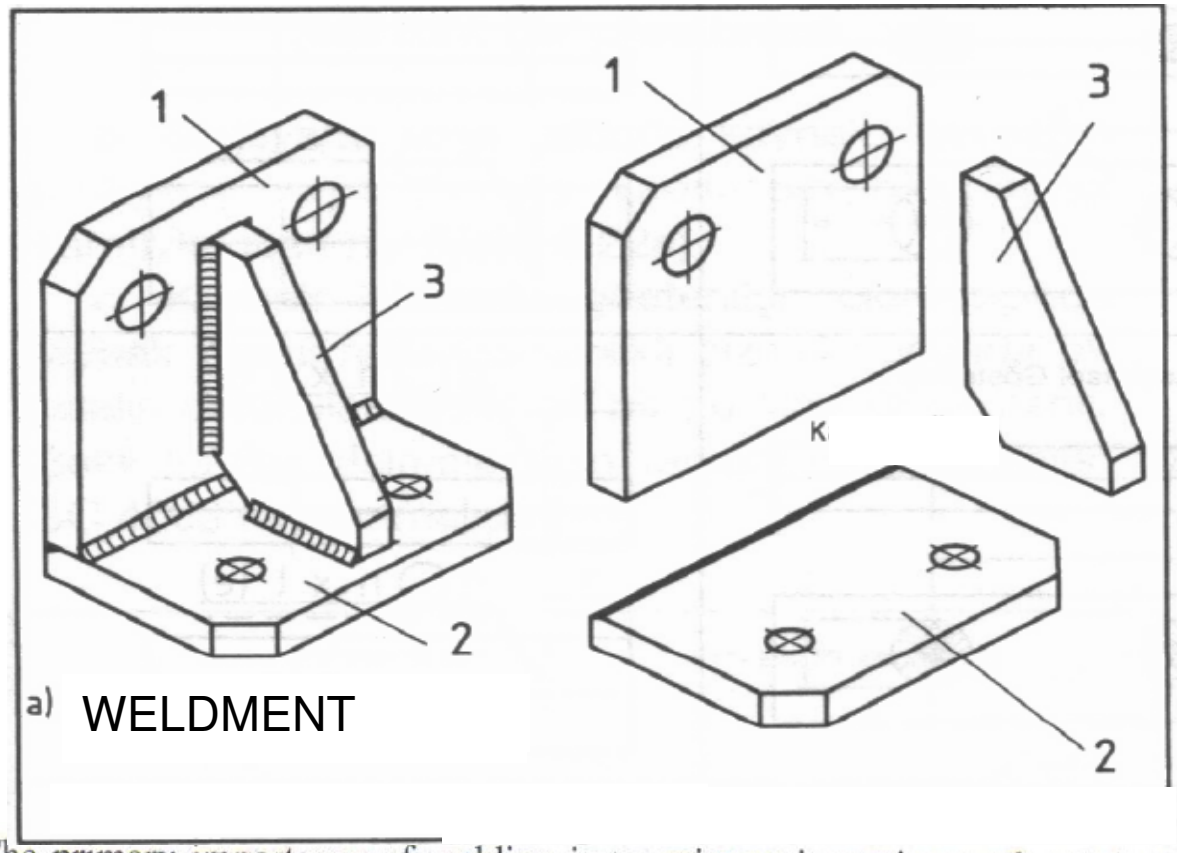
Welded Joints (Kaynaklı Bağlantılar)

Welding Symbols

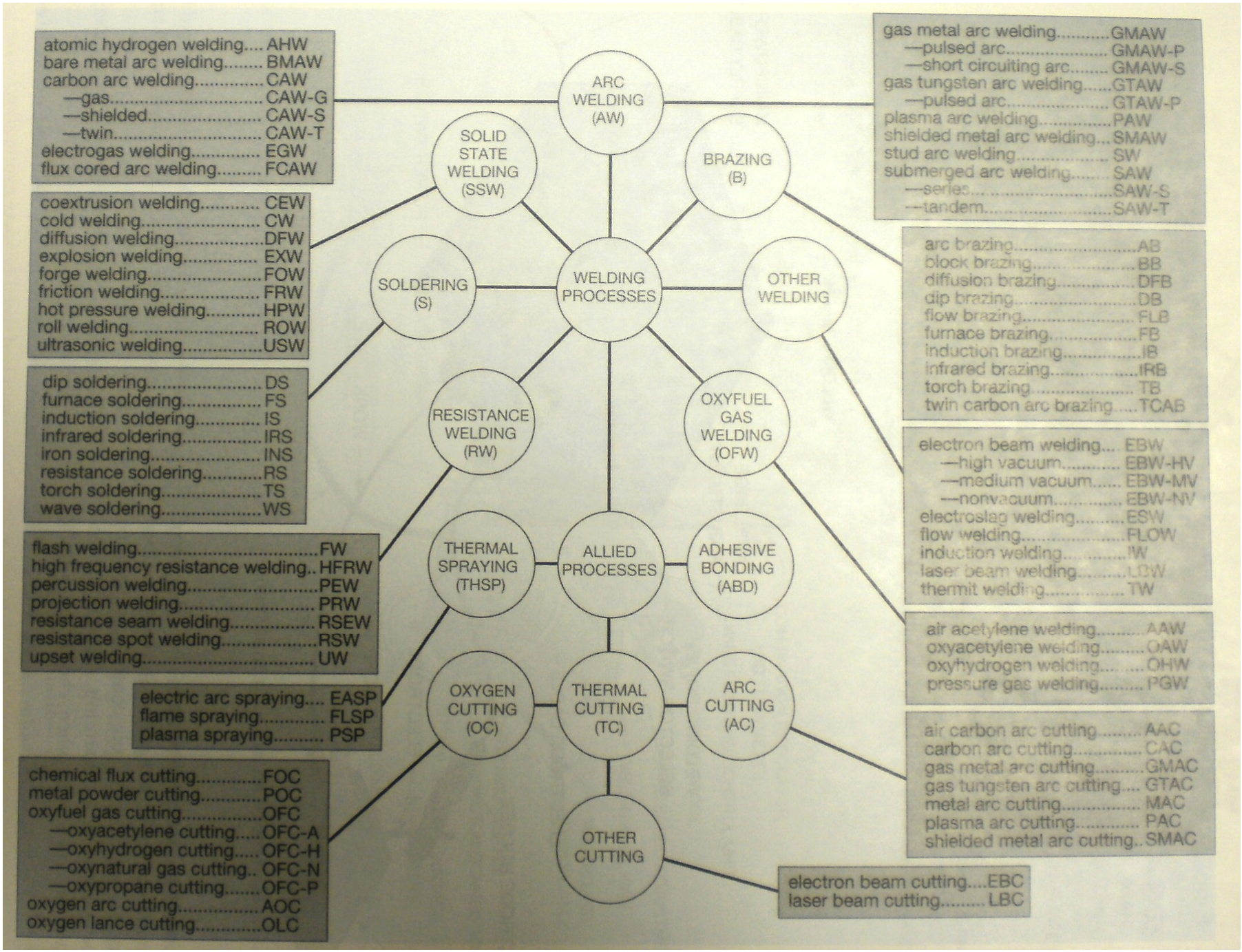


a) WELDMENT

The primary importance of welding is to unite various pieces of metal so that they will operate as a unit structure to support the loads to be carried. In order to design such a structure, which will be both economical and efficient, the drafter must have a knowledge of the basic principles of welding practice and an understanding of the advantages and limitations of the process.

Fasteners

- Permanent
  - Rivets
  - Welds
- Removable
  - Screws
  - Bolts
  - Studs
  - Nuts
  - Pins
  - Keys


WELDING PROCESSES
ARC WELDING (AW)
atomic hydrogen welding.... AHW
bare metal arc welding..... BMAW
carbon arc welding..... CAW
—gas..... CAW-G
—shielded..... CAW-S
—twin..... CAW-T
electrogas welding..... EGW
flux cored arc welding..... FCAW
gas metal arc welding..... GMAW
—pulsed arc..... GMAW-P
—short circuiting arc..... GMAW-S
gas tungsten arc welding..... GTAW
—pulsed arc..... GTAW-P
plasma arc welding..... PAW
shielded metal arc welding... SMAW
stud arc welding..... SW
submerged arc welding..... SAW
—series..... SAW-S
—tandem..... SAW-T
SOLID STATE WELDING (SSW)
coextrusion welding..... CEW
cold welding..... CW
diffusion welding..... DFW
explosion welding..... EXW
forge welding..... FOW
friction welding..... FRW
hot pressure welding..... HPW
roll welding..... ROW
ultrasonic welding..... USW
BRAZING (B)
arc brazing..... AB
block brazing..... BB
diffusion brazing..... DFB
dip brazing..... DB
flow brazing..... FLB
furnace brazing..... FB
induction brazing..... IB
infrared brazing..... IRB
torch brazing..... TB
twin carbon arc brazing..... TCAB
SOLDERING (S)
dip soldering..... DS
furnace soldering..... FS
induction soldering..... IS
infrared soldering..... IRS
iron soldering..... INS
resistance soldering..... RS
torch soldering..... TS
wave soldering..... WS
OTHER WELDING
electron beam welding... EBW
—high vacuum..... EBW-HV
—medium vacuum..... EBW-MV
—nonvacuum..... EBW-NV
electroslag welding..... ESW
flow welding..... FLOW
induction welding..... IW
laser beam welding..... LBW
thermit welding..... TW
RESISTANCE WELDING (RW)
flash welding..... FW
high frequency resistance welding.. HFRW
percussion welding..... PEW
projection welding..... PRW
resistance seam welding..... RSEW
resistance spot welding..... RSW
upset welding..... UW
OXYFUEL GAS WELDING (OFW)
air acetylene welding..... AAW
oxyacetylene welding..... OAW
oxyhydrogen welding..... OHW
pressure gas welding..... PGW
THERMAL SPRAYING (THSP)
electric arc spraying.... EASP
flame spraying..... FLSP
plasma spraying..... PSP
ALLIED PROCESSES
ADHESIVE BONDING (ABD)
OXYGEN CUTTING (OC)
chemical flux cutting..... FOC
metal powder cutting..... POC
oxyfuel gas cutting..... OFC
—oxyacetylene cutting..... OFC-A
—oxyhydrogen cutting..... OFC-H
—oxynatural gas cutting.. OFC-N
—oxypropane cutting..... OFC-P
oxygen arc cutting..... AOC
oxygen lance cutting..... OLC
THERMAL CUTTING (TC)
ARC CUTTING (AC)
air carbon arc cutting..... AAC
carbon arc cutting..... CAC
gas metal arc cutting..... GMAC
gas tungsten arc cutting.... GTAC
metal arc cutting..... MAC
plasma arc cutting..... PAC
shielded metal arc cutting.. SMAC
OTHER CUTTING
electron beam cutting....EBC
laser beam cutting..... LBC

Designation of welding processes by letters.

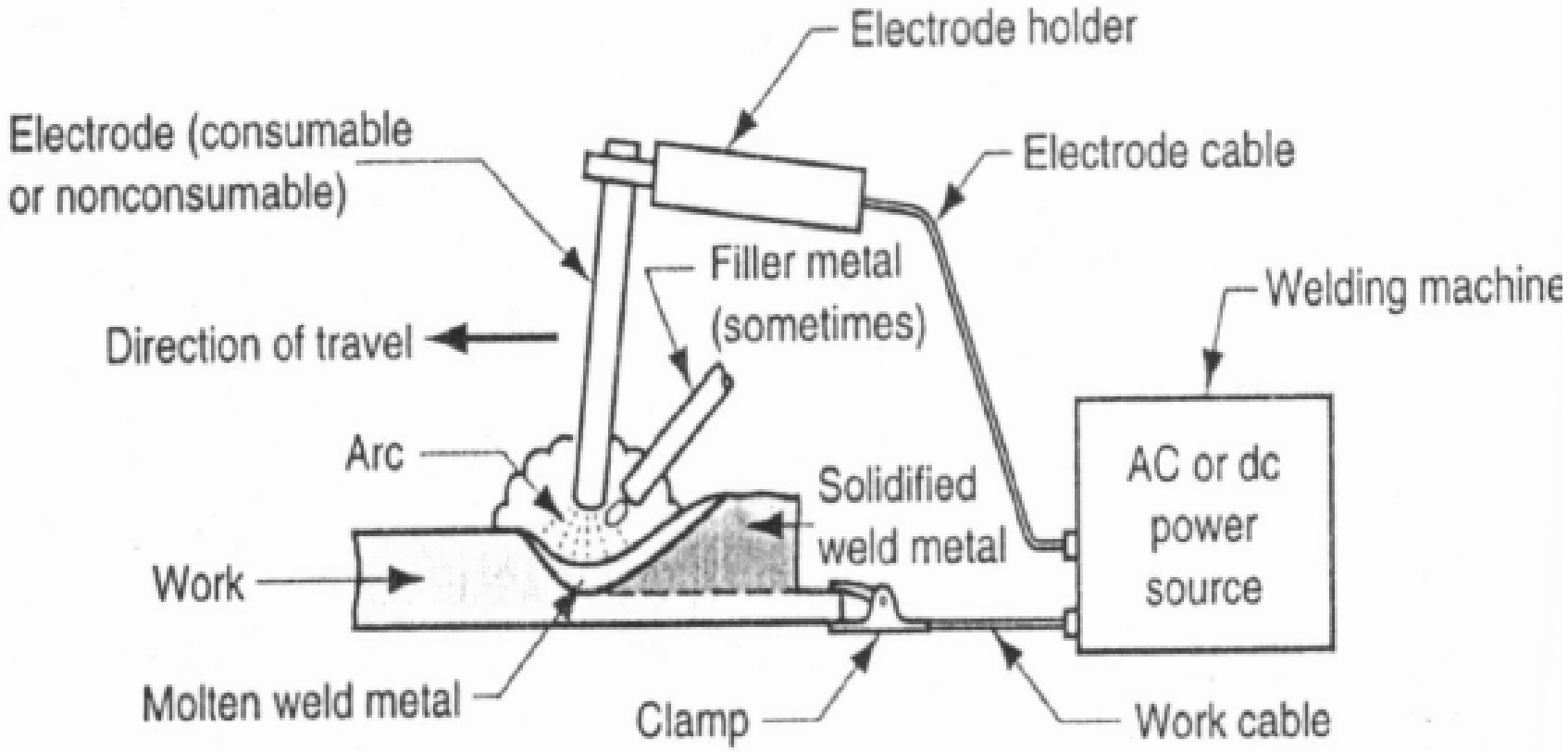
Designation	Welding Process
CAW	Carbon Arc Welding
CW	Cold Welding
DB	Dip Brazing
DFW	Diffusion Welding
EBW	Electron Beam Welding
ESW	Electroslag Welding
EXW	Explosion Welding
FB	Furnace Brazing
FCAW	Flux Cored Arc Welding
FOW	Forge Welding
FRW	Friction Welding
FW	Flash Welding
GMAW	Gas Metal Arc Welding
GTAW	Gash Tungsten Arc Welding
IB	Induction Brazing
IRB	Infrared Brazing
IW	Induction Welding
LBW	Laser Beam Welding
OAW	Oxyacetylene Welding
OHW	Oxyhydrogen Welding
PAW	Plasma Arc Welding
PEW	Percussion Welding
PGW	Pressure Gas Welding
PW	Projection Welding
RB	Resistance Brazing
RSEW	Resistance Seam Welding
RSW	Resistance Spot Welding
SAW	Submerged Arc Welding
SMAW	Shielded Metal Arc Welding
SW	Stud Welding
TB	Torch Brazing
TW	Thermit Welding
USW	Ultrasonic Welding
UW	Upset Welding

Designation of cutting process by letters.

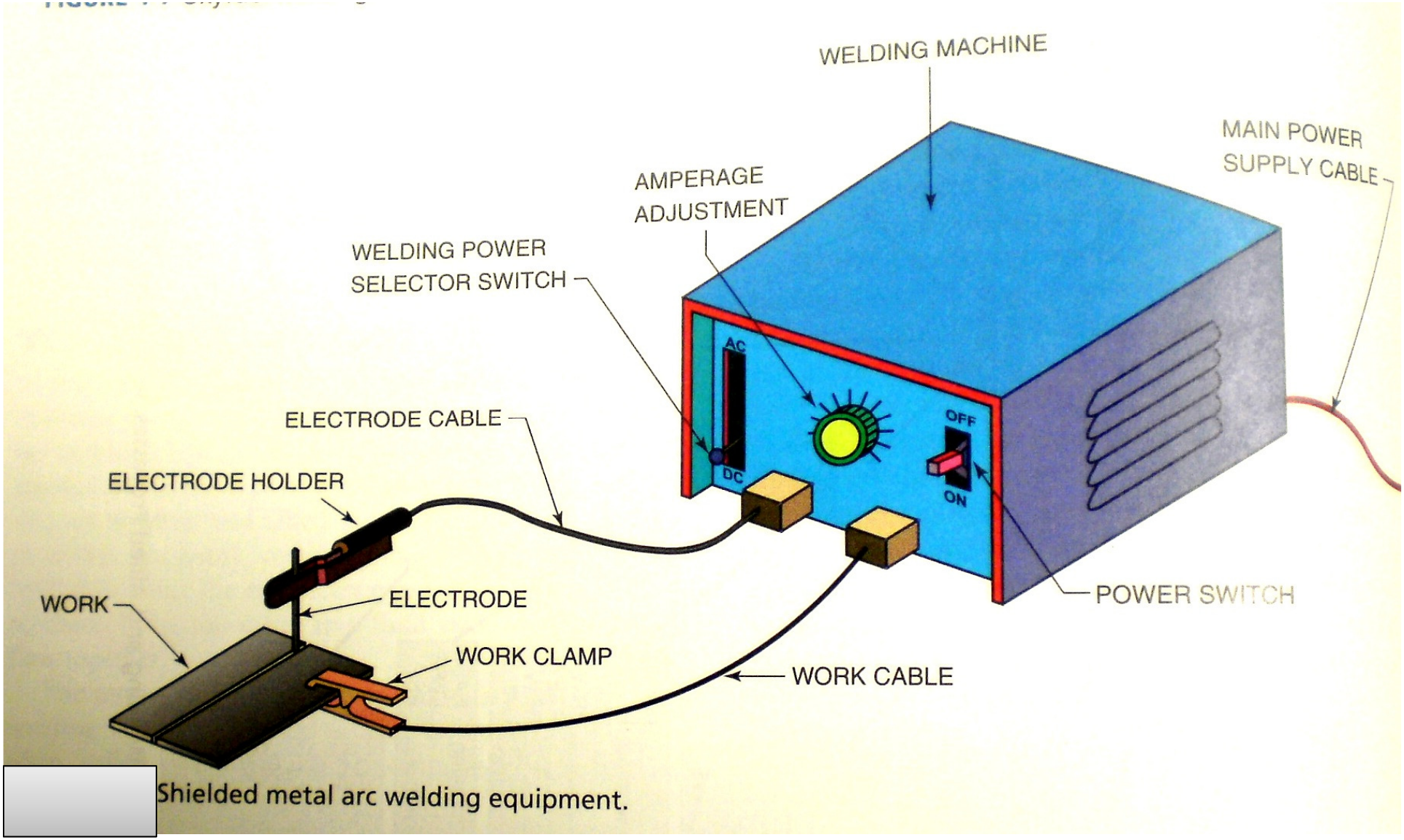
Designation	Cutting Process
AAC	Air-Carbon Arc Carbon
AC	Arc Cutting
AOC	Oxygen Arc Cutting
CAC	Carbon Arc Cutting
FOC	Chemical Flux Cutting
MAC	Metal Arc Cutting
OC	Oxygen Cutting
PAC	Plasma Arc Cutting
POC	Metal Powder Cutting

Weldability of various metals and alloys.

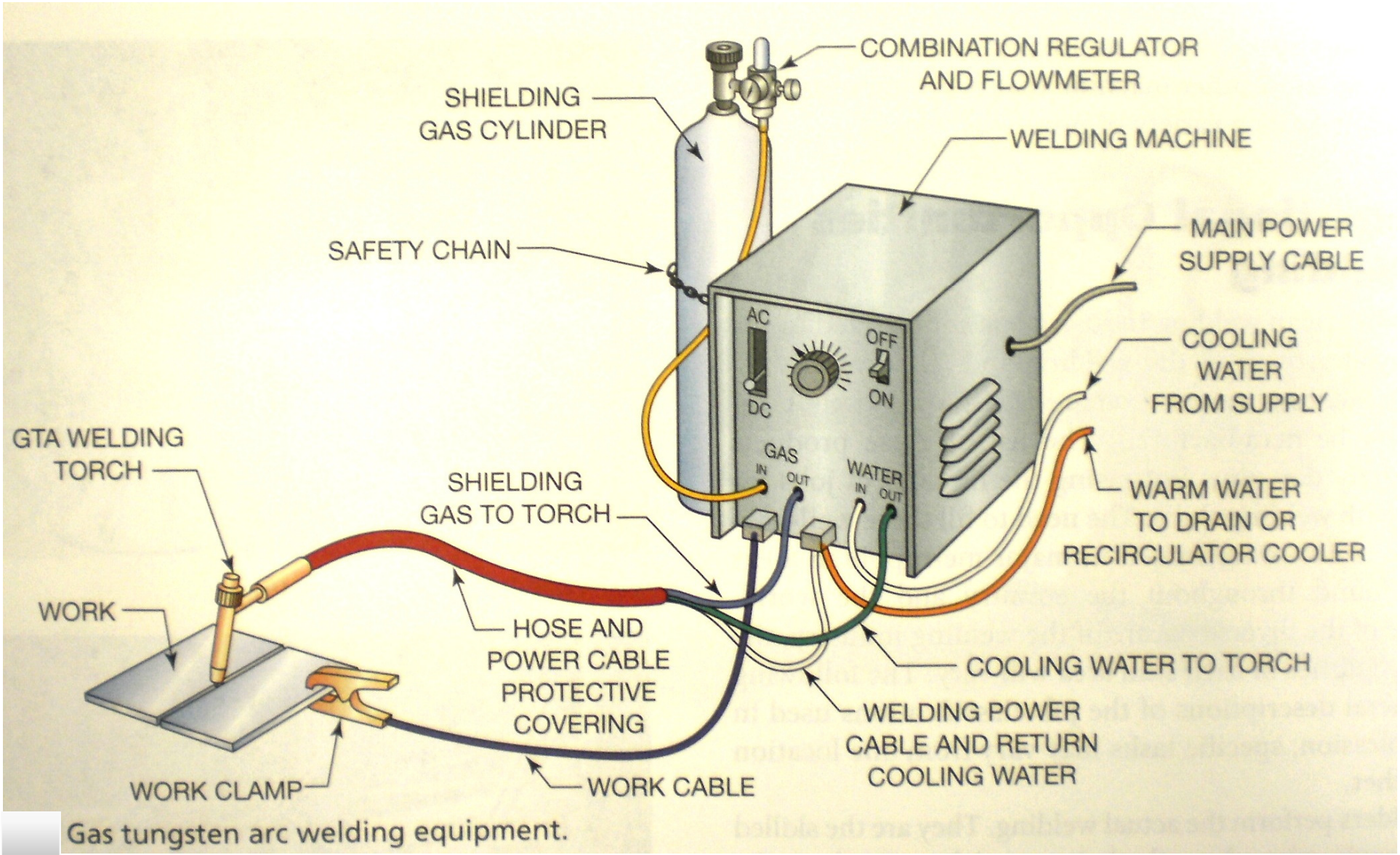
Metal or Alloy	GAS	ARC
Aluminum		
—Commercially Pure	X	X
—Al-Mn Alloy	X	X
Brass, Commercial	X	
Bronze, Commercial	X	
Copper (Deoxidized)	X	
Iron		
—Gray and Alloy	X	
—Malleable		
Lead	X	
Magnesium Alloys	X	
Nickel and Nickel Alloys	X	X
Steels, Carbon		
—Low and Medium Carbon	X	X
—High Carbon		X
—Tool Steel		X
Steel, Cast	X	X
Steels, Stainless		
—Chromium		X
—Chromium-Nickel	X	X



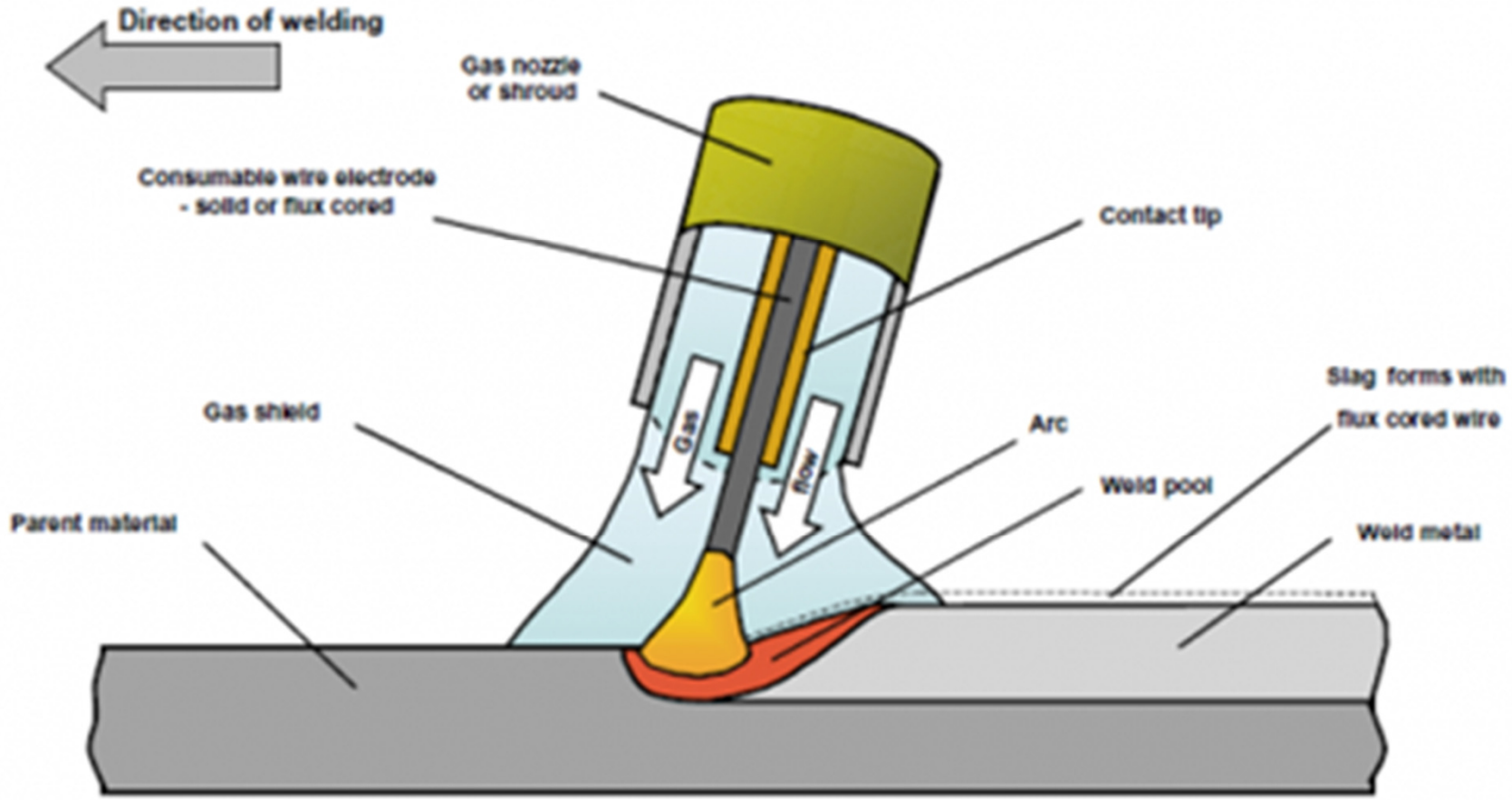
The basic configuration and electrical circuit of an arc welding process.



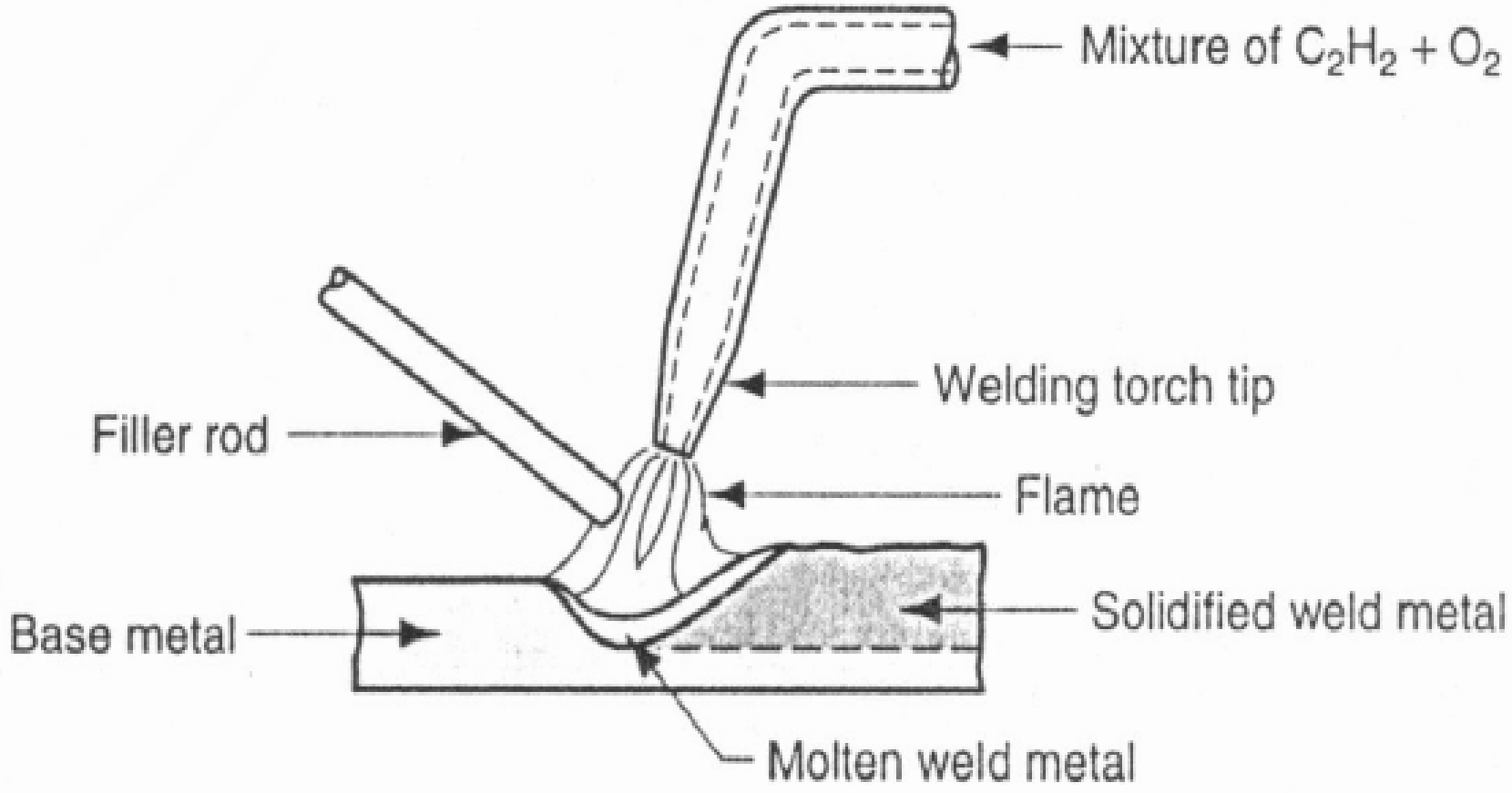
Shielded metal arc welding equipment.



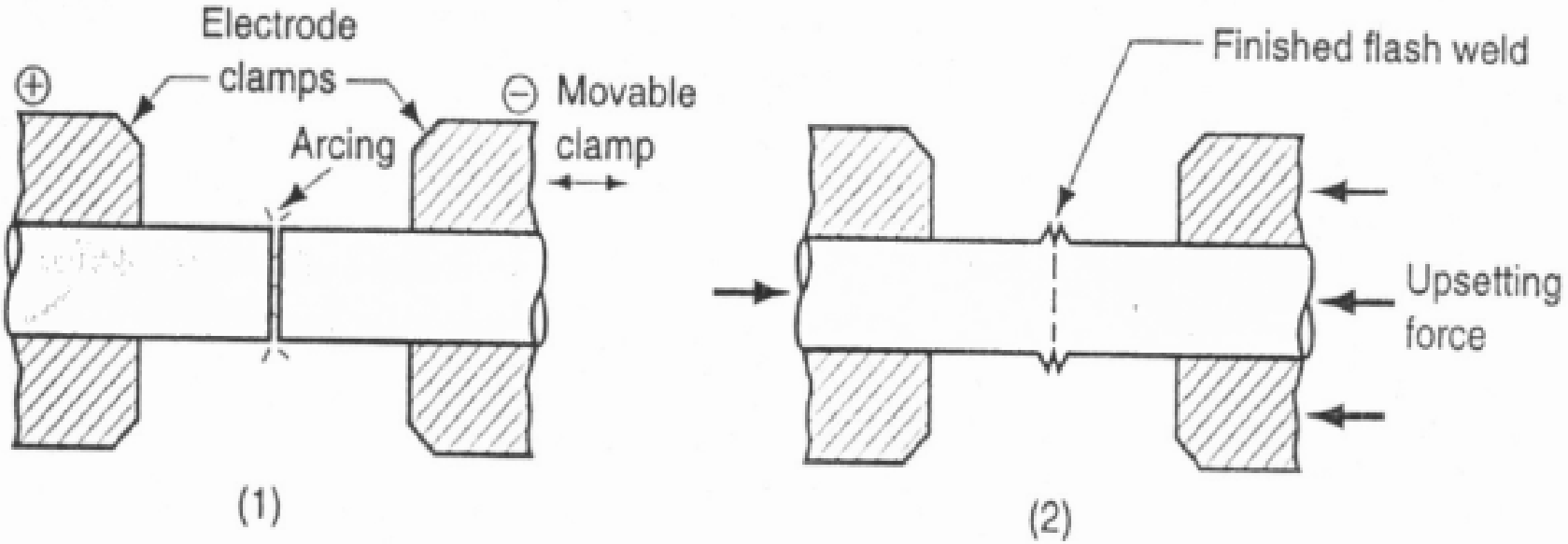
Gas tungsten arc welding equipment.


Direction of welding
Gas nozzle or shroud
Consumable wire electrode - solid or flux cored
Contact tip
Gas shield
Gas flow
Arc
Slag forms with flux cored wire
Weld pool
Parent material
Weld metal

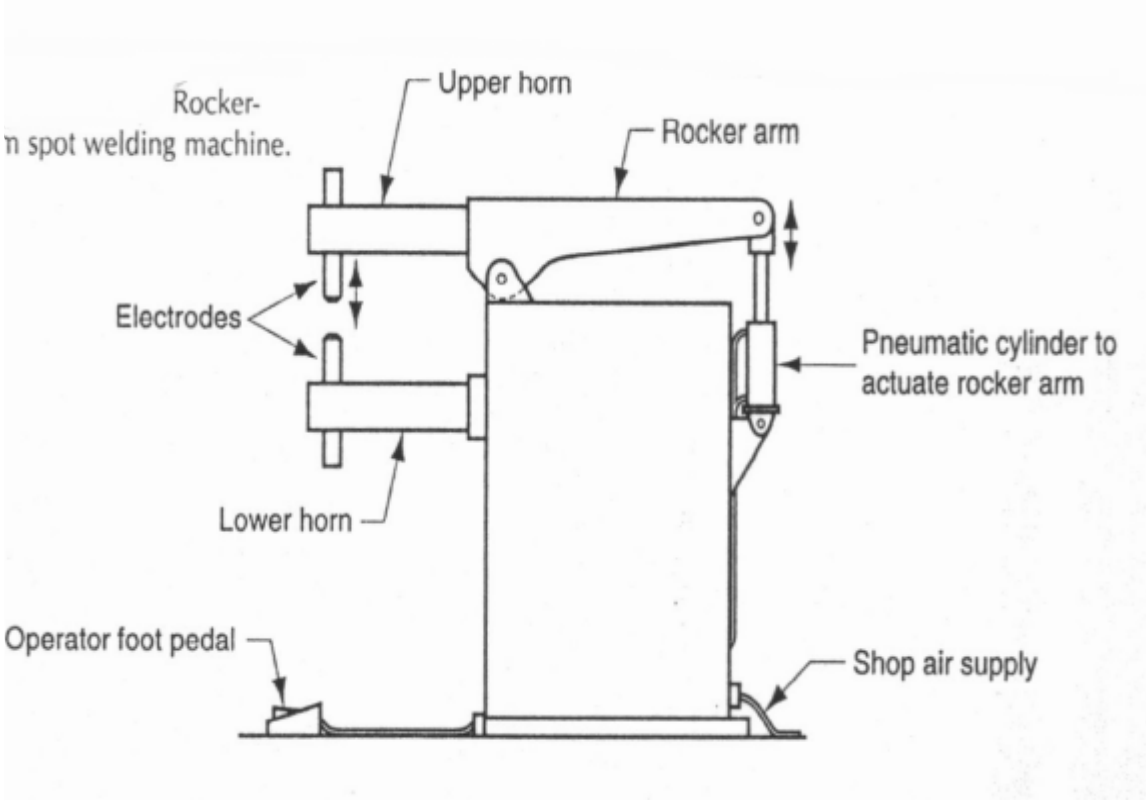
A typical oxyacetylene welding operation (OAW).

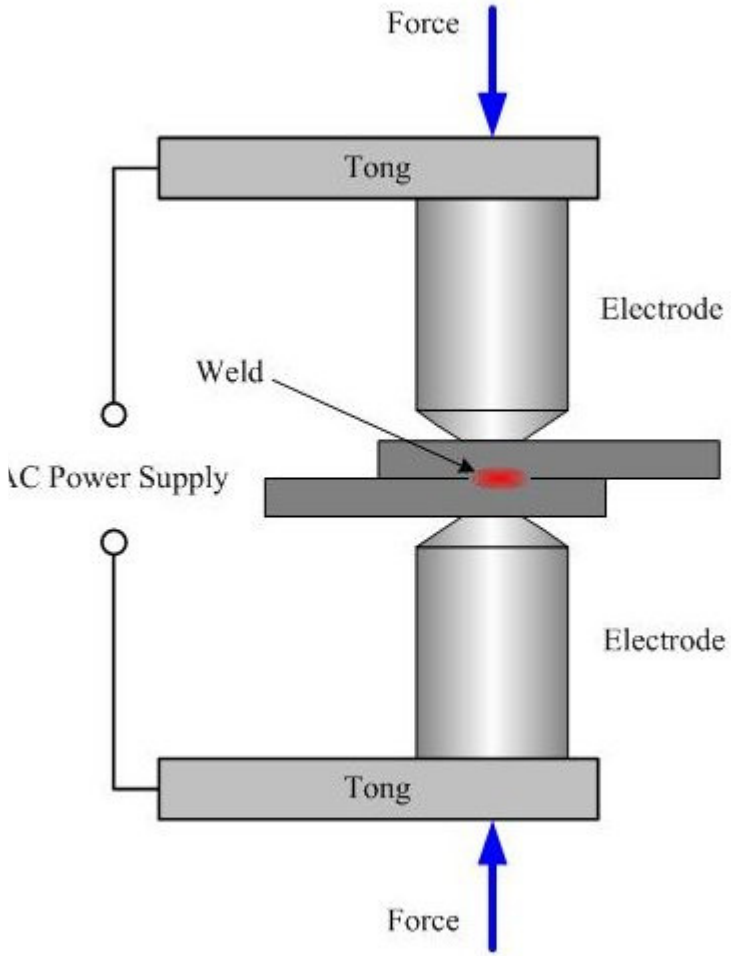


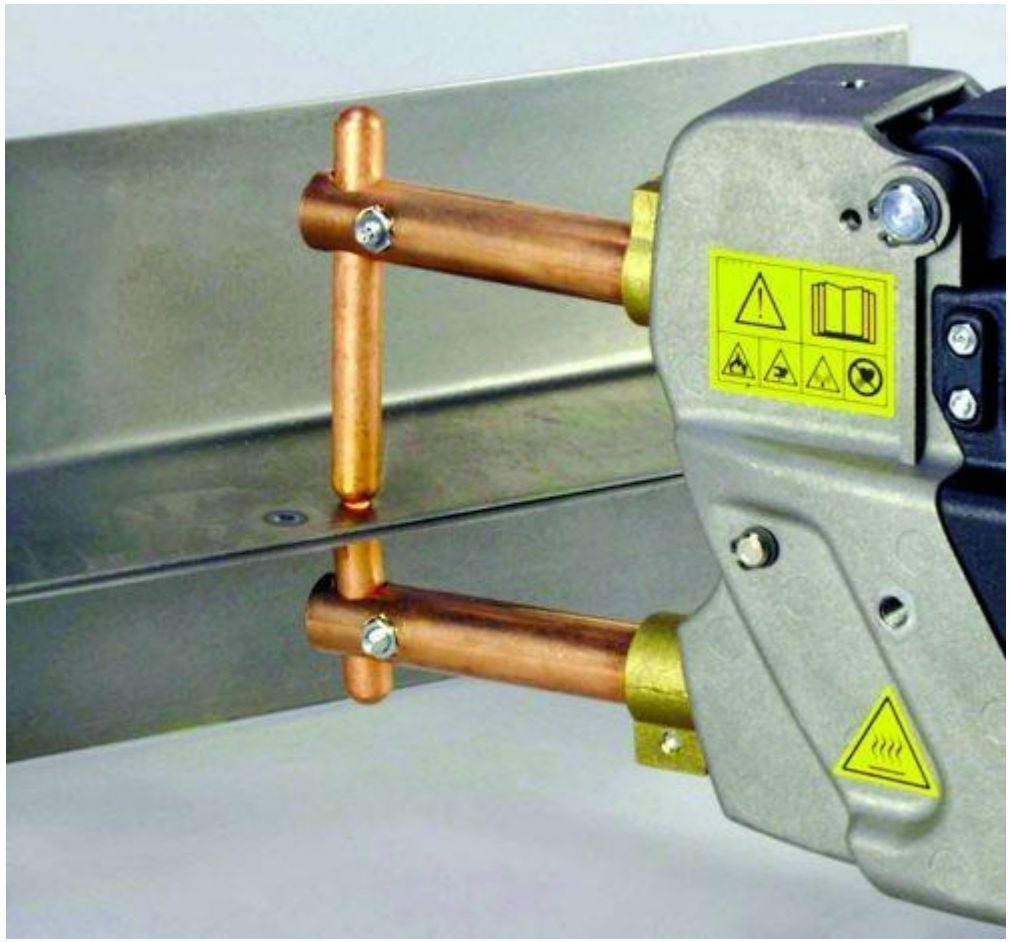
Flash welding (FW): (1) heating by electrical resistance and (2) upsetting (parts are forced together).

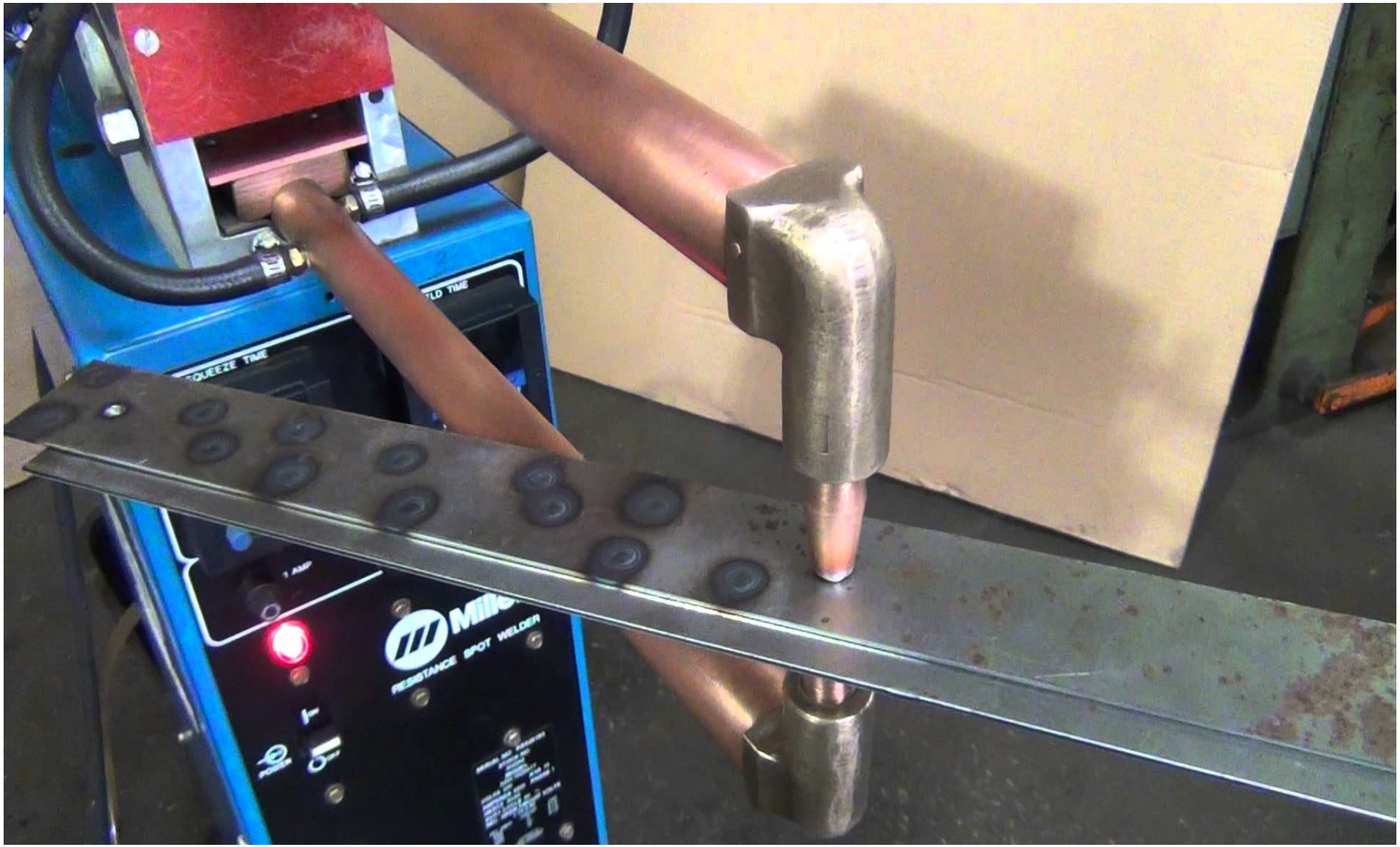


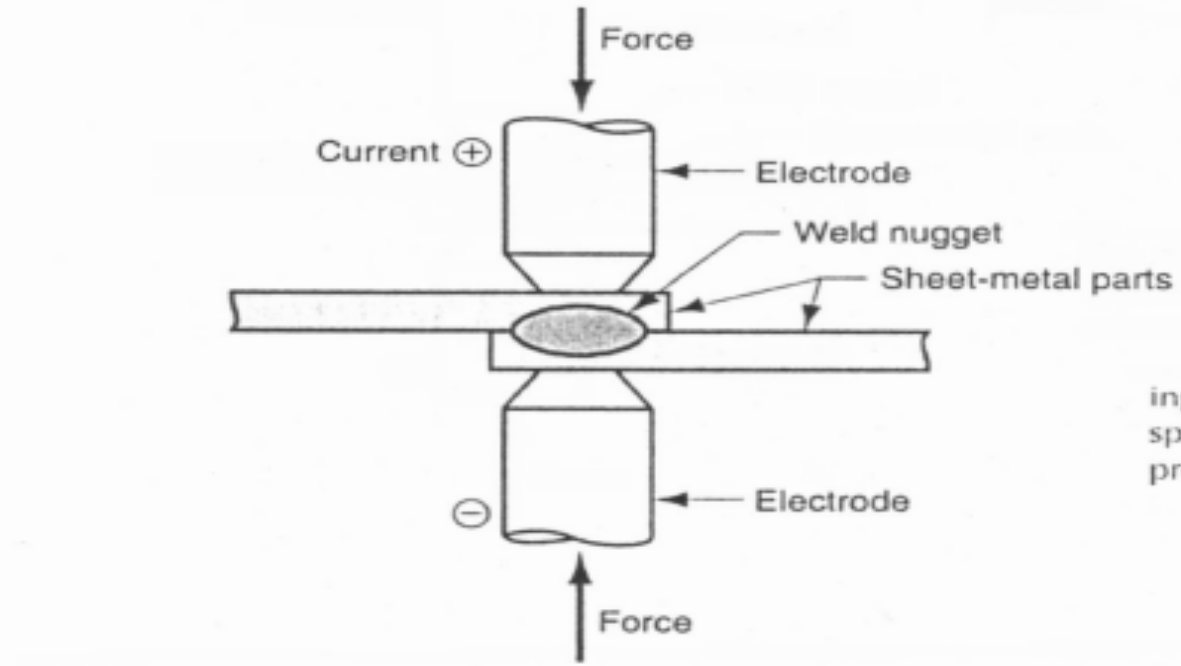
SPOT WELDING



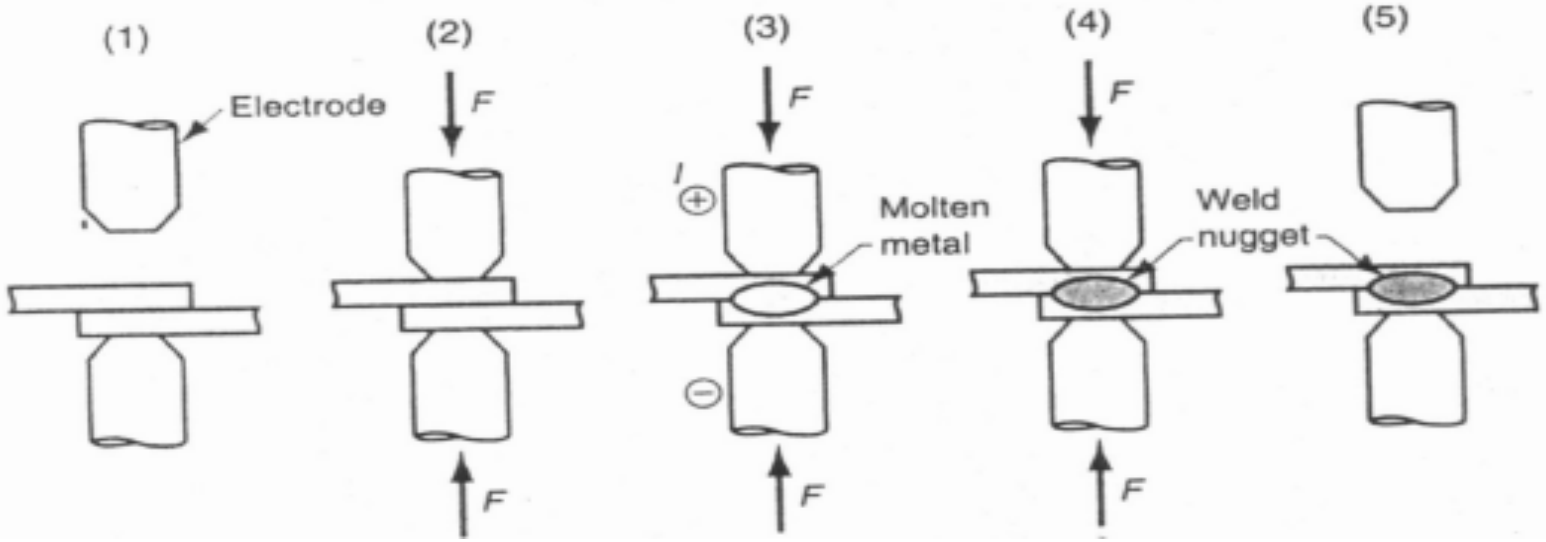

Force
Tong
Electrode
Weld
AC Power Supply
Electrode
Tong
Force



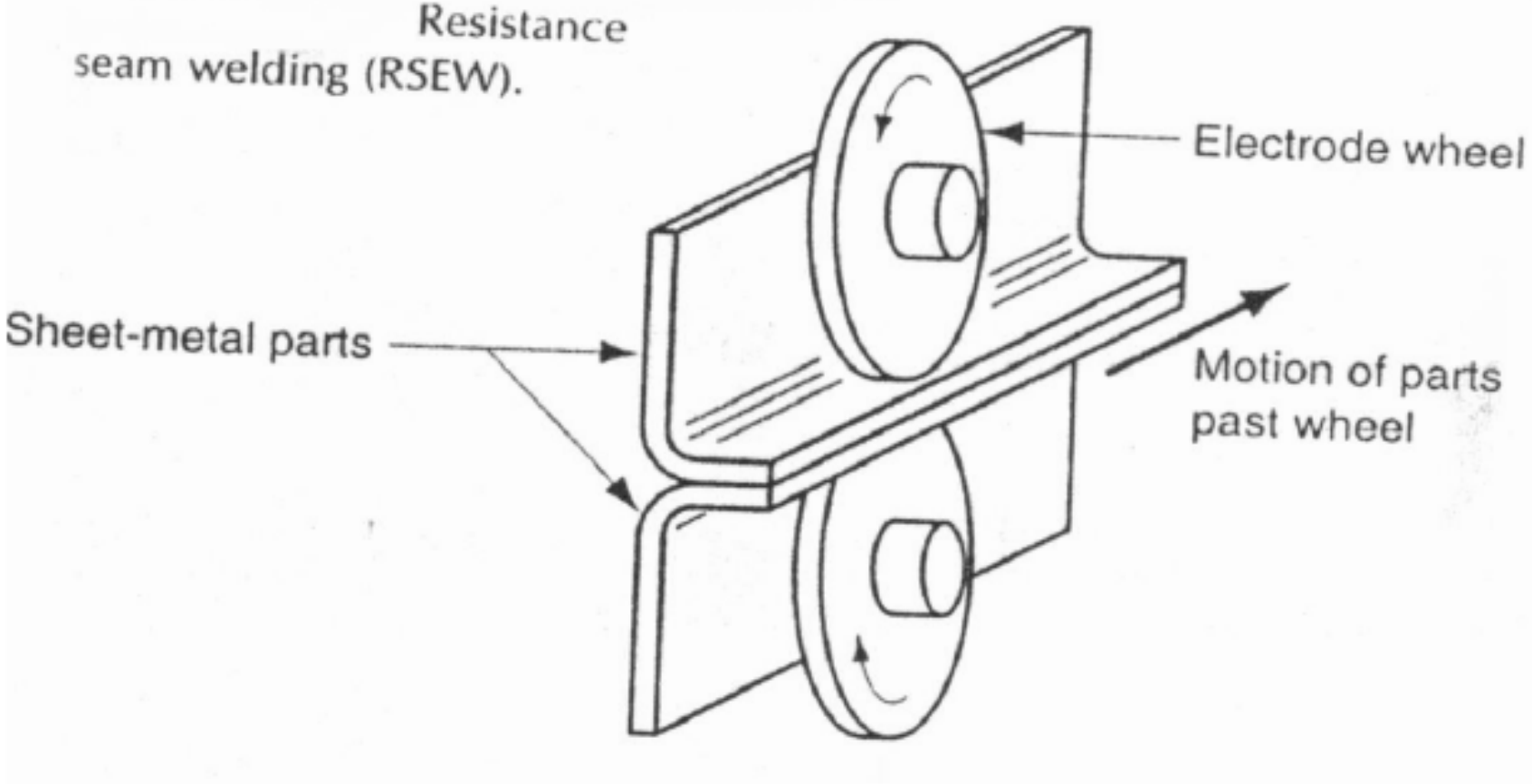

RESISTANCE SPOT WELDER

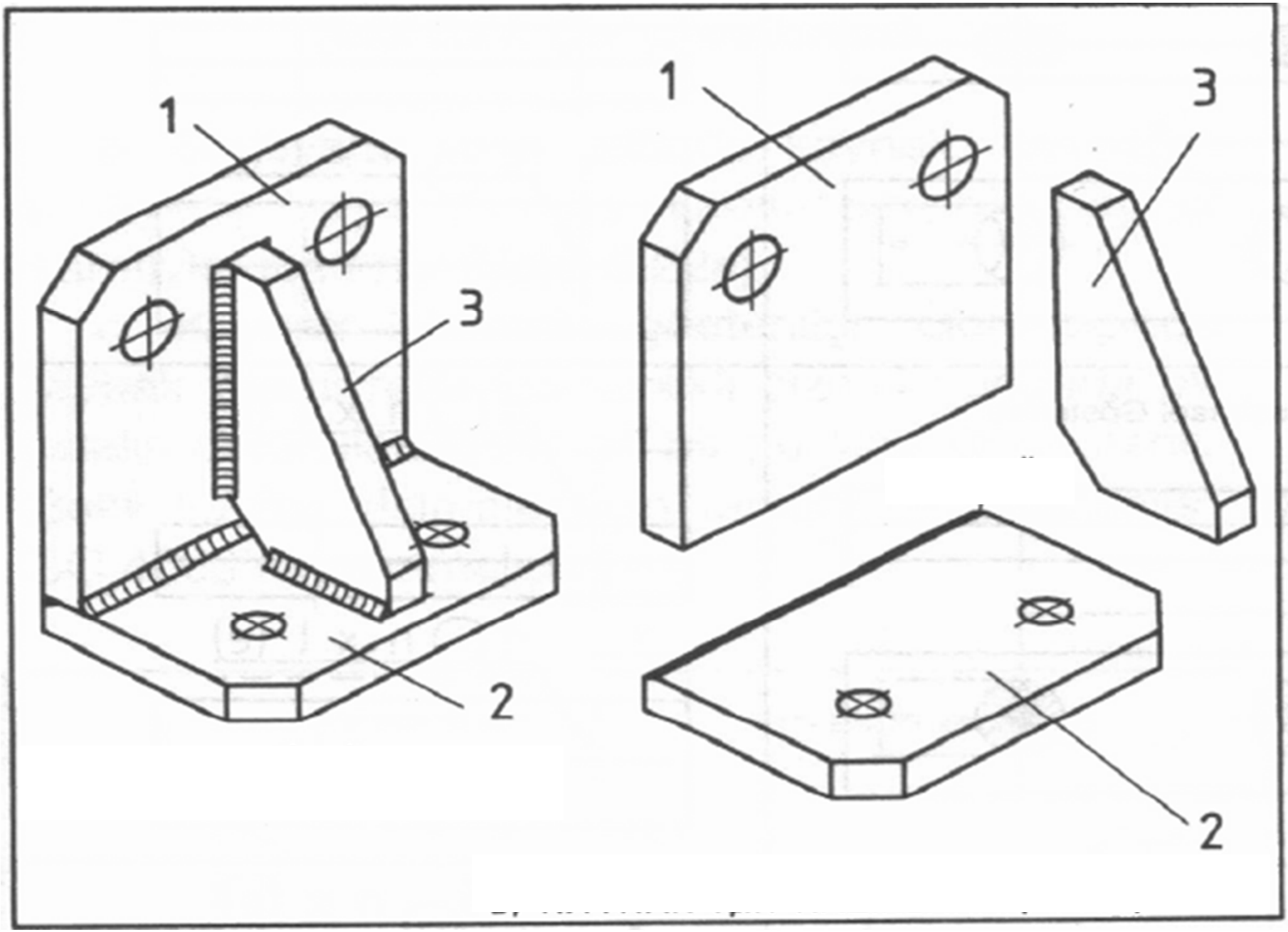


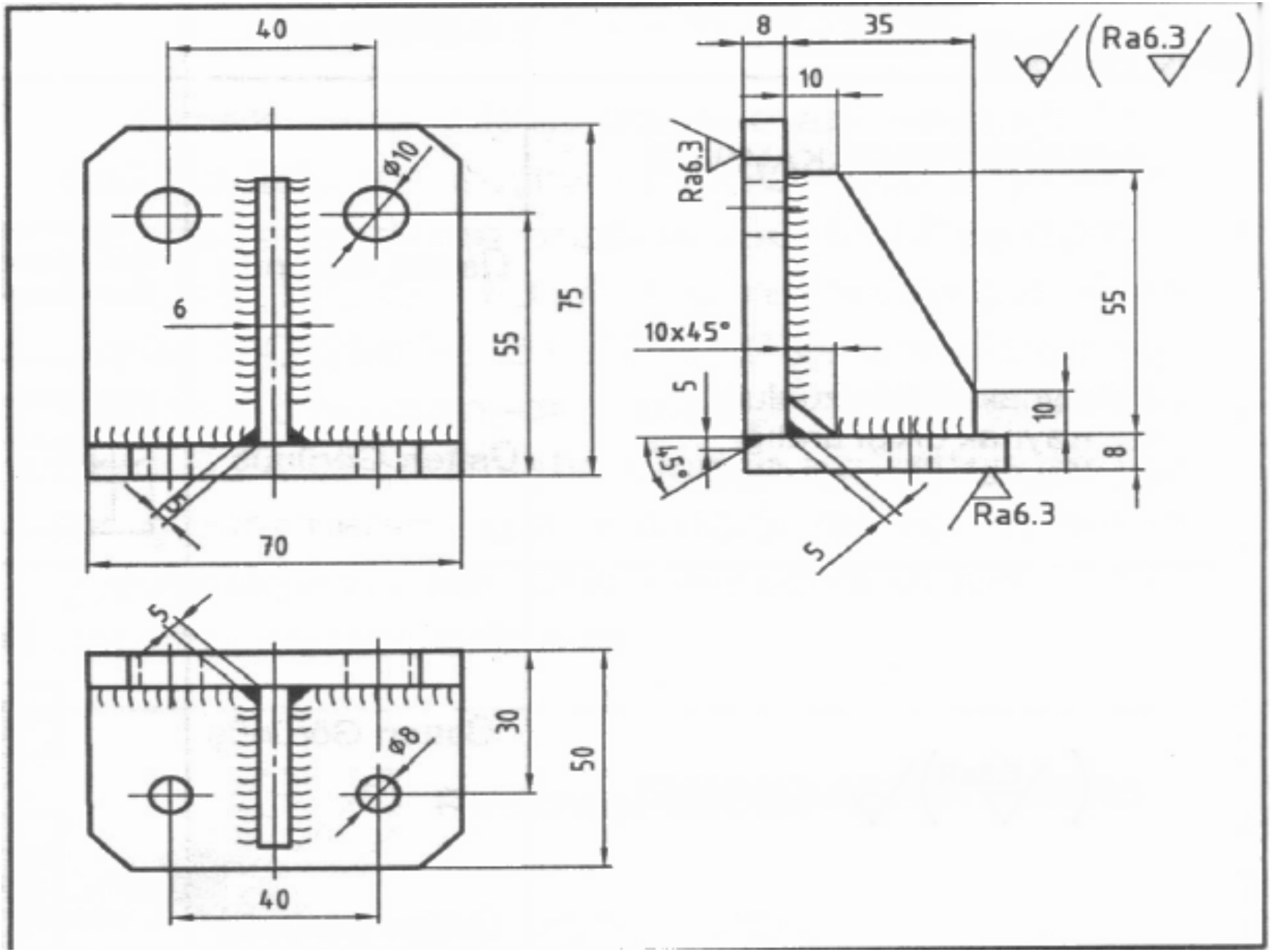
Resistance welding, showing the components in spot welding, the predominant process in the RW group.

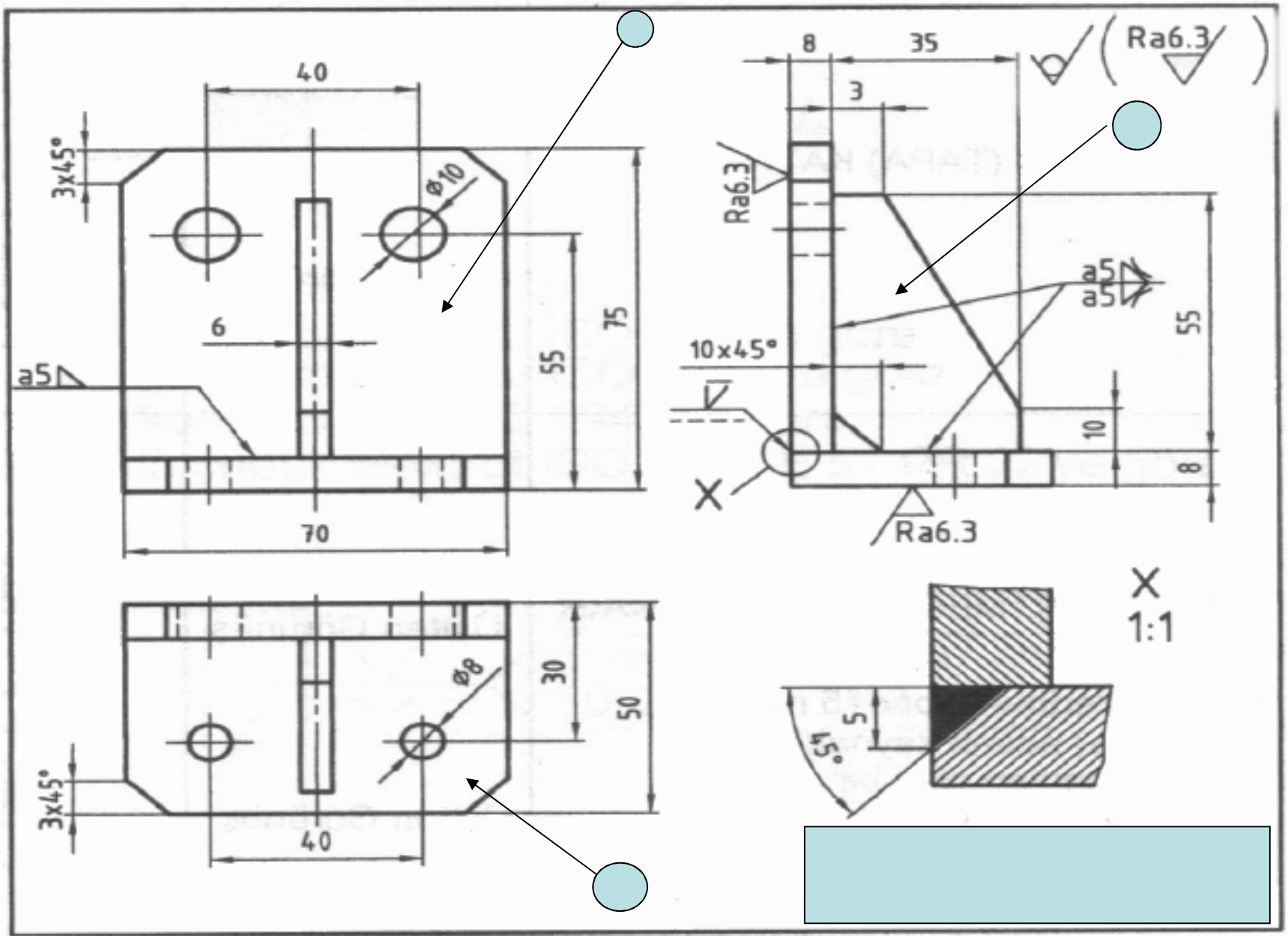


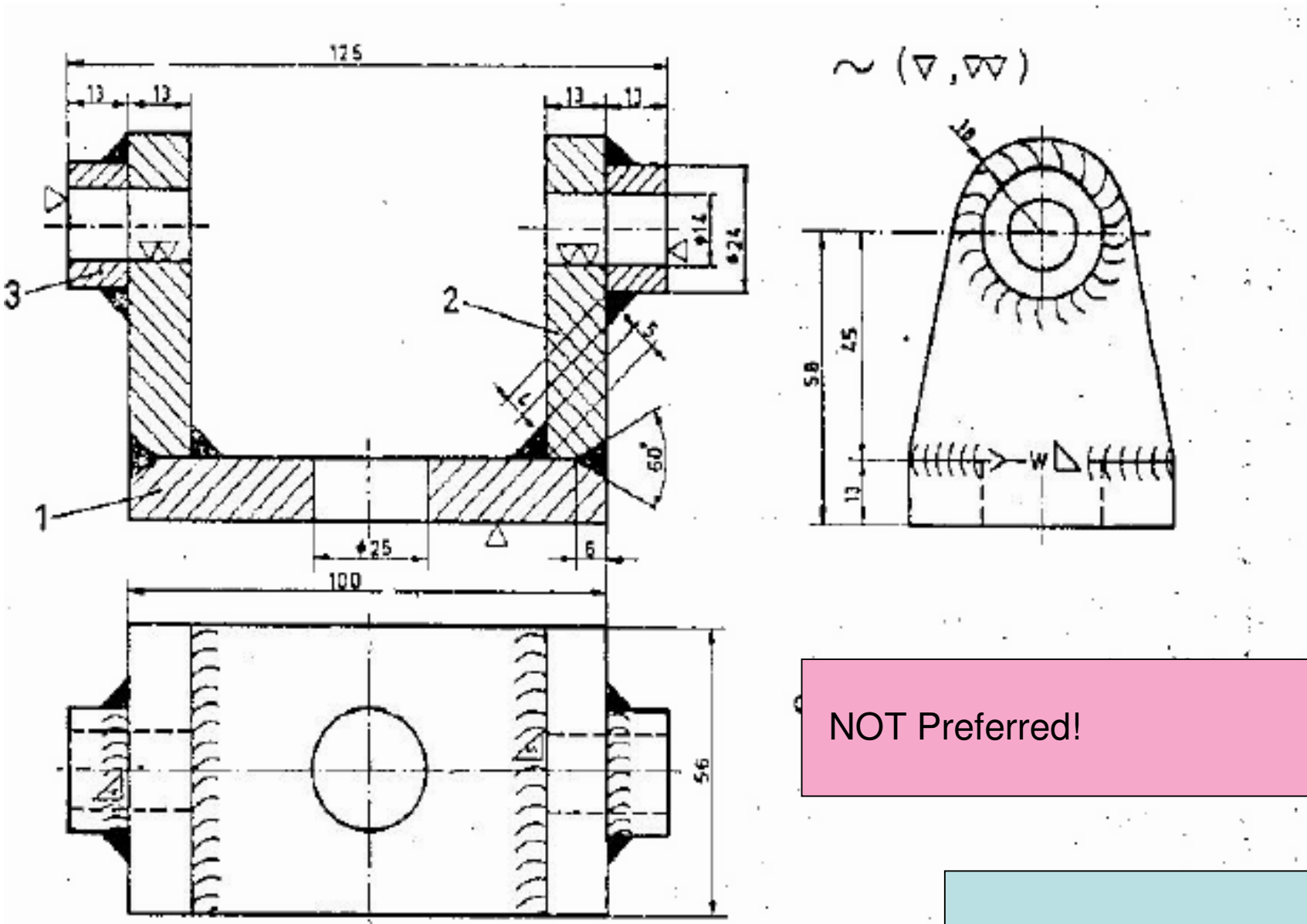
Resistance seam welding (RSEW).



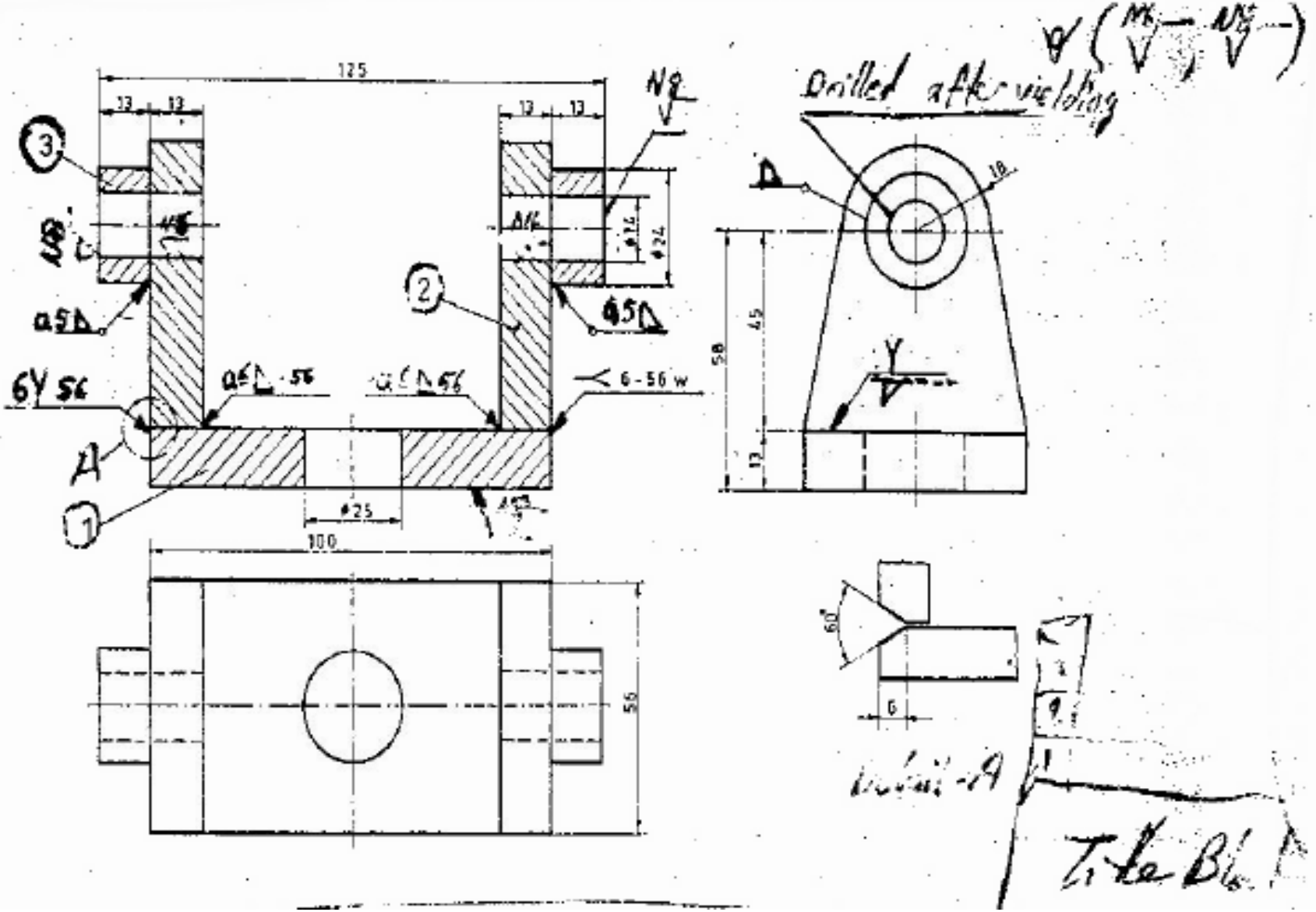

1
3
2
1
3
2


40
Ø10
6
55
75
70
8
35
10
Ra6.3
10x45°
5
55
10
8
Ra6.3
5
5
30
50
Ø8
40


40
3x45°
ø10
6
a5
55
75
70
8
35
3
Ra6.3
Ra6.3
a5
a5
10x45°
55
10
8
Ra6.3
X
X
1:1
ø8
30
50
3x45°
40
5
45°



NOT Preferred!


125
13
13
13
13
3
2
1
Drilled after welding
18
45
50
13
25
100
55
60
6
A

POSITIONS	POSTWELD HEAT TREATMENT
Position(s) of Groove: 3G (Vertical Only)	Soaking Temperature: N/A
Welding Progression: Vertical Uphill	Soaking Time: N/A
Position(s) of Fillet: 3F only	Heating Rate: N/A — Cooling Rate: N/A

PREHEAT	GAS
Preheat Temp. (Min.): 28°C	Percent Composition
Interpass Temp (max.): 250°C	Gas(es) / (Mixture) / Flow Rate
Preheat Maintenance : NA	Shielding(GTAW) ----- / ----- / -----
(Continuous or Special heating where applicable should be recorded)	Trailing ---- / --- / ---
	Backing --- / ---- / ----

TECHNIQUE		
String or Weave bead:	String & Weave	Oscillation: N/A
Max. Weave Width:	N/A	Contact tube to work distance: N/A
Orifice/Gas cup size:	N/A	Multiple/Single pass (per side): Multiple
Initial Cleaning:	Grinding / Wire brushing	Multiple/Single Electrode(s): Single
Interpass Cleaning: brushing	Grinding or & wire	Travel Speed (Range): 60-80mm/Min
Method of back gouging:	By Grinding	Peening: NA
Other: ---		Time between R&H.pass: ----

ELECTRICAL CHARACTERISTICS

	SMAW		SMAW
Current (A.C./D.C.)	DC	Polarity:	EP
Amps (Range) :	60-90	Volts (Range):	22-28
Tungsten Electrode Size & Type:	N/A	Mode of metal Transfer for GMAW: (Spray arc, short circuiting arc, etc.)	N/A

Electrode/Wire Feed Speed Range:

Weld Layer(s)	Process	Filler Metal		Current		Volts (Range)	Travel Speed (Range) mm/min	Heat Input KJ/mm
		Class	Dia	Type & Polarity	Amp. Range			
Root 1	SMAW	E-6010	2.6	DCEP	60-68	22-24	78	1.32-1.78
Hot Pass 2	SMAW	E-7018	2.6	DCEP	80-90	24-27	66	1.46-1.69
Fill Up 3	SMAW	E-7018	2.6	DCEP	90-95	24-26	60	1.29-1.29
Fill Up 4	SMAW	E-7018	2.6	DCEP	80-86	22-26	75	1.62-1.97
Fill Up 5	SMAW	E-7018	2.6	DCEP	80-88	22-28	70	1.07-1.26
Capping 6	SMAW	E-7018	2.6	DCEP	80-90	24-28	72	1.18-1.32
Back 8	SMAW	E-7018	2.6	DCEP	80-90	24-28	78	

06-11-20

CORE METAL L.L.C Sharjah-U.A.E

TÜVRheinland®
06/11/20
☐ Inspected ☑ Reviewed ☐ Witnessed

Welding Procedure Specification (WPS)

Welding Procedure Specification No.: Practice 21-8 Date: _____

Title:
Welding GTAW of sheet to sheet .

Scope:
This procedure is applicable for square groove and fillet welds within the range of 18 gauge through 10 gauge .

Welding may be performed in the following positions: 1G and 2F .

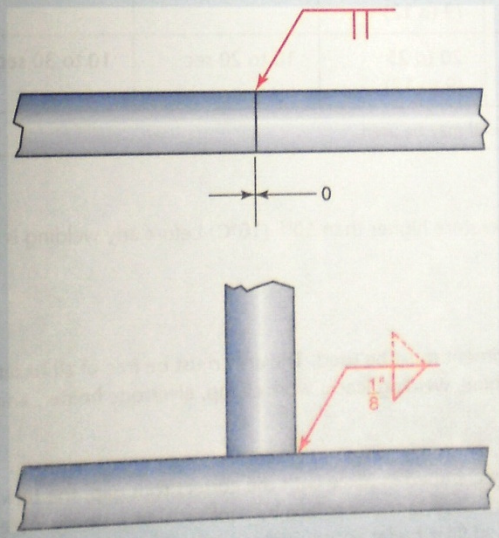
Base Metal:
The base metal shall conform to austenitic stainless steel M-8 or P-8 . Backing material specification: none .

Filler Metal:
The filler metal shall conform to AWS specification no. ER3XX from AWS specification A5.9 . This filler metal falls into F-number F-6 and A-number A-8 .

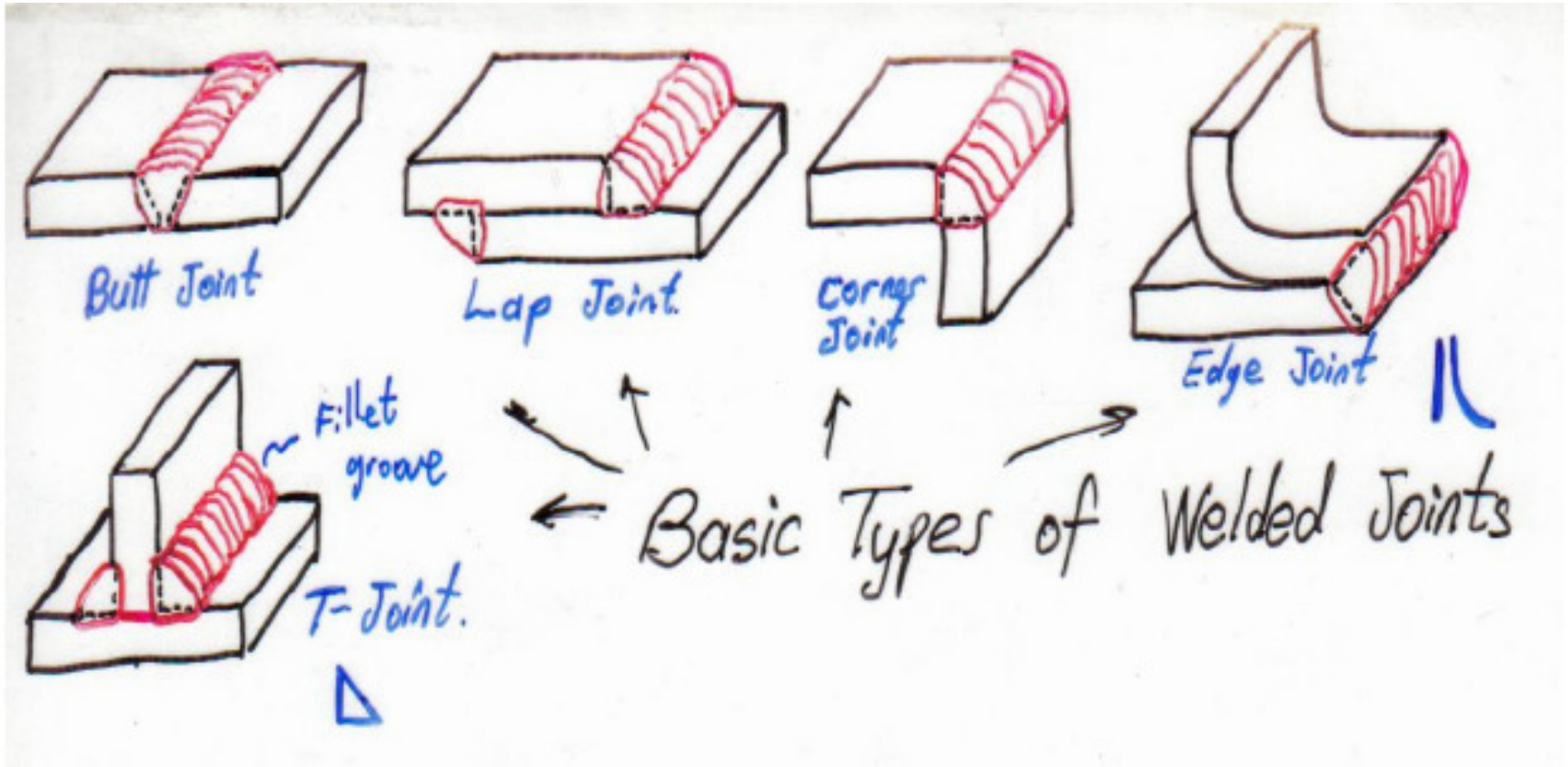
Electrode:
The tungsten electrode shall conform to AWS specification no. EWTh-2 from AWS specification A5.12 . The tungsten diameter shall be 1/8 in. (3.2 mm) maximum . The tungsten end shape shall be tapered at two to three times its length to its diameter .

Shielding Gas:
The shielding gas, or gases, shall conform to the following compositions and purity: welding grade argon .

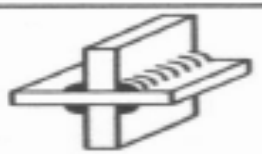
Joint Design and Tolerances:

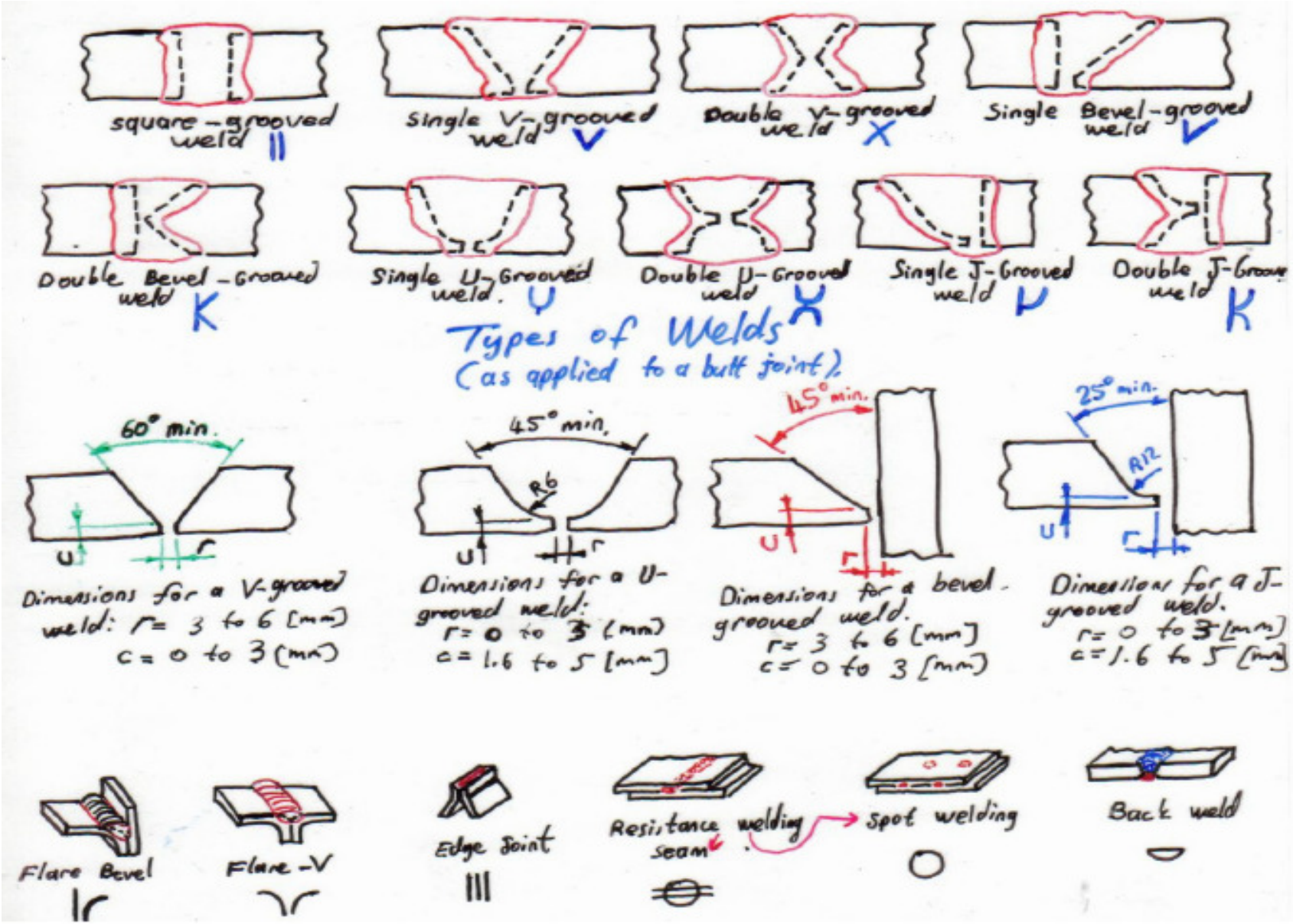


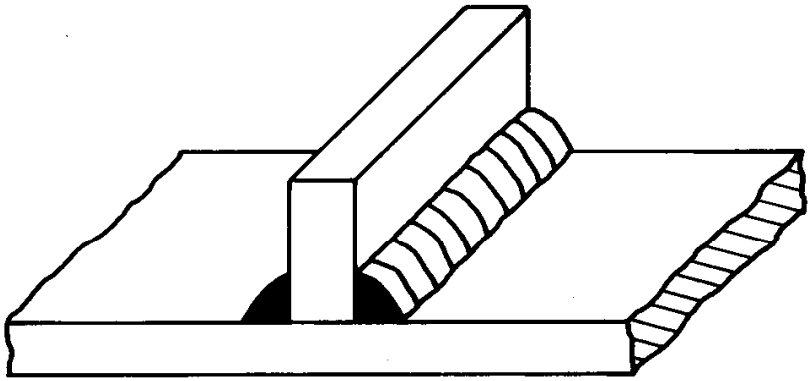
Preparation of Base Metal:
All hydrocarbons and other contaminations, such as cutting fluids, grease, oil, and primers, must be cleaned off all parts and filler metals before welding. This cleaning can be done with any suitable solvents or detergents. The joint face and inside and outside plate surface within 1 in. (25 mm) of the joint must be cleaned of slag, oxide, and scale. Cleaning can be mechanical or chemical. Mechanical metal cleaning can be done by grinding, stainless steel wire brushing, scraping, machining, or filing. Chemical cleaning can be done by using acids, alkalies, solvents, or detergents. Cleaning must be done down to bright metal.


Butt Joint
Lap Joint
Corner Joint
Edge Joint
Fillet groove
T-Joint.
Basic Types of Welded Joints

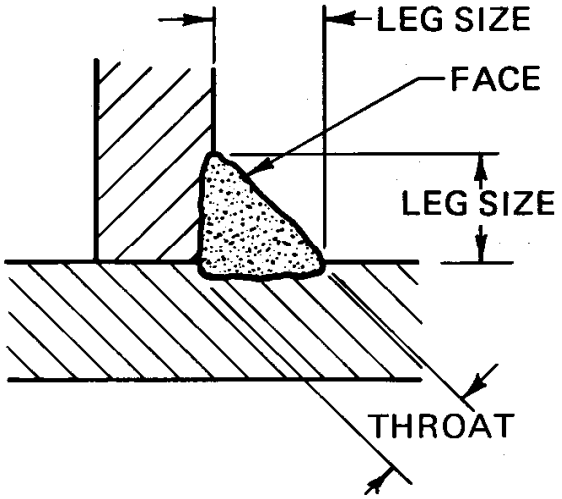
KAYNAKLI BİRLEŞTİRMELER

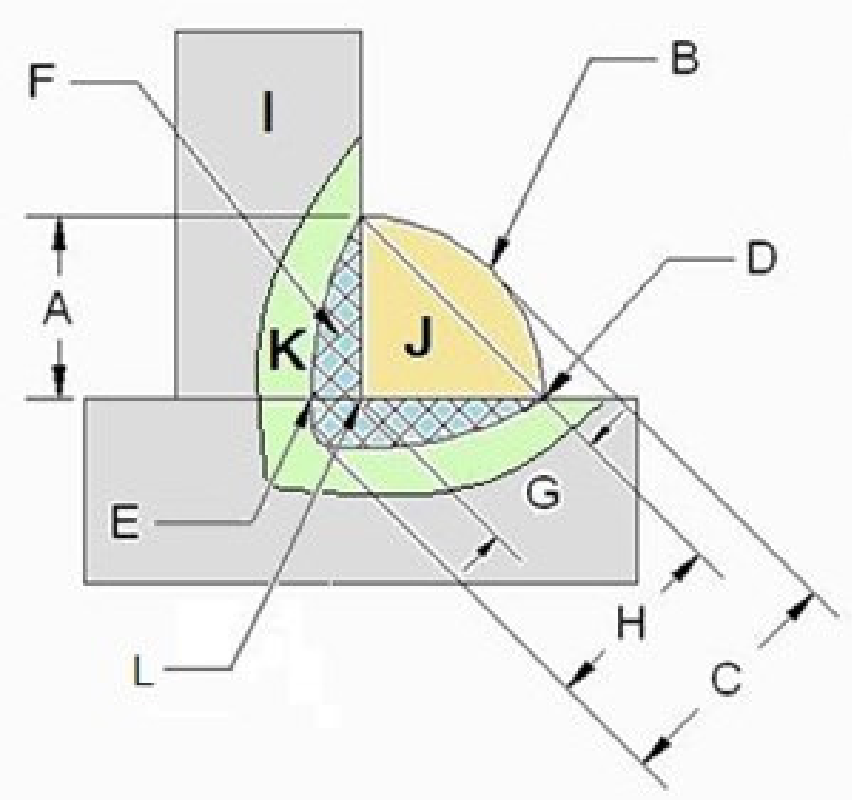
Sıra	Adı	Resim
1	Alın Birleştirme	
2	Paralel Birleştirme	
3	Bindirme Birleştirme	
4	T - Birleştirme	
5	Çift T - Birleştirme	
6	Eğik T - Birleştirme	
7	Köşe Birleştirme	
8	Çoklu Birleşik Birleştirme	


square-grooved weld
Single V-grooved weld
Double V-grooved weld
Single Bevel-grooved weld
Double Bevel-Grooved weld
Single U-Grooved weld
Double U-Grooved weld
Single J-Grooved weld
Double J-Groove weld
Types of Welds
(as applied to a butt joint)
60° min.
45° min.
R6
45° min.
25° min.
A12
Dimensions for a V-grooved weld: r= 3 to 6 [mm]
c = 0 to 3 (mm)
Dimensions for a U-grooved weld:
r= 0 to 3 (mm)
c= 1.6 to 5 [mm]
Dimensions for a bevel-grooved weld.
r= 3 to 6 [mm]
c= 0 to 3 [mm]
Dimensions for a J-grooved weld.
r= 0 to 3 [mm]
c= 1.6 to 5 [mm]
Flare Bevel
Flare-V
Edge Joint
Resistance welding seam
Spot welding
Back weld

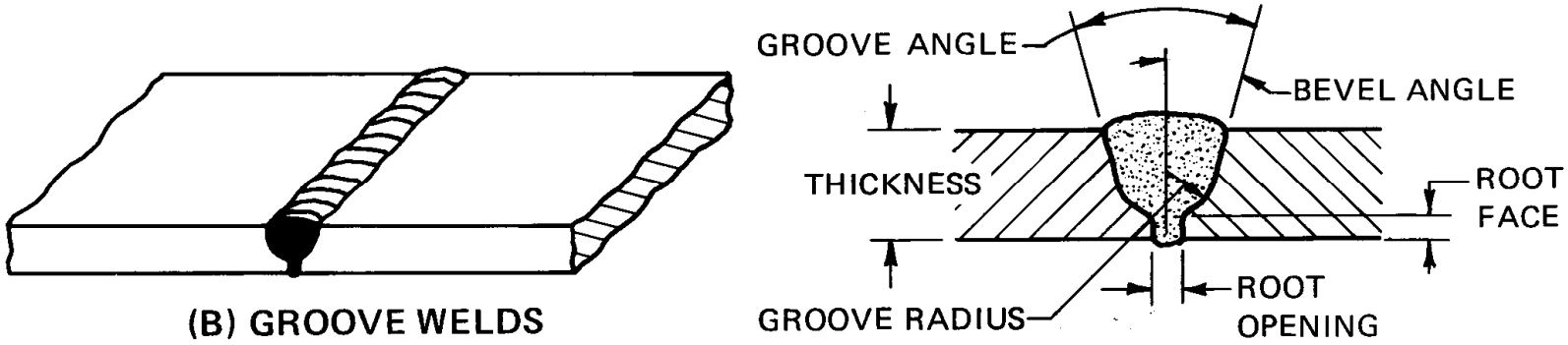


(A) FILLET WELDS



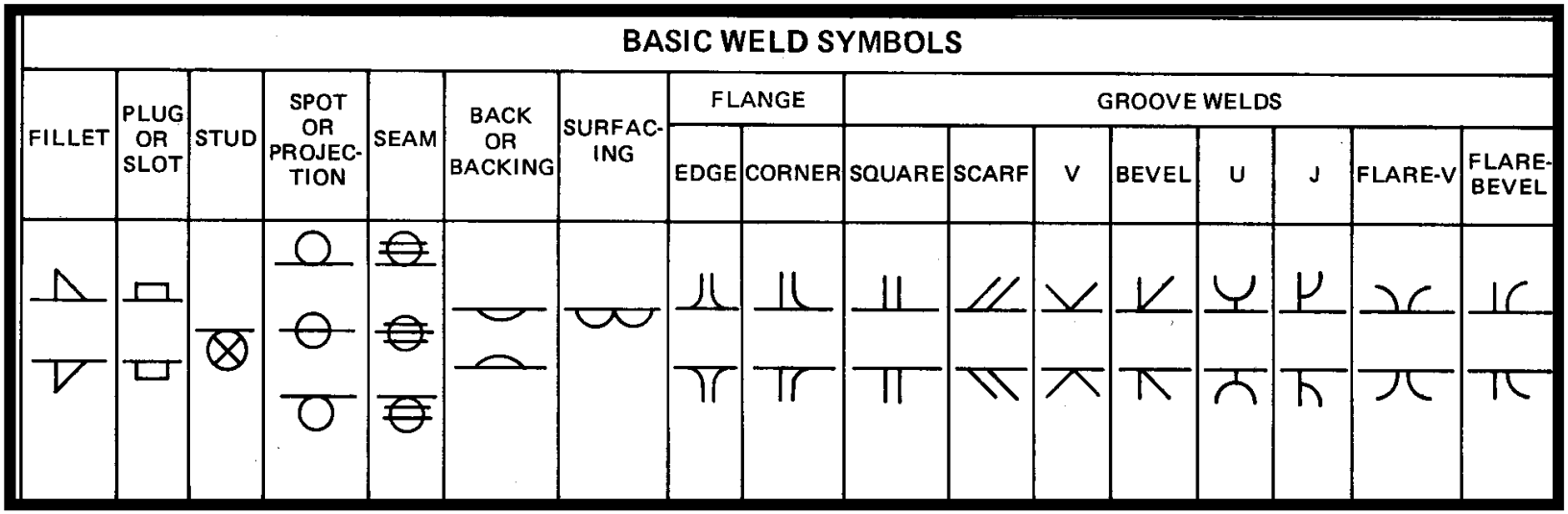


WELD TERMINOLOGY

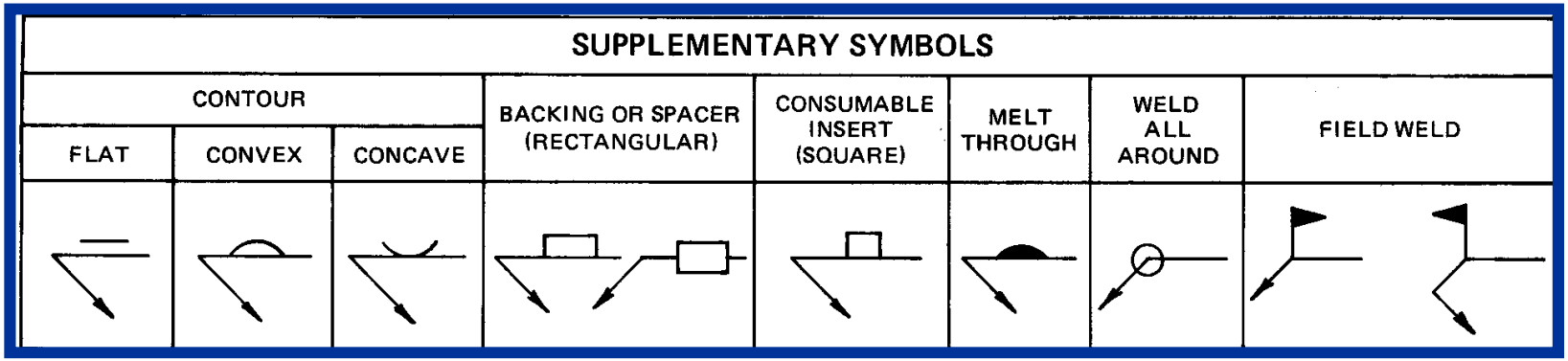


(B) GROOVE WELDS

WELD TERMINOLOGY

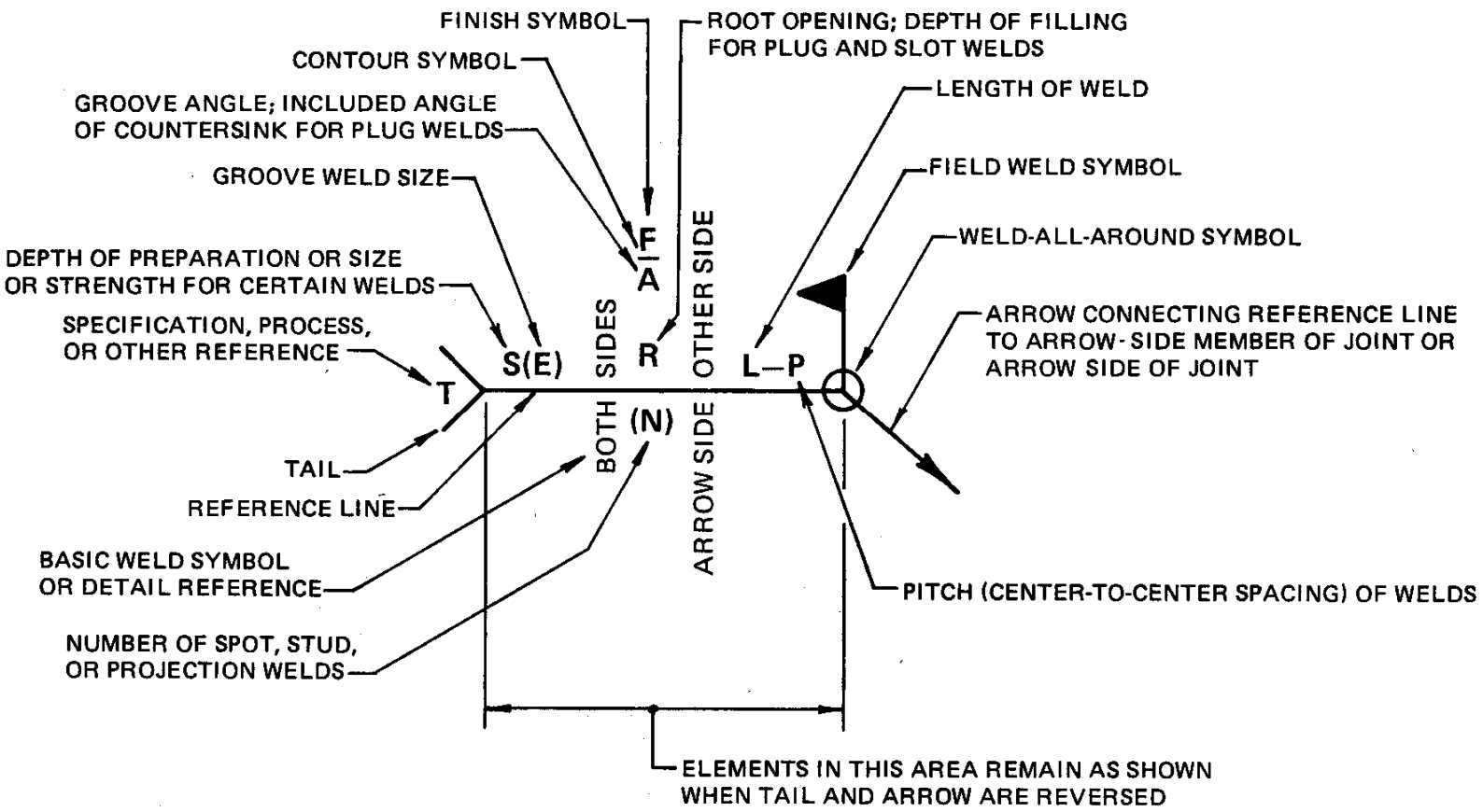


WELDING SYMBOLS

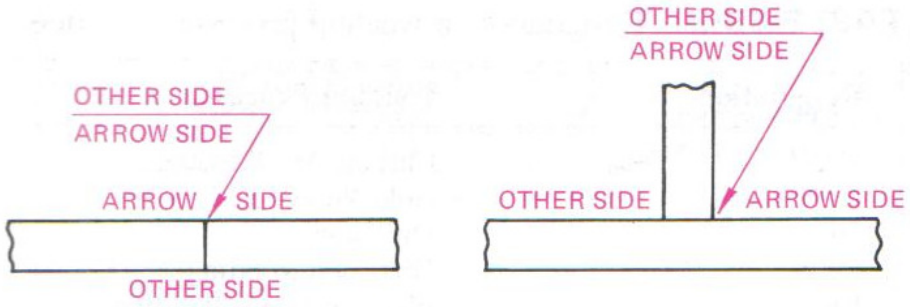


WELD TERMINOLOGY

WELDING DRAWINGS

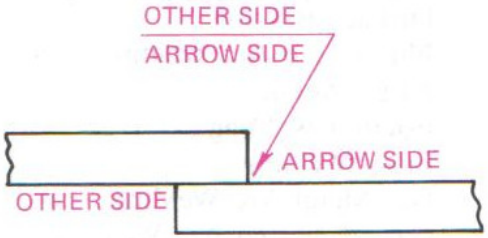


WELD TERMINOLOGY

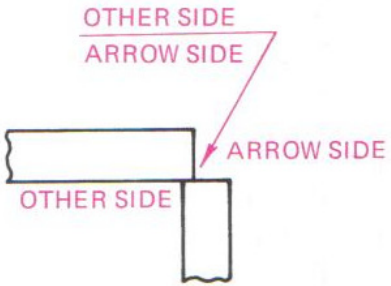


BUTT JOINT

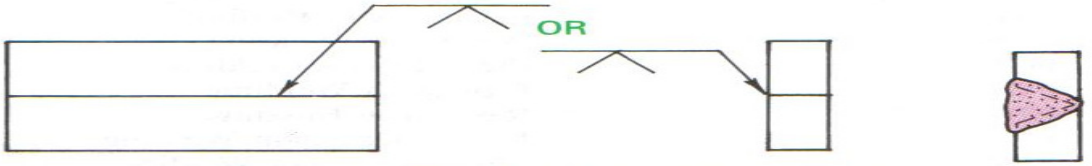
T–JOINT



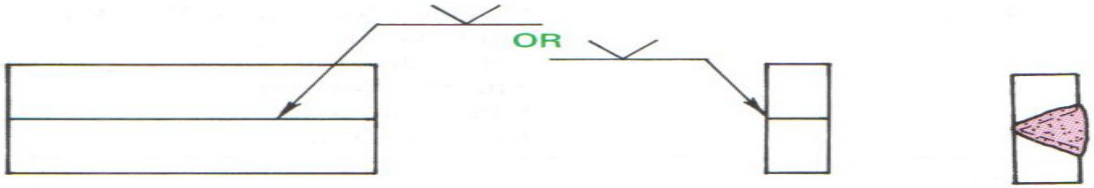
LAP JOINT



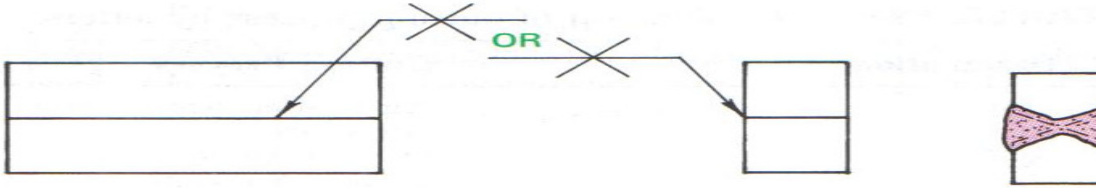
CORNER JOINT



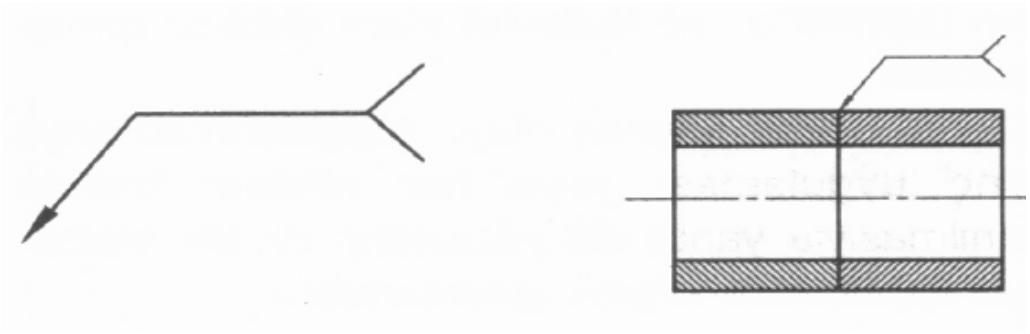
ARROW-SIDE V-GROOVE WELD SYMBOL



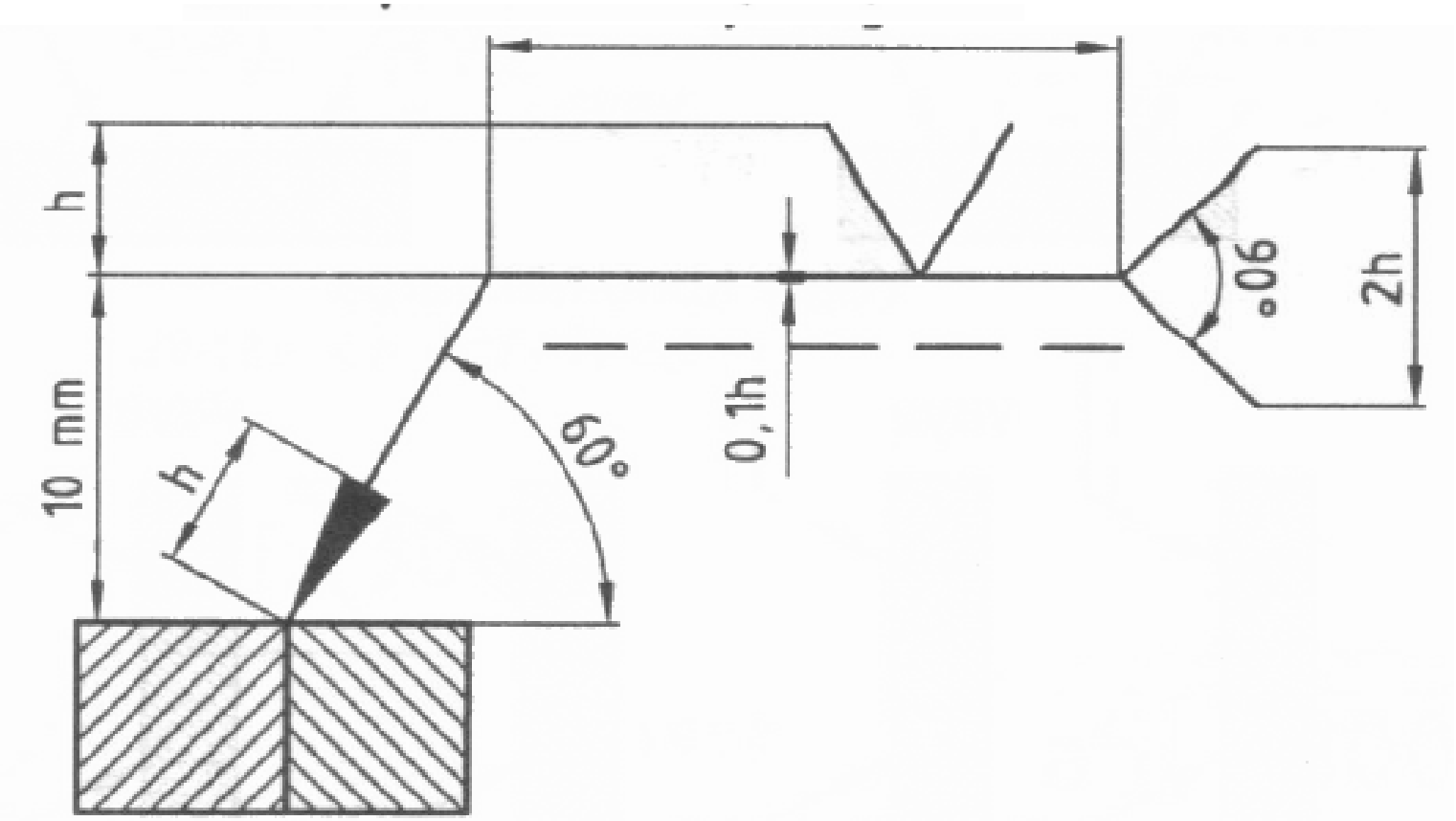
OTHER-SIDE V-GROOVE WELD SYMBOL

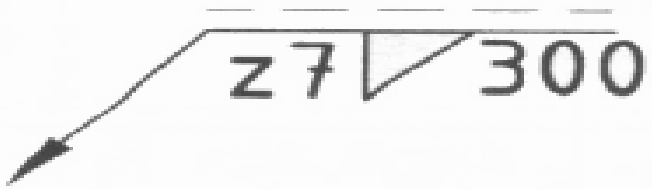


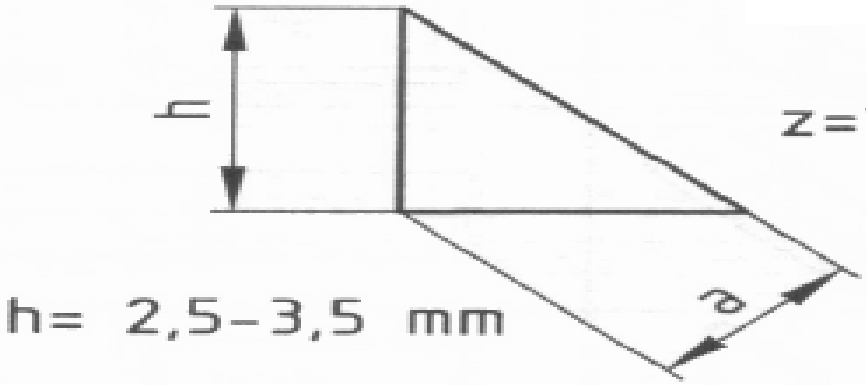
BOTH-SIDES V-GROOVE WELD SYMBOL



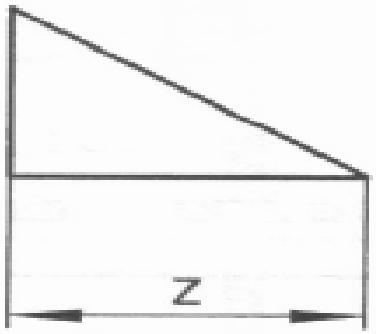
"TS 3004 EN 22553



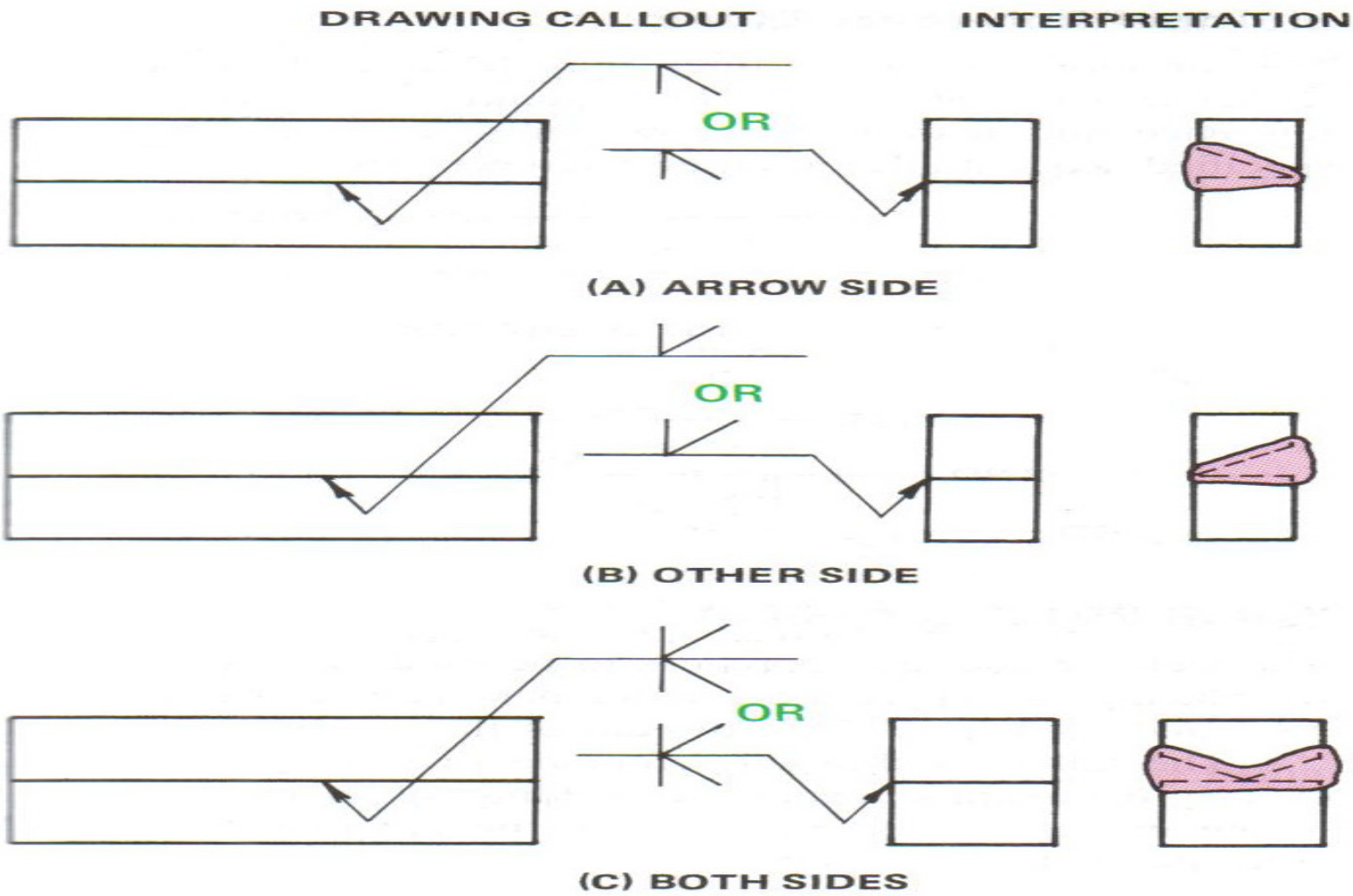




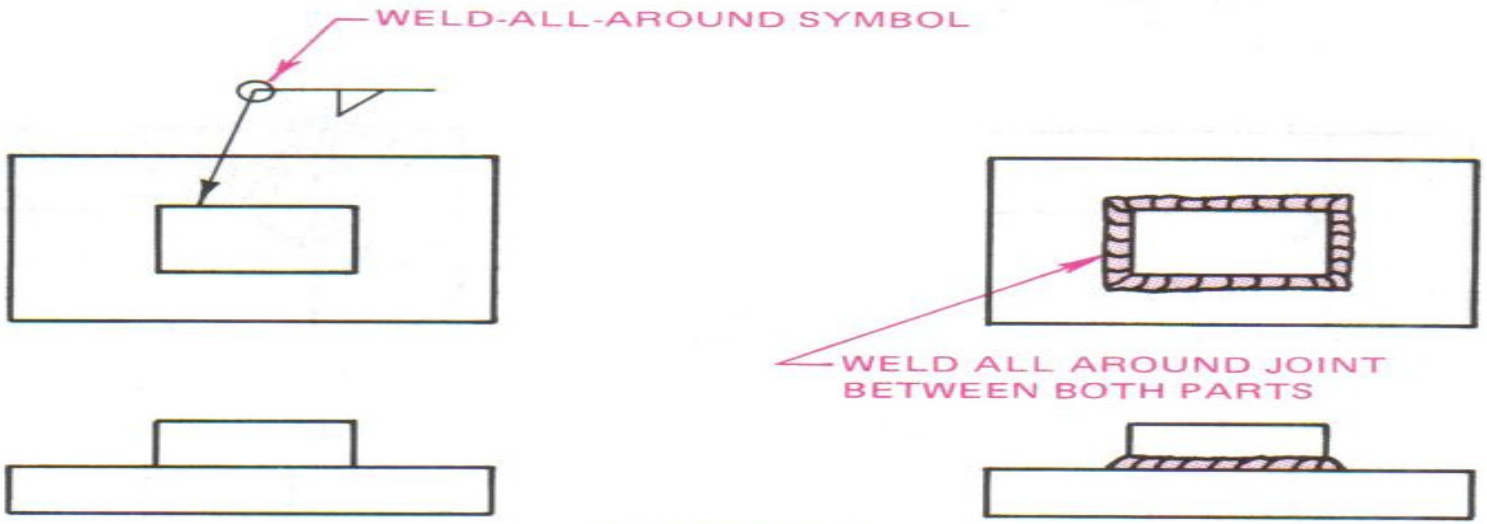
z=1,41.a



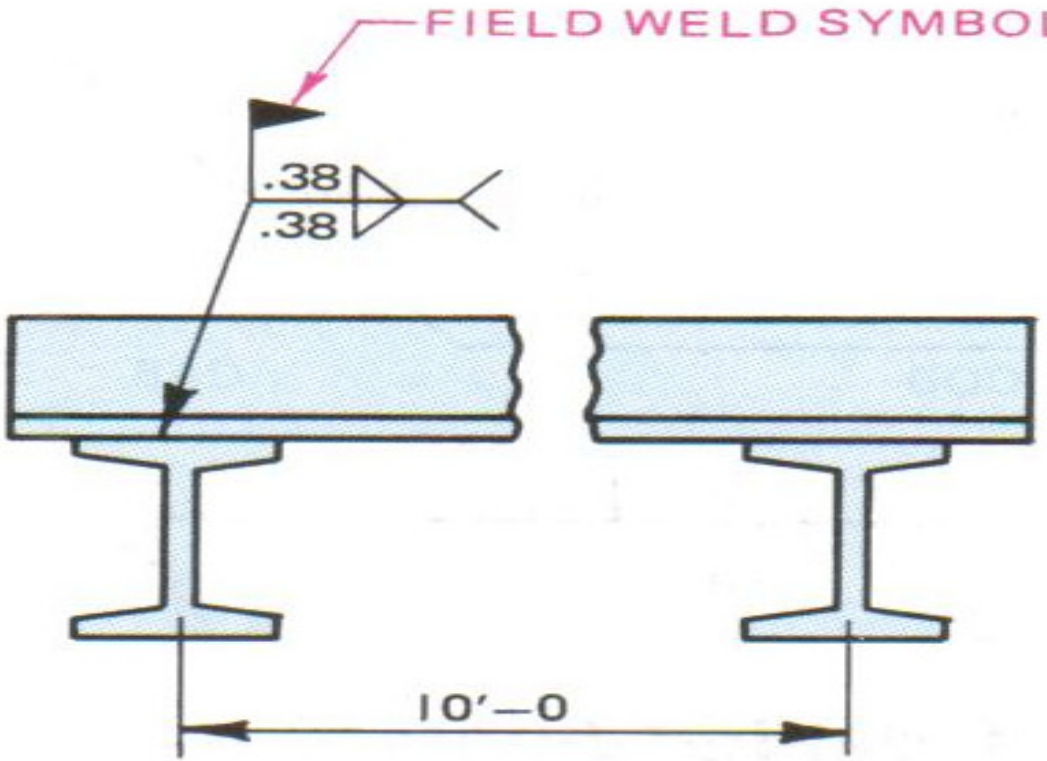
Break in Arrow When only one member of a joint is to be prepared, the arrow has a break and points toward that member . If it is obvious which member is to be prepared, or there is no preference as to which member is to be prepared, the arrow need not be broken.



Application of break in arrow of welding symbol.

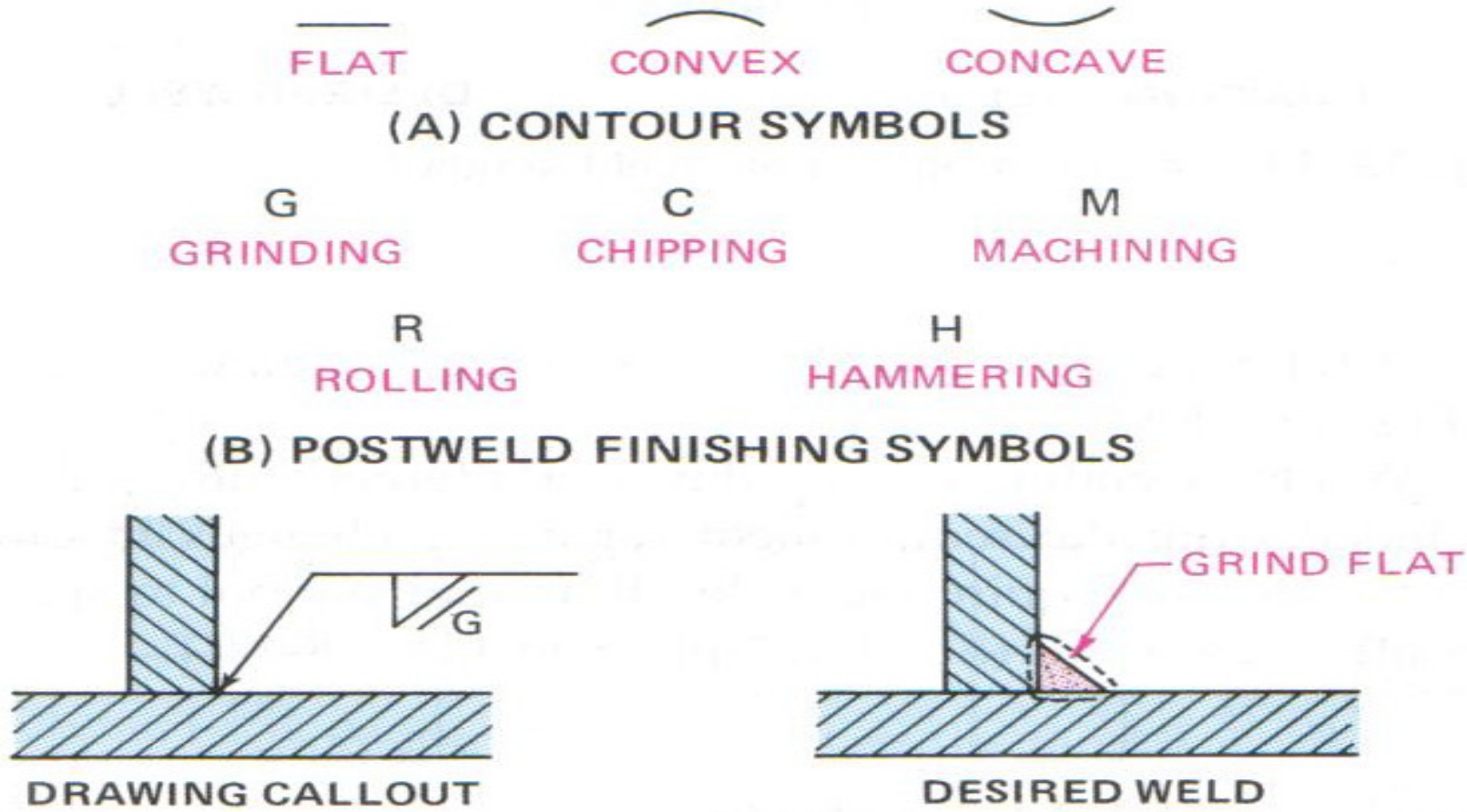

WELD-ALL-AROUND SYMBOL
WELD ALL AROUND JOINT
BETWEEN BOTH PARTS

EXAMPLE 2

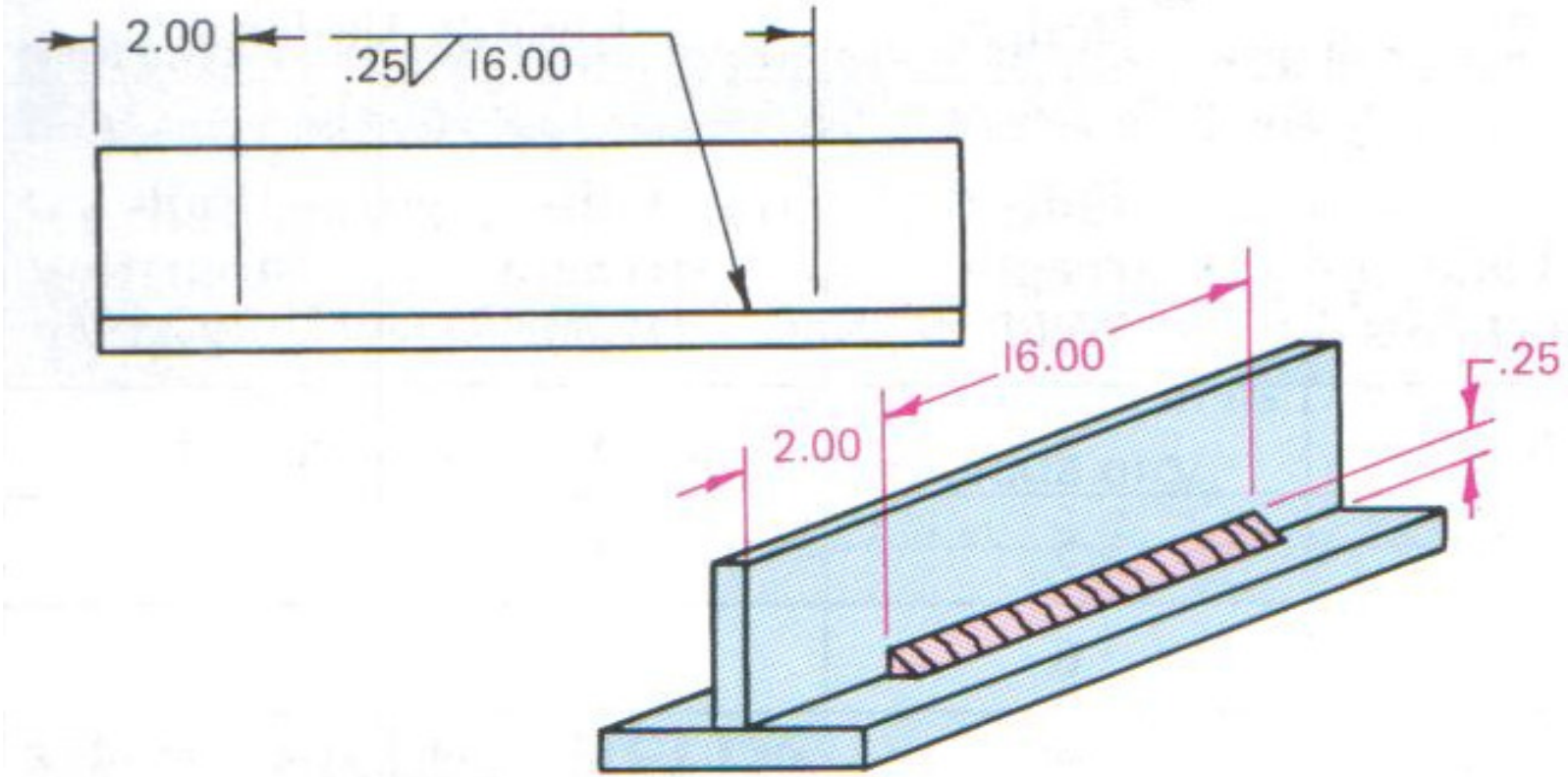

FIELD WELD SYMBOL
.38
.38
10'—0

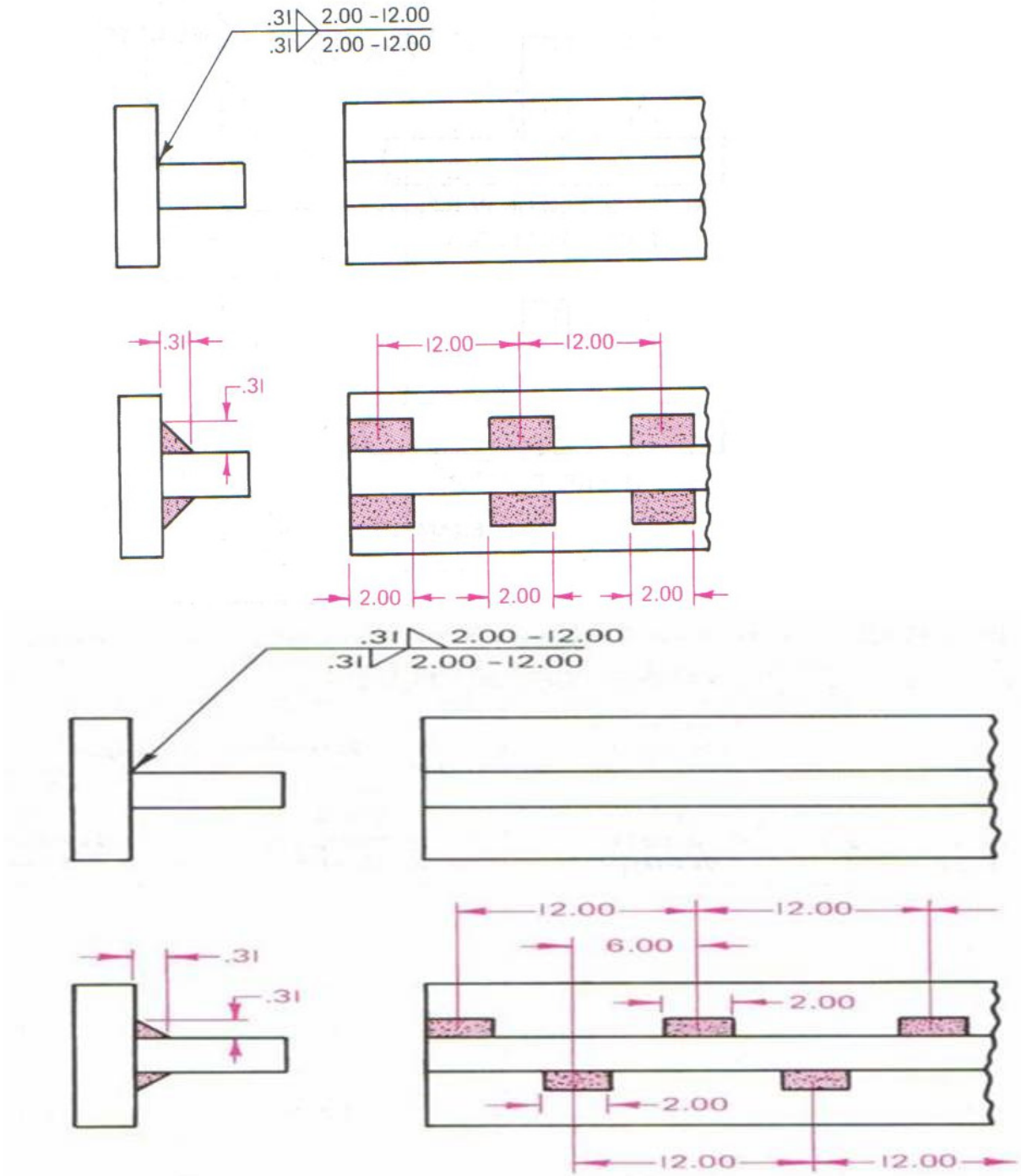
Contours Obtained by Welding

Welds that are to be welded with approximately flush or convex faces without postweld finishing are specified by adding the flush or convex contour symbol to the welding symbol.

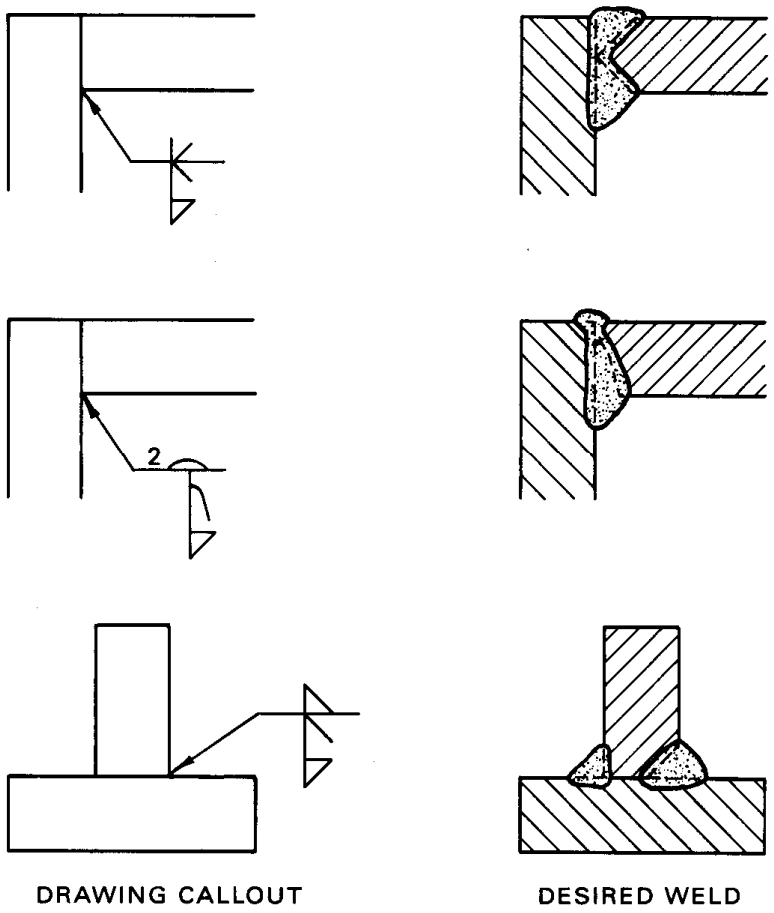


Finishing of welds.


2.00
.25
16.00
16.00
2.00
.25

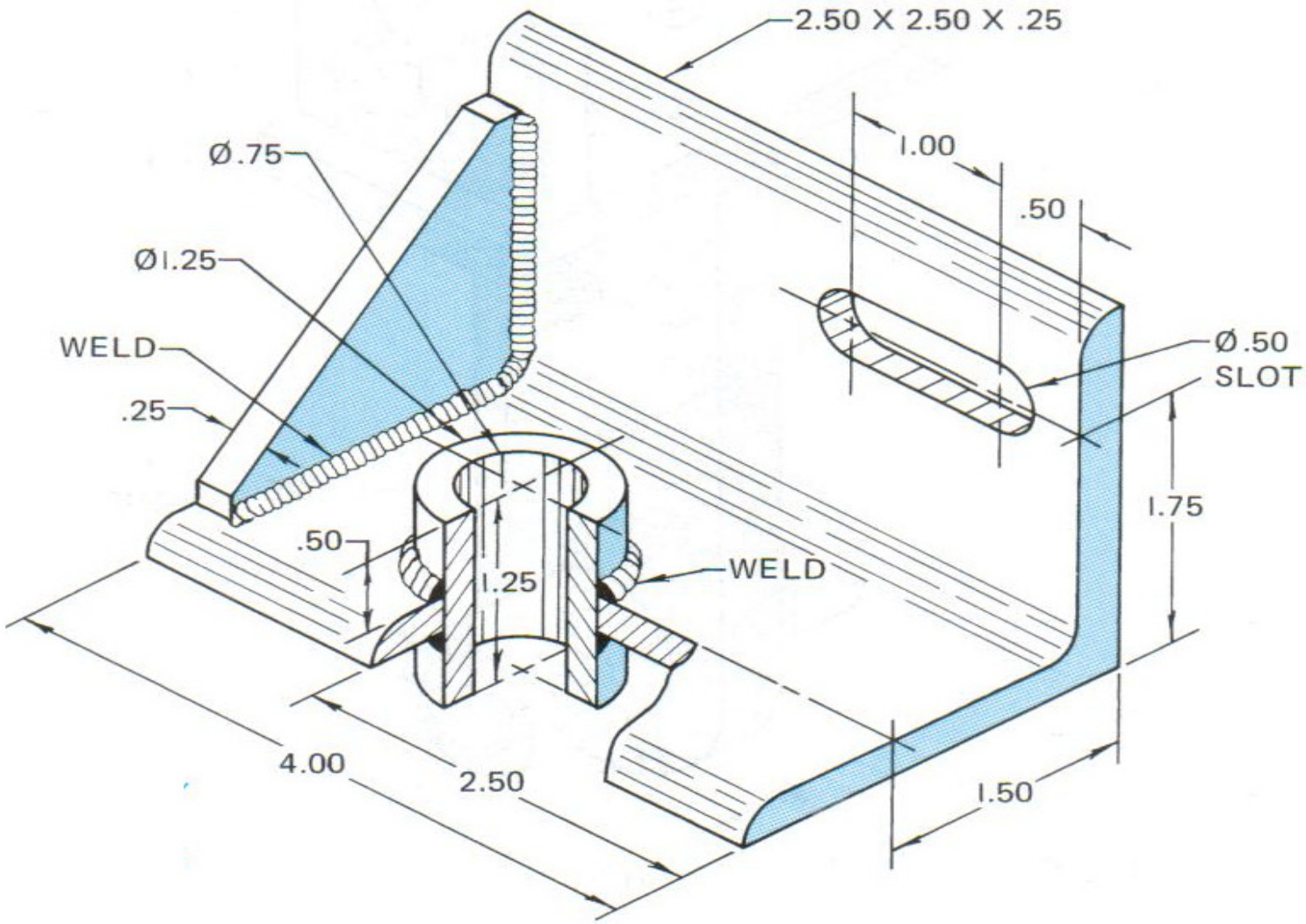

.31 2.00 -12.00
.31 2.00 -12.00
.31
.31
12.00
12.00
2.00
2.00
2.00
.31 2.00 -12.00
.31 2.00 -12.00
.31
.31
12.00
12.00
6.00
2.00
2.00
12.00
12.00

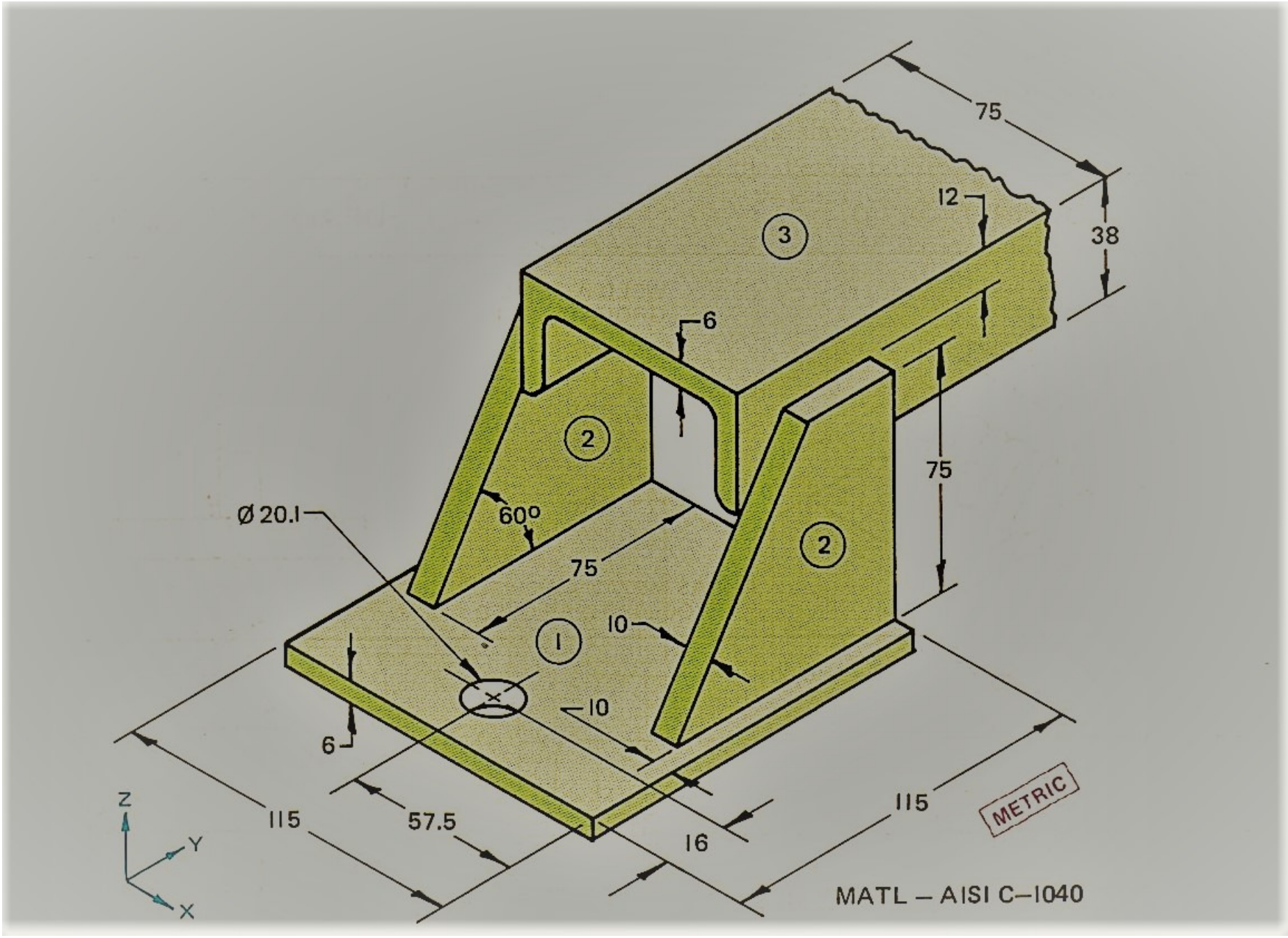
WELDING DRAWINGS

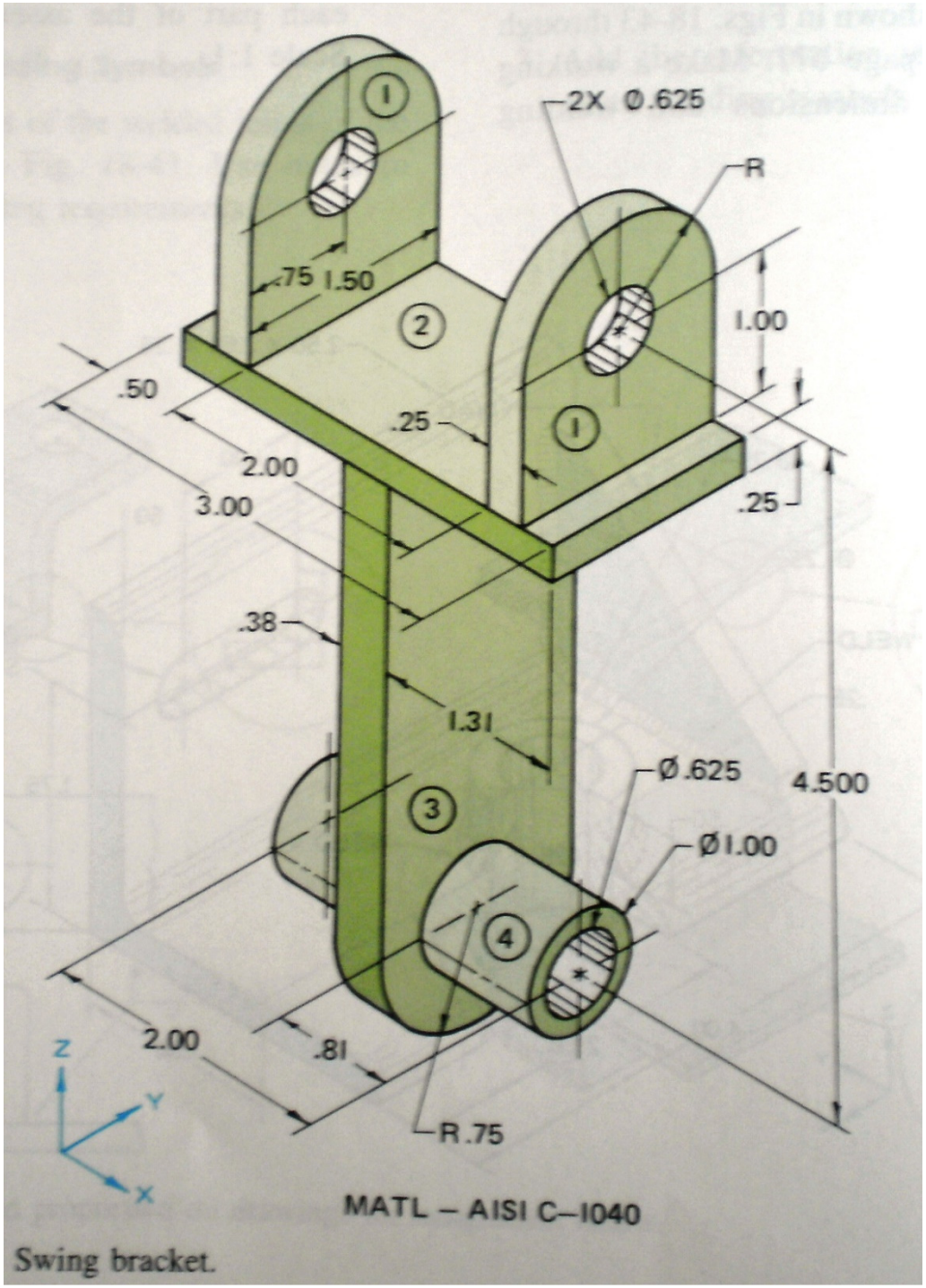


COMBINED WELDING SYMBOLS

Make a working drawing complete with dimensions and welding symbols. Include on the drawing an item list and identify each part of the assembly. Use full-strength welds.
Scale 1/1




75
12
38
3
6
2
Ø 20.1
60°
75
2
75
10
1
10
6
115
57.5
16
115
METRIC
Z
Y
X
MATL – AISI C–1040



Swing bracket.