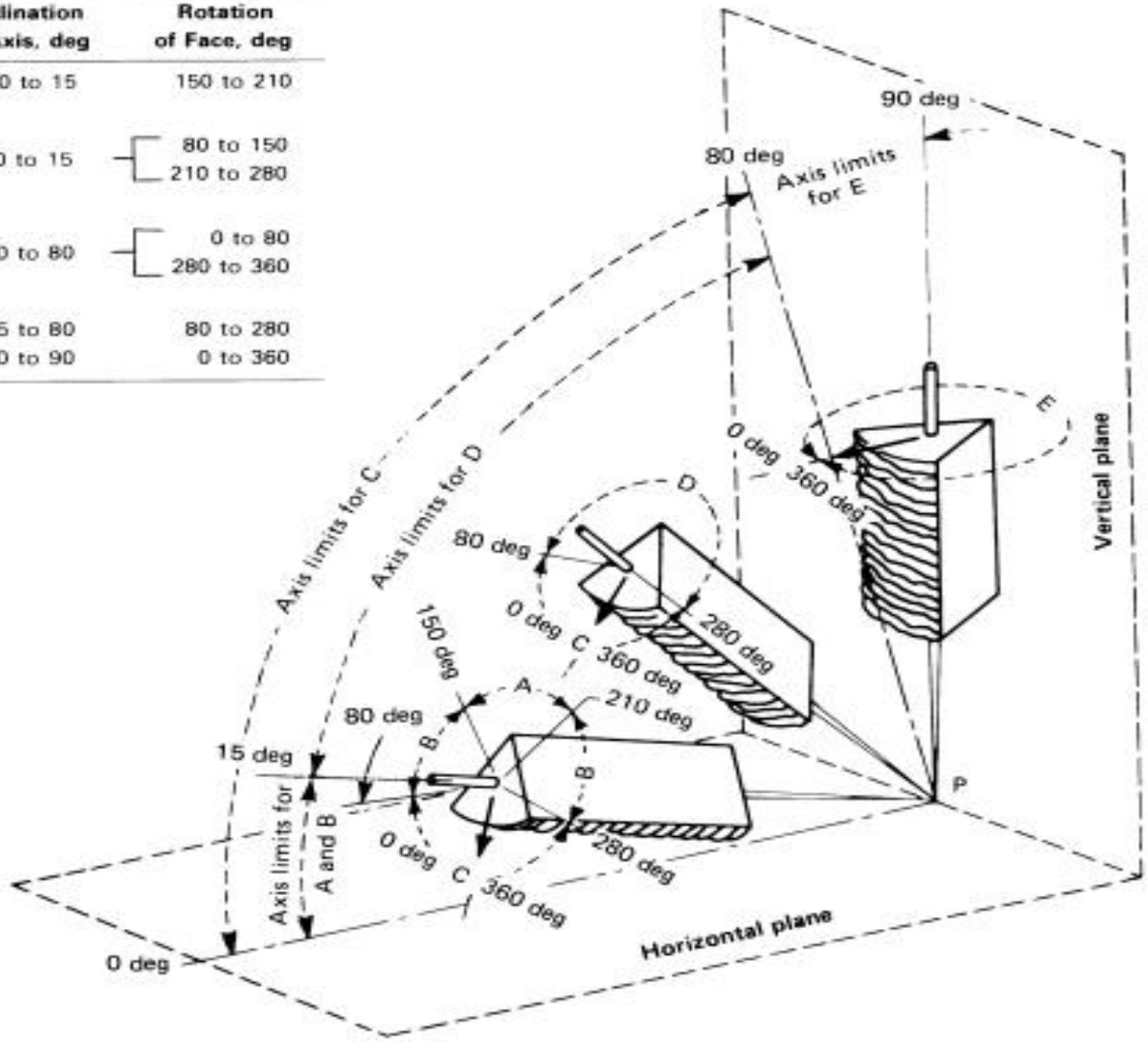
Welding Technology

Welding Position (ASME)-Groove Orientation

Positions of Welds — Groove Welds

Tabulation of Positions of Welds

Position	Diagram Reference	Inclination of Axis, deg	Rotation of Face, deg
Flat	A	0 to 15	150 to 210
Horizontal	B	0 to 15	80 to 150 210 to 280
Overhead	C	0 to 80	0 to 80 280 to 360
Vertical	D	15 to 80	80 to 280
	E	80 to 90	0 to 360

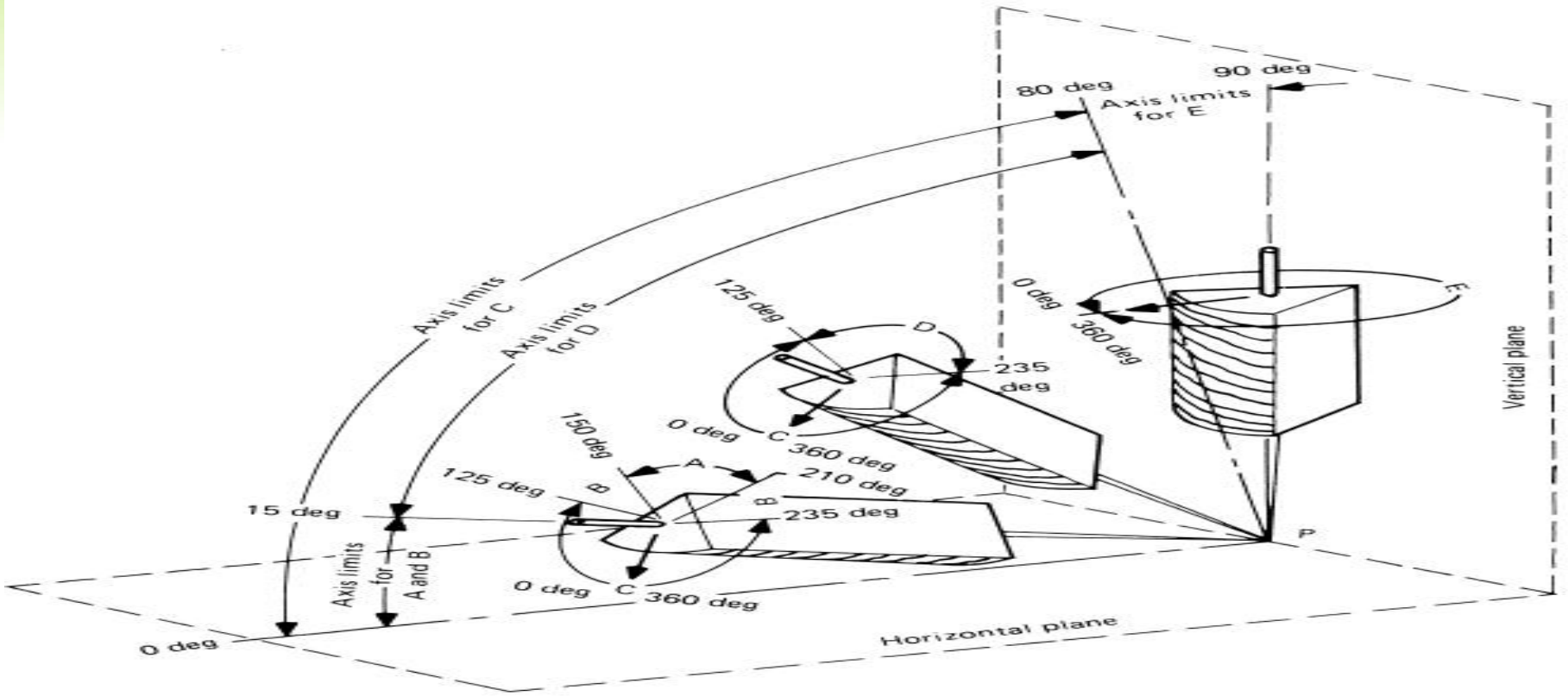


FILLET WELD ORIENTATION

Positions of Welds — Fillet Welds

Tabulation of Positions of Fillet Welds

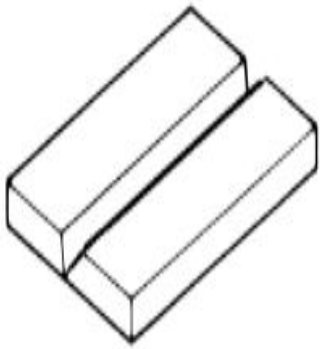
Position	Diagram Reference	Inclination of Axis, deg	Rotation of Face, deg
Flat	A	0 to 15	150 to 210
Horizontal	B	0 to 15	125 to 150 210 to 235
Overhead	C	0 to 80	0 to 125 235 to 360
Vertical	D	15 to 80	125 to 235
	E	80 to 90	0 to 360



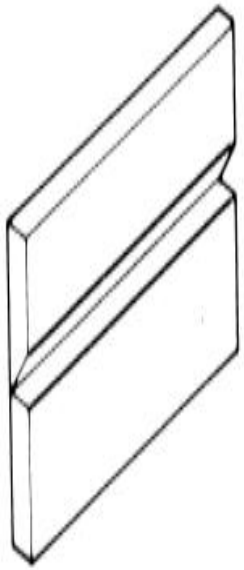
POSITIONS OF GROOVE WELD(G-GROOVE)

POSITION	PLATE	PIPE
1G- FLAT POSITION -PLATE OR PIPE AXIS WITH HORIZONTAL	WELD DEPOSITED FROM ABOVE.	PIPE ROTATES;TORCH REMAINS STATIONARY.
2G-HORIZONTAL POSITION-PLATE OR PIPE AXIS WITH VERTICAL	WELD DEPOSITS IN HORIZONATL AXIS.	PIPE STATIONARY
3G –VERTICAL POSITION -PLATE AXIS WITH VERTICAL	WELD DEPOSITS IN VERTICAL AXIS.	NOT APPLICABLE.
4G-OVER HEAD POSITION - PLATE AXIS WITH HORIZONTAL	WELD DEPOSITED FROM UNDERNEATH.	NOT APPLICABLE.
5G- MULTIPLE POSITION- PIPE AXIS IN HORIZONTAL; WELD GROOVE IN VERTICA AXIS	NOT APPLICABLE.	WELD DEPOSITED IN VERTICAL AXIS.
6G- MULTIPLE POSITION- PIPE AXIS 45˚ INCLINED TO HORIZONTAL	NOT APPLICABLE.	WELDING SHALL BE DONE WITHOUT ROATAION IN VERTICAL AXIS

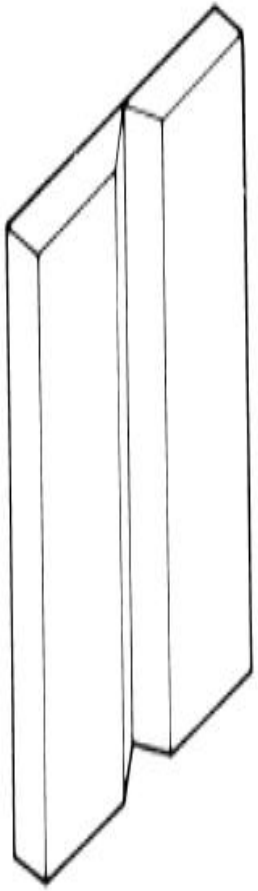
Groove Welds in Plate – Test Positions



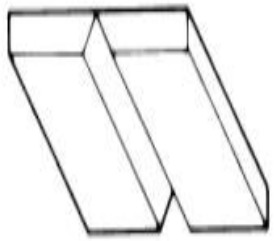
(a) 1G



(b) 2G

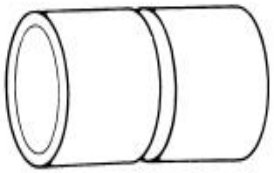


(c) 3G

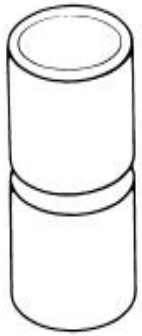


(d) 4G

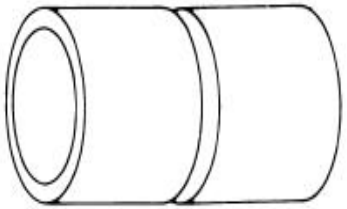
Groove Welds in Pipe — Test Positions



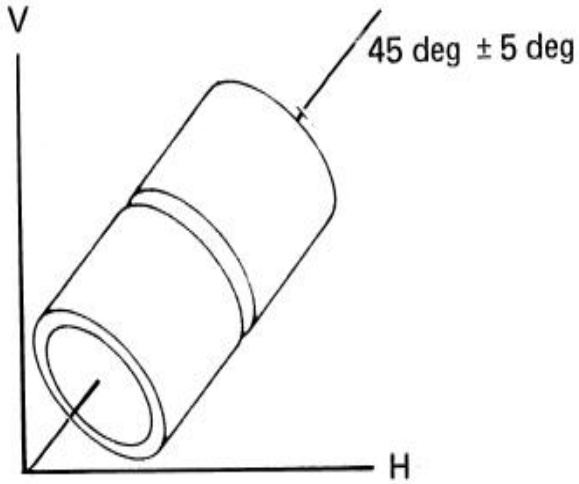
(a) 1G (Rotated)



(b) 2G



(c) 5G



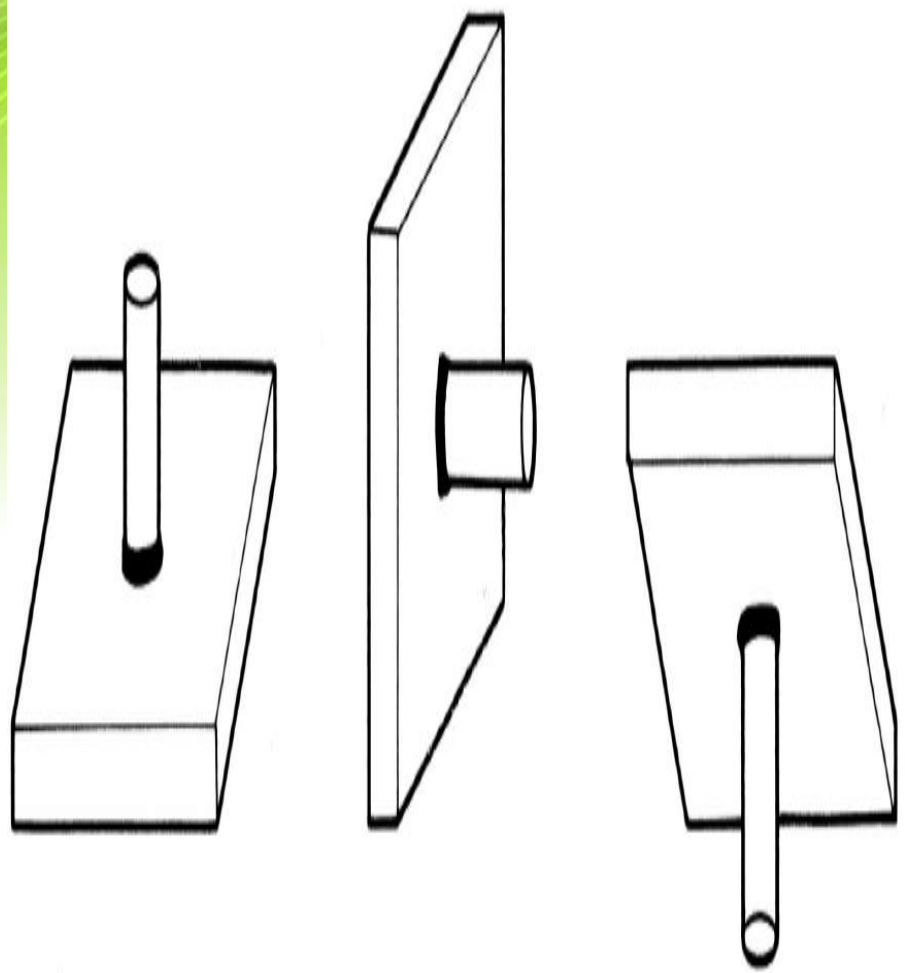
(d) 6G

POSITIONS OF STUD WELD(S-STUD)

- IN ALL CASES POSITION OF STUD IS PERPENTICULAR TO THE PLATE OR PIPE.

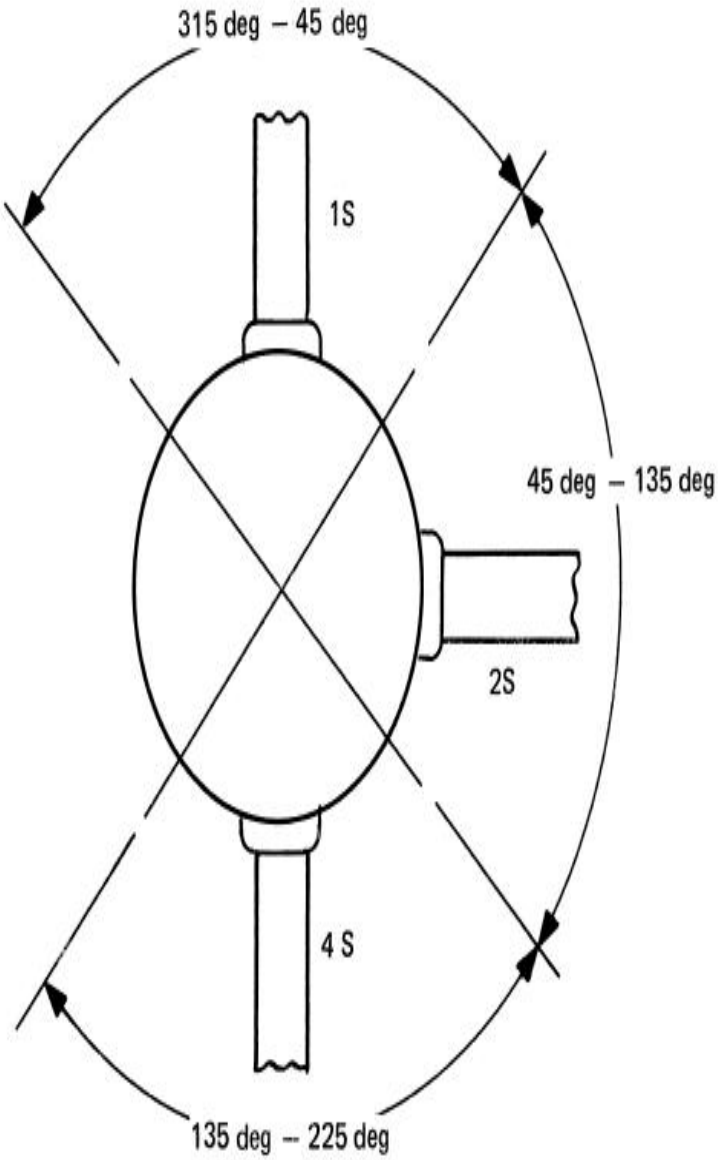
- **1S –** WELD DEPOSITED FROM ABOVE THE PLATE OR PIPE.
- **2S -** PLATE OR PIPE NOT ROTATED.
- **4S -** WELD DEPOSITED FROM BENEATH THE PLATE OR PIPE.

Stud Welds – Test Positions



(a) 1S (b) 2S (c) 4S

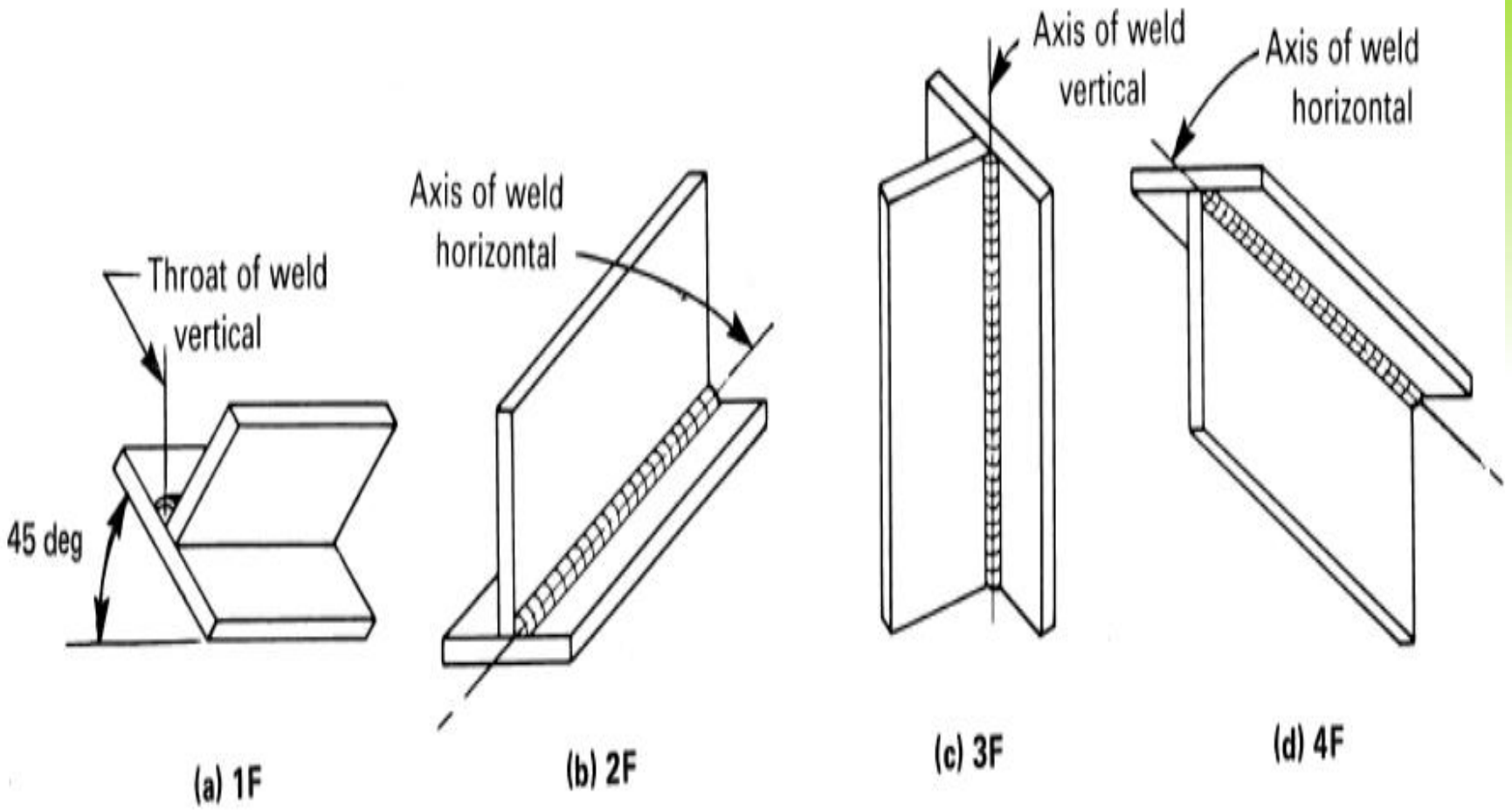
Stud Welds — Welding Positions



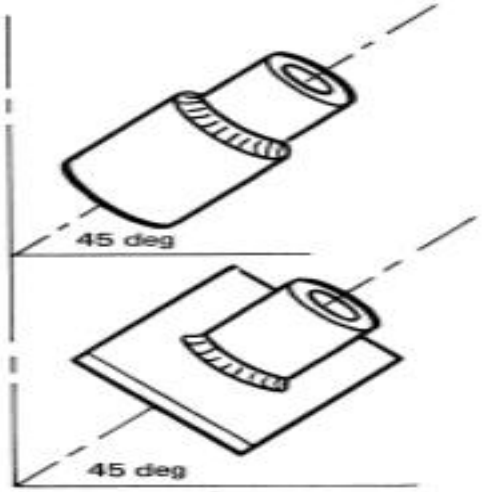
POSITIONS OF FILLET WELD(F-FILLET)

POSITION	PLATE	PIPE
1F- FLAT POSITION -PLATE OR PIPE IS 45 ˚ TO HORIZONTAL AXIS	AXIS OF THROAT IS VERTICAL PLANE ;WELD IS HORIZONTAL	AXIS OF THROAT IS VERTICAL PLANE ; WELD IS HORIZONTAL.PIPE IS ROTATED.
2F-HORIZONTAL POSITION- PLATE OR PIPE AXIS WITH VERTICAL	WELD DEPOSITED IN HORIZONTAL AXIS WITH VERTICAL PLANE	WELD DEPOSITED IN HORIZONTAL AXIS WITH VERTICAL PLANE
2FR-HORIZONTAL POSITION	NOT APPLICABLE	PIPE IS ROTATED
3F –VERTICAL POSITION - PLATE AXIS WITH VERTICAL	WELD DEPOSITED IN VERTICAL AXIS	NOT APPLICABLE
4F-OVER HEAD POSITION - PLATE AXIS WITH HORIZONTAL	WELD DEPOSITED WITH HORIZONTAL FROM UNDER NEATH	NOT APPLICABLE
5F- MULTIPLE POSITION- PIPE AXIS IN HORIZONTAL; WELD GROOVE IN VERTICA AXIS	NOT APPLICABLE	WELD IS VERTICAL WITH VERTICAL PLATE OR PIPE.

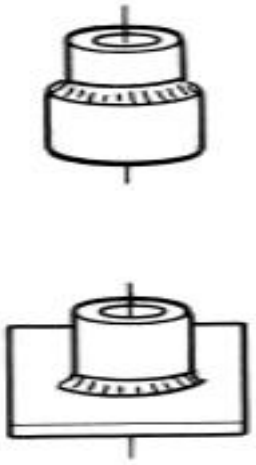
Fillet Welds in Plate — Test Positions



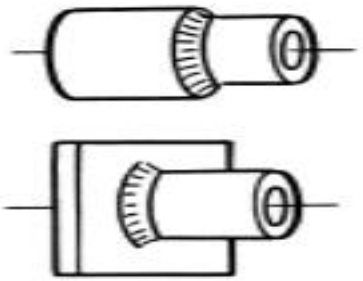
Fillet Welds in Pipe — Test Positions



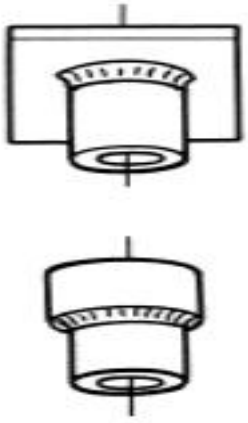
(a) 1F (Rotated)



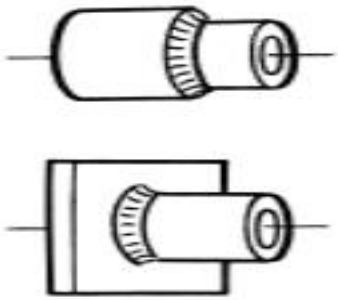
(b) 2F



(c) 2FR (Rotated)



(d) 4F



(e) 5F

Performance Qualification — Position and Diameter Limitations (Within the Other Limitations of QW-303)

Qualification Test		Position and Type Weld Qualified [Note (1)]		
		Groove		Fillet or Tack [Note (2)]
Weld	Position	Plate and Pipe Over 24 in. (610 mm) O.D.	Pipe ≤ 24 in. (610 mm) O.D.	Plate and Pipe
Plate — Groove	1G	F	F [Note (3)]	F
	2G	F, H	F, H [Note (3)]	F, H
	3G	F, V	F [Note (3)]	F, H, V
	4G	F, O	F [Note (3)]	F, H, O
	3G and 4G	F, V, O	F [Note (3)]	All
	2G, 3G, and 4G	All	F, H [Note (3)]	All
	Special Positions (SP)	SP, F	SP, F	SP, F
Plate — Fillet	1F	–	–	F [Note (3)]
	2F	–	–	F, H [Note (3)]
	3F	–	–	F, H, V [Note (3)]
	4F	–	–	F, H, O [Note (3)]
	3F and 4F	–	–	All [Note (3)]
	Special Positions (SP)	–	–	SP, F [Note (3)]
Pipe — Groove [Note (4)]	1G	F	F	F
	2G	F, H	F, H	F, H
	5G	F, V, O	F, V, O	All
	6G	All	All	All
	2G and 5G	All	All	All
	Special Positions (SP)	SP, F	SP, F	SP, F
Pipe — Fillet [Note (4)]	1F	–	–	F
	2F	–	–	F, H
	2FR	–	–	F, H
	4F	–	–	F, H, O
	5F	–	–	All
	Special Positions (SP)	–	–	SP, F

NOTES:

(1) Positions of welding as shown in QW-461.1 and QW-461.2.

F = Flat
H = Horizontal
V = Vertical
O = Overhead
SP = Special Positions (see QW-303.3)

(2) Tack welds are not limited by pipe or tube diameters when their aggregate length does not exceed 25% of the weld circumference.

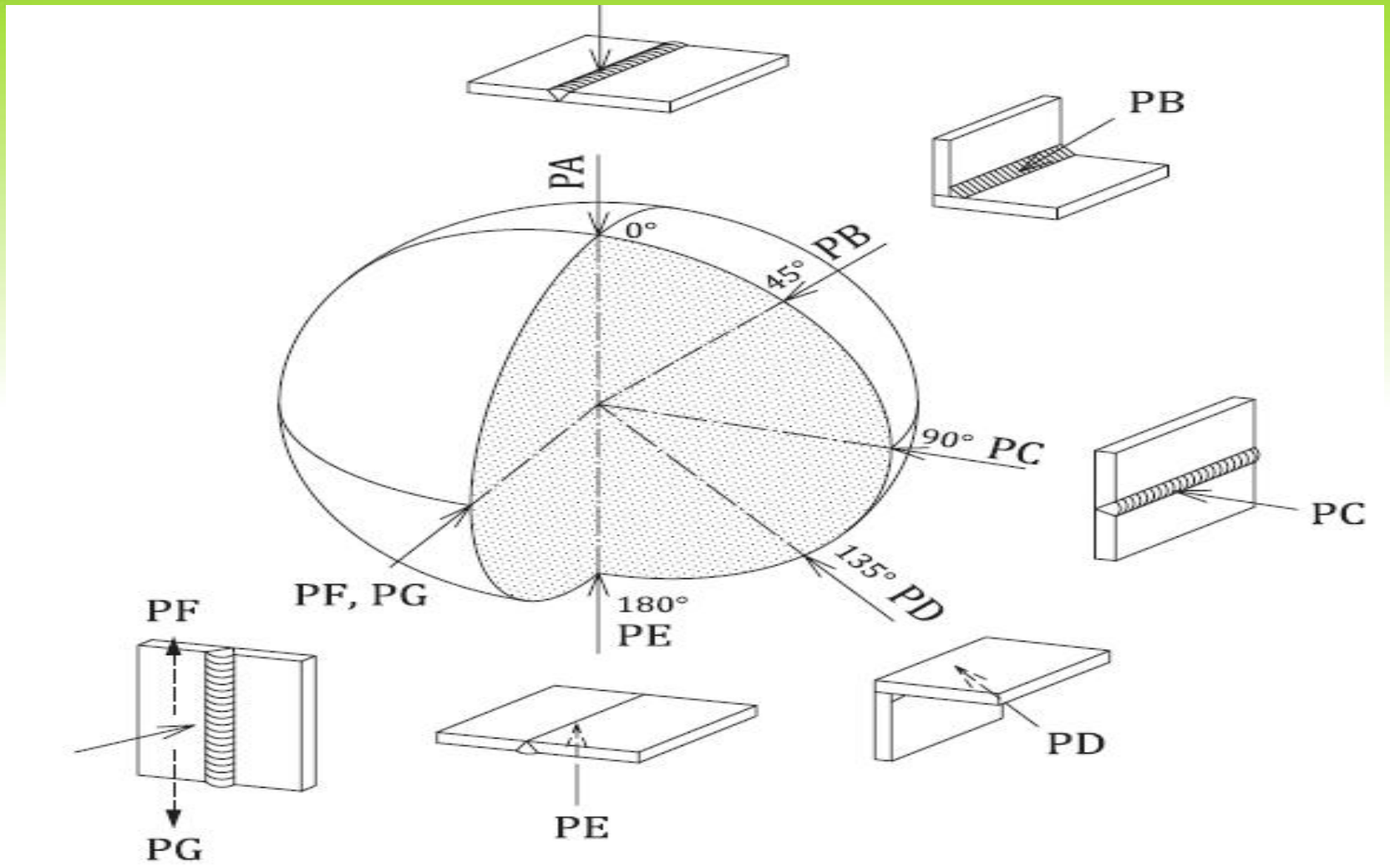
(3) Pipe $2^{7}/_{8}$ in. (73 mm) O.D. and over.

WELDING POSITIONS ISO 6947

- PA- FLAT POSITION
- PB –HORIZONTAL VERTICAL POSITON
- PC- HORIZONATL POSITION
- PD –HORIZONTAL OVER HEAD POSITION
- PE –OVER HEAD POSITION
- PF –VERTICAL DOWN POSITION
- PG – VERTICAL UP POSITION
- PH -PIPE VERTICAL UPHILL (5G PIPE)
- PJ – PIPE VERTICAL DOWNHILL(5G PIPE)
- PH-L045- PIPE (45˚)VERTICAL UPHILL (6G PIPE)
- PJ-L045 –PIPE (45˚)VERTICAL DOWNHILL (6G PIPE)

- PB 015 -10 – HORIZONTAL VERTICAL POSITION –SLOPE 10˚ -ROTATION 15˚
- PH-L-045 – VERTICAL UPHILL -45 ˚ ORIENTATION

WELDING POSITIONS ISO 6947



WELDING ORIENTATION

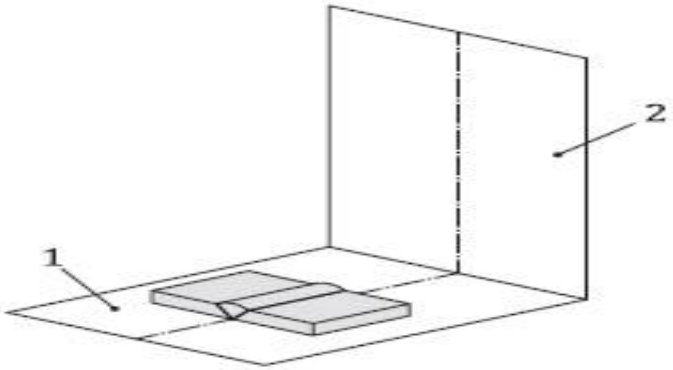
— Slope and rotation ranges for welding positions in production butt welds

elding position	Main welding position	Slope *S*	Rotation *R*
Flat	PA	±15°	±30°
Horizontal	PC	±15°	+60° −10°
Overhead	PE	±80°	±80°
Vertical	PF, PG	+10° to +75°	±100°
		±10°	±180°

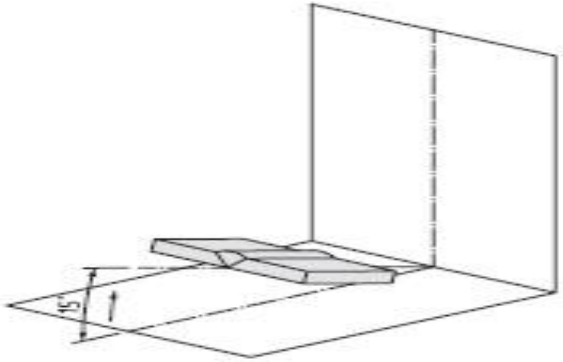
— Slope and rotation ranges for welding positions in production fillet welds

elding position	Main welding position	Slope *S*	Rotation *R*
Flat	PA	±15°	±30°
Horizontal vertical	PB	±15°	+15° −10°
Horizontal	PC	±15°	+35° −10°
Horizontal overhead	PD	±80°	+35° −10°
Overhead	PE	±80°	±35°
Vertical	PF, PG	+10° to +75°	±100°
		±10°	±180°

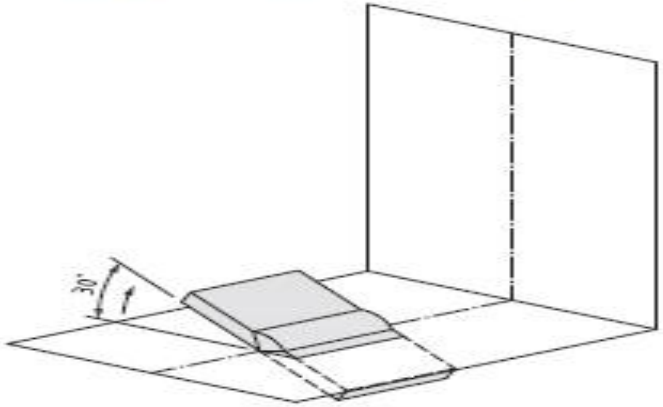
SLOPE AND ROTATION LIMITS



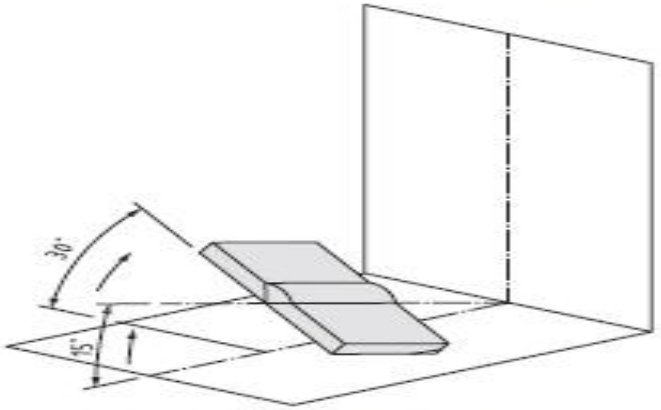
a) Main welding position (PA)



b) Flat position (PA) slope limit



c) Flat position (PA) rotation limit



d) Flat position (PA) slope limit and rotation limit

Key

1 horizontal plane

2 vertical plane

Heat input relationship with Position

- Highest heat input position
  - PA
  - PF
- Highest heat input position
  - PC
  - PE

Range of qualification for welding positions for butt welds

Testing position	Range of qualification				
	PA Flat	PC Horizontal	PE Overhead	PF Vertical up	PG Vertical down
PA	×	—	—	—	—
PC	×	×	—	—	—
PE (plate)	×	×	×	—	—
PF (plate)	×	—	—	×	—
PH (pipe)	×	—	×	×	—
PG (plate)	—	—	—	—	×
PJ (pipe)	×	—	×	—	×
H-L045	×	×	×	×	—
J-L045	×	×	×	—	×

NOTE See also 5.3.

× indicates those welding positions for which the welder is qualified.

— indicates those welding positions for which the welder is not qualified.

Range of qualification for welding positions for fillet welds

Testing position	Range of qualification						
	PA Flat	PB Horizontal	PC Horizontal	PD Overhead	PE Overhead	PF Vertical up	PG Vertical down
PA	×	—	—	—	—	—	—
PB	×	×	—	—	—	—	—
PC	×	×	×	—	—	—	—
PD	×	×	×	×	×	—	—
PE (plate)	×	×	×	×	×	—	—
PF (plate)	×	×	—	—	—	×	—
PH (pipe)	×	×	×	×	×	×	—
PG (plate)	—	—	—	—	—	—	×
PJ (pipe)	×	×	—	×	×	—	×

NOTE See also 5.3.

× indicates those welding positions for which the welder is qualified.

— indicates those welding positions for which the welder is not qualified.