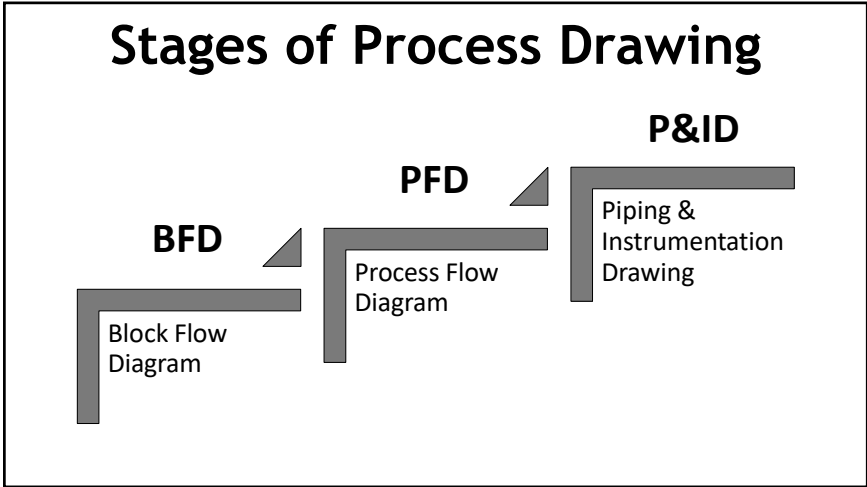
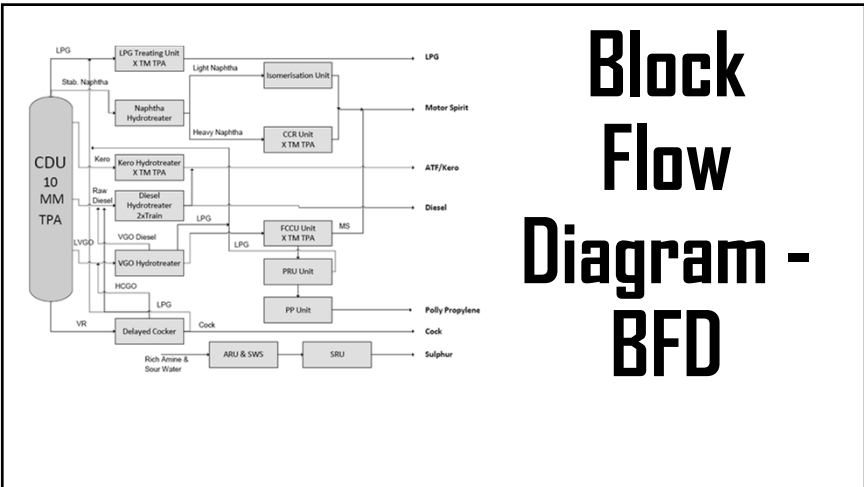


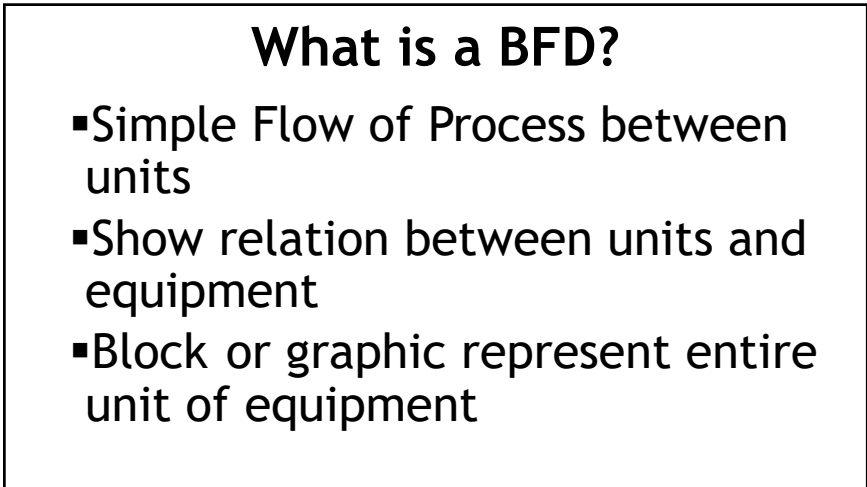
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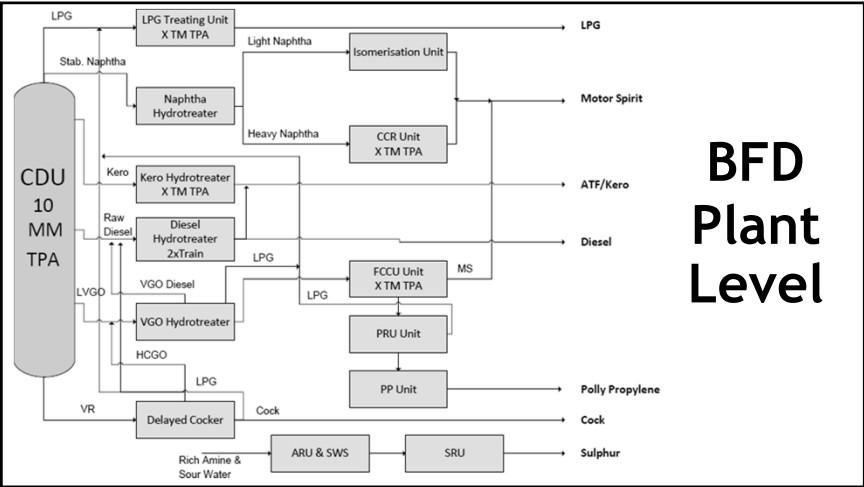


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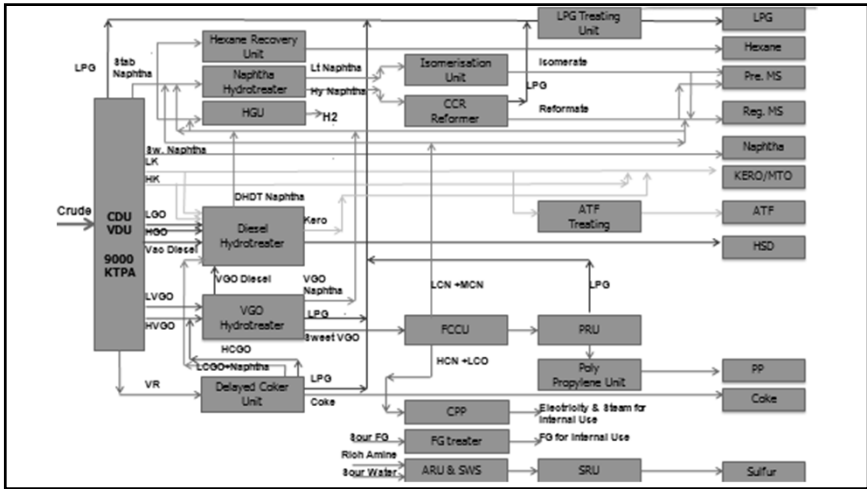
# BFD Types

- Plant Level
- Unit Level
- Process Level

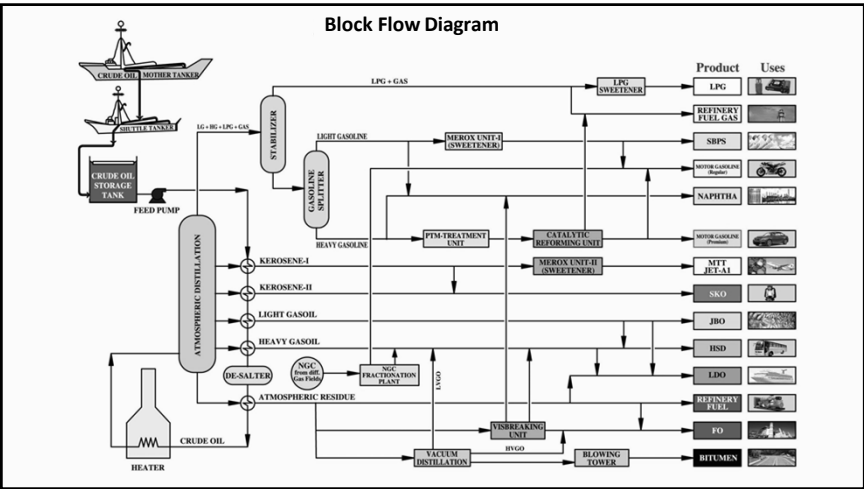
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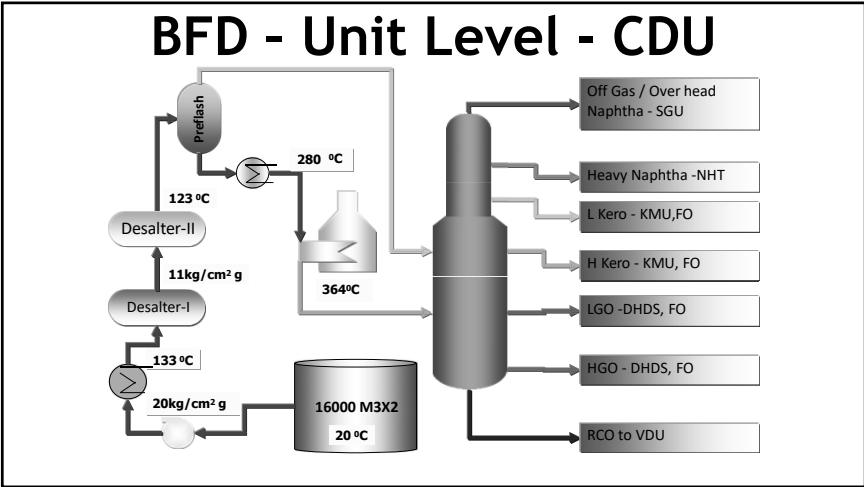
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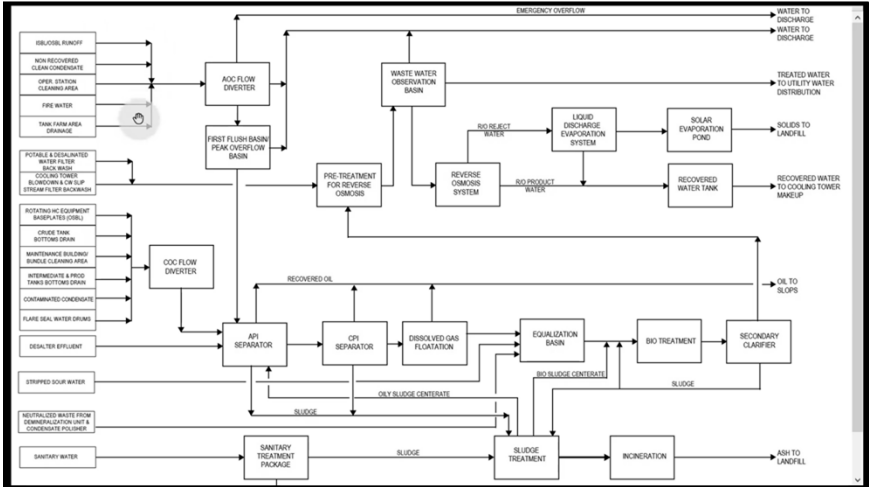
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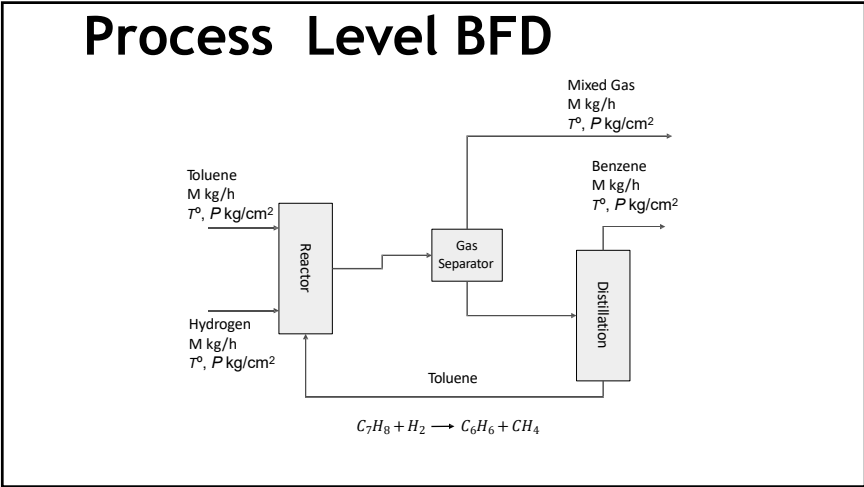
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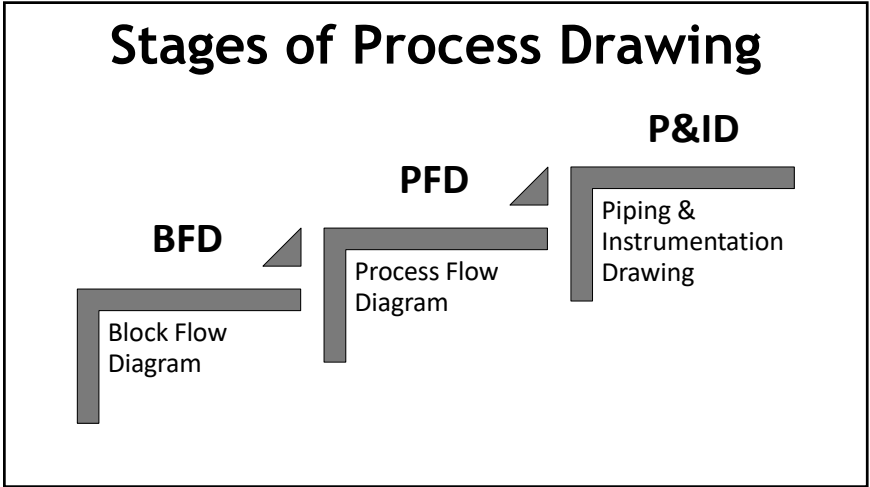
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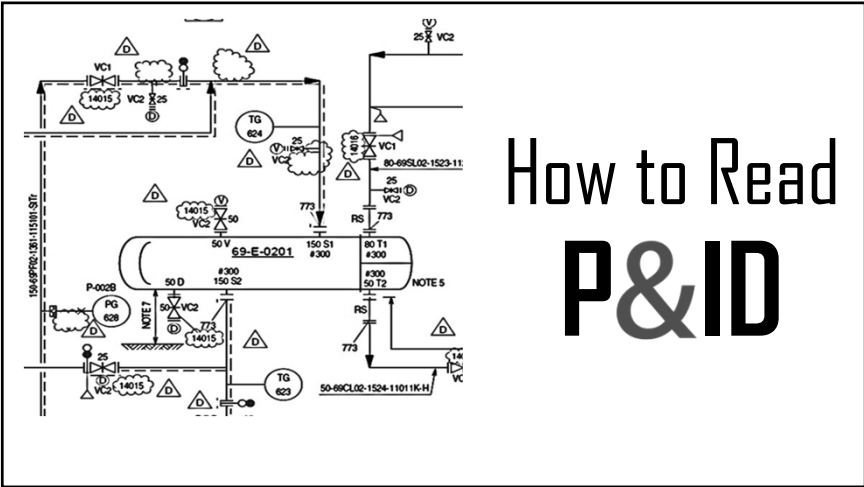
10



11



12



# How to Read P&ID

13

## What is P&ID?

- A graphical representation of the process unit
- Use various symbols to represent actual equipment
- Complex drawing compare to PFD

14

## Use of P&ID- Pre EPC

- Project capital cost estimate for EPC (engineering, procurement and construction)
- Develop the contract specifications
- Develop the plot plant
- FEED deliverable

15

## Use of P&ID/PEFS - EPC

- Development of plant layout
- Identifying hazardous areas classification
- Preparing data sheets of equipment, valves and instrument
- Development of piping layout drawings
- Preparing bulk material take-off for piping, electrical, instrumentation, civil

16

## Use of P&ID/PEFS - EPC

- HAZOP and SIL reviews
- Operations review
- Employee training

103

17

## What information does P&ID provide?

- All the equipment, including installed spares, and associated piping including drain and vent line
- Instrumentation
- Heat tracing and insulation detail
- Information of utilities

104

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## What information does P&ID provide?

- Piping components
  - Size
  - Class
  - Tag Number
- Information required for design, construction and operation such as
  - Slope of the line
  - Minimum and maximum distance
  - Minimum straight lengths

105

19

## What is not included in a P&ID?

- Process conditions and physical data
- Operating conditions
- Stream flow details
- Equipment locations
- Pipe routing, length and fittings
- Support and structural details

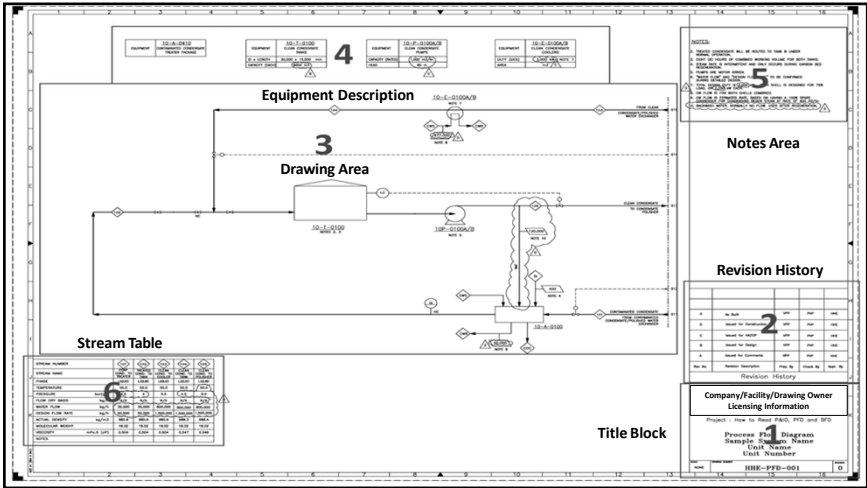
106

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PFD and P&ID contains

- 1. Process Symbology
- 2. Fluid Stream Data
- 3. Equipment Information

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Title Block

<b>Company/Facility/Drawing Owner Licensing Information</b>		
Project : How to Read P&ID, PFD and BFD		
Process Flow Diagram Sample System Name Unit Name Unit Number		
SCALE NONE	DRAWING NUMBER HHE-PFD-001	REVISION 0

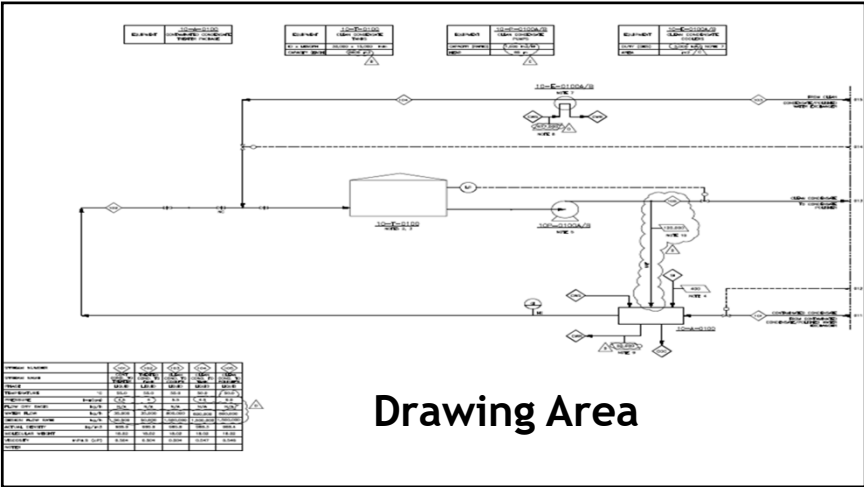
- Name and Logo
- Project Name
- Drawing Name
- System Name
- Unit Name
- Unit Number
- Drawing Number
- Project Number
- Unit Number
- Sheet Number
- Scale
- Revision Number

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Revision History Block

0	As Built	VPP	PVP	HHE
D	Issued for Construction	VPP	PVP	HHE
C	Issued for HAZOP	VPP	PVP	HHE
B	Issued for Design	VPP	PVP	HHE
A	Issued for Comments	VPP	PVP	HHE
Rev No	Revision Description	Prep By	Check By	Appr. By

24



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### Equipment Description

EQUIPMENT	10-T-0100 CLEAN CONDENSATE TANKS
ID x LENGTH	30,000 x 15,000 mm
CAPACITY (EACH)	(8600 m <sup>3</sup> )

**B**

EQUIPMENT	10-P-0100A/B CLEAN CONDENSATE PUMPS
CAPACITY (RATED)	(1,000 m <sup>3</sup> /hr)
HEAD	85 m

**C**

EQUIPMENT	10-E-0100A/B CLEAN CONDENSATE COOLERS
DUTY (DES)	(3,000 kW) NOTE 7
AREA	m <sup>2</sup> / °C

26

### Notes Area

**NOTES:**

- TREATED CONDENSATE WILL BE ROUTED TO TANK B UNDER NORMAL OPERATION.
- EIGHT (8) HOURS OF COMBINED WORKING VOLUME FOR BOTH TANKS.
- STEAM RATE IS INTERMITTENT AND ONLY OCCURS DURING CARBON BED REGENERATION.
- PUMPS ARE MOTOR DRIVEN.
- "WATER FLOW" AND "DESIGN FLOW RATE" TO BE CONFIRMED DURING DETAILED DESIGN.
- TOTAL DESIGN DUTY IS (3,000) KW. EACH SHELL IS DESIGNED FOR 75% LOAD, OR (2,250) KW EACH.
- CW FLOW IS FOR BOTH SHELLS COMBINED.
- CW FLOW IS ESTIMATED RATE, BASED ON HAVING A 100% SPARE CONDENSER FOR CONDENSING REGEN STEAM AT RATE OF 400 KG/hr.
- BACKWASH WATER. NORMALLY NO FLOW. USED AFTER REGENERATION.

**D**

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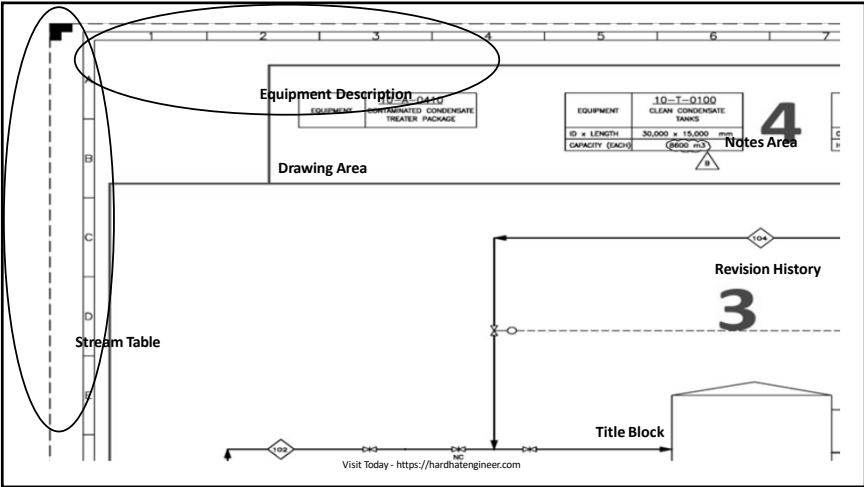
27

### Stream Table

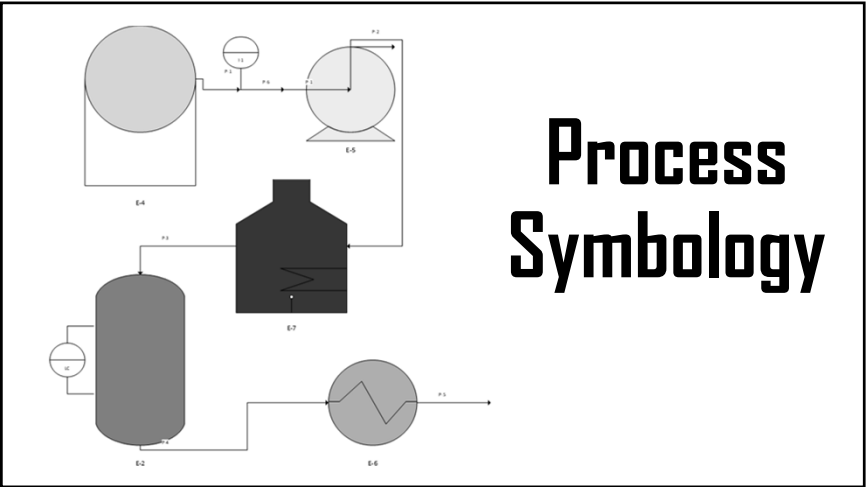
STREAM NUMBER	101	102	103	104	105
STREAM NAME	CONT COND. TO TREATER	TREATED COND. TO TANK	CLEAN COND. TO COOLER	CLEAN COND. TO TANK	CLEAN COND. TO POLISHER
PHASE	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
TEMPERATURE °C	55.0	55.0	55.0	50.0	(50.0)
PRESSURE bar(ga)	(4.5)	4	5.5	(4.5)	9.0
FLOW DRY BASIS kg/h	N/A	N/A	N/A	N/A	N/A
WATER FLOW kg/h	35,000	35,000	800,000	800,000	800,000
DESIGN FLOW RATE kg/h	50,500	50,000	1,500,000	1,500,000	1,500,000
ACTUAL DENSITY kg/m <sup>3</sup>	985.9	985.9	985.9	988.3	988.4
MOLECULAR WEIGHT	18.02	18.02	18.02	18.02	18.02
VISCOSITY mPa.S (cP)	0.504	0.504	0.504	0.547	0.546
NOTES					

**D**

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Pipeline		
	<b>Major Process Line</b>	Main Process line such as raw material, intermediated product, final product etc.
	<b>Minor Process Line</b>	Services such as utility lines, secondary process lines such as air, nitrogen, firewater


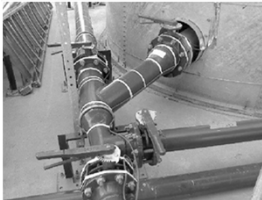
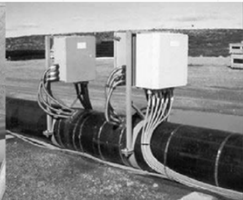

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Pipeline		
	<b>Pipeline with Heat Tracing</b>	<b>Electrical or Steam Tracing</b>
<small>Image - <a href="http://ecf.insteadvice.org/insulation-tracing-covers/">http://ecf.insteadvice.org/insulation-tracing-covers/</a></small>	<small>Image - <a href="http://vapsum.com/downloads.html">http://vapsum.com/downloads.html</a></small>	

32

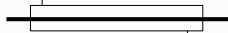
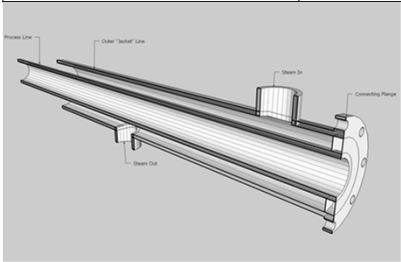



# Pipeline

	<b>Pipeline with Heat Tracing</b>	<b>Electrical or Steam Tracing</b>
		
<small>Image - <a href="http://www.sli-services.com/index-7e.html">http://www.sli-services.com/index-7e.html</a></small>	<small>Image - <a href="http://www.urecon.com/tracing/tracing_main.html">http://www.urecon.com/tracing/tracing_main.html</a></small>	<small>Image - <a href="https://www.piperacks.com/">https://www.piperacks.com/</a></small>



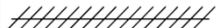
33

# Pipeline

	<b>Jacketed Pipeline</b>
	
<small>Image - <a href="https://simpleengineeringarticles.wordpress.com/2013/05/16/steam-jacketed-process-line/">https://simpleengineeringarticles.wordpress.com/2013/05/16/steam-jacketed-process-line/</a></small>	<small>Image - <a href="http://flowfab.net/products-2/jacketed-pipe/">http://flowfab.net/products-2/jacketed-pipe/</a></small>

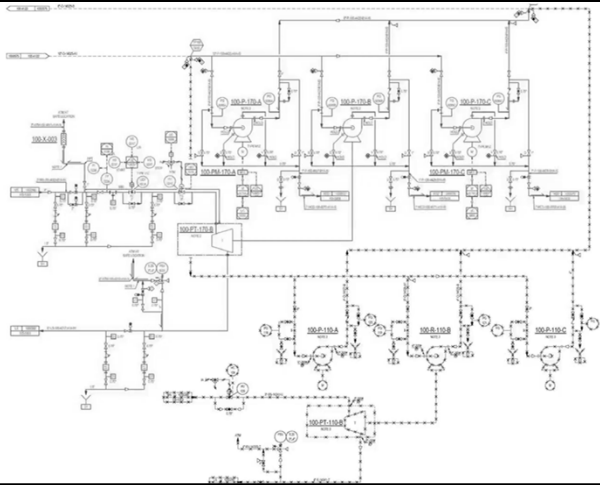
34

# Pipeline Modification

	<b>Future Pipeline</b>
	<b>Existing Pipeline</b>
	<b>Existing Pipeline to be Removed</b>


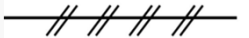
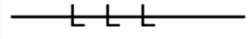
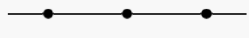
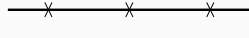
Sometimes new or existing pipeline to be removed may be indicated with a different color

35






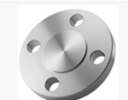
36

### Instrumentation Connection

	Electrical Connection
	Pneumatic Connection
	Hydraulic Connection
	Mechanical Connection
	Capillary Connection







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### Pipeline End Connection

	Cap Butt welded	 
	Blind Flange End	 

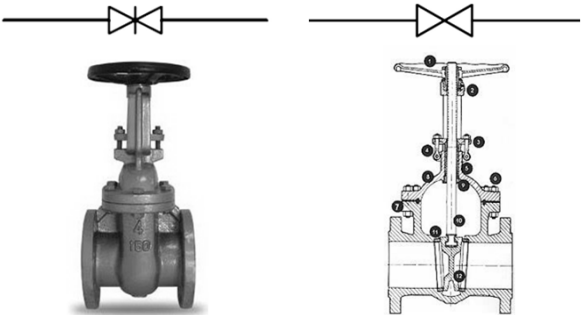
38

### Pipeline End Connection

	Cap Threaded	
	Plug	
	Hose Connection	

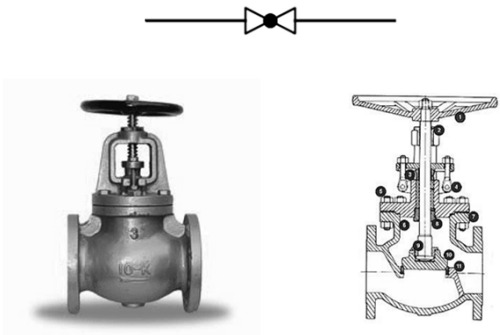
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### Gate valve



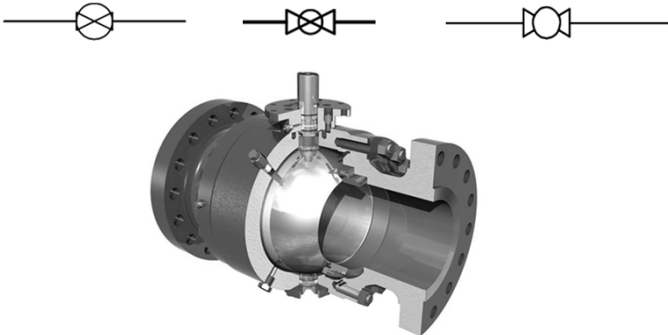
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### Globe valve



41

### Ball valve



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### Butterfly valve








43

### Control Valve - Modifier

	Hand Wheel Operated Control Valve	
	Motor Operated Control Valve	
	Piston Operated Control Valve	
	Diaphragm Operated Control Valve	






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### Control Valve - Modifier

	Solenoid Operated Control Valve	
	Internal sensing, Self acting Back-pressure Regulator	
	External sensing, Self acting Back-pressure Regulator	
	Self acting Temperature Regulator	






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### Control Valve - Modifier

	Internal sensing, Self acting Pressure Reducing Regulator	
	External sensing, Self acting Pressure Reducing Regulator	
	Internal sensing, Self acting Differential Pressure Regulator	
	External sensing, Self acting Differential Pressure Regulator	

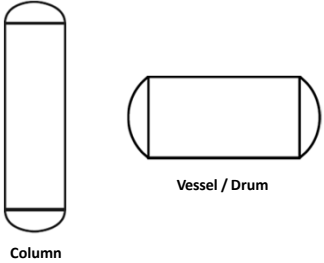
46

### Special & Symbol with Note

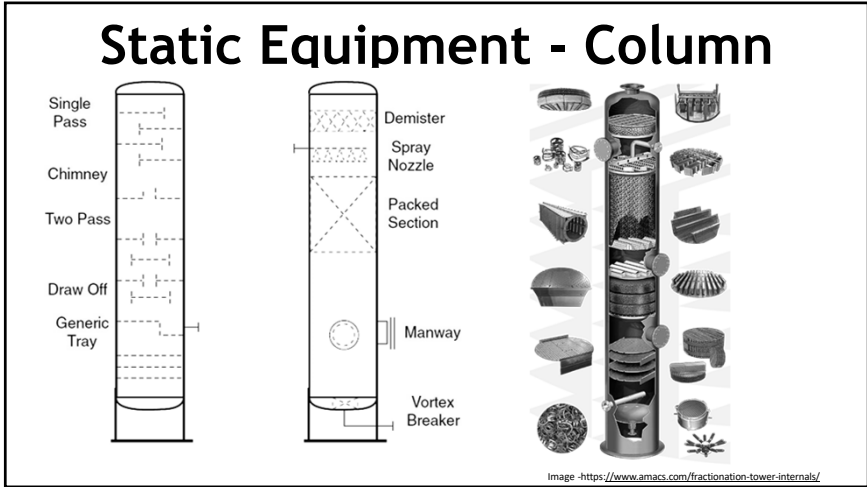
	Special Valve
	Normally Closed Valve
	Sealing Direction, Shaded Area = Pressure End
	Fail Closed
	Fail Open

47

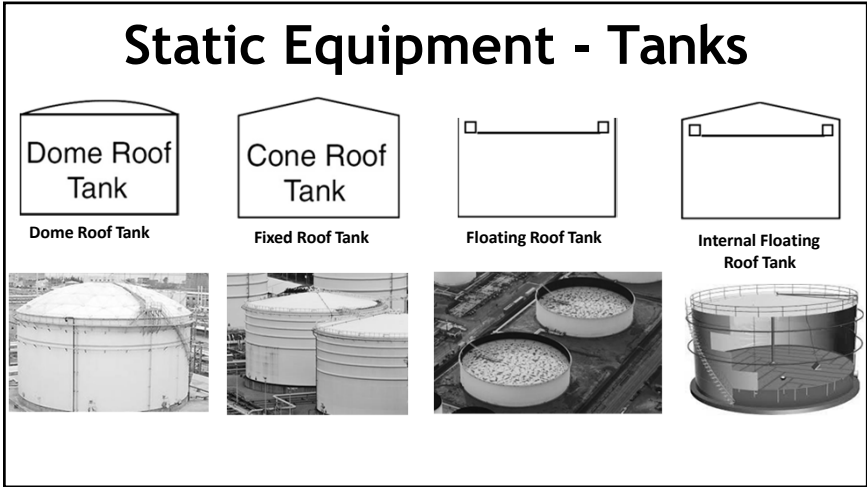
### Static Equipment - Vessel



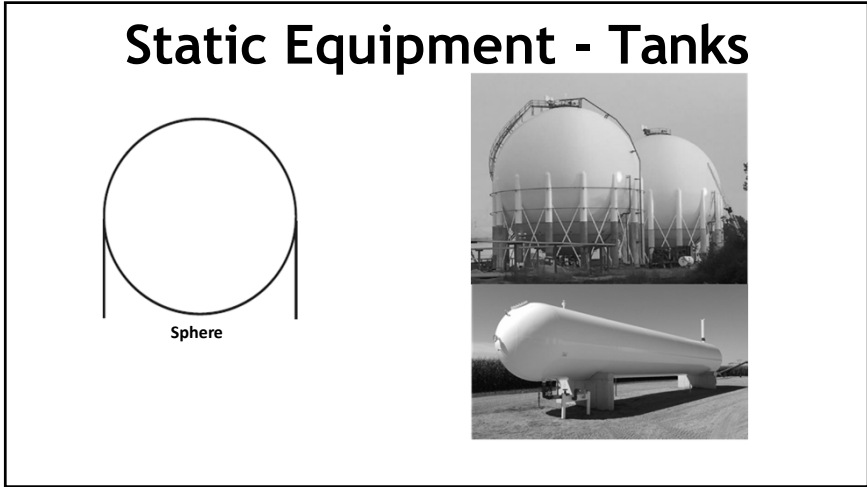
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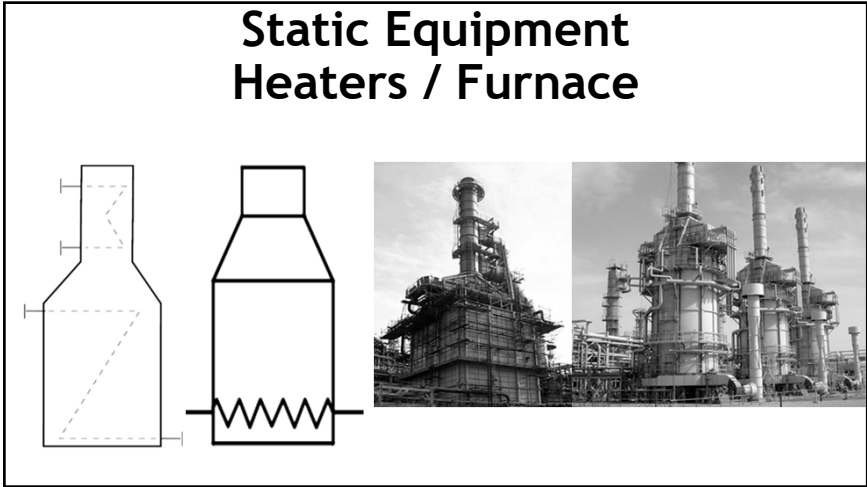
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51



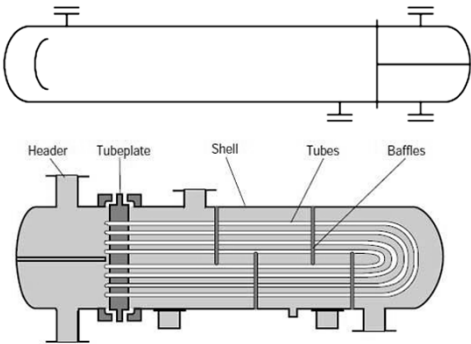
52

### Static Equipment Heat Exchanger



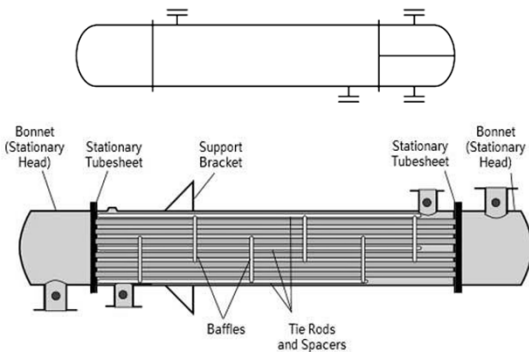
53

### Heat Exchanger with U-tube Bundle



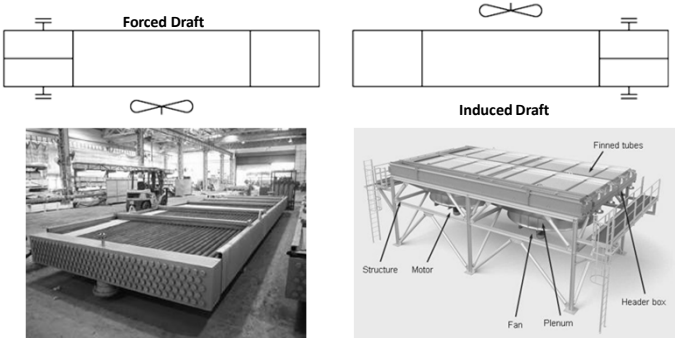
54

### Heat Exchanger with Fixed Tube Sheet



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### Fin Fan Cooler or Air cooled Heat Exchanger



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# Heat Exchanger Symbols



Shell and Tube Type Heat Exchangers Drawing Symbols

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# Rotary Equipment - Centrifugal Pump

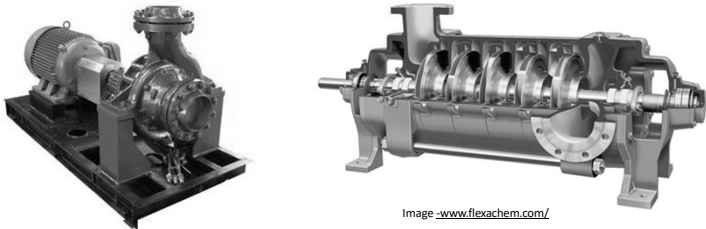
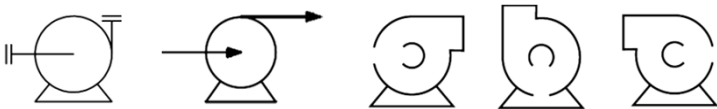
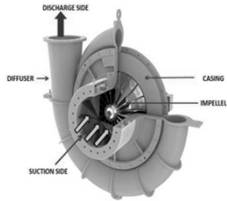
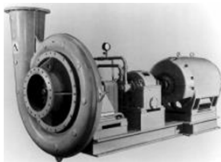


Image :[www.flexachem.com/](http://www.flexachem.com/)

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# Rotary Equipment - Centrifugal Compressor



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# Instrument Symbols

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### Instrument Symbols

	Temp Indicator		Flow Indicator		Transducer
	Temp Transmitter		Flow Transmitter		Pressure Indicating Controller
	Temp Recorder		Flow Recorder		Pressure Recording Controller
	Temp Controller		Flow Controller		Level Alarm
	Level Indicator		Pressure Indicator		Flow Element
	Level Transmitter		Pressure Transmitter		Temperature Element
	Level Recorder		Pressure Recorder		Level Gauge
	Level Controller		Pressure Controller		Analyzer Transmitter

#### Measured Variable

P - Pressure

T - Temperature

F - Flow

L - Level

#### Measured Function

I - Indicator

R - Recorder

C - Controller

T - Transmitter

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### Instrument Symbols

Variable Being Measured

Instrument Function

Loop Number

	Field Mounted Instrument
	Panel Mounted Instrument
	Behind Panel Instrument
	Secondary Panel (Local Panel) Instrument

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