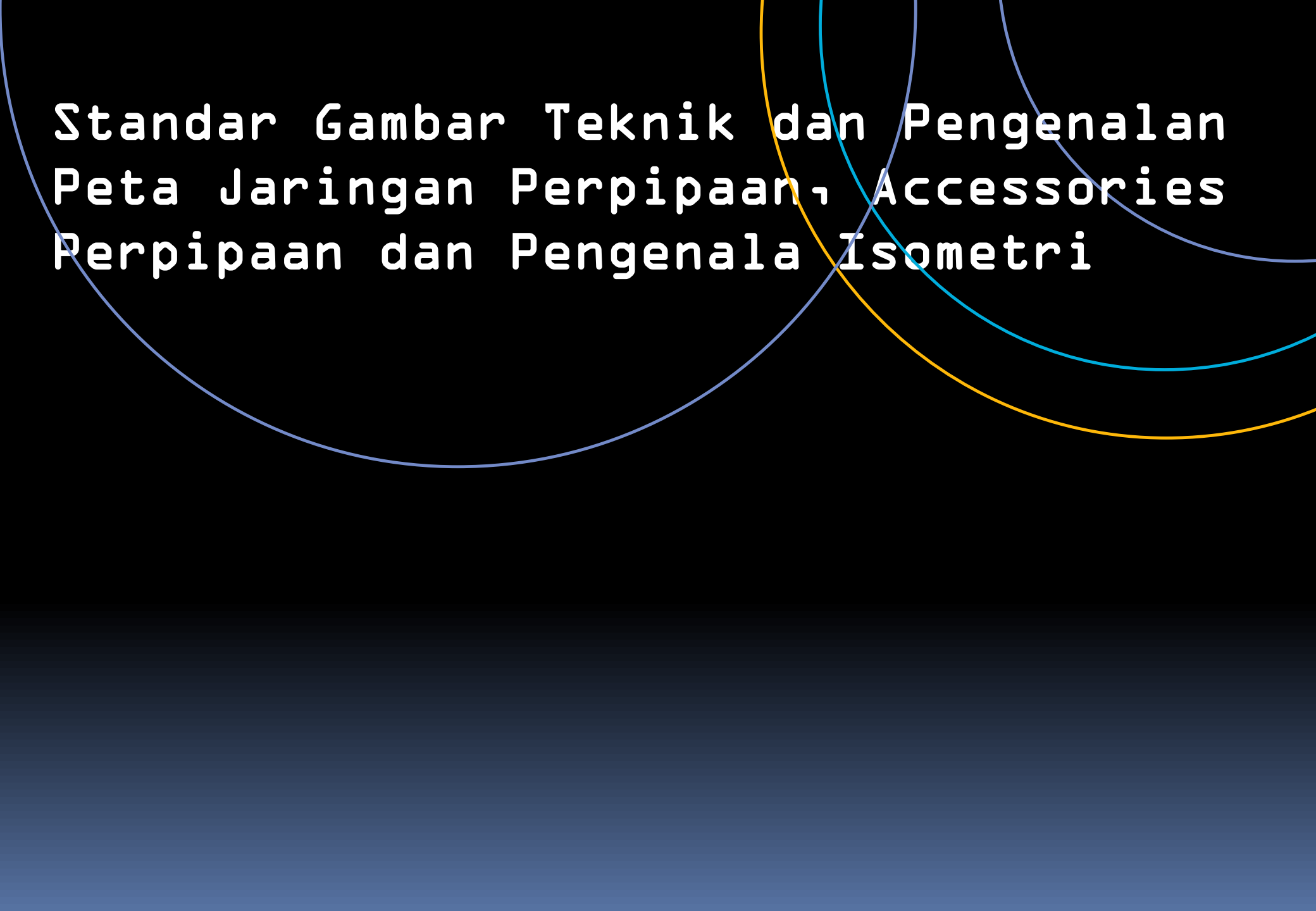




Standar Gambar Teknik dan Pengenalan
Peta Jaringan Perpipaan, Accessories
Perpipaan dan Pengenala Isometri



Sasaran

(Level 1)

Peserta mampu membaca dan memahami peta

Peserta mampu mengidentifikasi sistem jaringan pipa, klasifikasi pipa menurut diameternya, dan menurut fungsinya

Peserta mampu menggambarkan peta jaringan perpipaan sesuai dengan standar gambar teknis perpipaan

Standar Gambar Teknik Pipa Jaringan

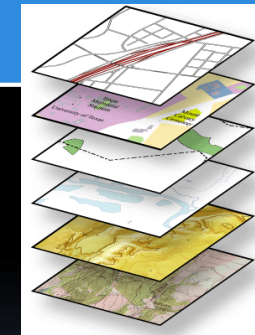
Gambar Simbol Jaringan Pipa

- Valve, AV, Tapping, Wash Out, dll



Membaca Peta Jaringan Pipa

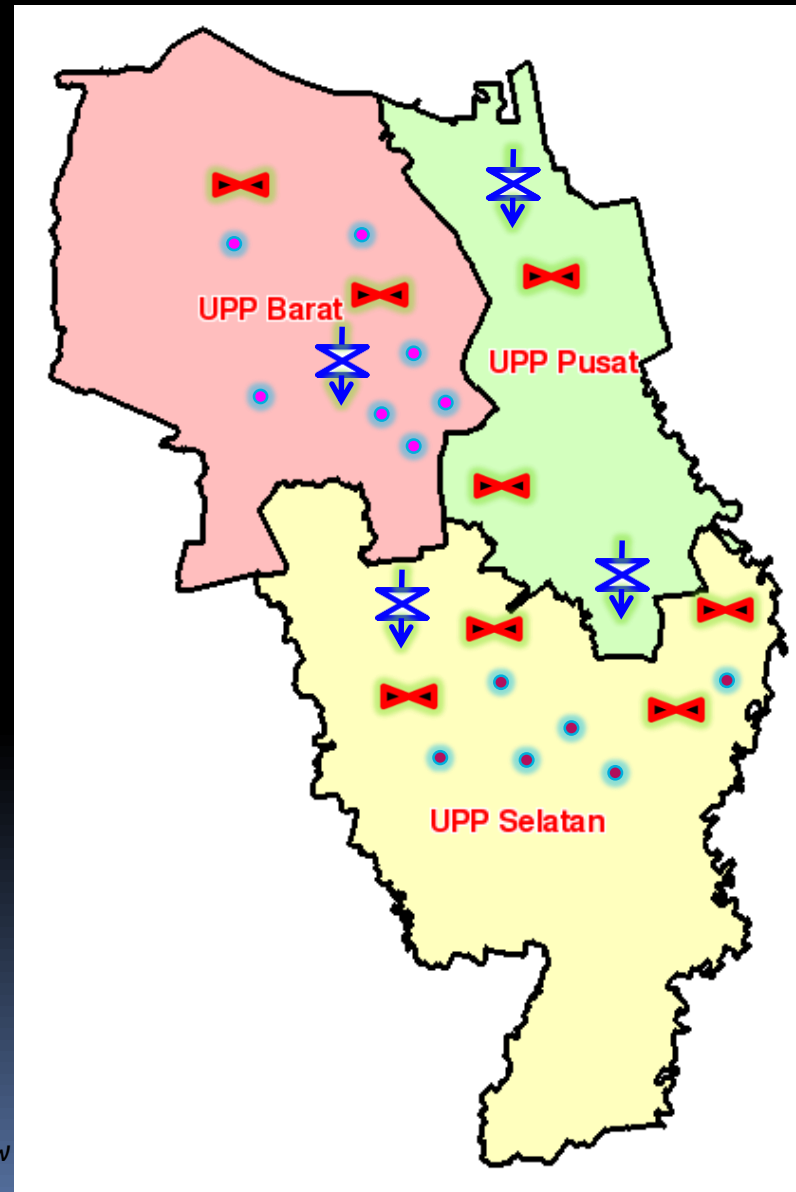
- As Built Drawing
- Buku Peta (Booklet)
- WebGIS



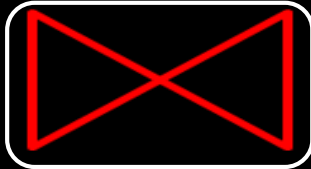
Menggambar pipa jaringan

Mengenal Simbol

-  Wash Out
-  Valve
-  Pelanggan baru Jan'12 - UPPS
-  Tunggakan Apr'12 - UPPB



Simbol Aksesoris Jaringan Pipa



• Valve



• Valve Inlet



• Operated/Throttle Valve



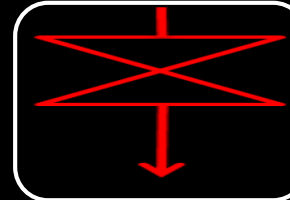
• Pressure Reducing Valve



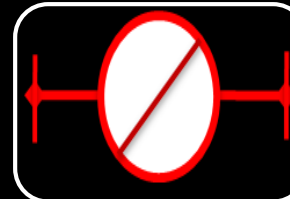
• Boundary Valve



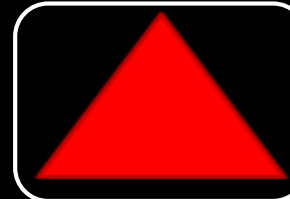
• Air Valve



• Wash Out



• Flow Meter



• Tapping Point

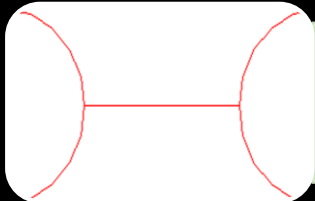


• Leak Repaired
(Leakage History)

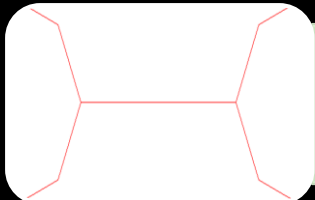


• Chamber

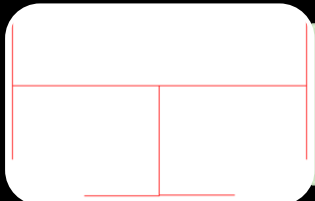
Simbol Fitting Jaringan Pipa



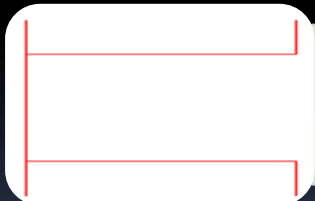
- Socket



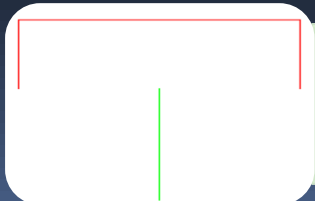
- Collar



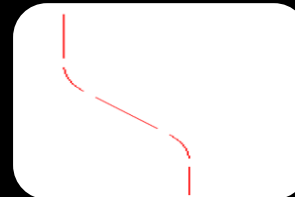
- Tee



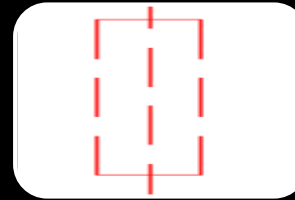
- Flange Adaptor Universal



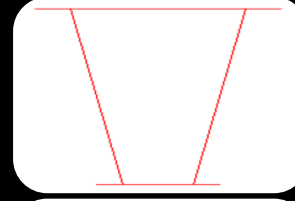
- End Cap/ Dop



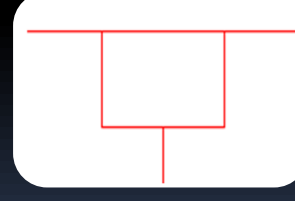
- Bend 45°



- Casing



- Reducer

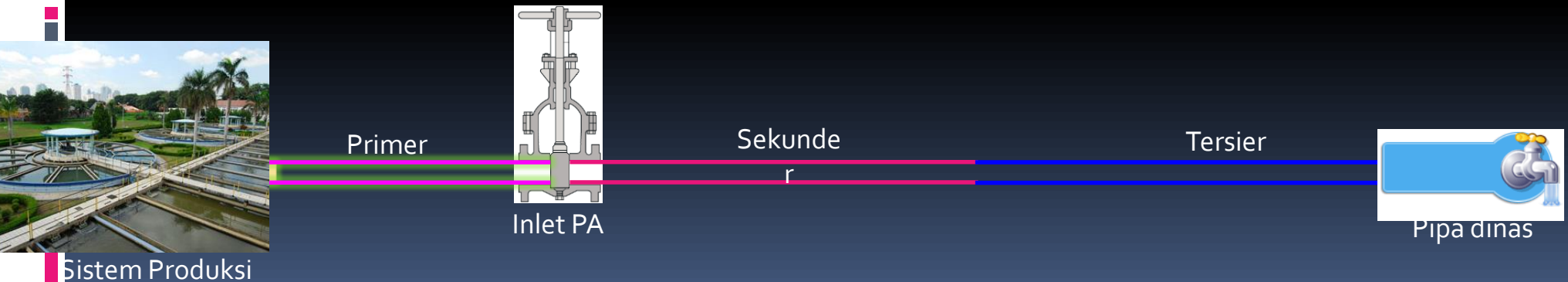


- Stub Flange

Klasifikasi Pipa

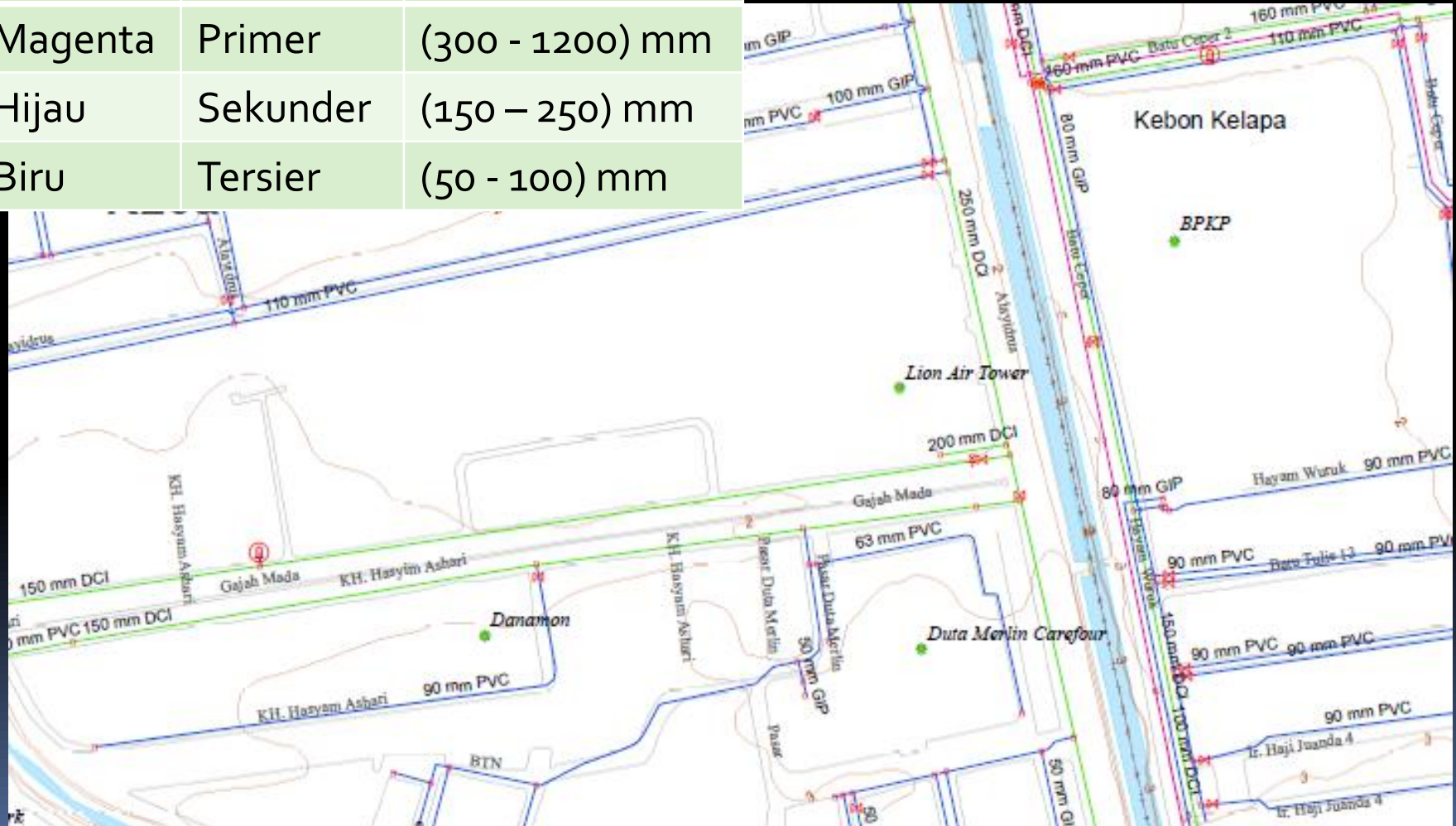
Pembagian fungsi Pipa dalam sistem jaringan air bersih

- **Pipa Primer** mengalirkan air dari sistem produksi ke inlet PA
- **Pipa Sekunder** mengalirkan air dari inlet PA ke pipa tersier
- **Pipa Tersier** mengalirkan air ke pipa dinas pelanggan



Klasifikasi Pipa

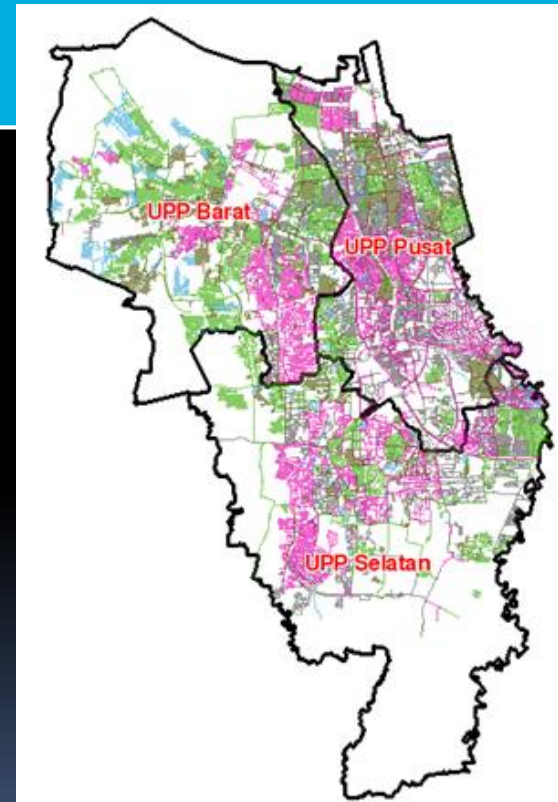
WARNA	KLAS PIPA	DIAMETER
	Primer	(300 - 1200) mm
	Sekunder	(150 – 250) mm
	Tersier	(50 - 100) mm



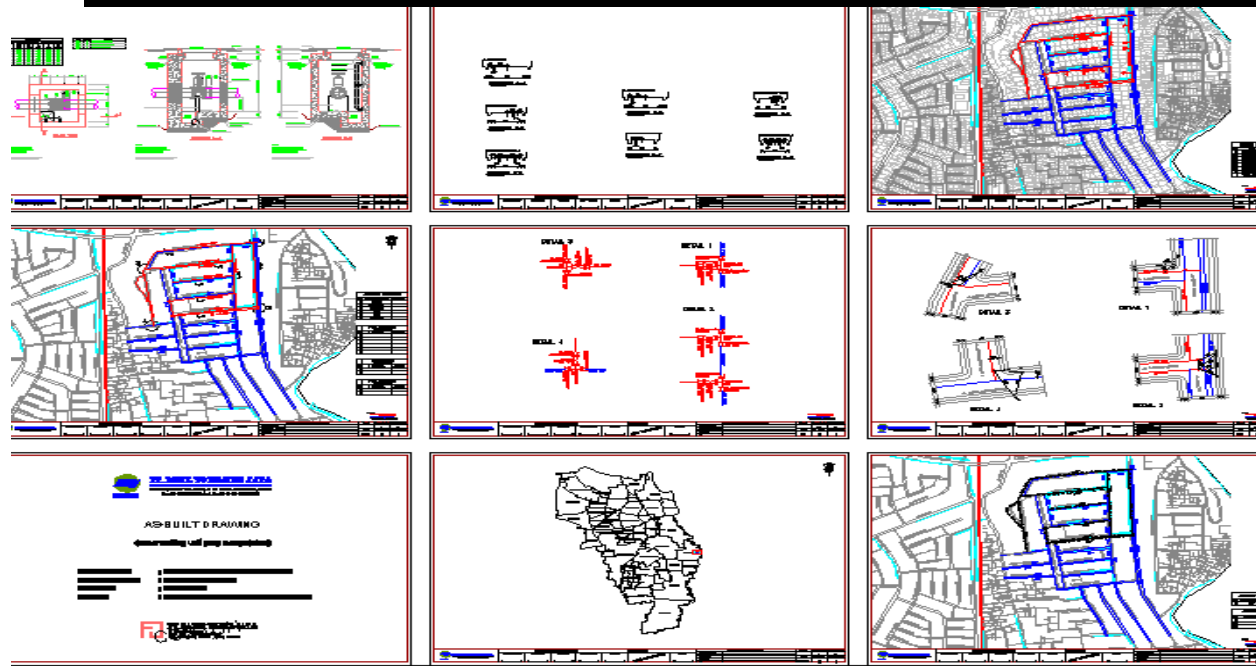
Sumber Peta

Sumber peta jaringan air bersih

- As Built Drawing (ABD)
- Buku Peta (Booklet)
- WebGIS



As-Built Drawing



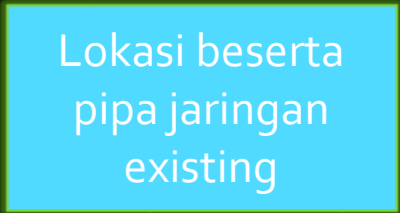
- Cover depan
- Indeks lokasi pekerjaan
- Peta jaringan eksisting
- Peta jaringan terpasang
- Peta detail lokasi
- Gambar detail aksesoris
- Gambar penampang

1111



Lokasi
Proyek:
Gudang
Peluru di S12

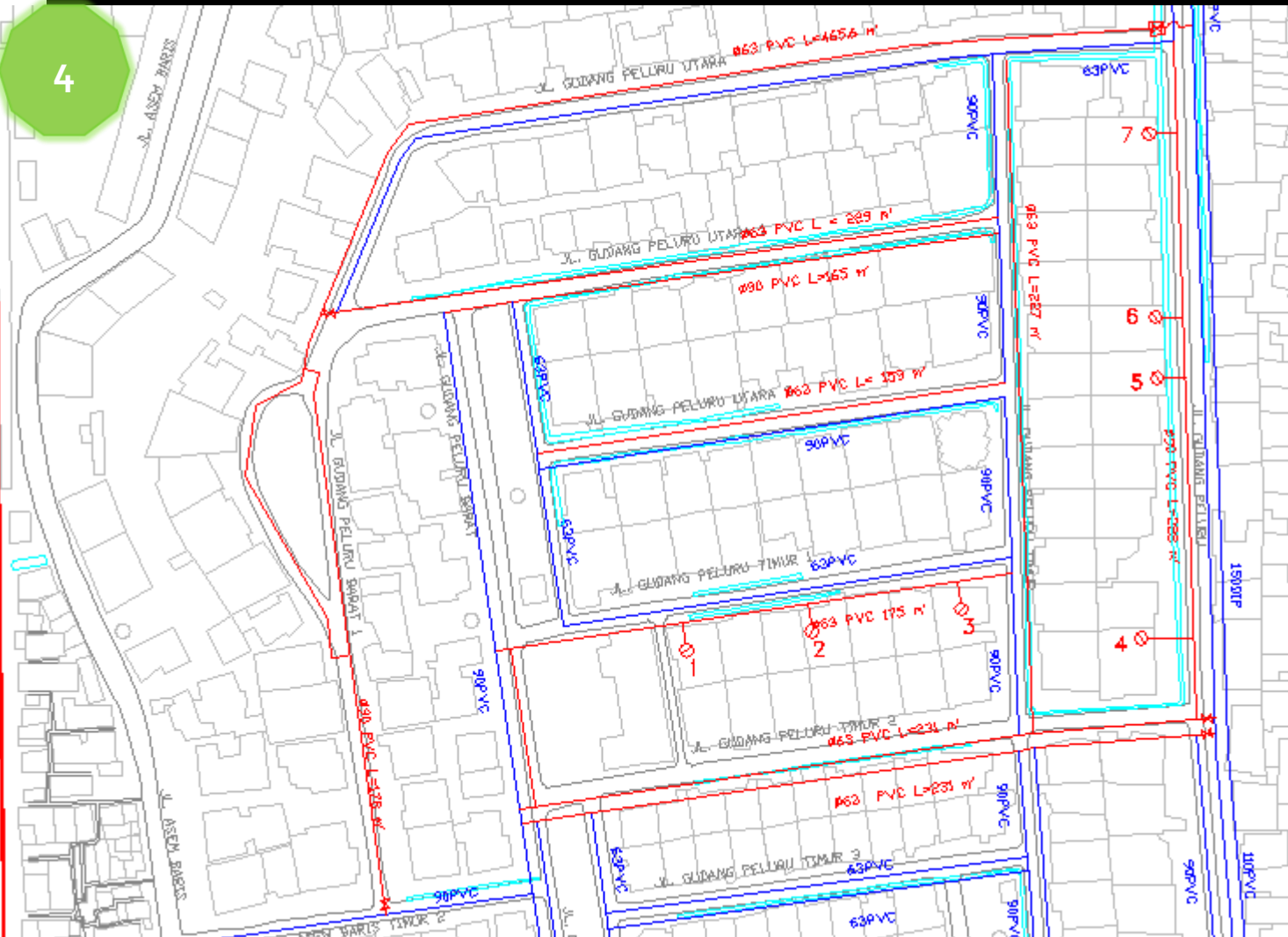
11111111



Lokasi beserta
pipa jaringan
existing

As-Built Drawing: Kondisi Existing & Terpasang

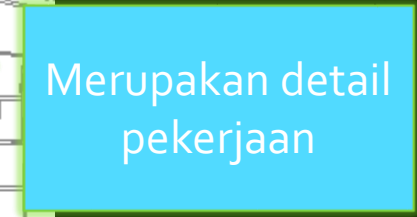
4



- PIPA TERPASANG
- PIPA EXISTING
- PIPA ABANDONING

Flow Management Level 1

1111



As-Built Drawing: Detail Fitting Material

DETAIL 1

7

Fl-Connector
DCI Ø110

Ø110 (PVC)

TEE, 110x110
DCI

Fl-Connector
DCI Ø110

Ø110 (PVC)

Gate Valve
DCI Ø110

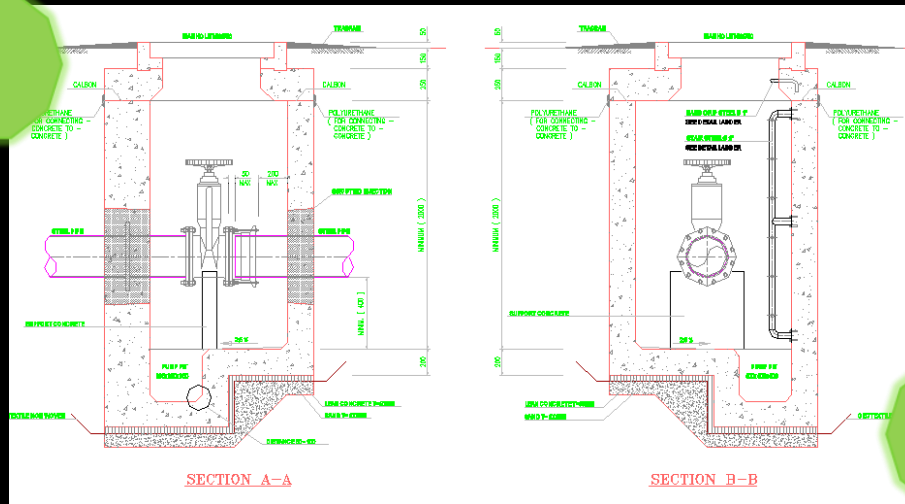
Fl-Connector
DCI Ø110

Fitting /
Sambungan
Material

— PIPA TERPASANG
— PIPA EXISTING
-XXX- PIPA ABANDONING

As-Built Drawing: Gambar Penampang Desain

8



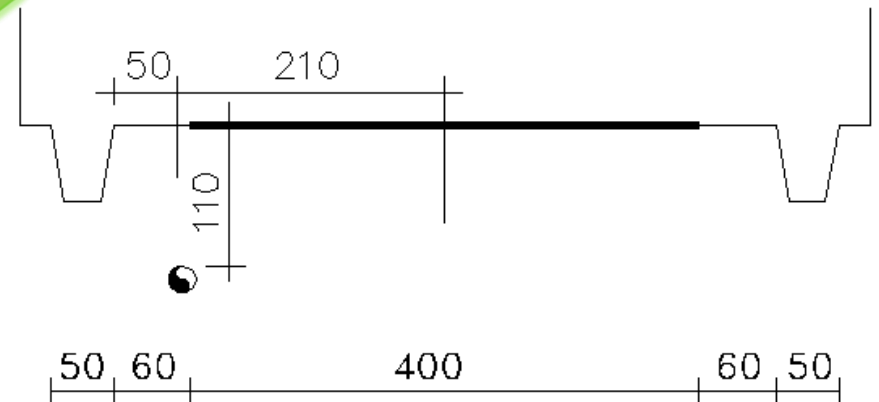
Skala 1: 20

Flow Manag

9

As-Built Drawing: Detail Ukuran (Pipe Laying)

UL. GUDANG PELURU



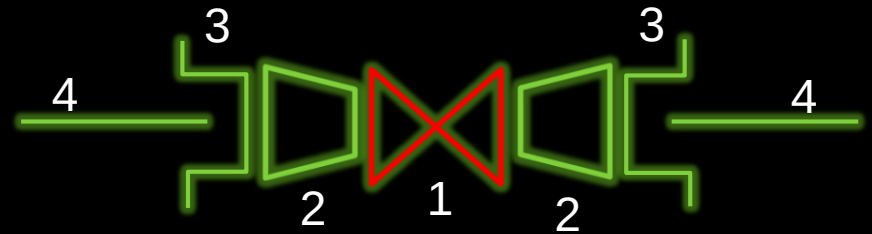
POTONGAN A-A

SKALA : 1 : 100

Contoh Penggambaran Aksesoris



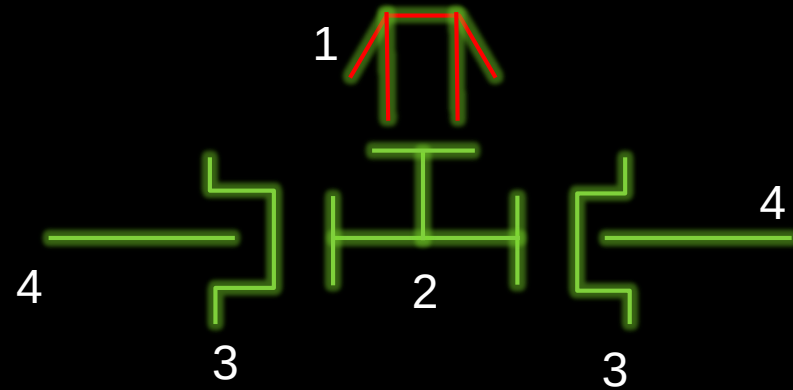
Pemasangan Gate Valve



Keterangan:

1. Gate Valve
2. Reducer FL – FL
3. Flange Adaptor Universal
4. Pipa PVC

Contoh Penggambaran Fitting



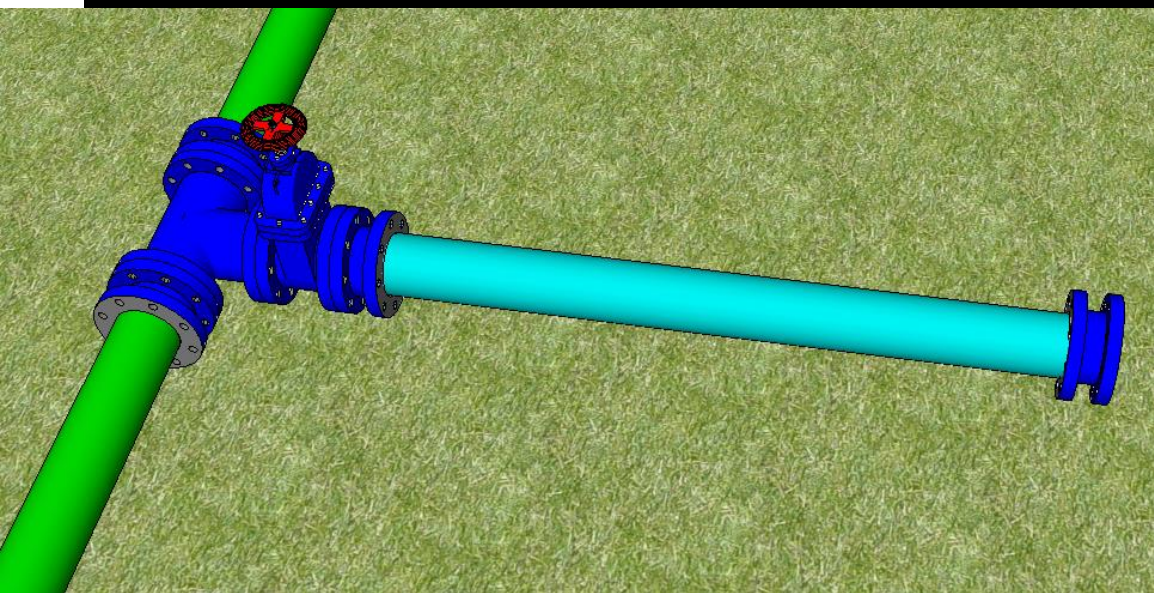
Keterangan:

1. Air Valve Double
2. Tee DCI FL – FL
3. Flange Adaptor Universal
4. Pipa DCI

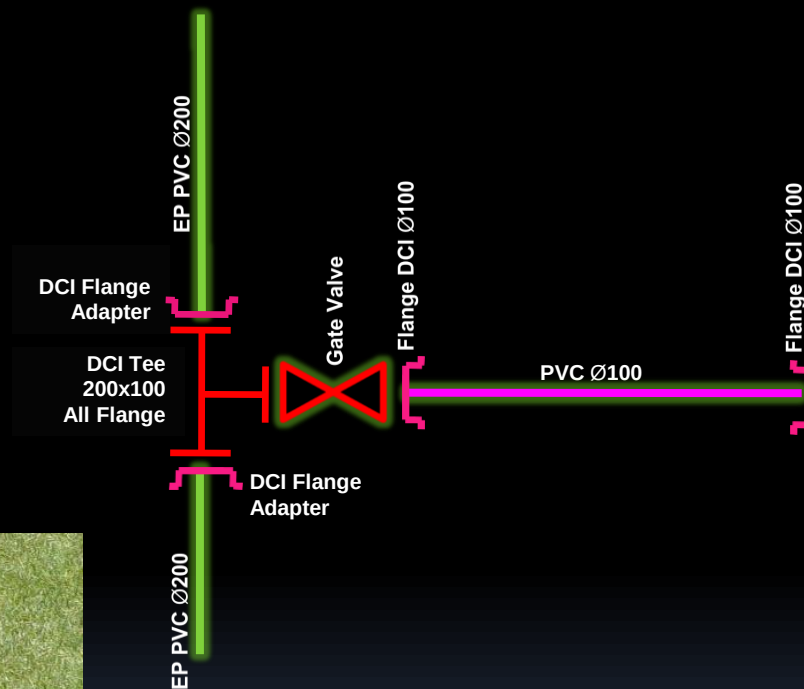
Sket Lapangan

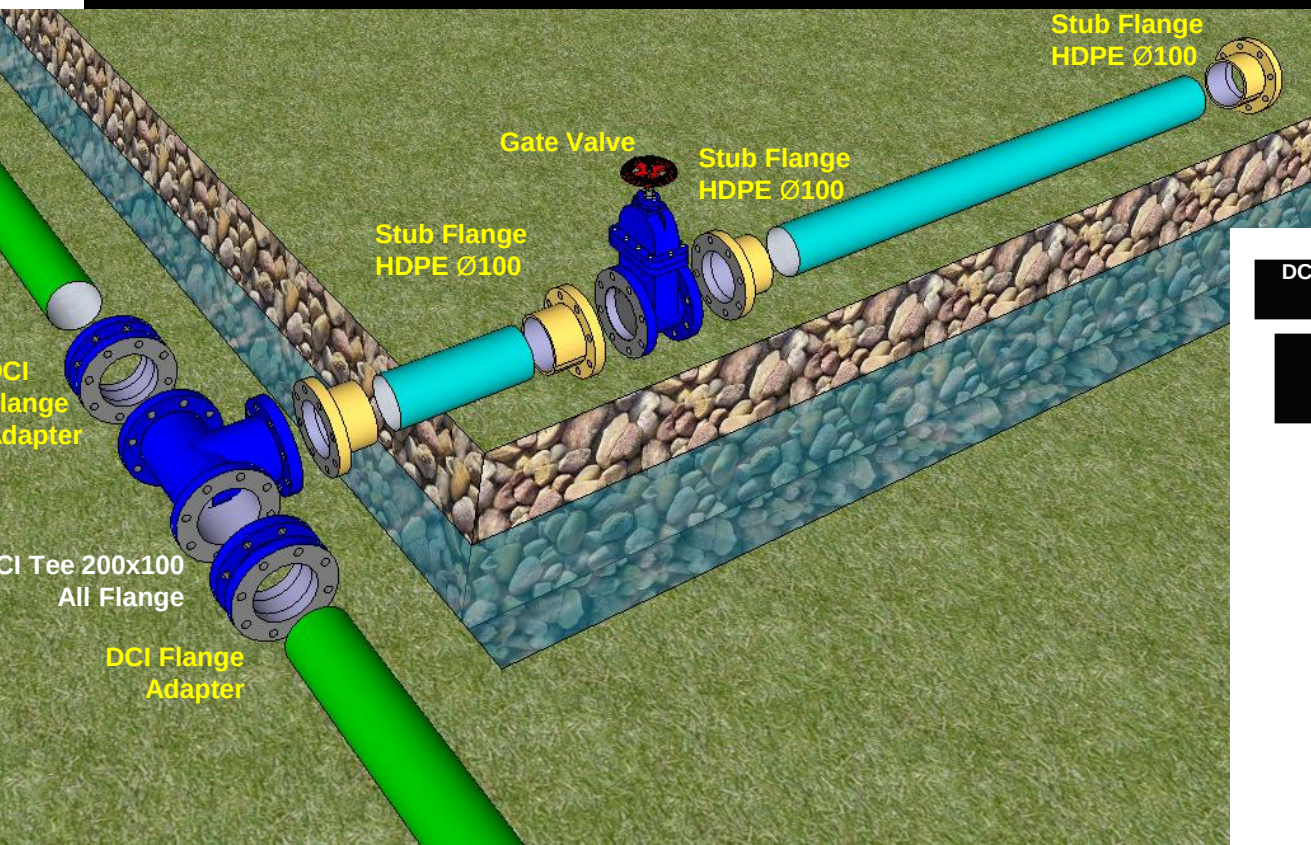
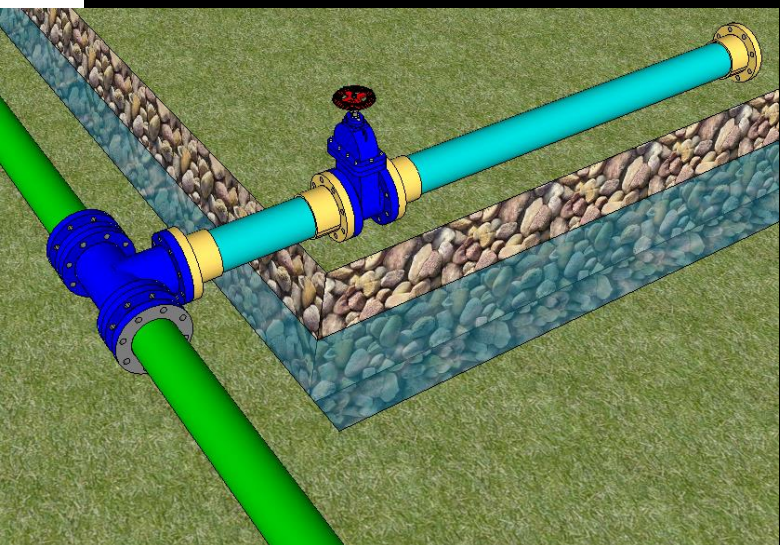
Gambar Sket Lapangan :

1. Mengikat Lokasi Aksesoris
2. Detail Pemasangan Aksesoris

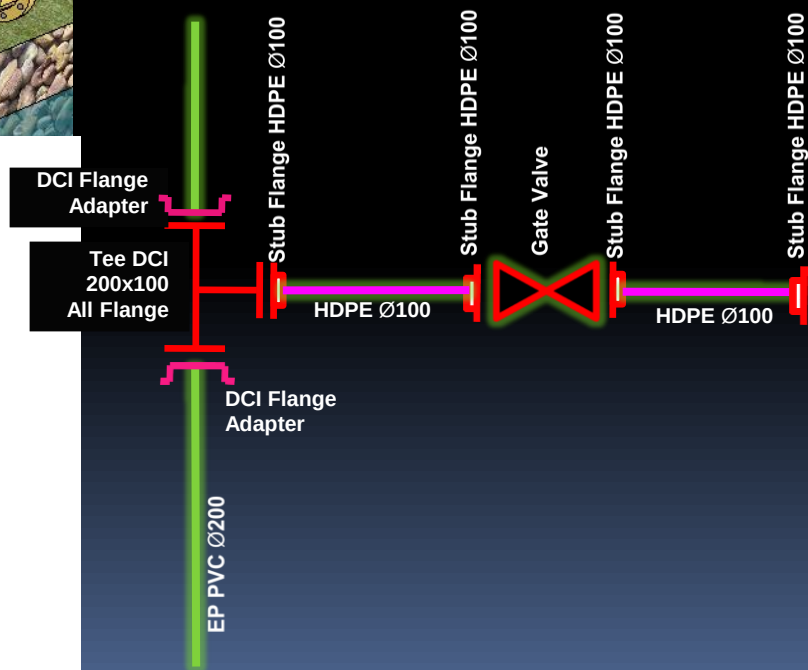


Gambaran Sket:





Gambaran Sket:



SYMBOLS - FITTINGS

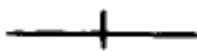
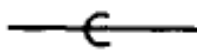
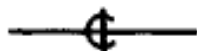
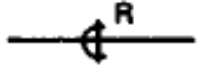
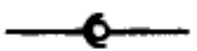
Pipe fittings			
Symbol	Description	Symbol	Description
	Cross		Tee
	Cross (branch up)		Tee (branch up)
	45° elbow		Tee (branch down)
	45° elbow (up)		Side outlet tee (up)
	45° elbow (down)		Reducer
	Lateral		Eccentric reducer (Elevation)
	90° elbow		Union, screwed
	90° elbow (up)		Sleeve coupling
	90° elbow (down)		Sleeve coupling (harnessed)
	45° elbow (long radius)		Meter (identify type)
	90° elbow (long radius)		Venturi meter

SYMBOLS – FITTINGS (2)

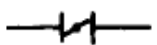
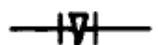
Pipe fittings			
Symbol	Description	Symbol	Description

	45° elbow (long radius)		Meter (identify type)
	90° elbow (long radius)		Venturi meter
	Base elbow		Expansion joint, metal bellows
	Side outlet elbow (up)		Expansion joint, rubber bellows
	Side outlet elbow (down)		Strainer
	Duplex strainer		Thermostat
	Flame trap		Pressure gauge
	Lube oil filter		Water level alarm
	Scale trap		
	Vent		Thermometer

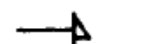
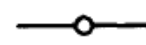
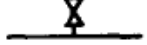
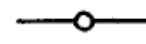
SYMBOLS - JOINTS

Pipe joints	
Symbol	Description
	Flange
	Bell and spigot
	Mechanical joint
	Mechanical joint, restrained
	Bell and ball

SYMBOLS - VALVES

Valves		
Stem relative to plane		Description
Perpendicular	Parallel	
		Gate
		Butterfly
		Eccentric plug
		Eccentric plug (alternate)
		Cone
		Ball
		Check, swing
		Globe
		Angle

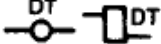
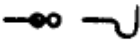
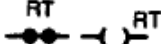
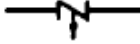
Valves		
Stem relative to plane		Description
Perpendicular	Parallel	

		Three way
		Flap
		Diaphragm
		Auto air and vacuum release
		Auto air release
		Auto vacuum release
		Hose (bibb)
		Valve, manual operation
		Control valve with hydraulic, pneumatic or electric actuator

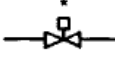
SYMBOLS - FIXTURES

Fixture symbols			
Symbol	Description	Symbol	Description
 FD	Floor drain	 WH	Water heater
 AD	Area drain	 L	Lavatory
 RD	Roof drain	 S	Sink
 A	Compressed air outlet	 SH	Shower stall
 G	Gas outlet	 U	Urinal
 VAC	Vacuum outlet	 WC	Water closet
 HB	Hose bibb	 WC	Water closet, wall hung
 DF	Drinking fountain	 EWC	Electric water cooler

SYMBOLS – PIPES (1)

Piping symbols			
Symbol	Description	Symbol	Description
<u>ST</u>	Storm	<u>F</u>	Fire protection
<u>S</u>	Soil	<u>SP</u>	Fire sprinkler
<u>W</u>	Waste	Plan El	
<u>D</u>	Drain		Drum trap
<u>V</u>	Vent		P-trap
<u>AW</u>	Acid waste		Running trap
<u>AV</u>	Acid vent		Backflow preventer
<u>SW</u>	Service water		Cleanout (exposed pipe)
<u>CW</u>	Cold water		Cleanout (floor or grade)
<u>EW</u>	Effluent water	<u>HWS</u>	Heating water supply
		<u>HWR</u>	Heating water return

SYMBOLS – PIPES (2)

Symbol	Description	Symbol	Description
<u>LPS</u>	Low-pressure steam		Three-way control valve * (P): pneumatic * (E): electric
- - - LPC	Low-pressure condensate		Control valve * (P): pneumatic * (E): electric
<u>MPS</u>	Medium-pressure steam		Pipe guide
- - - MPC	Medium-pressure condensate		Pipe anchor
<u>HPS</u>	High-pressure steam		Float and thermostatic trap
- - - HPC	High-pressure condensate		Thermostatic trap
<u>FOS</u>	Fuel oil supply		Expansion joint
- - - FOR	Fuel oil return		Expansion joint (harnessed)
<u>BF</u>	Boiler feed		Pipe flow direction
<u>NG</u>	Natural gas		Pipe pitch down with respect to flow
<u>LPG</u>	Liquefied petroleum gas		Pipe pitch up with respect to flow
<u>RL</u>	Refrigerant liquid		Pipe capped
<u>RS</u>	Refrigerant suction		
<u>CPD</u>	Condensate pump discharge		

MORE IN PUMPING STATION DESIGN

Piping Joints

- **Threaded**
Accuracy (?), Metal/plastic. Plumbing
- **Flanged**
Industrial pipes, low/medium pressure and temperature. Metal/Plastic. Steam, oil, water,
- **Welded**
Permanent; High pressure and temperature.
Industrial, Water, steam, oil, chemicals,
Water supply, sewage, large hydro - Concrete

Piping Joints

Threaded / Flanged / Welded

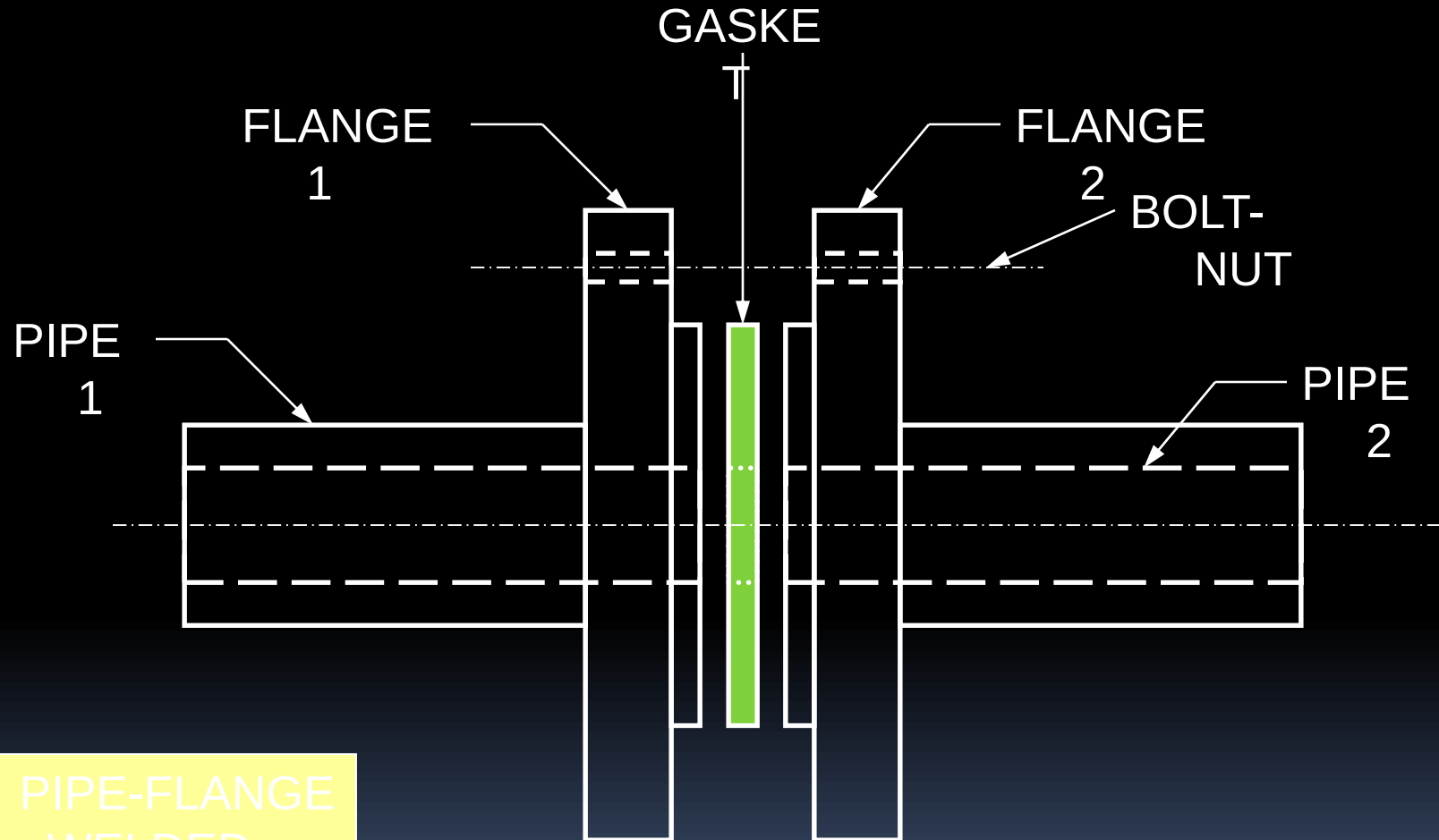


Piping Joints

Threaded / **Flanged** / Welded



Pipe - Flanged connection



Pipe - Flanged connection



Piping Joints

Threaded / Flanged / **Welded**



Piping Joints



Piping Bends

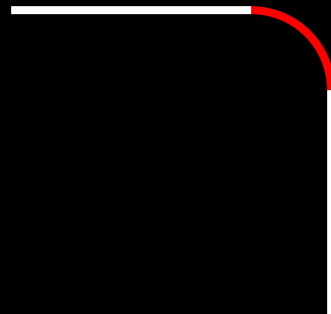
Tee (T)

Short Radius (SR)
Elbow

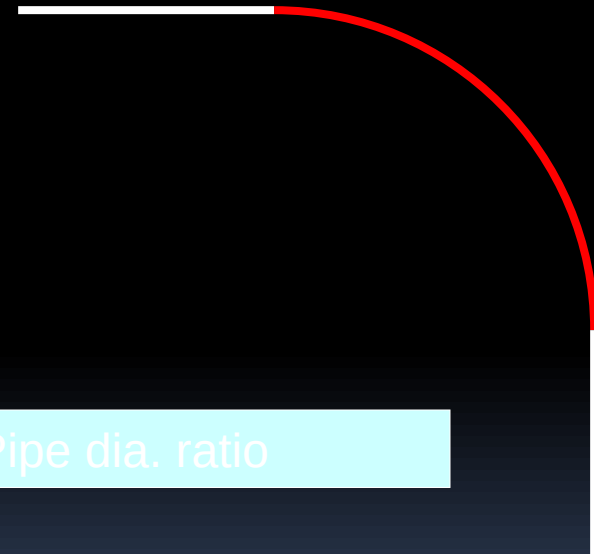
Long Radius (SR)
Elbow



Hydrodynamics.
Space.



Radius/Pipe dia. ratio



Piping : Vents, Drains & Supports

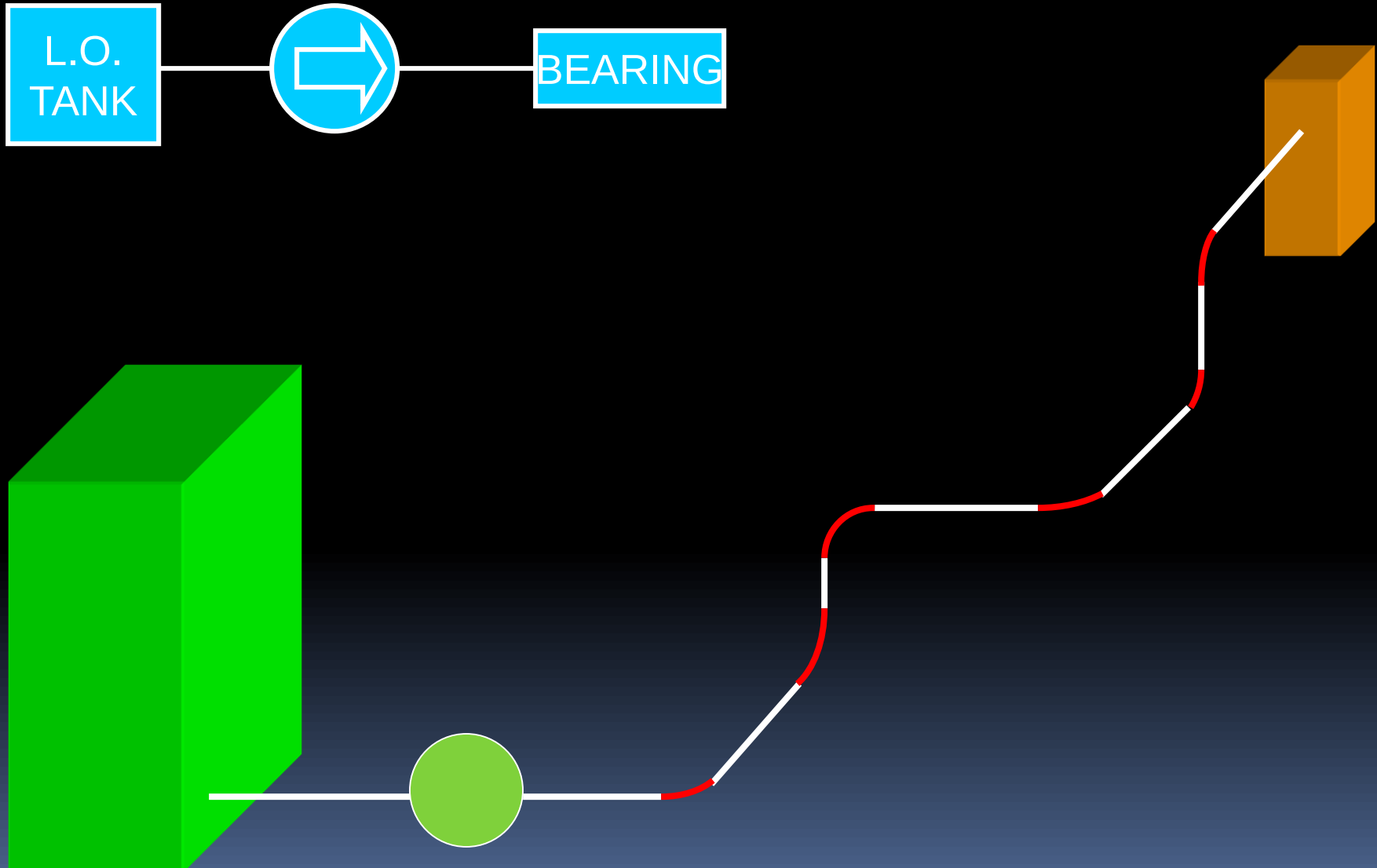
Vents : Location, accessibility, outlet

Drains : Location, accessibility, collection, funnel,

Supports : Anchor/foundation, hanger

- *Thermal expansion*
- *Pipe weight*
- *Surges, water hammer*
- *Equipment vibrations*
- *Seismic*

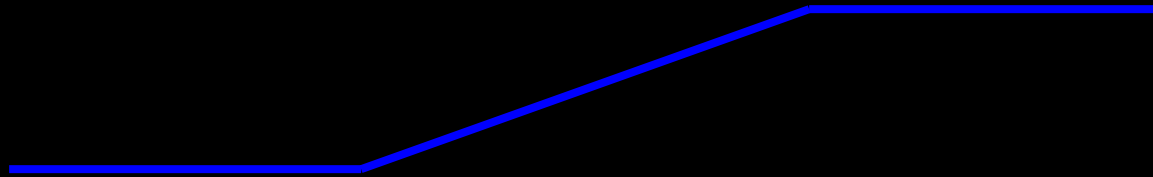
Francis Turbine – Lube Oil Piping (2)



Piping – Plan & Elevation (1)



Piping – Plan & Elevation (2)



ISOMETRIC

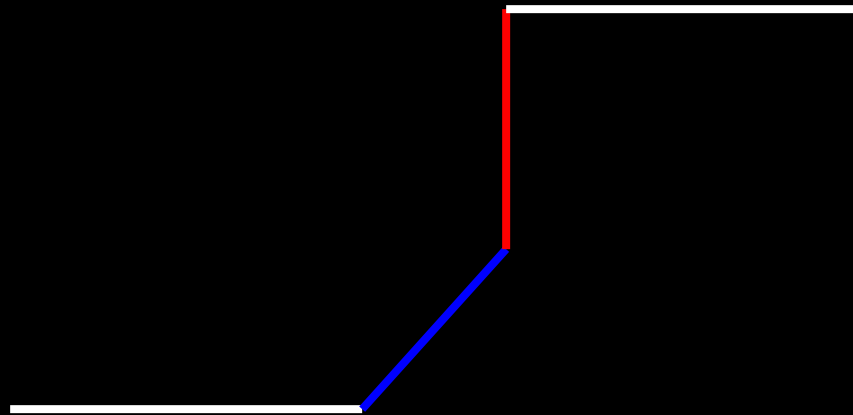


PLAN

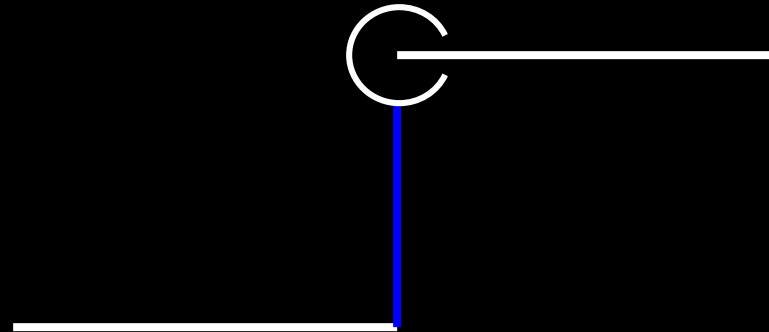


ELEVATION

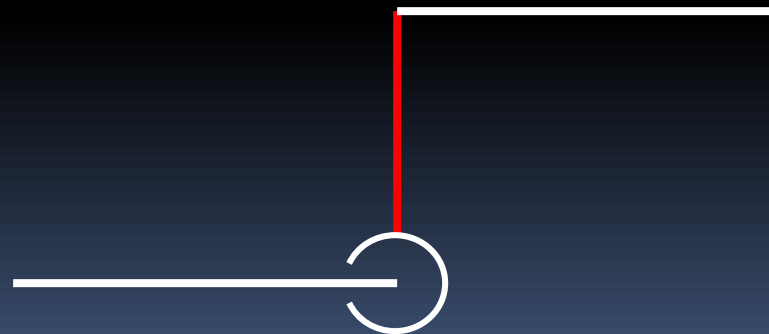
Piping – Plan & Elevation (3)



ISOMETRIC



PLAN

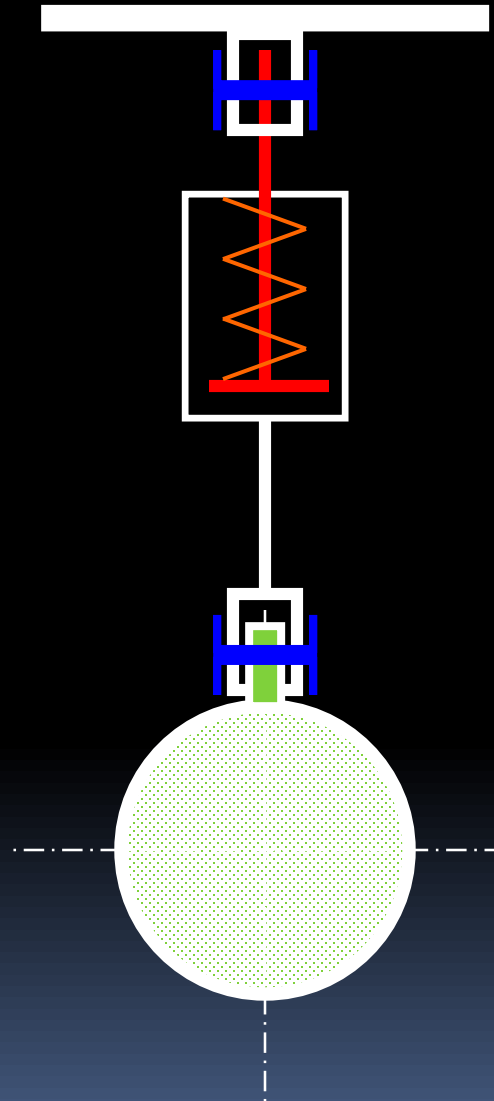


ELEVATION

Pipe supports

- Foundation
- Hanger
- Rack
- Clamp
- Underground – foundation
- ❖ “Rigid” - anchor vs. “flexible” allows pipe to move
- ❖ All along pipe length (at regular intervals?)

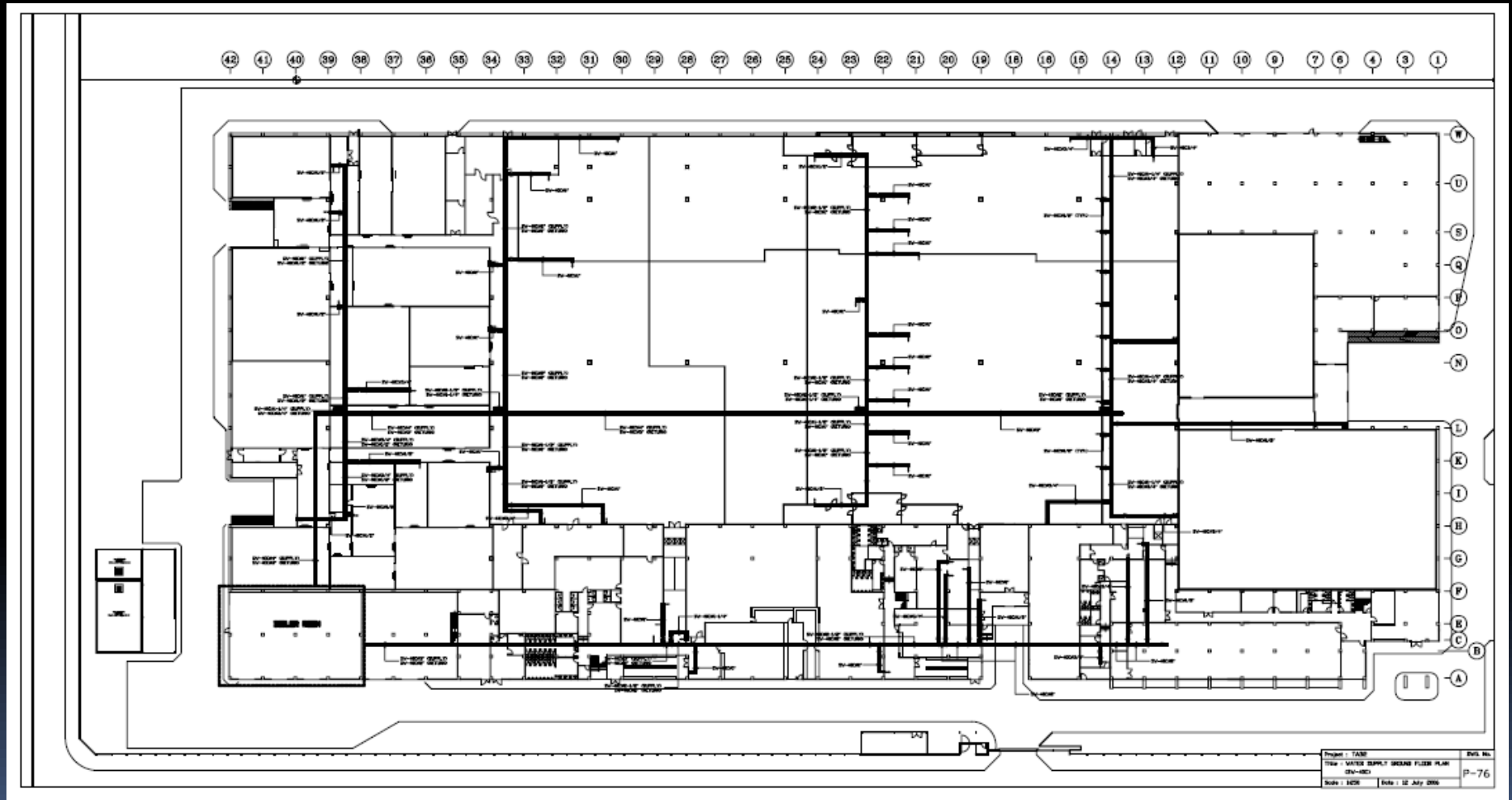
Pipe support - Hanger



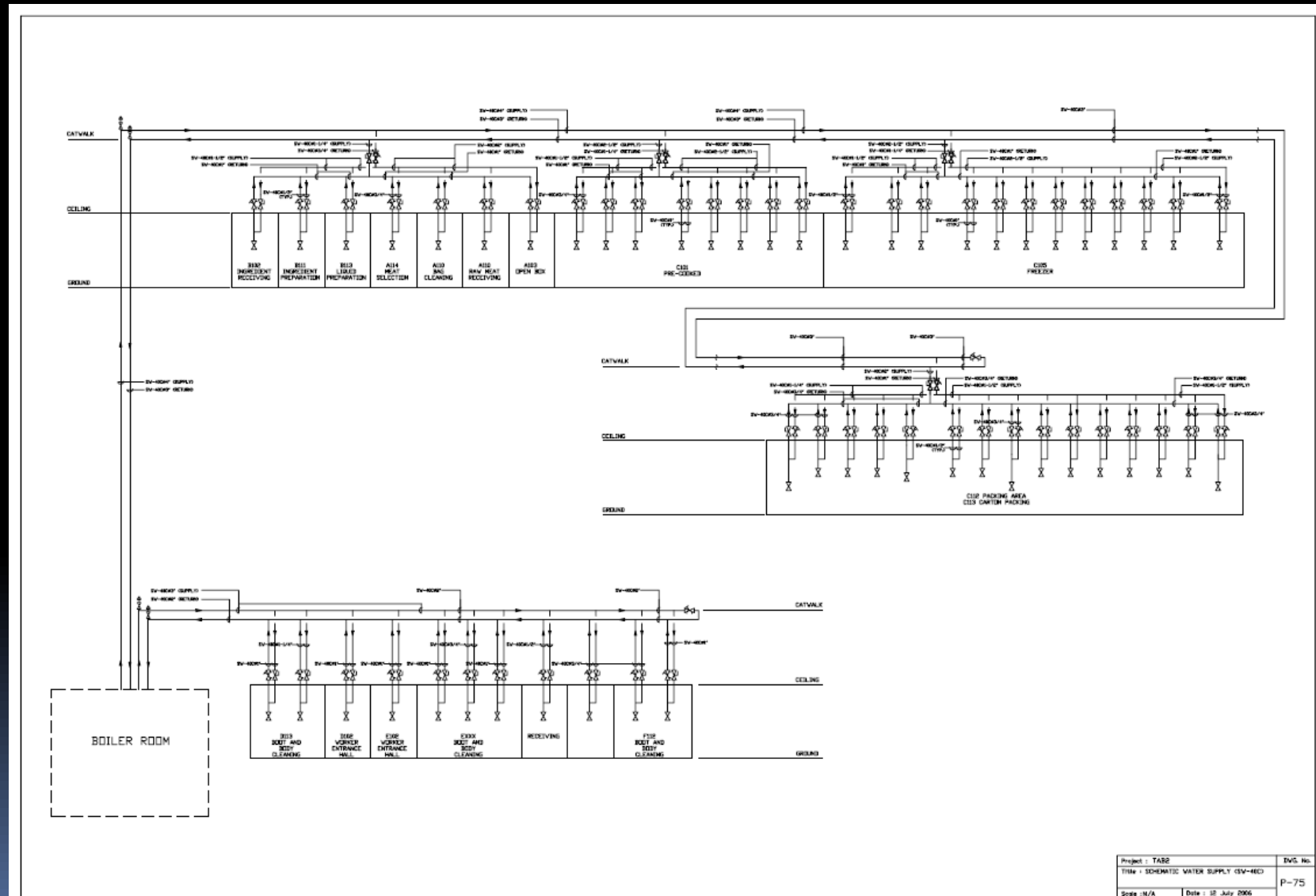
Piping Examples

Oil pumping station, Central A.C. system,

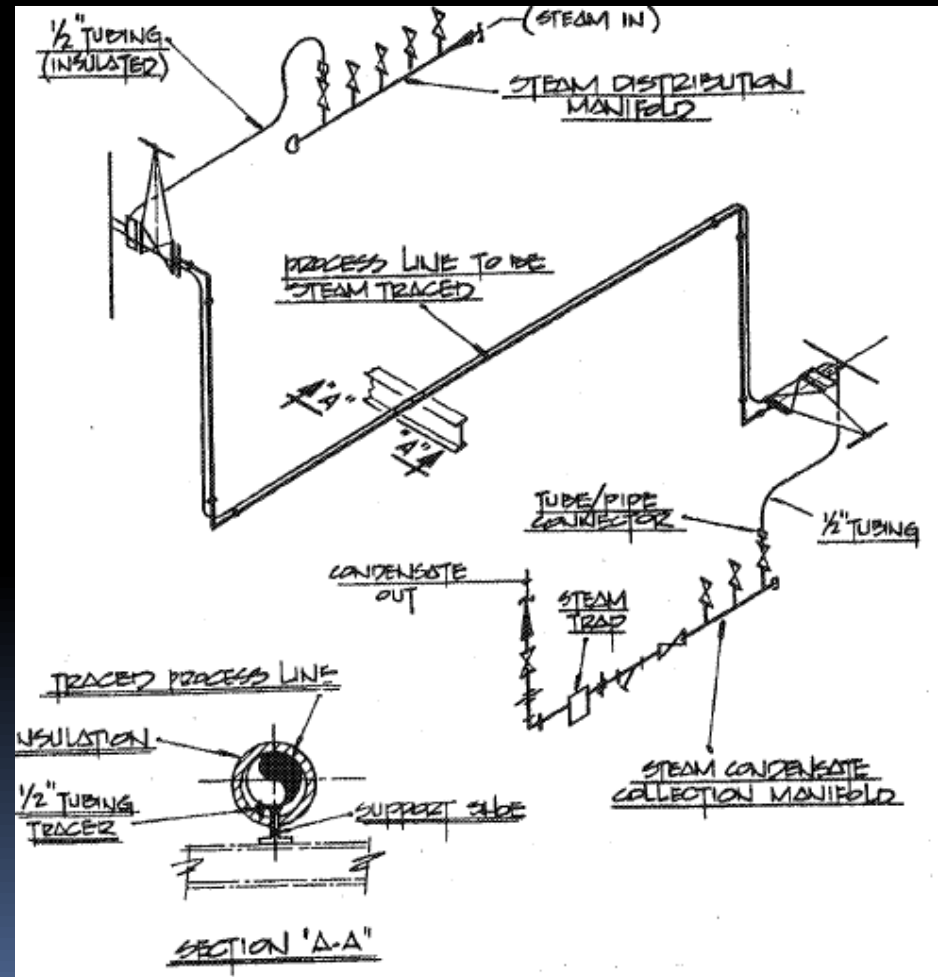
PIPING DRAWING - FLOOR PLAN



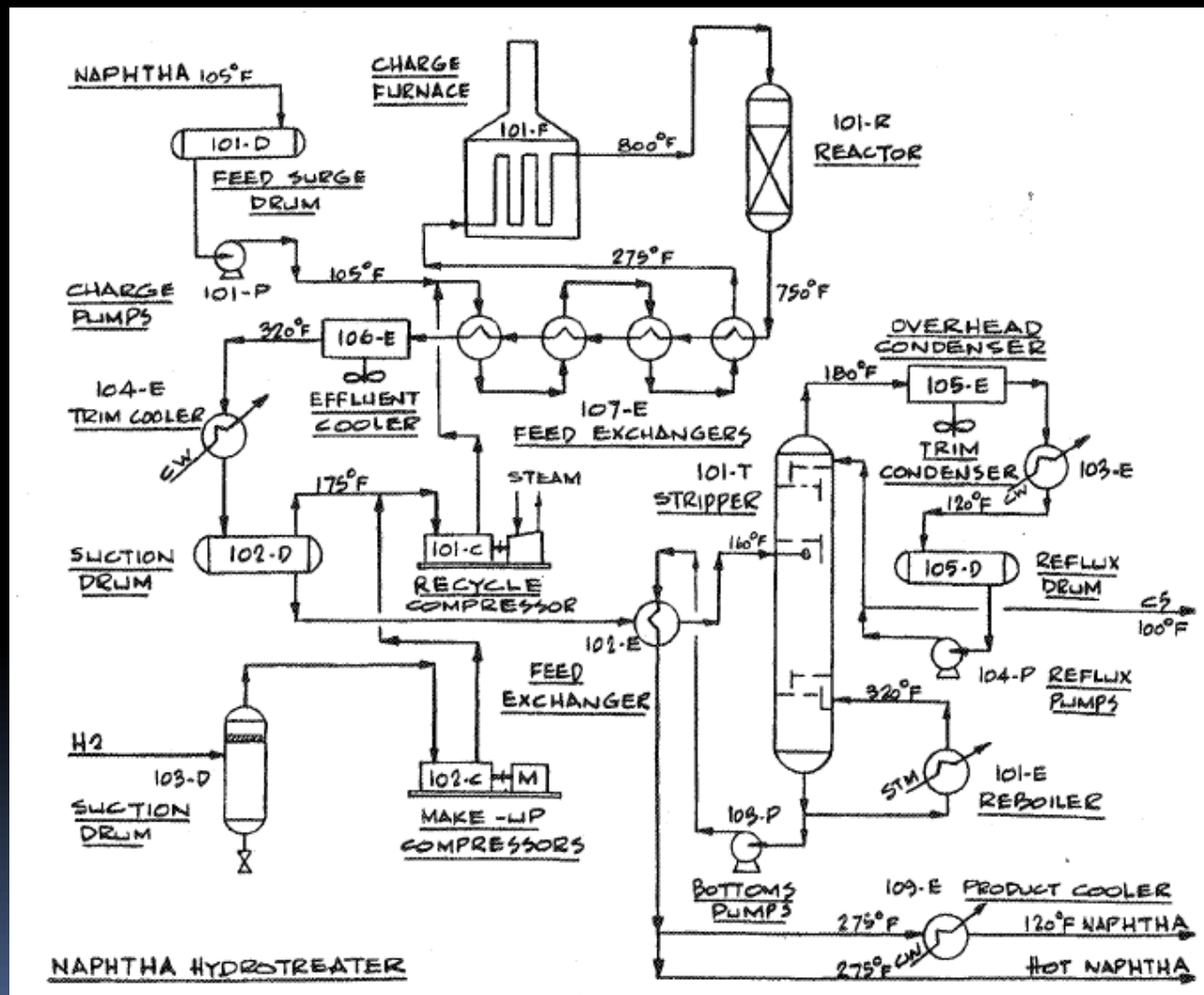
PIPING SYSTEM SCHEMATIC DIAGRAM (FLAT)



SCHEMATIC DIAGRAM (ISOMETRIC)

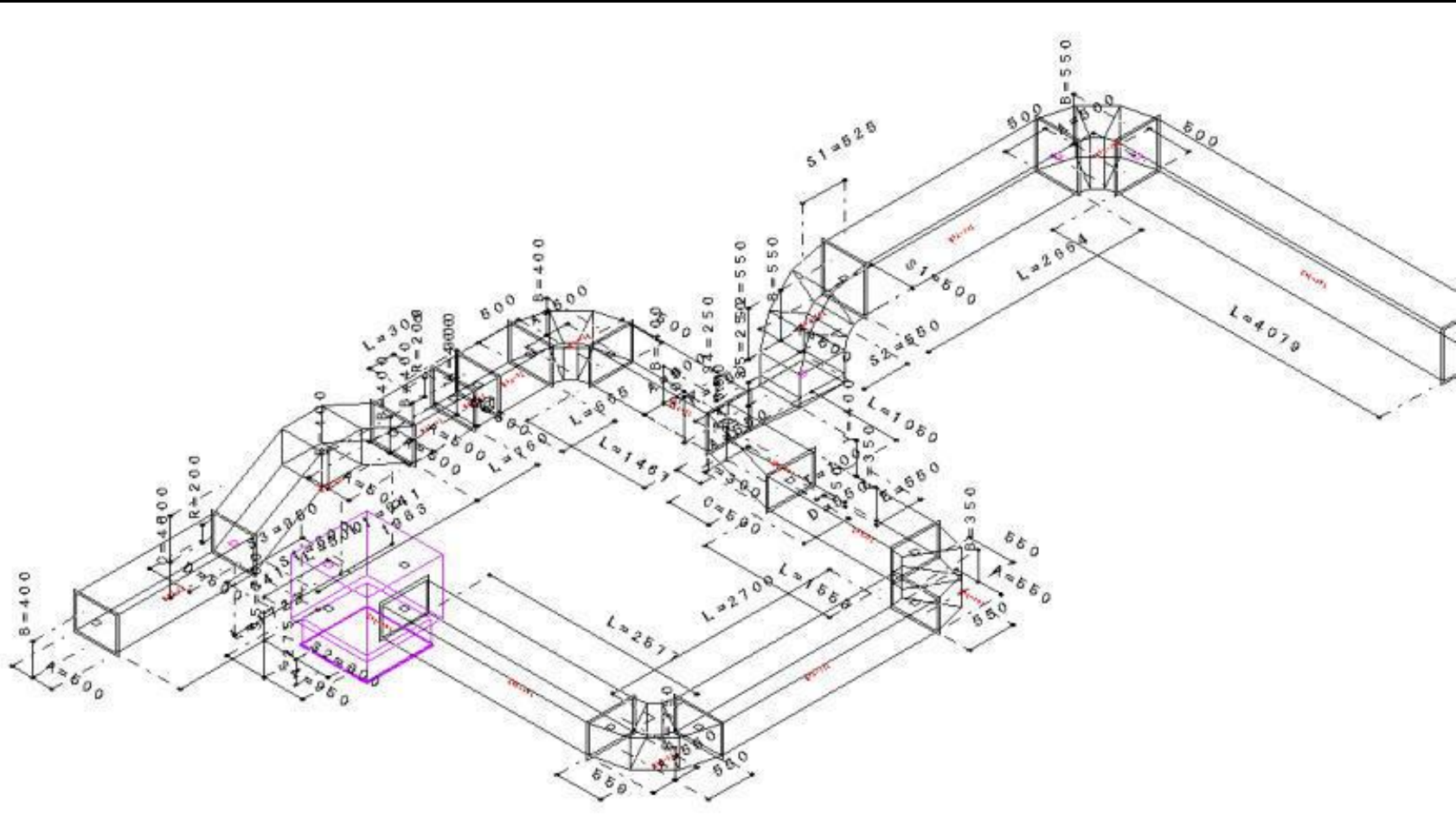


PROCESS SCHEMATIC DIAGRAM

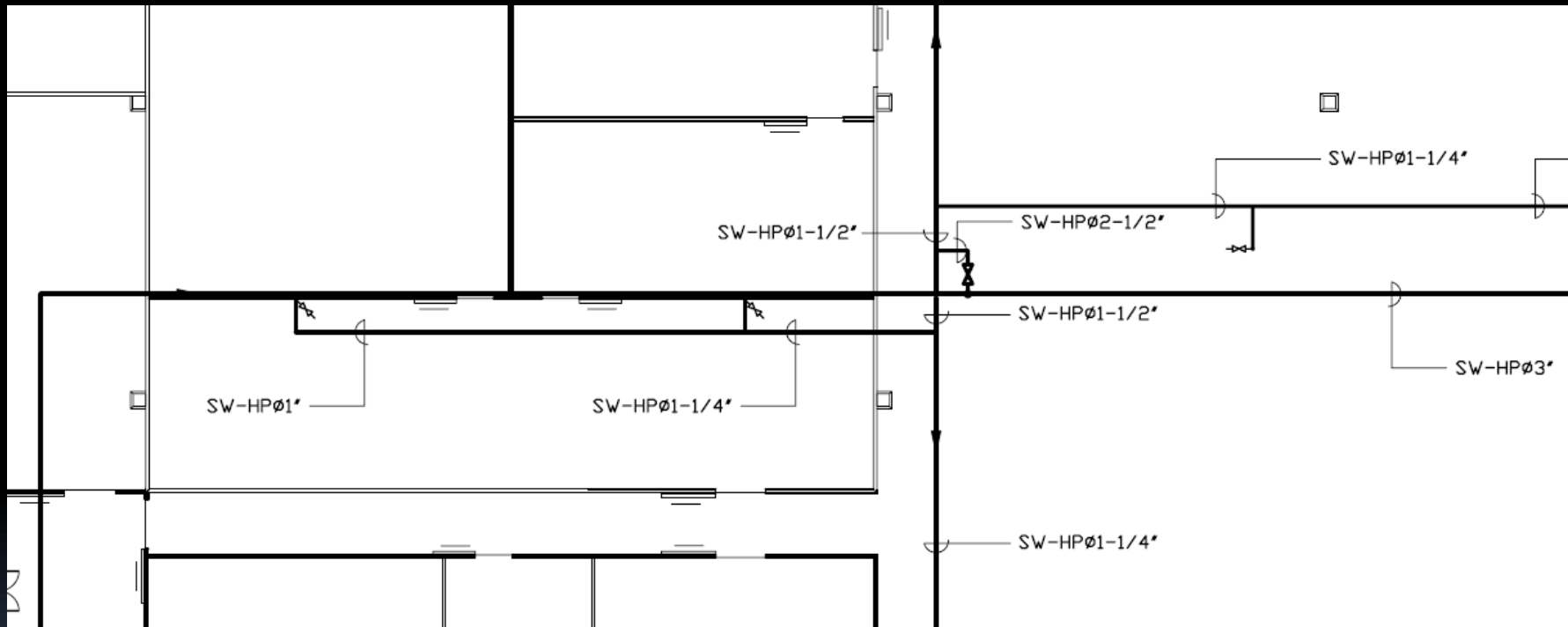


[illegible]

DUCT DRAWING



DIMENSIONING



PENGERTIAN

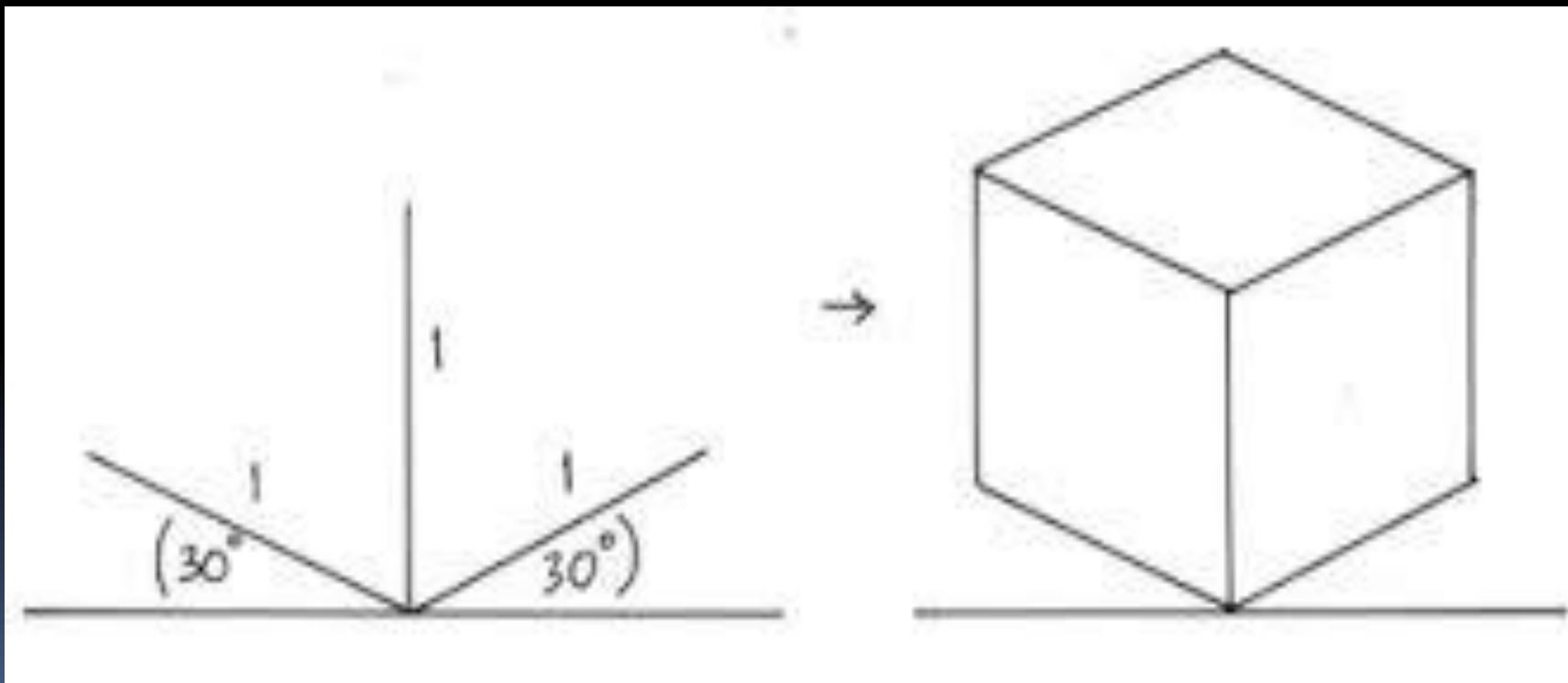
- Isometri adalah suatu transformasi atas Refleksi (pencerminan), Translasi (pergeseran), dan Rotasi (perputaran) pada sebuah garis yang mempertahankan jarak (panjang suatu ruas garis)
- Proyeksi isometri menyajikan benda dengan tepat, karena panjang garis pada sumbu-sumbunya menggambarkan panjang sebenarnya.
- Cara menggambarinya sangat sederhana karena tidak ada ukuran-ukuran benda yang mengalami skala perpendekan.

ISOMETRI

- Proyeksi isometri : suatu proyeksi yang mempunyai perbandingan panjang antara ketiga sumbunya, yaitu :
$$X : Y : Z = 1 : 1 : 1$$
- Pada proyeksi ini ciri yang paling mendasar adalah besar sudut antara sumbu X & Y terhadap garis mendatar adalah 30° .
- Cara menampilkan penggambarannya meliputi 3 sajian tampilan yaitu : proyeksi isometri normal, terbalik, dan horisontal.

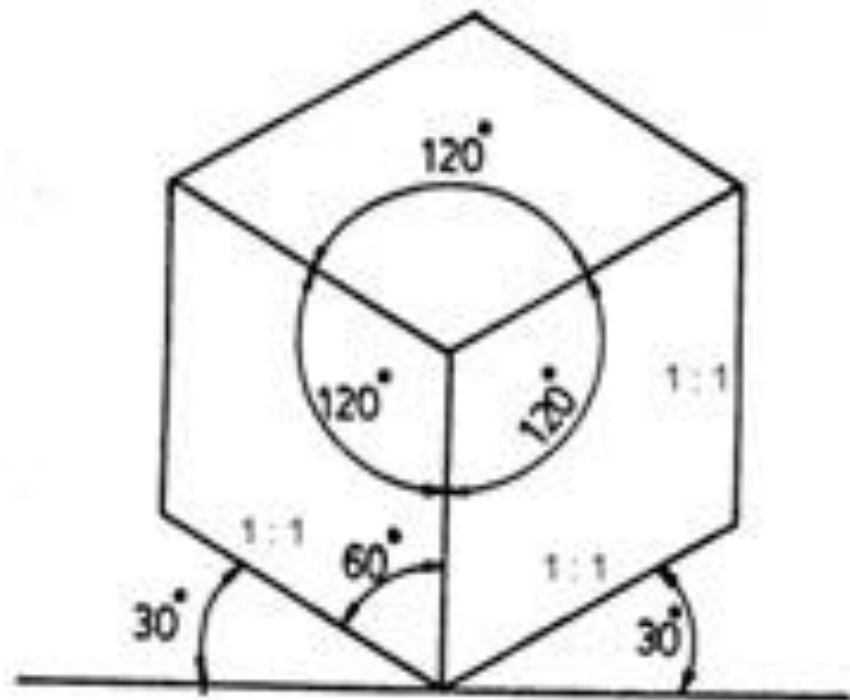
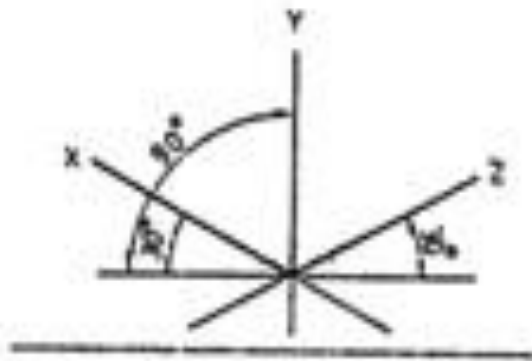
ISOMETRI

- Menggambar dengan metode 3 Dimensi, yakni dgn sumbu X, Y dan Z, secara otomatis kita dapat melihat semua pandangan dari Atas, Depan, dan Samping.



ISOMETRI

$$a:b:c=1:1:1$$



ISOMETRI NORMAL

- Kedudukan proyeksi **isometri normal** :
sumbu x dan y terhadap garis horisontal adalah 30° ,
sedangkan sumbu z, tegak lurus membentuk sudut 90°
terhadap garis horisontal dengan nilai negatif.



ISOMETRI TERBALIK

- Kedudukan proyeksi **isometri terbalik** :
kedudukan dimana bentuk gambar dari proyeksi isometri normal diputar 180° ke arah **kanan**, sehingga kedudukan sumbu z, tegak lurus membentuk sudut 90° terhadap garis horizontal dengan nilai positif.



ISOMETRI HORISONTAL

- Kedudukan proyeksi **isometri horisontal** : kedudukan dimana bentuk gambar dari proyeksi isometri normal diputar 270° ke arah **kanan**, sehingga kedudukan sumbu x dan y terhadap garis vertikal membentuk sudut 30° , sedangkan kedudukan sumbu z, sejajar dengan garis horisontal ke arah positif.



LATIHAN SOAL : ISOMETRI KUBUS

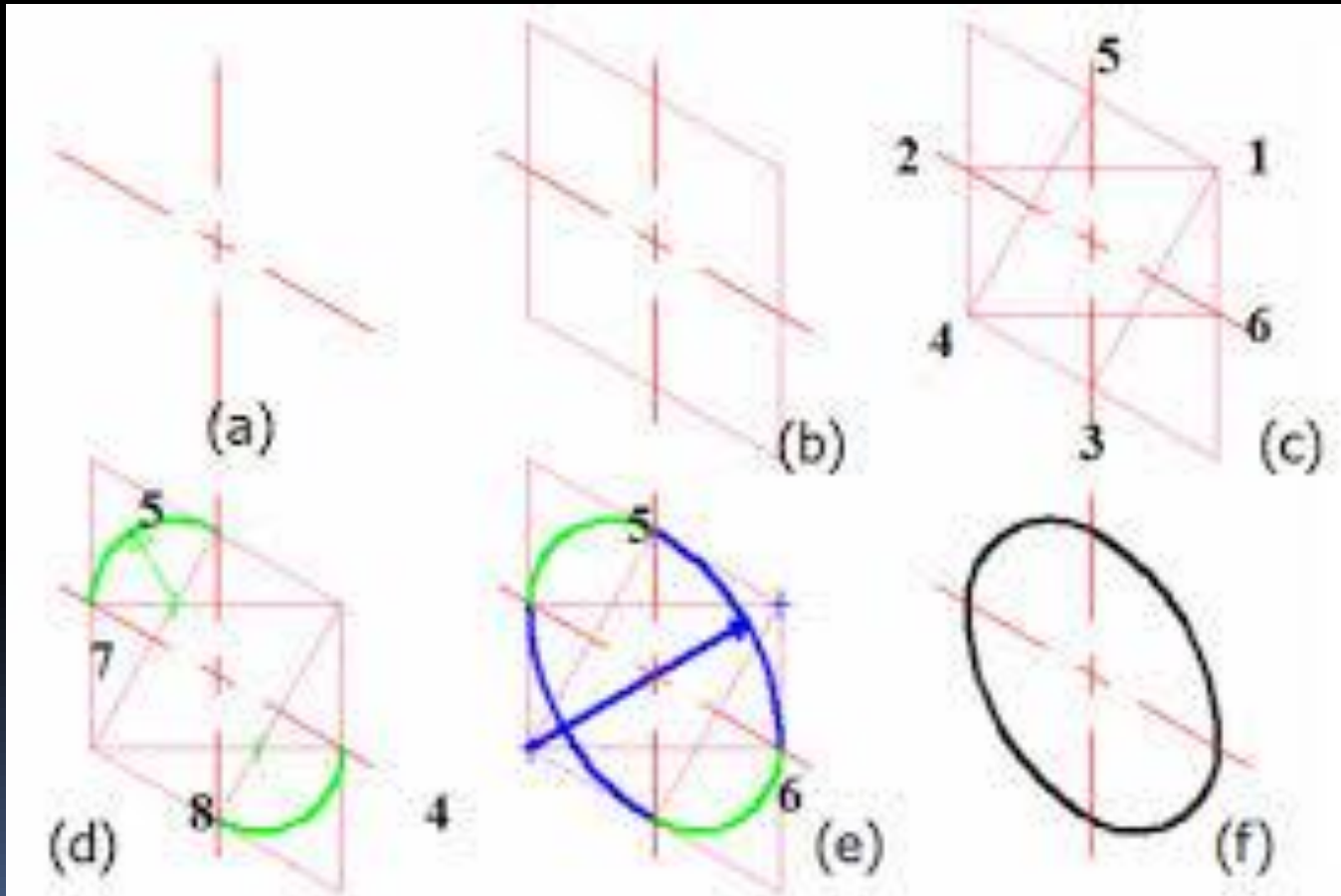
- Buat garis bantu mendatar pada kertas gambar A3. Jarak 4 cm dari tepi bawah kertas.
- Tentukan 1 titik di tengah garis.
- Gunakan sudut penggaris segitiga 30° pada bidang horizontal di titik tersebut, membentuk garis X & garis Y. Garis Z dibuat dengan penggaris segitiga siku-siku, mengarah ke atas.

LATIHAN SOAL : ISOMETRI KUBUS

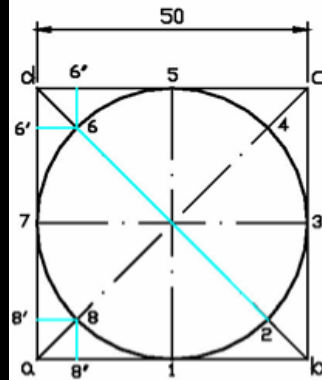
- Dari titik tengah garis, tentukan jarak 10 cm pada salah 1 garis (X/Y/Z) menggunakan **jangka**.
- Lalu dengan jangka juga (tidak diubah ukurannya), tentukan jarak 10 cm pada garis lainnya.
- Buatlah sebuah kubus secara isometri.

LATIHAN SOAL : ISOMETRI BENTUK LINGKARAN

- Gunakan jangka dan 2 penggaris segitiga

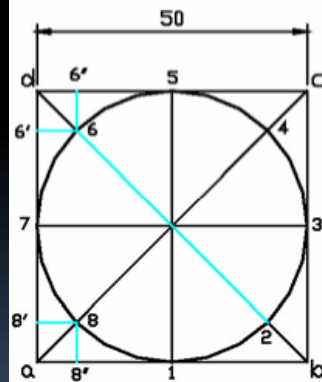
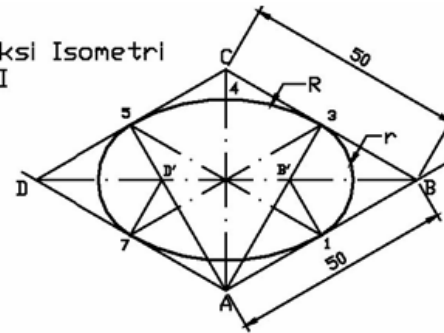


ISOMETRI BENTUK LINGKARAN

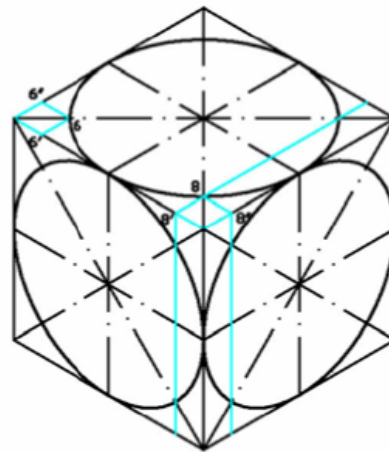


Proyeksi Orthogonal

Proyeksi Isometri
Cara I



Proyeksi Orthogonal



Proyeksi Isometri