TIMAH
POLITEKNIK MANUFAKTUR

GTM10

GAMBAR TEKNIK MESIN

POLITEKNIK MANUFAKTUR TIMAH (POLMAN - TIMAH)
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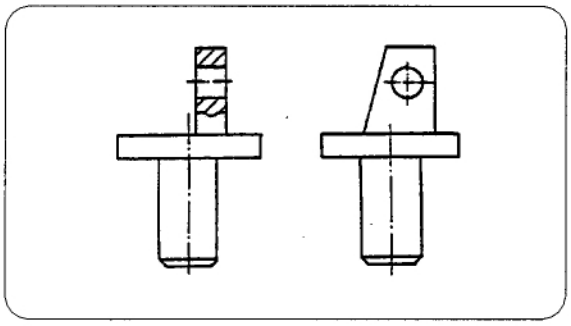
MATERI X

10. PENGELASAN

- **Simbol Pengelasan**
- **Penunjukan Pengelasan**



1. TUJUAN

1.1 Mengenal pemakaian dan jenis simbol las.

1.2 Dapat membaca arti penunjukkan ukuran lasan gambar konstruksi pengelasan.

Nama	Simbol
1. Las tepi	
2. las sudut	
3. Las Tumpul V	

2. SIMBOL

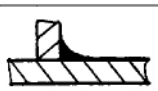
2.1 Simbol dasar

Tiap jenis lasan pada gambar konstruksi ditunjukkan dengan simbol lasan. (Lihat lampiran)

Permukaan	Simbol
1.Lurus	
2.Cembung	
3.Cekung	

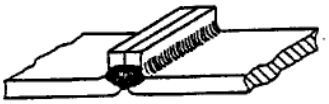
2.2 Simbol pelengkap

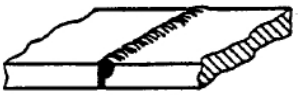
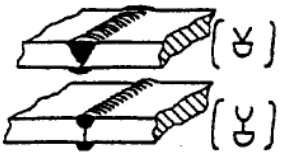
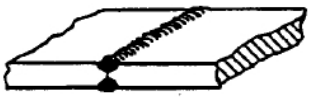
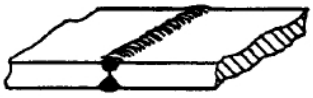
Dicantumkan pada simbol dasar untuk memperjelas bentuk permukaan lasan yang diinginkan.

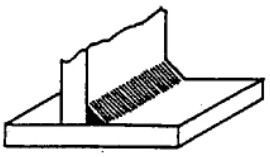
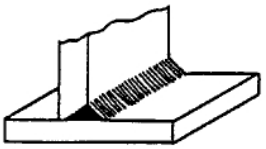
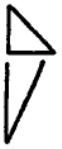
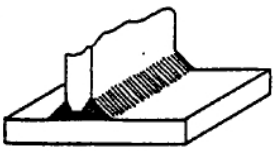
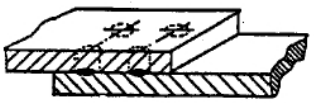
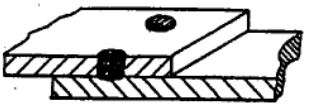
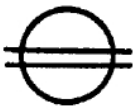
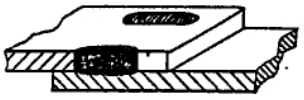
Bentuk Las	Simbol
	
	
	

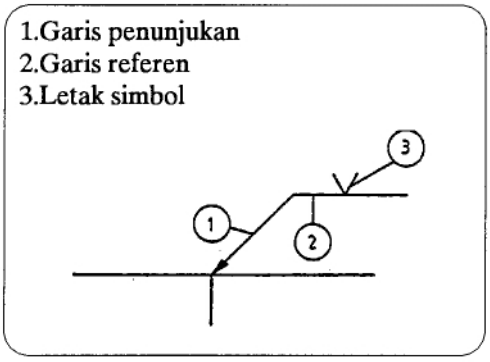
2.3 Simbol dasar dan pelengkap

Bentuk permukaan hasil proses pengelasan.
Permukaan lurus dibentuk dengan penggerindaan.

No.	NAMA	GAMBAR SEBENARNYA	SIMBOL DASAR
1	Las tepi beban ringan		
2	Las tumpul I beban statis		
3	Las tumpul V tunggal beban statis		
4	Las tumpul V tunggal beban statis		
5	Las tumpul V tunggal dengan kaki		
6	Las tumpul V		

No.	NAMA	GAMBAR SEBENARNYA	SIMBOL DASAR
7	Las tumpulU tunggal dengan kaki, beban statis dan dinamis		
8	Las tumpul J tunggal		
9	Las penguat beban (sebagai tambahan pada las V ; Y)		
10	Las tumpul V ganda beban statis dan dinamis		
11	Las tumpul V ganda beban statis		
12	Las tumpul V dengan V tunggal		

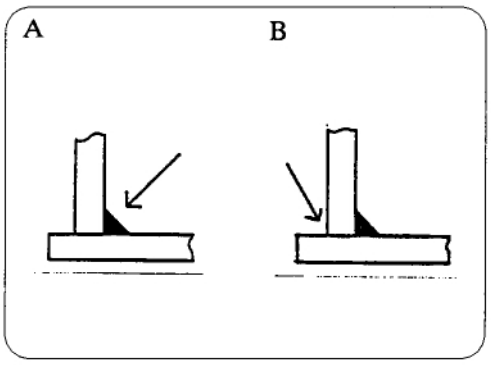
No.	NAMA	GAMBAR SEBENARNYA	SIMBOL DASAR
13	Las sudut beban statis		
14	Las sudut dengan las tumpul V		
15	Las tumpul dengan las sudut		
16	Las listrik		
17	Las seam		
18	Las slot		



3. POSISI SIMBOL PADA GAMBAR

3.1 Letak Simbol

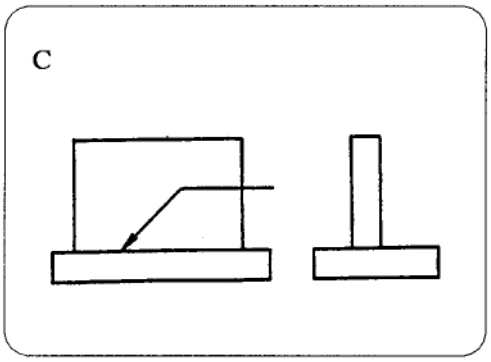
Simbol diletakkan pada garis reference penunjukkan ukuran. Anak panah menuju sambungan yang dilas.



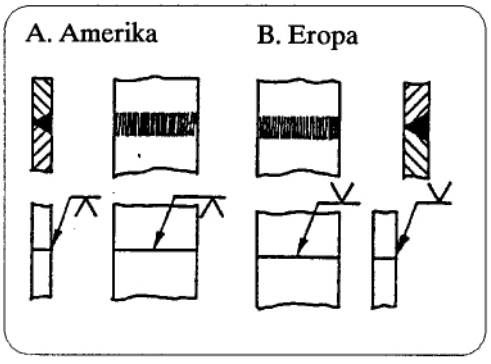
3.2 Letak Penunjukkan (pada penampang potong profil)

A. Penunjukkan langsung pada bagian pengelasan.

B. Penunjukan dibalik bagian pengelasan.



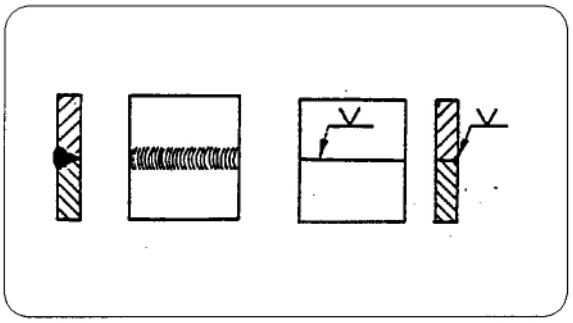
C. Penunjukan diberikan tidak pada penampang potong profil.



4. METODE PELETAKAN PENUN-JUKAN SIMBOL LAS

A. Proyeksi Eropa

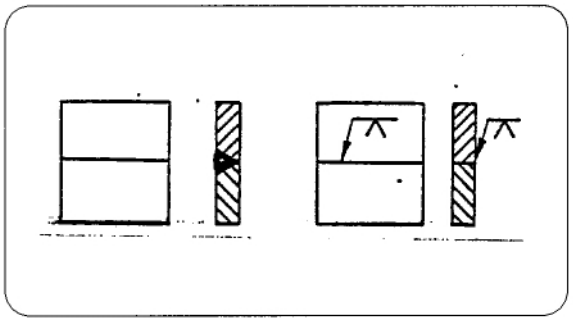
B. Proyeksi Amerika



4.1 Peletakan Simbol Metode Eropa

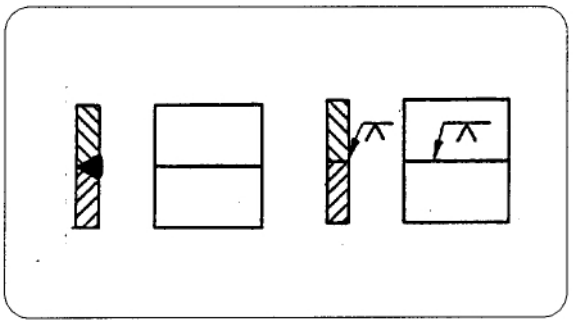
4.1.1 Diatas garis penunjukan

Bila permukaan bagian luar las (face weld) pada tanda panah.



4.1.2 Dibawah garis penunjukan

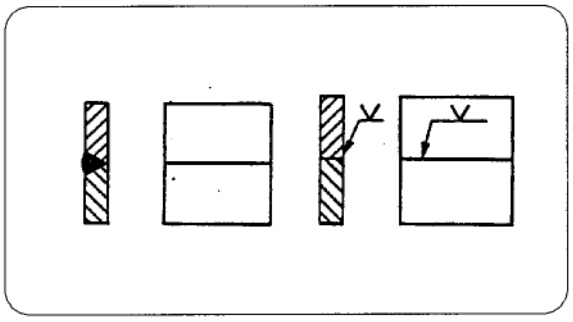
Bila permukaan bagian luar las (face weld) disebaliknya tanda panah.



4.2 Peletakkan Simbol Metode Amerika

4.2.1 Di bawah Garis Penunjukan

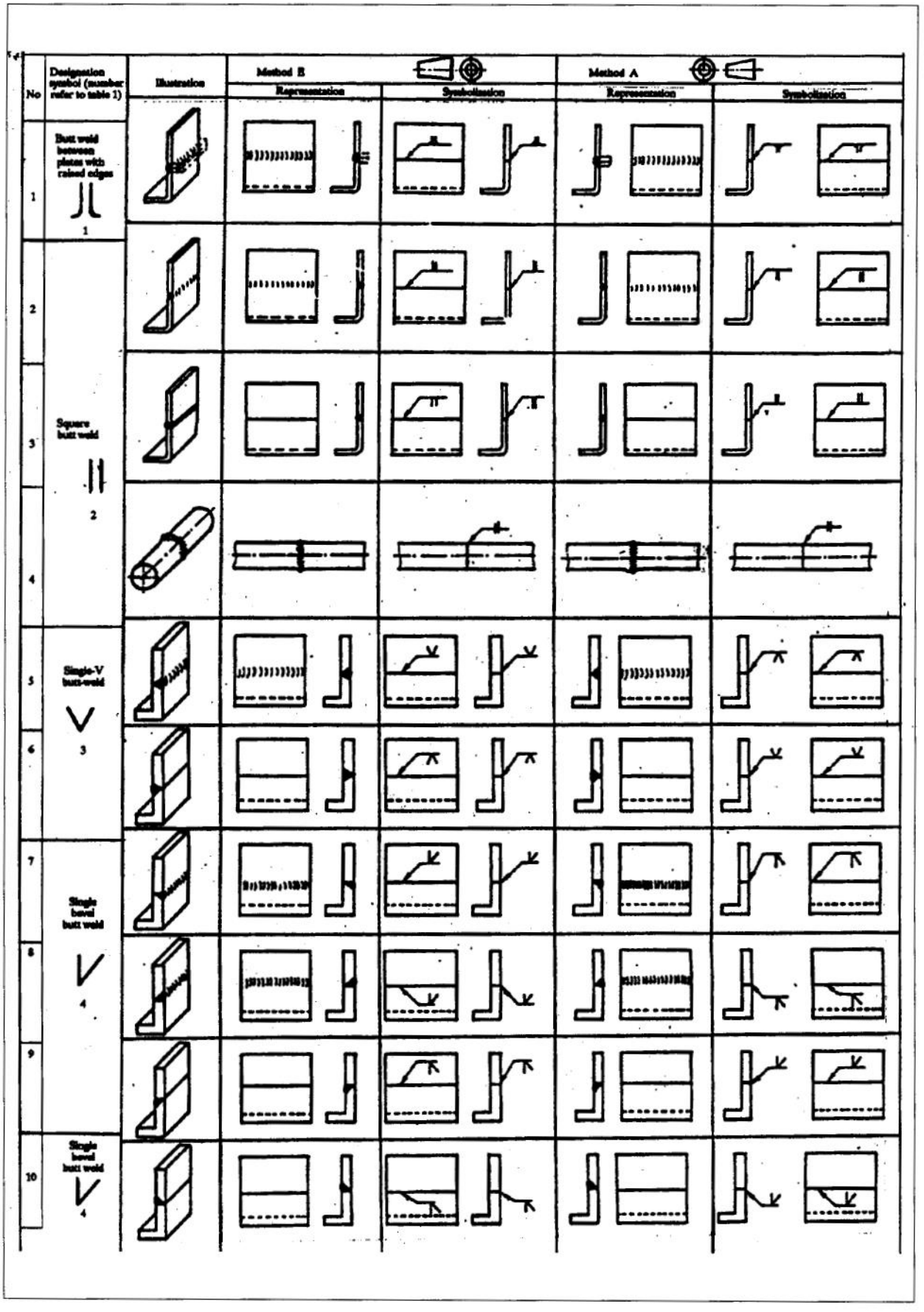
Bila permukaan bagian luar las (weld face) pada tanda panah.



4.2.2 Di atas garis Penunjukan

Bila permukaan bagian luar las (weld face) disebaliknya tanda panah.

DESIGNATION OF WELDING BY BASIC SYMBOL



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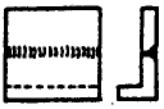
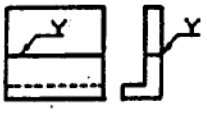
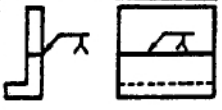
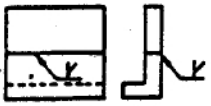
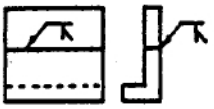
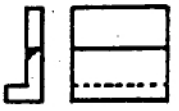
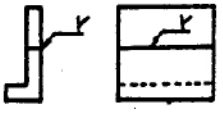
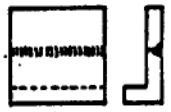
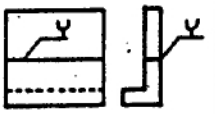
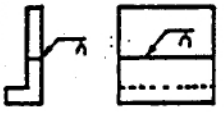
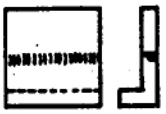
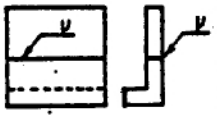
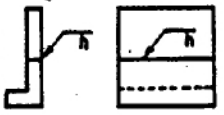
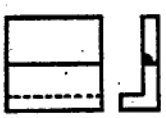
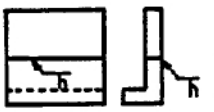
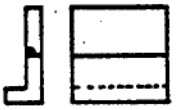
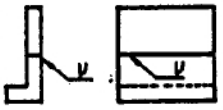
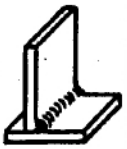
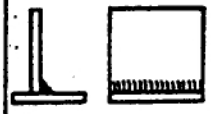
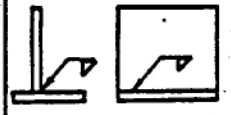
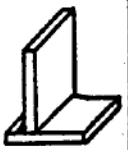
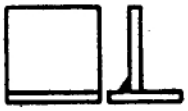
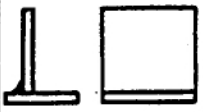
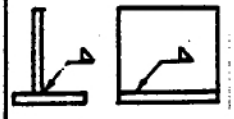
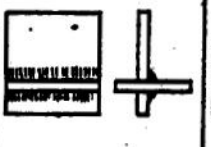
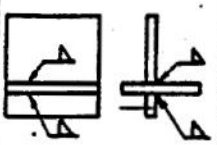
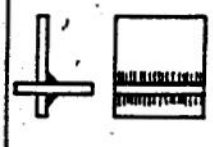
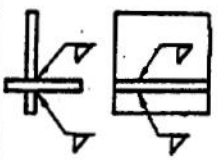
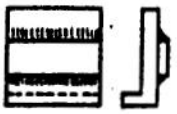
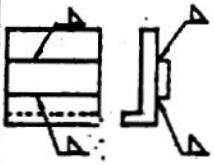
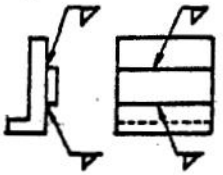
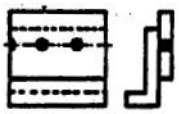
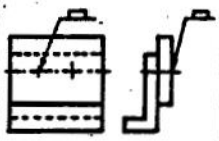
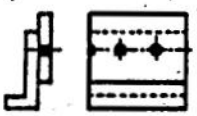
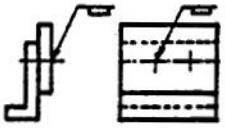
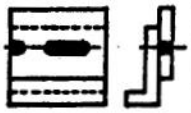
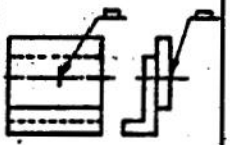
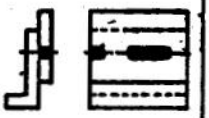
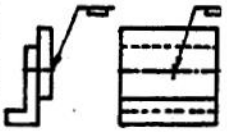
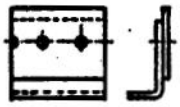
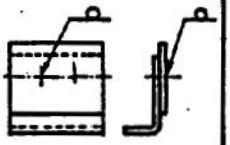
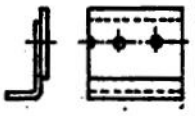
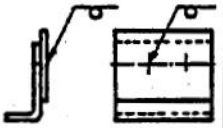
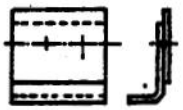
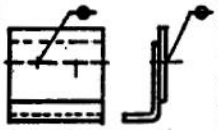
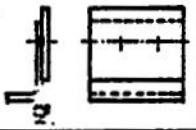
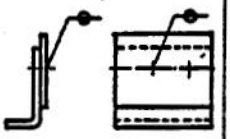
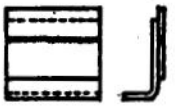
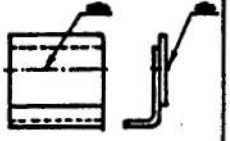
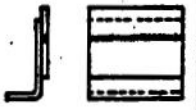
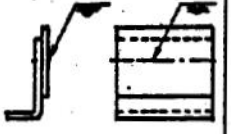
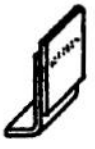
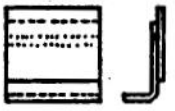
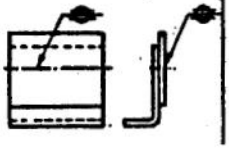
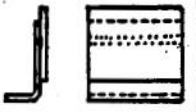
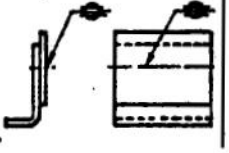
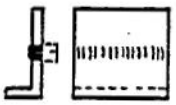
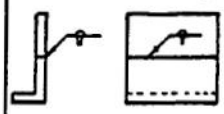
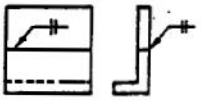
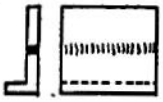
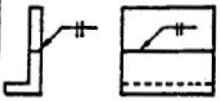
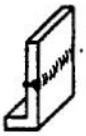
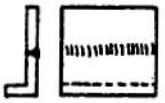
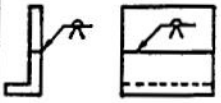
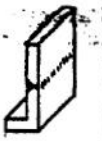
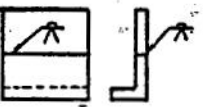
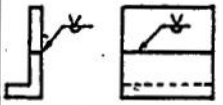
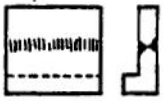
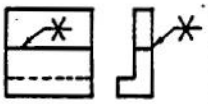
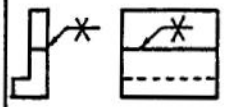
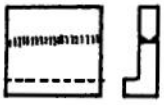
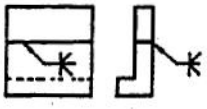
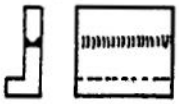
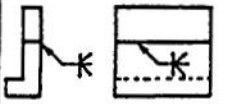
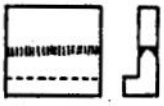
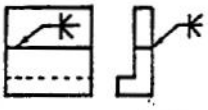
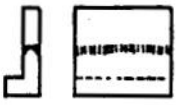
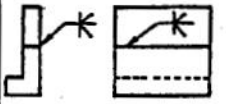
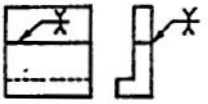
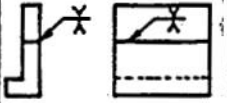
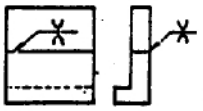
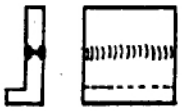
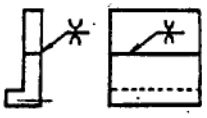
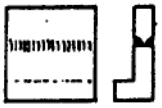
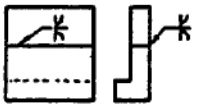
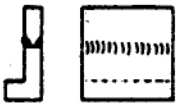
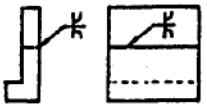
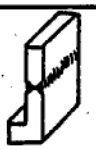
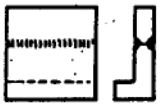
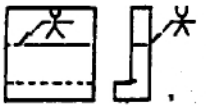
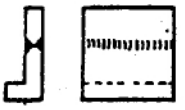
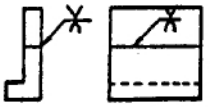
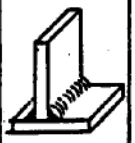
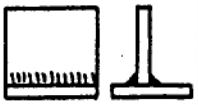
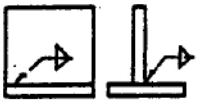
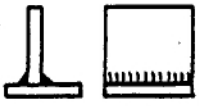
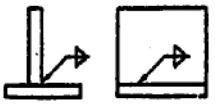
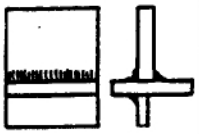
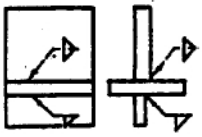
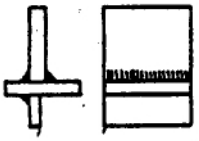
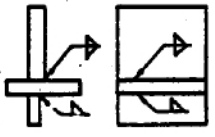
No	Designation symbol (number refer to table 1)	Illustration	Method E		Method A	
			Representation	Symbolization	Representation	Symbolization
11	Single-V butt weld with broad root face 5					
12	Single bevel butt weld with broad face 6					
13						
14	Single U-butt weld 7					
15	Single J butt weld 8					
16						
17	Fillet weld 9					
18						
19						

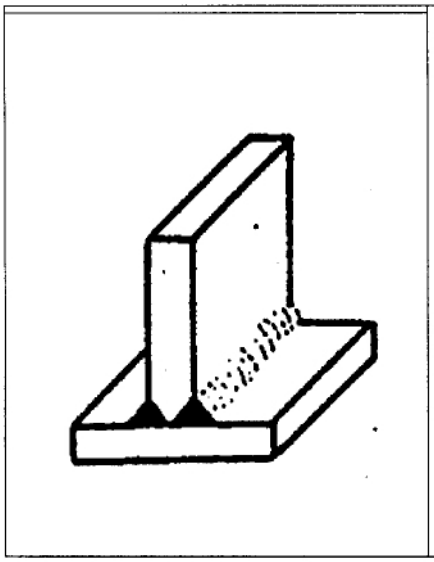
No	Designation symbol (number refer to table 1)	Illustration	Method E		Method A	
			Representation	Symbolization	Representation	Symbolization
20	Fillet weld 10					
21						
22	Plug weld 11					
23						
24	Spot weld					
25	12					
26	Seam weld					
27	13					

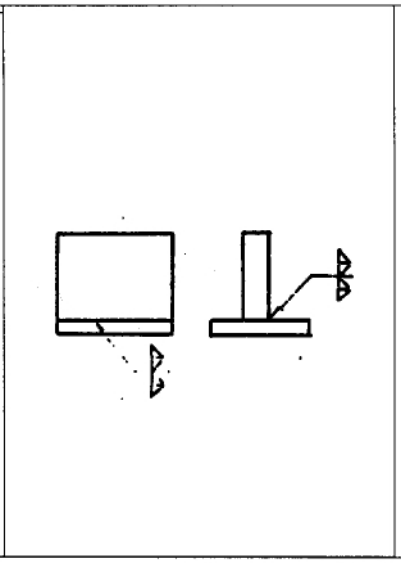
DESIGNATION OF WELDING BY COMBINATION SYMBOL

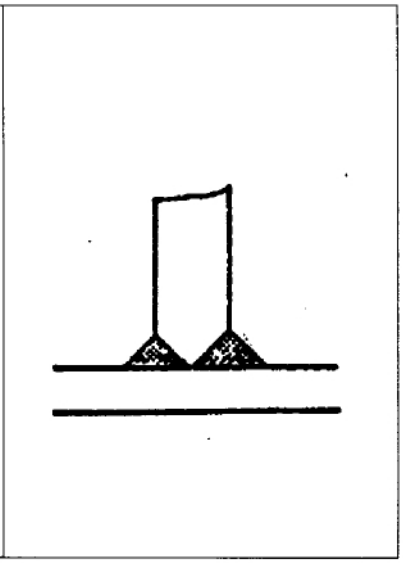
No	Designation symbol (number refer to table 1)	Illustration	Method E		Method A	
			Representation	Symbolization	Representation	Symbolization
1	Butt weld between plates with raised edge 1 1 9					
2	Square butt weld 2 welded from both side 2 2					
3	Single-V butt-weld 3 and backing run					
4	3 9					
5	Double-V butt weld 3 (x weld) 3 3					
6	Double bevel butt weld 4					
7	k-weld 4 4					
8	Double-V butt weld with broad root face 5 5 5					
9	Double-V butt weld with broad root face 6 6 6					

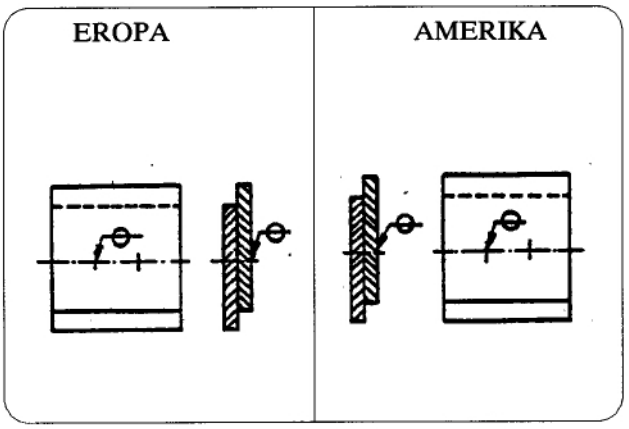
No	Designation symbol (number refer to table 1)	Illustration	Method E		Method A	
			Representation	Symbolisation	Representation	Symbolisation
10	Double U butt weld 7 7					
11	Double J butt weld 8 8					
12	Single V butt weld and single U butt weld 3 7					
13	Fillet weld and fillet weld 10 10					
14						

DESIGNATION OF WELDING CONSTRUCTION



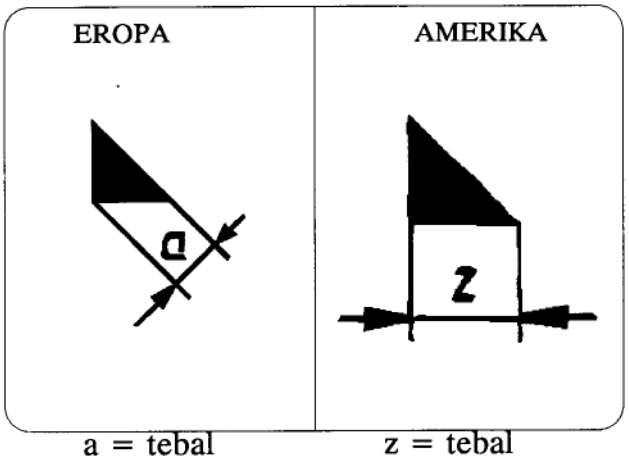






4.3 Memotong Garis Penunjukan

Bila pengelasan di dalam bidang sambungan (Las tahanan)



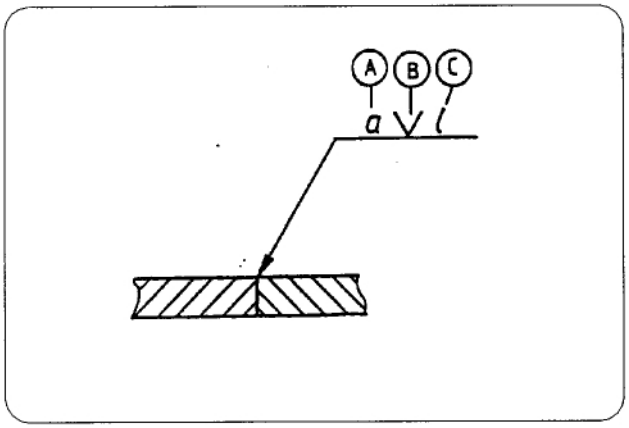
a = tebal z = tebal

5. UKURAN LASAN

5.1 Tebal las sudut.

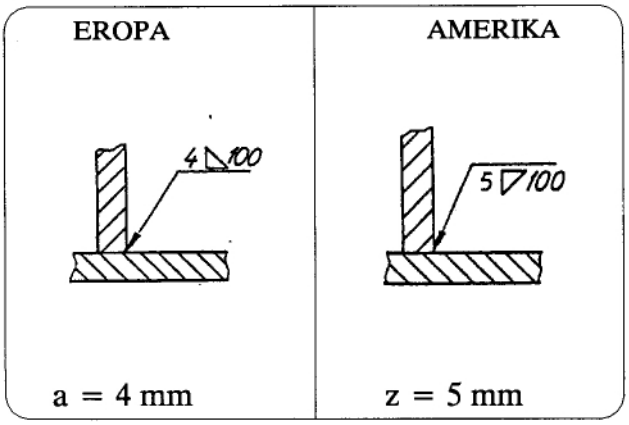
a = Tebal las (mm) metode Eropa.
z = Tebal las (mm) metode Amerika.

Tebal pada jenis las lainnya lihat lampiran.



5.2 Standar Penunjukan Lasan

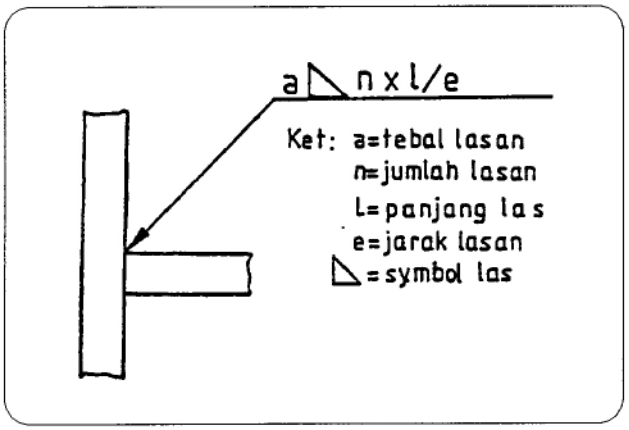
A. Ukuran tebal lasan
B. Simbol jenis las V
C. Ukuran panjang lasan (Satuan dalam mm)



a = 4 mm z = 5 mm

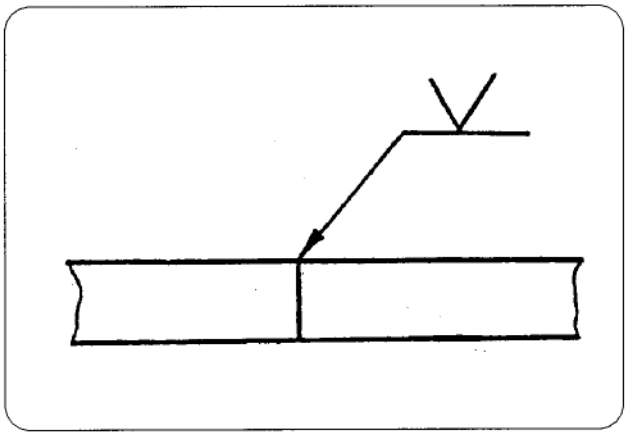
Contoh :

a = Tebal las 4 mm (Eropa)
z = Tebal las 5 mm (Amerika)
l = Payung las 100 mm
= Jenis las sudut



5.3 Ukuran Lasan dengan Keterangan Pelengkap

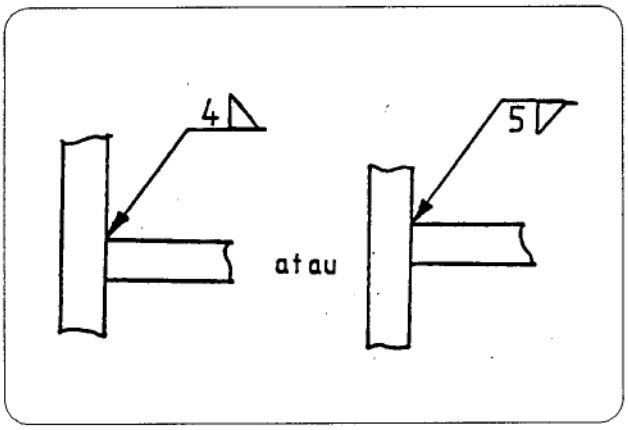
Keterangan pelengkap ditulis untuk memperjelas konstruksi pengelasan yang diinginkan.



6. PEMBACAAN PENUNJUKAN PENGELASAN

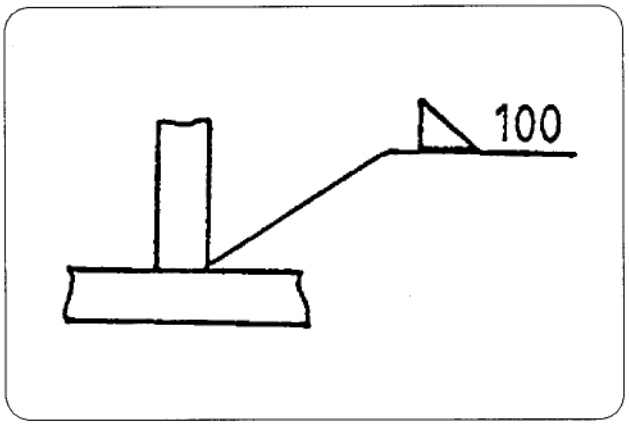
6.1 Simbol Dasar

Tebal (a atau z) = Setebal pelat paling tipis.
Panjang (l) = Sepanjang sambungan benda kerja.



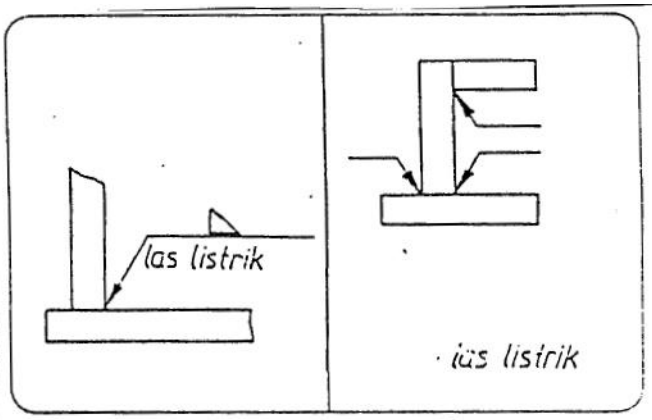
6.2 Simbol Dasar dan Ketebalan

Pengelasan dilakukan dengan ketebalan a = 4 mm atau z = 5 mm, sepanjang sambungan benda kerja.



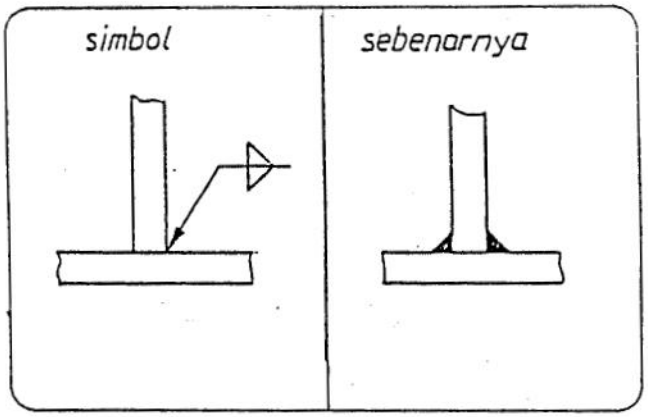
6.3 Simbol Dasar dan Panjang Las

Pengelasan setebal plat paling tipis dengan panjang lasan 100 mm



6.4 Pencantuman Proses Pengelasan

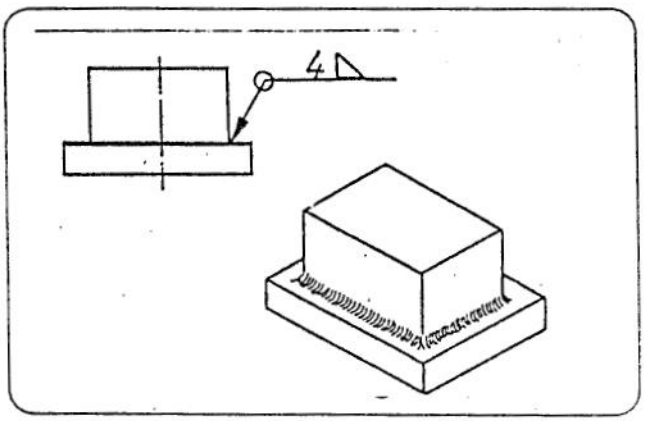
a. Ditulis dibawah garis reference (untuk insidentil)
b. Ditulis sebagai keterangan umum dibawah gambar konstruksi lasan.



6.5 Posisi Lasan Bolak-Balik

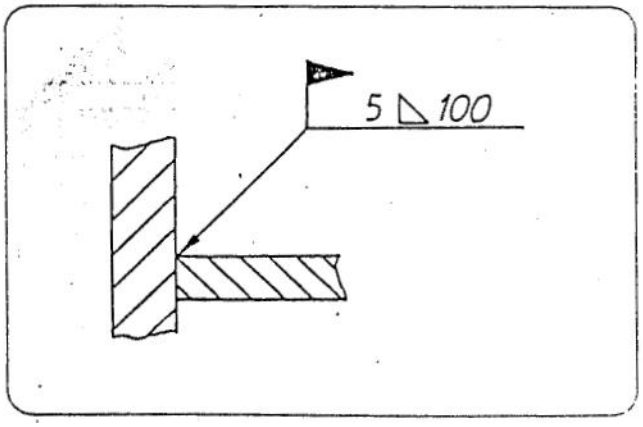
Simbol ditulis pada satu garis penunjukan ukuran

Ketentuan teknis lihat lampiran hal.13, no 5 s/d 8 dan lampiran hal.12, no 6.



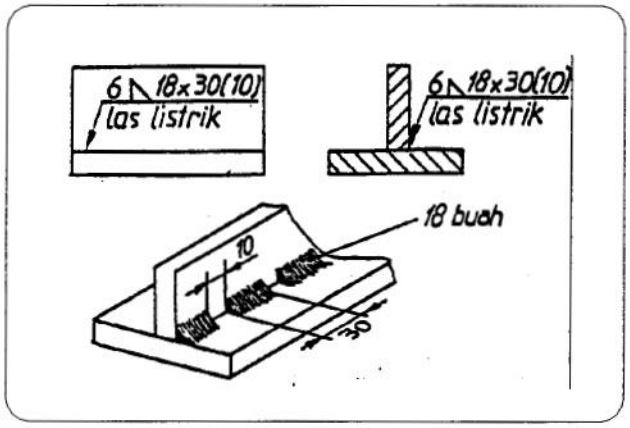
6.6 Posisi Lasan Melingkar

Diberikan keterangan pelengkap lingkaran pada patahan garis penunjukan lasan.
Berlaku pada benda bukan silinder.



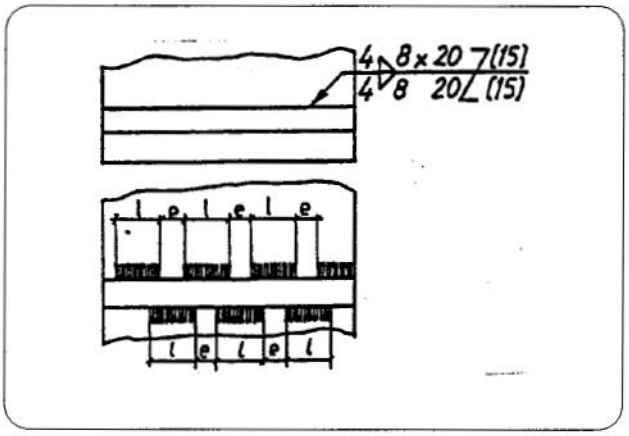
6.7 Pengelasan Dilakukan pada Saai Pemasangan atau Assembling

Diberikan keterangan pelengkap berupa bendera di patahan garis penunjukan lasan.



6.8 Pengelasan Terputus-putus pada Satu Sisi.

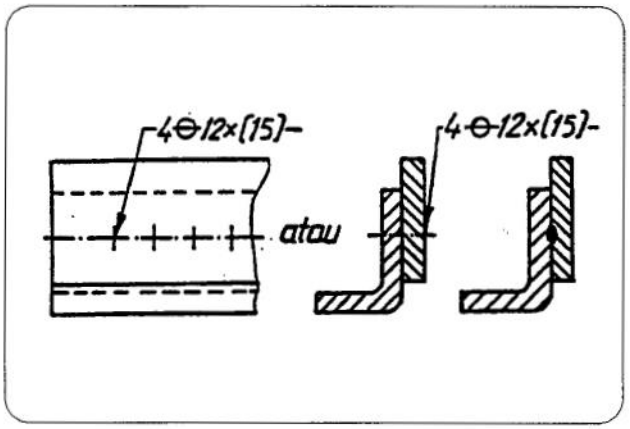
Tebal las (a) = 6 mm
Jumlah lasan (n) = 18 bh
Panjang lasan (1) = 30 mm
Jarak tiap bagian (e) = 10 mm



6.9 Pengelasan Zig-Zag

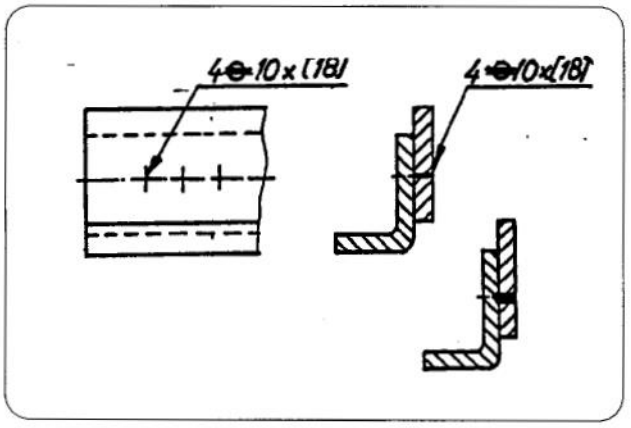
Tebal las (a) = 4 mm
Jumlah lasan (n) = 8 bh
Panjang lasan (1) = 20 mm
Jarak tiap bagian (e) = 10 mm

= Simbol Zig-Zag



6.10 Las Titik di tengah Sambungan

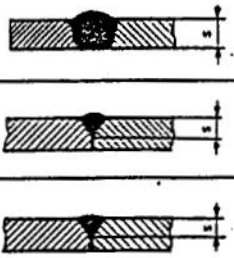
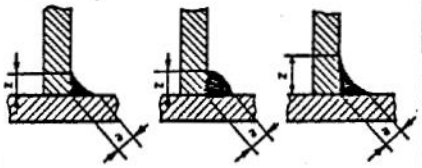
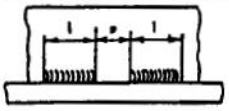
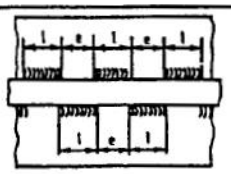
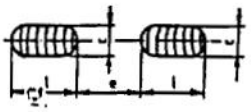
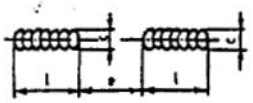
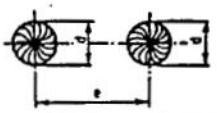
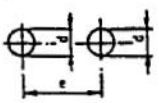
Diameter lasan (0) = 4 mm
Jumlah lasan (n) = 12 bh
Jarak tiap lasan = 15 mm



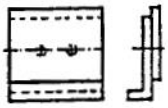
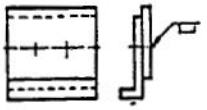
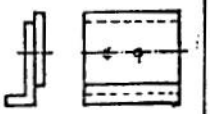
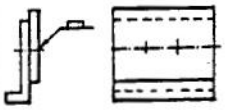
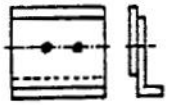
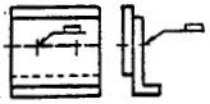
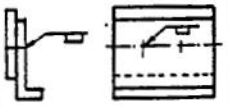
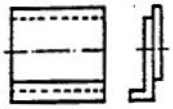
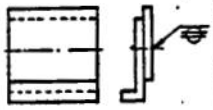
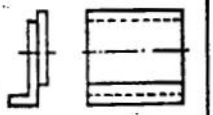
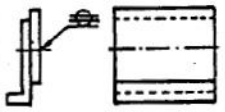
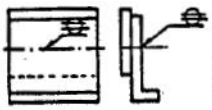
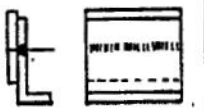
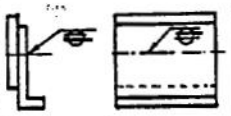
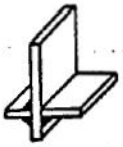
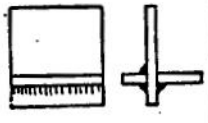
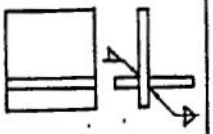
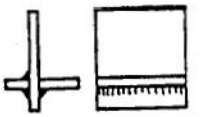
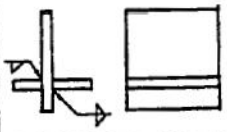
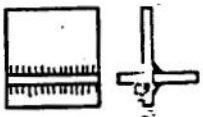
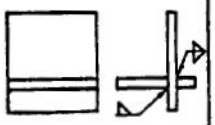
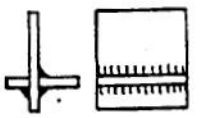
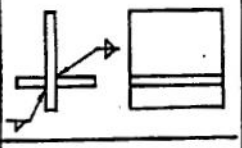
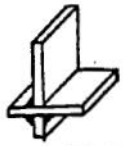
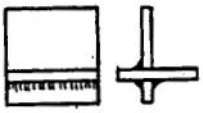
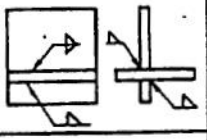
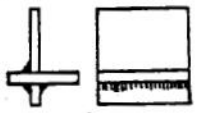
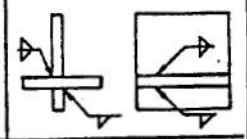
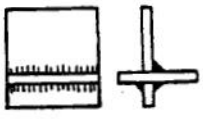
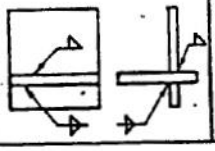
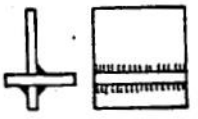
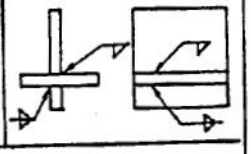
6.11 Las Seam pada Satu Sisi Plat

Diameter lasan (0) = 4 mm
Jumlah lasan (n) = 10 bh
Jarak tiap lasan = 18 bh

DIMENSION OF WELDING CONSTRUCTION

No	Designation of we	Definition		Inscription
1	Butt weld		S = minimum distance from the surface of the part to the bottom of the penetration, which cannot be greater than thickness of the thinner part	(See notes) / (See notes) / (See notes)
2	Butt weld between plates with raised edges		S= minimum distance from the external surface of the weld to the bottom of the penetration	(See notes)
3	Continuous filled weld		a = height of the largest isosceles triangle that can be inscribed in the section z = side the largest isosceles triangle that can be inscribed in the section	a / z (See notes)
4	Intermittent fillet weld		l = lenght of weld (whitout end craters) (e)= distance between adjacent weld elements n = numbers of weld elements a z see no. 3	a n x l / z n x l (See notes)
5	Stagegered intermittent fillet weld			a n x l / a n x l / z n x l / z n x l (See notes)
6	Plug or Slot weld		l (e) see no. 4 n c = width of slot	e n x l (See notes)
7	Seam weld		l (e) see no. 4 n c = width of weld	c n x l
8	Plug weld		n = see no. 4 (e) = spacing d = diameter of hole	d n x l
9	Spot weld		n = see no. 4 (e) = spacing d = diameter of spot	d n x l

CORRECTLY PLACED OF WELDING SYMBOLS

No	Illustration	Method E		Method A	
		Representation	Symbolization	Representation	Symbolization
1					
2					
3					
4					
5					
6					
7					
8					

APLICATION SUPLEMENT SYMBOL ON WELDING

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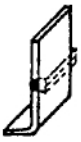
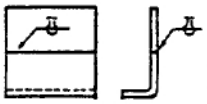
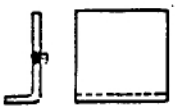
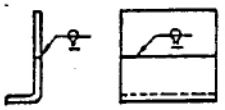
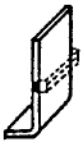
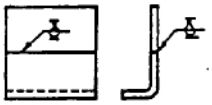
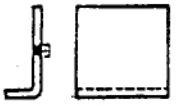
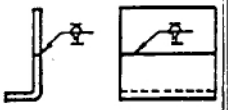
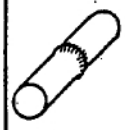
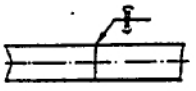
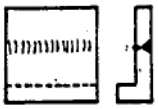
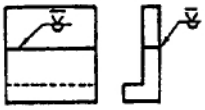
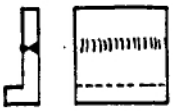
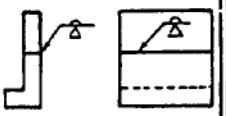
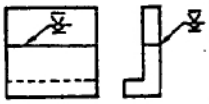
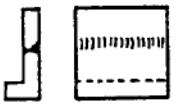
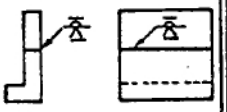
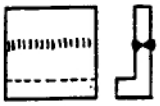
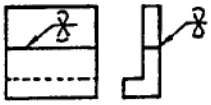
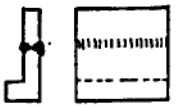
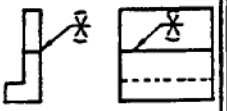
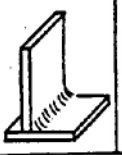
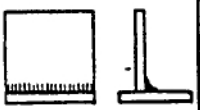
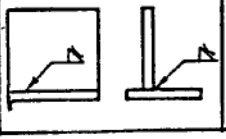
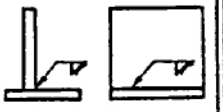
1						
2						
3						
4						
5						
6						
7						

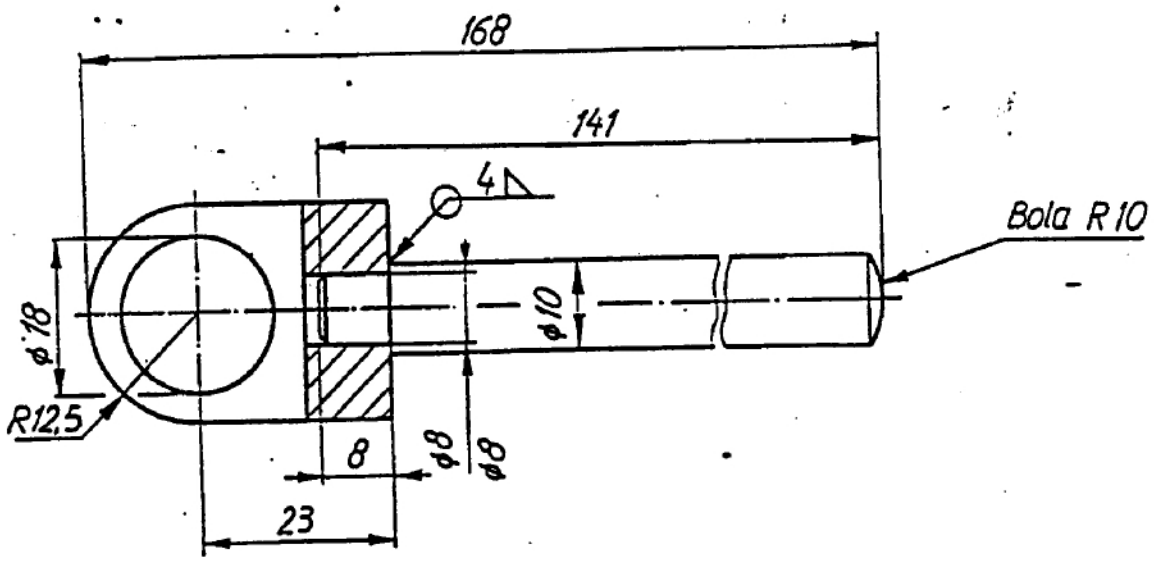
7. GAMBAR KONSTRUKSI PENGELASAN

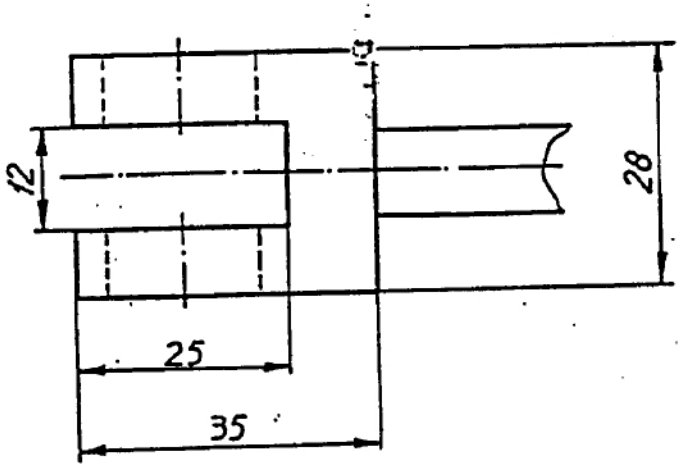
Ada beberapa cara untuk menampilkan gambar konstruksi pengelasan, yaitu :

A. Gambar konstruksi las susunan.
B. Gambar konstruksi las susunan dan bagian.
C. Gabungan dari cara A dan B di atas.

7.1 Gambar konstruksi las susunan

Biasanya untuk suatu konstruksi las sederhana, baik sebagai sub susunan maupun suatu fungsi bagian.





Perlakuan Permesinan

Pada konstruksi ini, umumnya proses permesinan untuk bentukan fungsi (seperti lubang alur dll) dapat dikerjakan setelah dilas ataupun sebelum dilas, tergantung dari kemudahan pengerjaannya.

Biasanya pada gambar konstruksi pengelasannya dicantumkan semua ukuran baik ukuran permesinan untuk bentukan, maupun ukuran gabungan setelah pengelasan. Ada baiknya pada pengerjaannya ditangani oleh satu operator.

7.2 Gambar Konstruksi Las Susunan dan Bagian

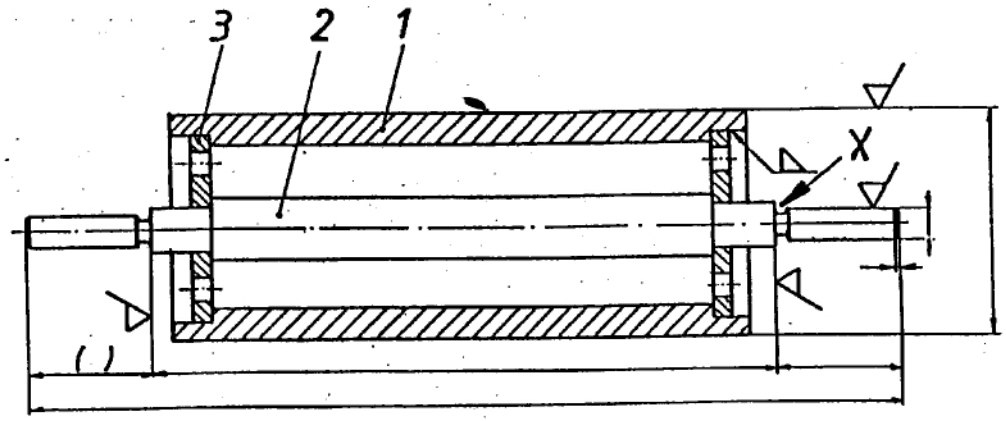
Konstruksi ini berupa gabungan dari bagian-bagian yang memerlukan permesinan awal, baik untuk membuat bentukan fungsi maupun tidak.
Gambar pada satu kertas terdiri dari gambar susunan konstruksi las, berikut ukuran akhir setelah pengelasan dan gambar bagian- bagiannya yang harus diproses awal sebelum di las.

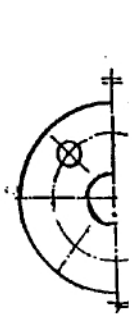
Perlakuan Permesinan

Sesuai dengan penunjukan ukuran pada gambar susunan dan gambar bagiannya, semua ukuran yang ditunjukan adalah ukuran yang dicapai pada konstruksi tersebut setelah proses pengelasan.
Baik dengan permesinan maupun tanpa permesinan (perhatikan simbol tanda pengerjaan atau besar ukuran).

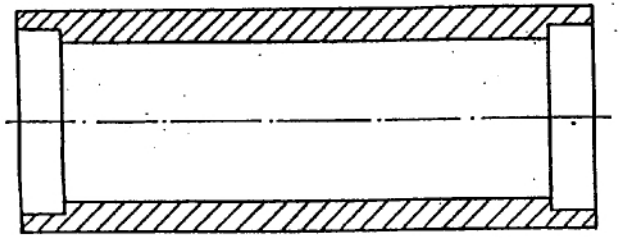
Ukuran-ukuran pada gambar bagian yang tidak dicantumkan pada gambar susunan, berarti harus dikerjakan sebelum pengelasan.
Untuk mencapai ukuran akhir pada konstruksi las, biasanya pada gambar bagian diberi kelebihan ukuran untuk persiapan permesinan setelah pengelasan.

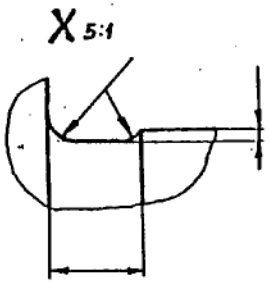
Pengerjaannya dapat dilakukan beberapa pelaksana maupun oleh seorang pelaksana saja.

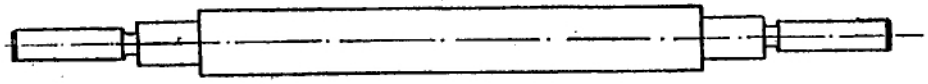




1



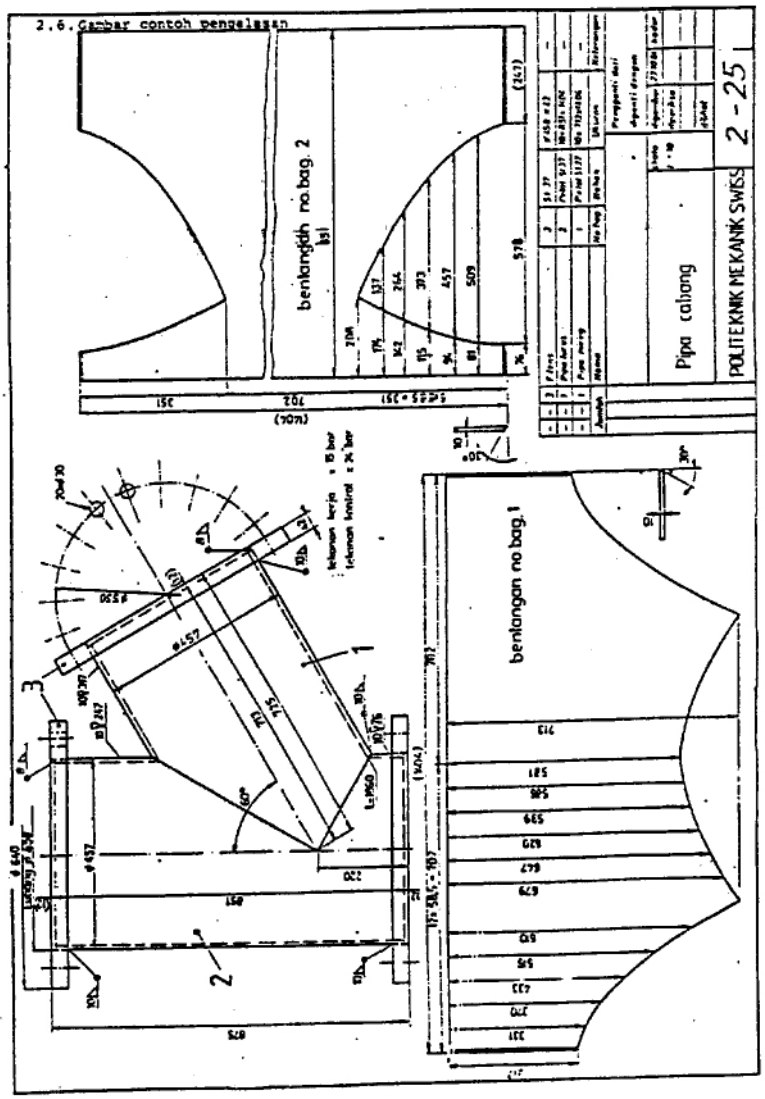




7.3 Gambar Konstruksi Las Bervariasi

Gambar Konstruksi ini pengerjaannya mengikuti ketentuan pada point 7.1 dan 7.2.

Yang perlu diperhatikan adalah, penentuan proses permesinan sebelum / sesudah pengelasan. Pada bagian-bagian konstruksi tidak perlu pertimbangan kemampuan permesinan labih seksama, kadang- kadang pada proses pengelasannya diperlukan alat bantu sebagai penepat.



TEST TEORI

I. Jawablah dengan singkat dan jelas !

1. Ada dua cara pencantuman bentuk lasan pada gambar kerja yaitu :

   .....

   .....

2. Ketebalan las sudut pada metode Eropa yaitu

   .....

   .....

3. Sedangkan menurut metode Amerika ialah

   .....

   .....

4. Fungsi simbol pelengkap lasan ialah:

   .....

   .....

5. Ketentuan peletakannya adalah

   .....

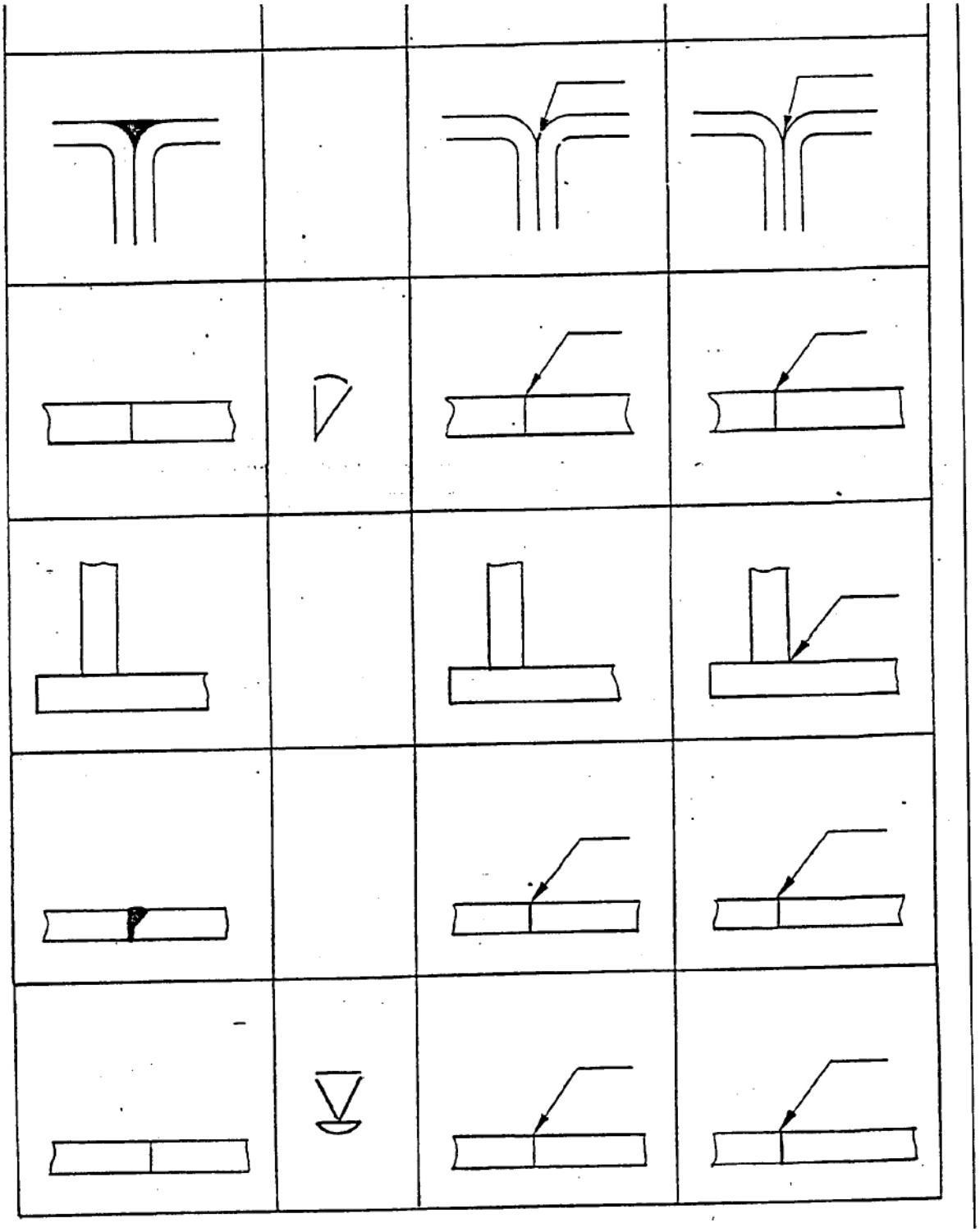
   .....

6. Pada pembacaan gambar konstruksi las, ada satu hal yang perlu diperhatikan pada saat akan melakukan pengelasan yaitu

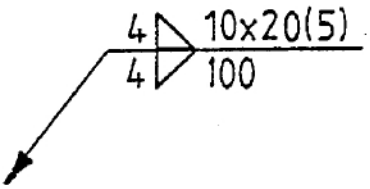
   .....

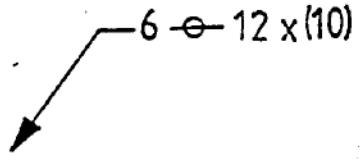
   .....

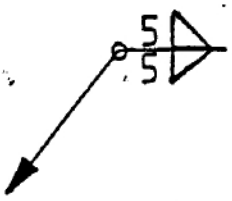
II. Lengkapi bagan ini, sehingga jelas maksudnya !

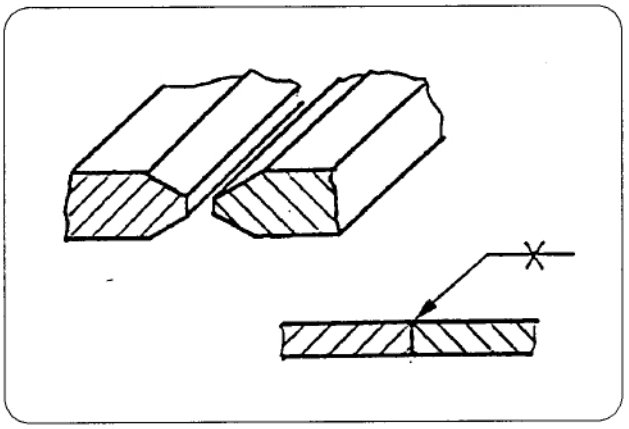


III. Jelaskan maksud penulisan simbol ini !

1. 

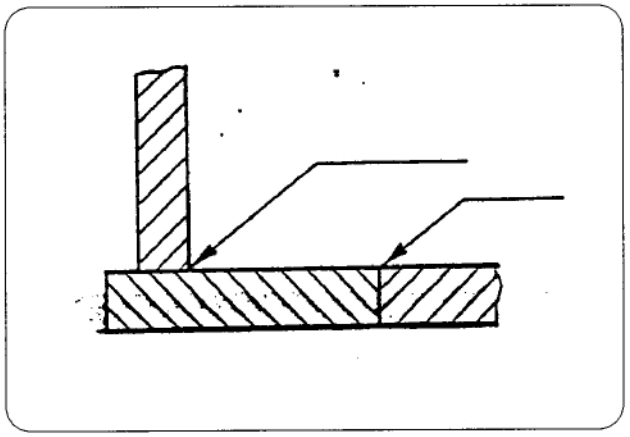
2. 

3. 



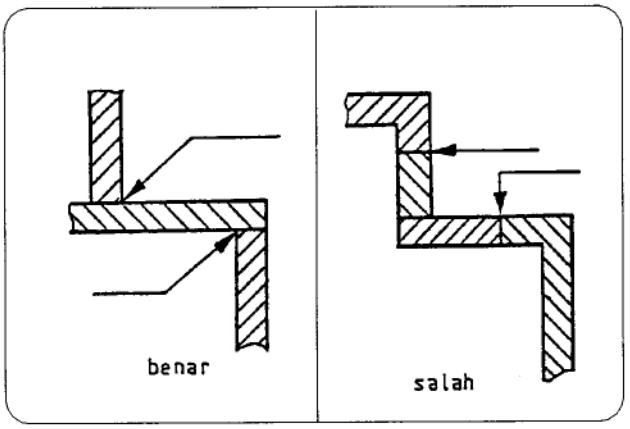
1. TUJUAN

Mengetahui :
- Penunjukan ukuran pengelasan pada konstruksi sederhana.
- Pengerjaan awal sebelum pengelasan.
- Persyaratan praktis untuk pemilihan jenis lasan.

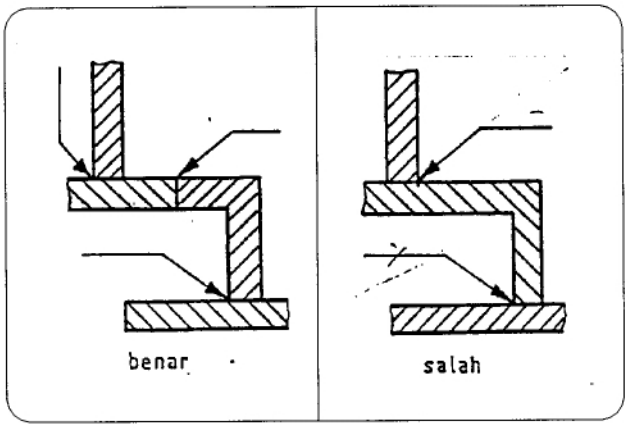


2. PENCANTUMAN GARIS PENUNJUKAN

2.1 Anak panah tepat menuju sambungan lasan.



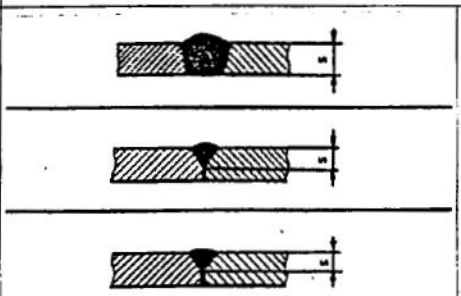
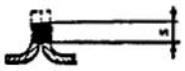
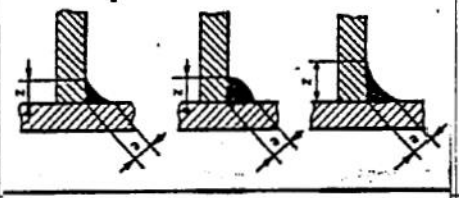
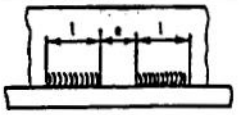
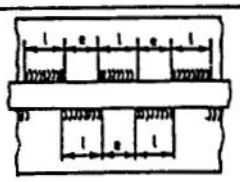
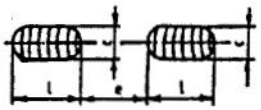
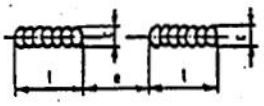
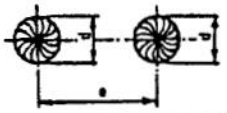
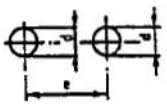
2.2 Garis penunjukkan selalu miring terhadap posisi horizontal & vertikal.



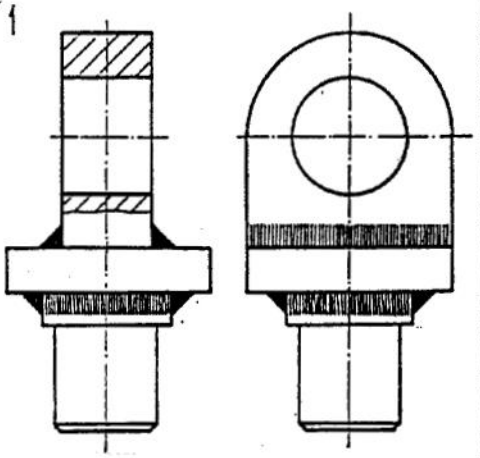
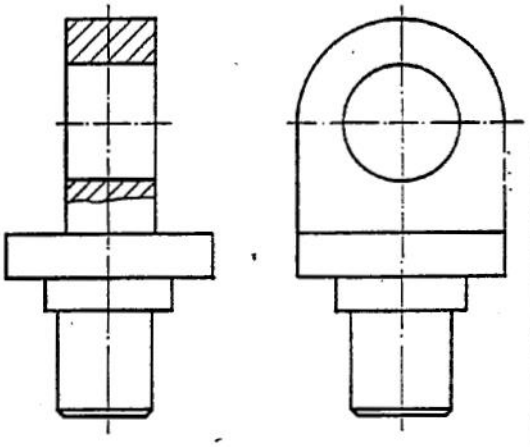
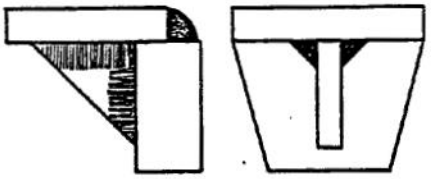
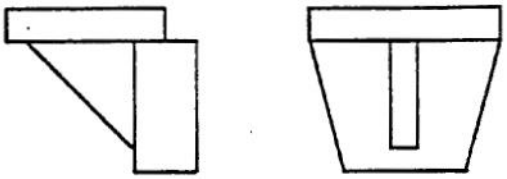
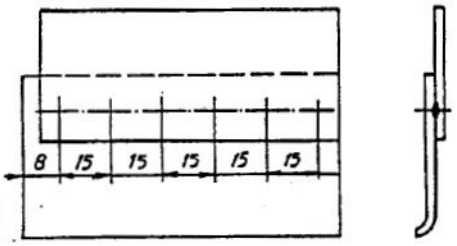
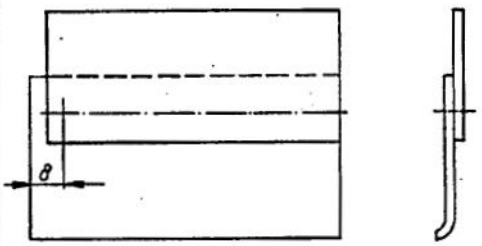
2.3 Garis referensi selalu lurus sejajar posisi horizontal. Pada keadaan khusus bisa vertikal.

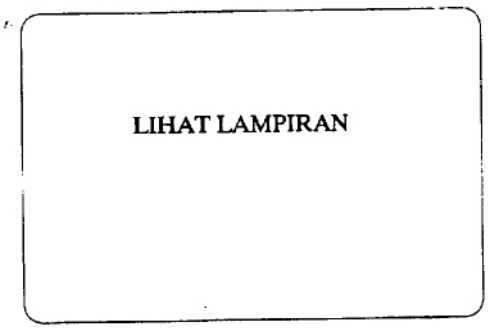
* Lihat lampiran-lampiran.

DIMENSION OF WELDING CONSTRUCTION

No	Designation of weld	Definition		Inscription
1	Butt weld		S = minimum distance from the surface of the part to the bottom of the penetration, which cannot be greater than thickness of the thinner part	(See notes)
				s (See notes)
				s (See notes)
2	Butt weld between plates with raised edges		S= minimum distance from the external surface of the weld to the bottom of the penetration	s (See notes)
3	Continuous filled weld		a = height of the largest isosceles triangle that can be inscribed in the section z = side the largest isosceles triangle that can be inscribed in the section	a z (See notes)
4	Intermittent fillet weld		l = length of weld (whitout end craters) (e)= distance between adjacent weld elements n = numbers of weld elements a, z } see no. 3	a n x l (e) z n x l (e) (See notes)
5	Staggered intermittent fillet weld			a n x l (e) / a n x l (e) z n x l (e) / z n x l (e) (See notes)
6	Plug or Slot weld		l (e) see no. 4 n c = width of slot	e n x l (e) (See notes)
7	Seam weld		l (e) see no. 4 n c = width of weld	c n x l (e)
8	Plug weld		n = see no. 4 (e) = spacing d = diameter of hole	d n x l (d)
9	Spot weld		n = see no. 4 (e) = spacing d = diameter of spot	d n x l (e)

LATIHAN

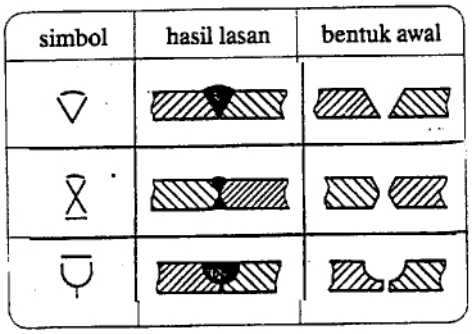
Bentuk las Sebenarnya	Dengan Penunjukkan Pengelasan
1 	
2. 	
3. 	



3. PENENTUAN BENTUK LAS DAN PERMESINAN AWAL SAMBUNGAN

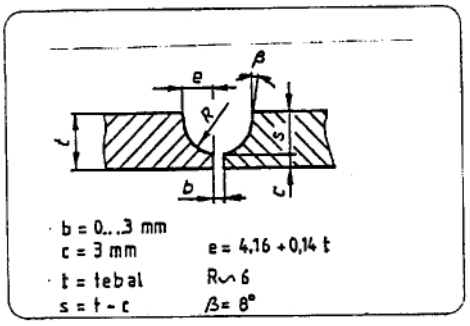
3.1 Penentuan Jenis Bentuk Las.

Bentuk las dipilih sesuai kebutuhan fungsi konstruksi, perhitungan dan standar.



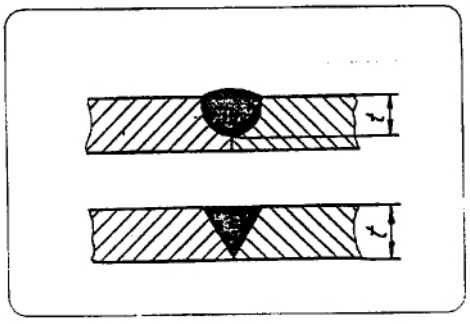
3.2 Bentuk Awal Sambungan

Dari bentuk las yang dipilih, sesuaikan bagian yang akan disamb nung dengan bentuk lasan tersebut.



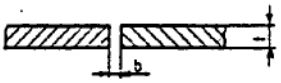
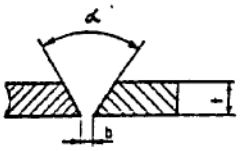
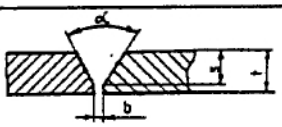
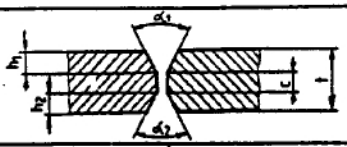
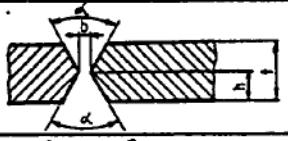
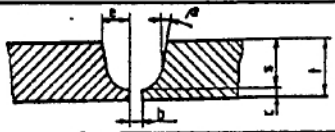
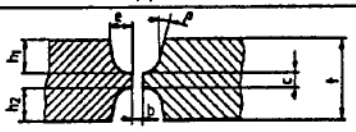
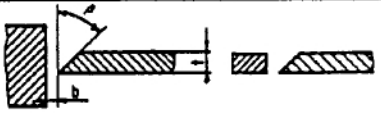
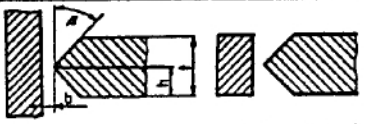
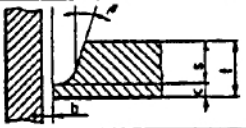
Ukuran bentuk awal dibuat sesuai ketentuan standar permesinan awal sambungan

Lihat lampiran !



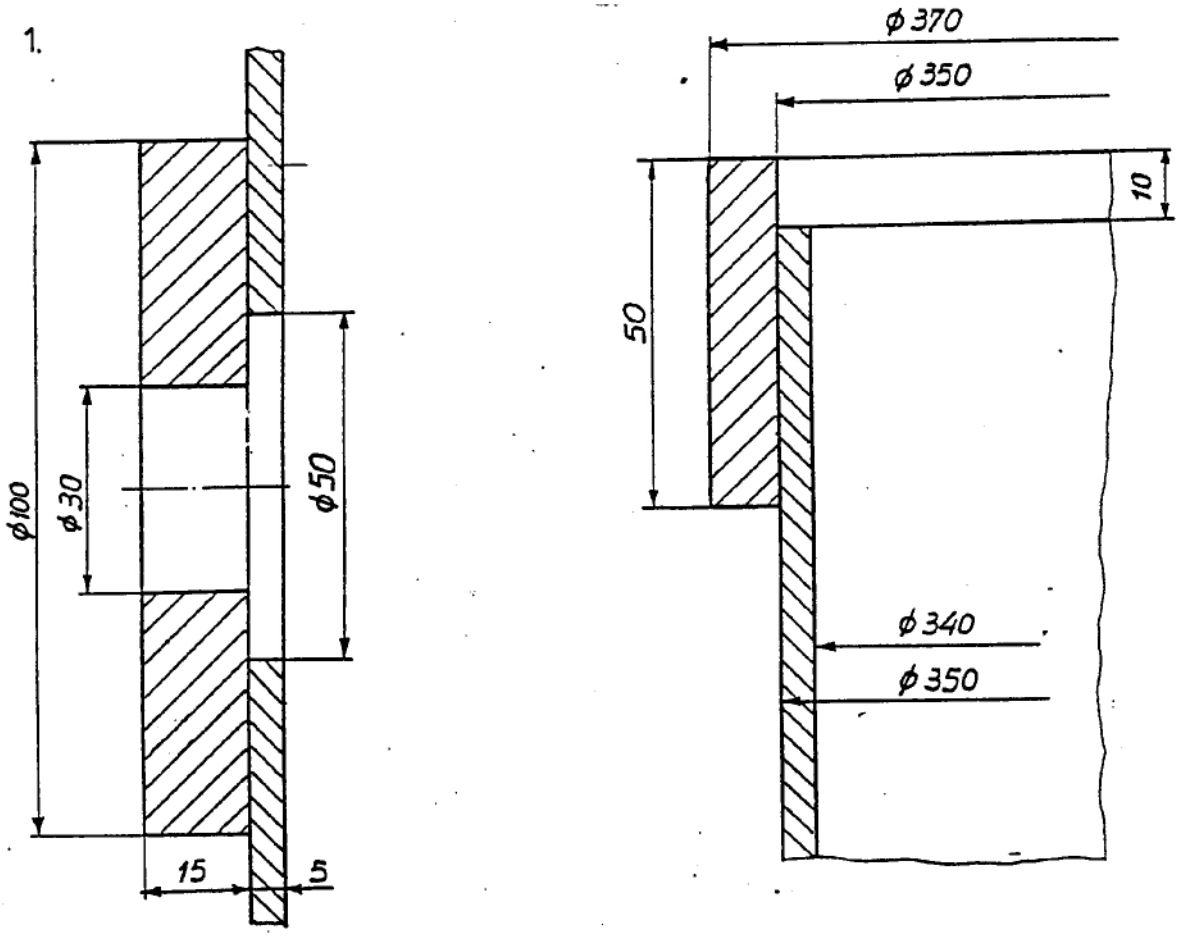
3.3 Ukuran Tebal & Panjang

Secara ideal, tebal & panjang las berdasarkan perhitungan.
Pada las tumpul, tebal las sesuai tebal plat.
Perhatikan lampiran !

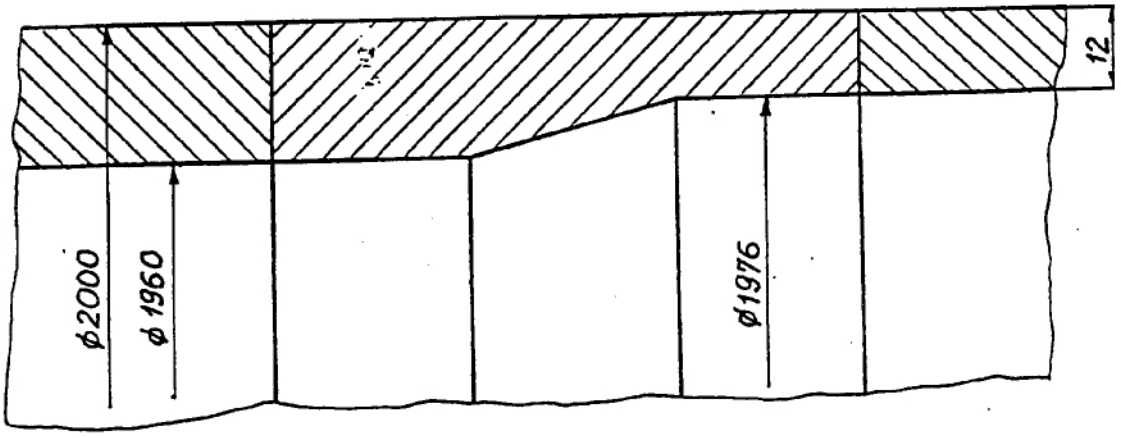
< 2	Butt weld between plates with raised edges			—	—	—	G E TIG MIG MAG
< 4	Square butt weld			t	—	—	G E TIG
				0...t	—	—	MIG MAG
3.....10	Single V butt weld			0...3	—	60	G E TIG
					—	40..60	MIG MAG
3.....40	Single V butt weld with backing run			0...3	—	60	G E TIG
					—	40..60	MIG MAG
>10	Single V butt weld with broad root face			0...3	2...4	60	E TIG
					2...4	40..60	MIG MAG
>10	Double V butt weld with broad root face			0...4	2...6	60	E TIG
					2...6	40..60	MIG MAG
> 10	Double V butt weld			0...3	—	60	E TIG
						40..60	MIG MAG
> 12	U-butt weld with broad root face			0...3	3	8	E TIG MIG MAG
> 30	Double U butt weld with broad root face			0...3	3	8	E TIG MIG MAG
3.....40	Bevel butt weld			0...4		40..60	E TIG MIG MAG
> 10	Double bevel butt weld			0...4	—	40..60	E TIG MIG MAG
> 16	J-butt weld			0...3	2	10..20	E MIG MAG

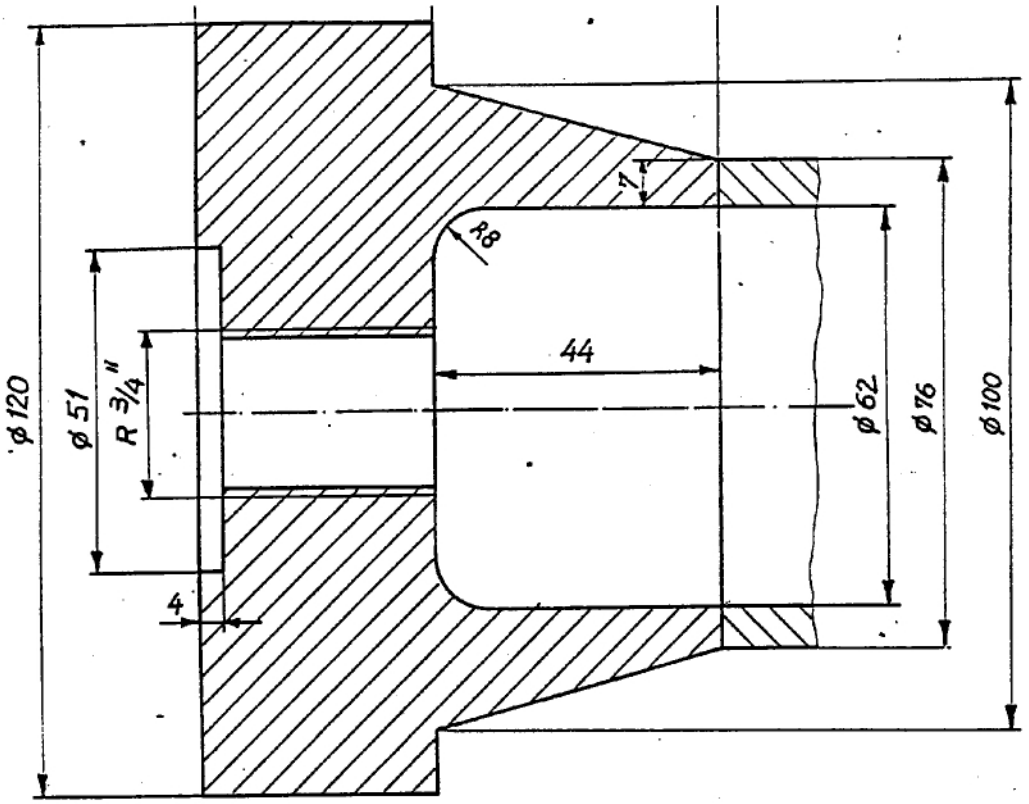
Latihan

1.


ϕ370
ϕ350
10
50
ϕ100
ϕ30
ϕ50
ϕ340
ϕ350
15
5

3.


12
ϕ2000
ϕ1960
ϕ1976



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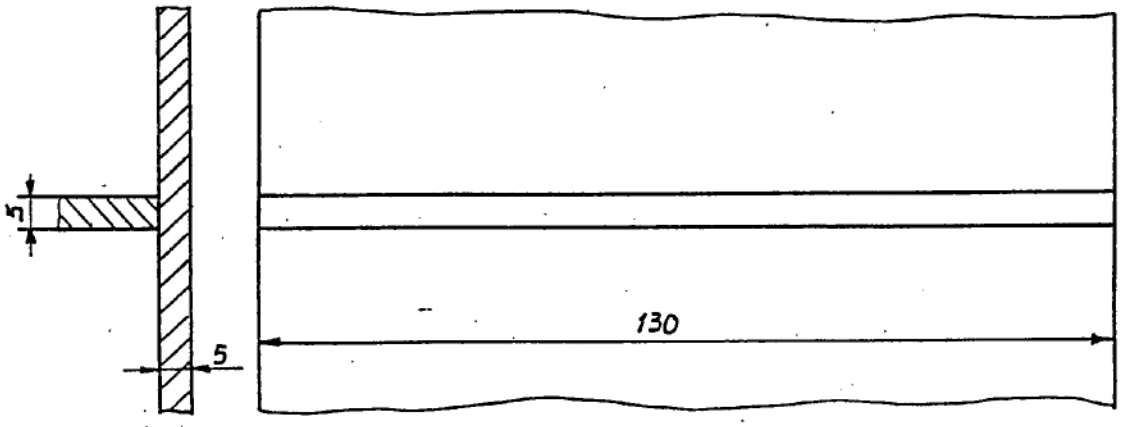
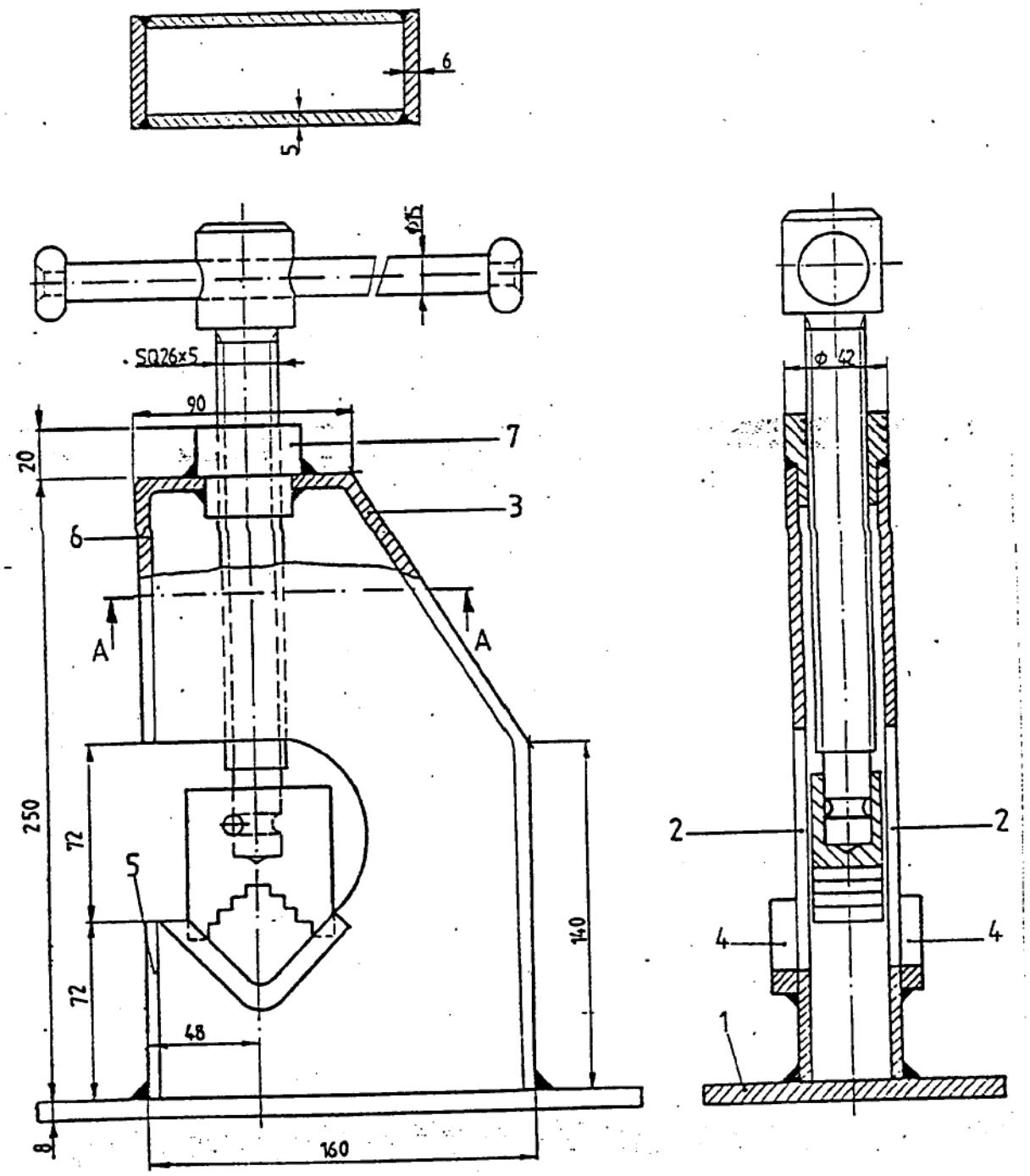


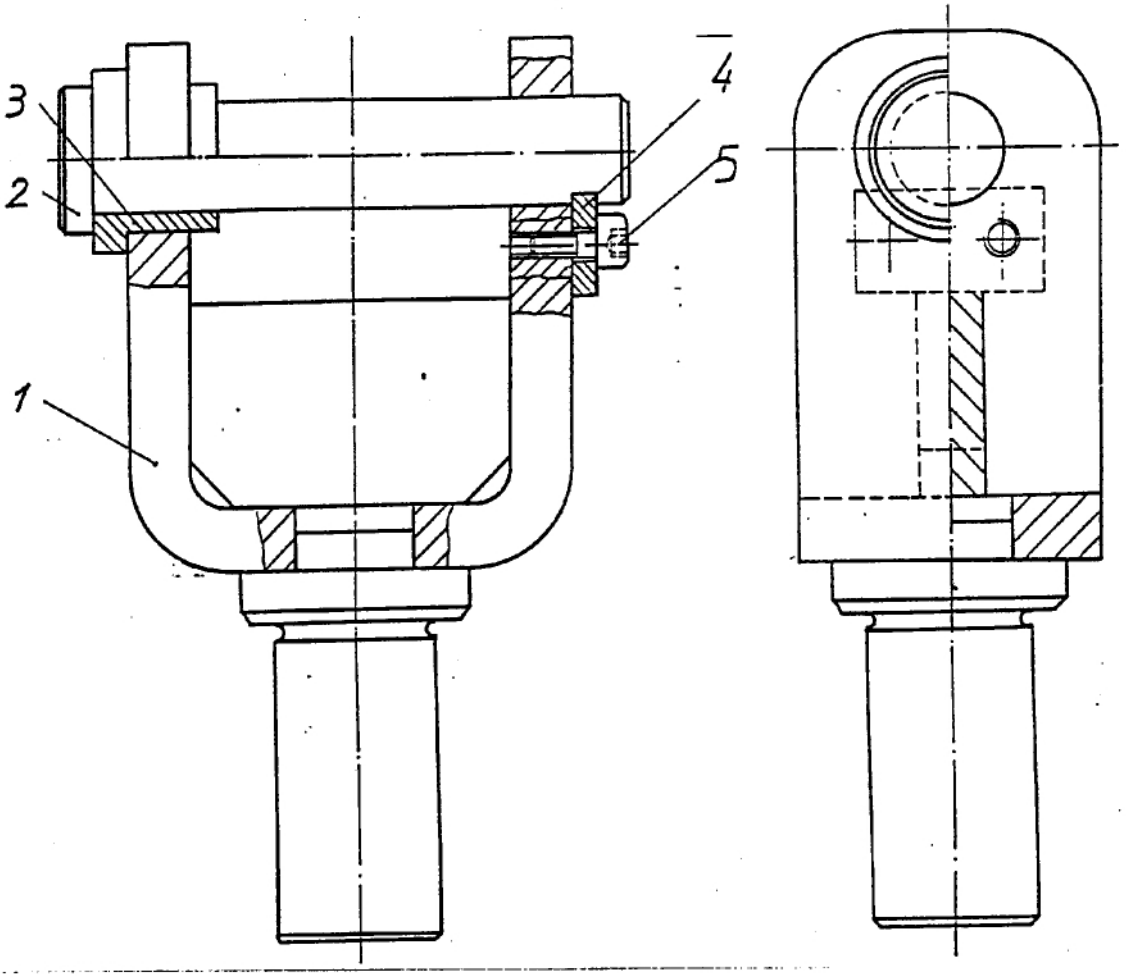
6. Gantilah dengan penunjukan simbol lengkap

(Dikerjakan pada halaman berikut)



TEST

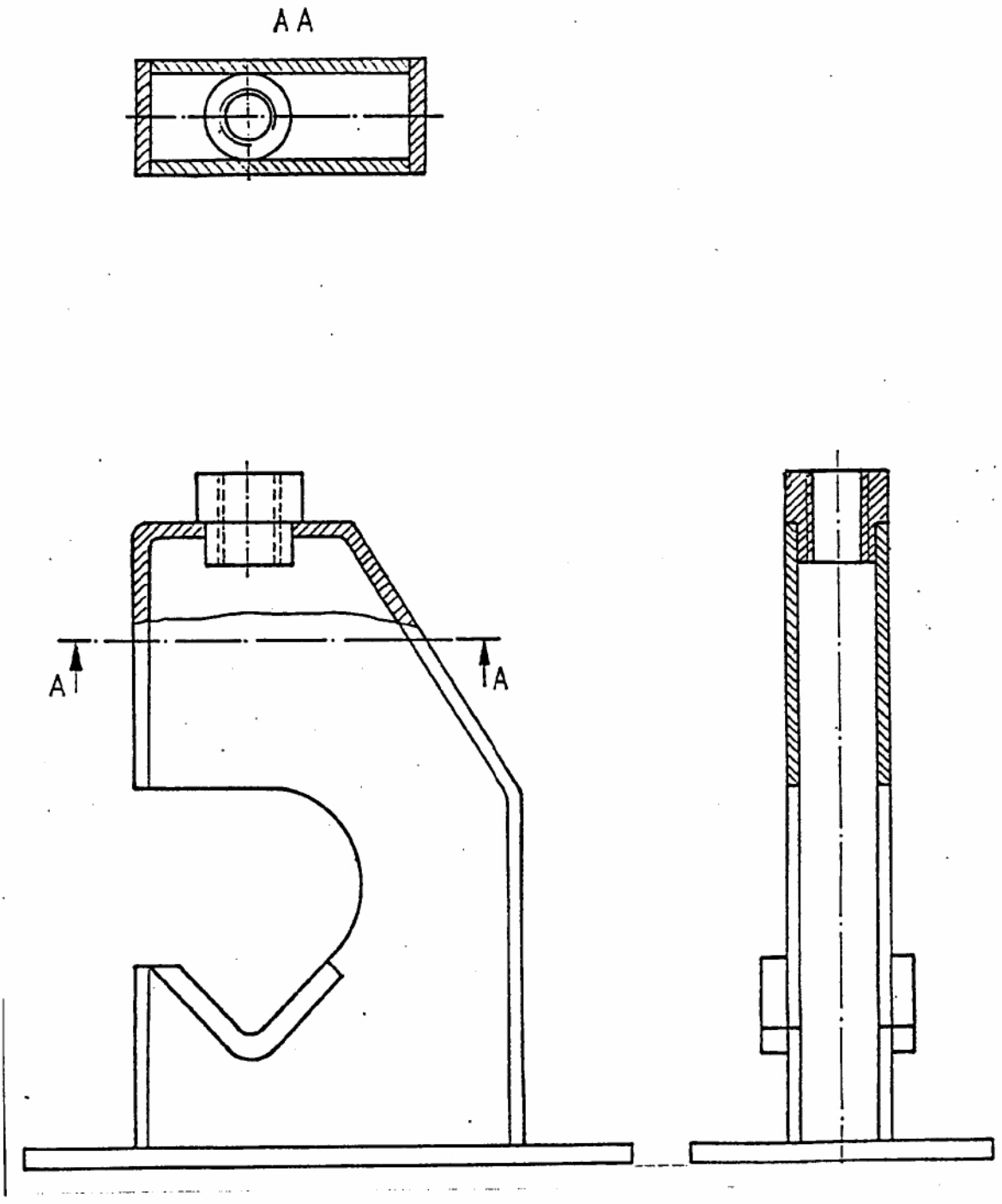
TangkaiPenahan



Keterangan : Nomor bagian 1 merupakan konstruksi Tangkai Berahang yang terdiri dari beberapa bagian yang di las.

Soal : Gambarkan dengan sket yang baik konstruksi pengelasan Tangkai Berahang tersebut.

Perhatikan :
- Terdiri dari beberapa bagian konstruksi tersebut ?
- Bagaimanakah proses permesinannya ?


A A
A
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KUNCI JAWABAN

1. Ada dua cara pencantuman bentuk lasan pada gambar kerja yaitu :

   a. Dengan menggunakan simbol las.
   b. Penggambaran langsung dari bentuk lasan.

2. Ketebalan las sudut pada methode Eropa yaitu :
   Diukur pada tinggi segitiga bentuk las terhadap sisi terpanjang

3. Sedangkan menurut methode Amerika ialah :
   Diukur langsung pada sisi las yang menempel pada benda kerja.

4. Fungsi simbol pelengkap lasan ialah :
   Untuk memperjelas bentuk permukaan lasan yang diinginkan.

5. Ketentuan peletakannya adalah :

   Selalu diletakkan bagian luar simbol dasar.

6. Pada pembacaan gambar konstruksi las, satu hal yang perlu diperhatikan pada saat akan melakukan pengelasan yaitu :