Welcome to this presentation.

It shows the different types of Process diagrams and will help you to read them.

It also provides you with reference information as to their contents.

Comments are most welcome (herve.baron@gmail.com), which I will incorporate for the benefit of all.

Hervé
The Process Diagrams

- The Block Flow Diagram (BFD)
- The Process Flow Diagram (PFD)
- The Piping & Instrumentation Diagram (P&ID)
  - The various types of P&IDs
  - The different revisions of the P&IDs
- Other Process diagrams
- Quiz
What is this drawing?
The Block Flow Diagram
The Block Flow Diagram

- Results from the high level functional requirements of the plant
- Depicts the various Processes carried out within the facility and their sequence
- Shows the inputs (feed) and outputs (products)
- The item of the BFD is the Process Unit
What is this drawing?
The Process Flow Diagram (PFD)
The Process Flow Diagram (PFD)

- Results from process simulations
- Depicts the various Equipment within a Process (or Utility) Unit and their sequence
- Shows the process controls
- The individual drawing item of the PFD is the *Equipment Item*
The Process Flow Diagram (PFD)

Scheme that includes the following information, as a minimum:

- Main equipment (all the itemized ones),
- Process lines between equipment,
- All control loops and main instruments,
- For each stream, indication of:
  - Temperature
  - Pressure
  - Composition
  - Specific gravity
  - Operating density
  - Heat content
  - Flow rate (relevant to each phase)
- Design conditions of main equipment.
- It shall be drawn-up according to ISA 6.12 regulation as far as symbology is concerning
Heat and material balance
What type of diagram is this?
“a document that clearly identifies the equipment in the physico-chemical process and the circulation of fluids between these equipment items. It also shows the piping systems and control devices necessary for unit operation as well as the specific requirements to be taken into account for the design of systems.”

The PFD is a detailing of the PFD that show all lines, instruments necessary for the operation, monitoring, control and maintenance around individual equipment.
What information does a P&ID contain?
Compare the information shown on the PFD and the P&ID
Compare the information shown on the PFD and the P&ID
What purpose does a P&ID serve?

At design stage:
What purpose does a P&ID serve?

At design stage:

- Defines the design basis for Piping & Instrumentation disciplines
What purpose does a P&ID serve?

At design stage:

- Defines the design basis for Piping & Instrumentation disciplines
- Serves to show and agree the operating and maintenance features between Engineer and Owner or between Engineer and Vendor
What purpose does a P&ID serve?

At design stage:

- Defines the design basis for Piping & Instrumentation disciplines
- Serves to show and agree the operating and maintenance features between Engineer and Owner or between Engineer and Vendor

At the P&ID review
What purpose does a P&ID serve?

At design stage:

- Defines the design basis for Piping & Instrumentation disciplines
- Serves to show and agree the operating and maintenance features between Engineer and Owner or between Engineer and Vendor

At the P&ID review

What are the main items that are discussed during the P&ID review?
Ease of operation and maintenance:

- Isolation /bypass of equipment
Ease of operation and maintenance:

- Isolation /bypass of equipment
- Isolation/bypass of valves
Ease of operation and maintenance:

- Isolation /bypass of equipment
- Isolation/bypass of valves
- Vents/drains
What purpose does a P&ID serve?

At design stage:

- Defines the design basis for Piping & Instrumentation disciplines
- Serves to show and agree the operating and maintenance features between Engineer and Owner or between Engineer and Vendor
Review/comment of the design

Scope of supply: counter flange to be supplied by vendor, as per contractual specification

Decision during a clarification meeting with vendor, for instance to allow maintenance

Comments on Instrument numbering and installation: Vendor P&ID shall use the same nomenclature than project’s P&ID

Missing information: setting pressure of PCV shall be indicated on P&ID
What purpose does a P&ID serve?

At design stage:

- Defines the design basis for Piping & Instrumentation disciplines
- Serves to show and agree the operating and maintenance features between Engineer and Owner or between Engineer and Vendor
- Serves to show the interface with equipment/package vendors
What purpose does a P&ID serve?

At design stage:

- Defines the design basis for Piping & Instrumentation disciplines
- Serves to show and agree the operating and maintenance features between Engineer and Owner or between Engineer and Vendor
- Serves to show the interface with equipment/package vendors
- Perform HAZOP review
What purpose does a P&ID serve?

At design stage:

- Defines the design basis for Piping & Instrumentation disciplines
- Serves to show and agree the operating and maintenance features between Engineer and Owner or between Engineer and Vendor
- Serves to show the interface with equipment/package vendors
- Perform HAZOP review
Hazard and Operability Review (HAZOP)

Too much, too little, no
Flow, Pressure, Temperature
What purpose does a P&ID serve?

At design stage:

• Defines the design basis for Piping & Instrumentation disciplines

• Serves to show and agree the operating and maintenance features between Engineer and Owner or between Engineer and Vendor

• Serves to show the interface with equipment/package vendors

• Perform HAZOP review

During operation:
What purpose does a P&ID serve?

At design stage:
- Defines the design basis for Piping & Instrumentation disciplines
- Serves to show and agree the operating and maintenance features between Engineer and Owner or between Engineer and Vendor
- Serves to show the interface with equipment/package vendors
- Perform HAZOP review

During operation:
- Reference drawing for operator, work permit, plant modifications etc.
What purpose does a P&ID serve?

At design stage:

- Defines the design basis for Piping & Instrumentation disciplines
- Serves to show and agree the operating and maintenance features between Engineer and Owner or between Engineer and Vendor
- Serves to show the interface with equipment/package vendors
- Perform HAZOP review

During operation:

- Reference drawing for operator, work permit, *plant modifications* etc.
Important features

Normal operation
- Redundancy for critical instruments / safety switches

Shutdown
- Check valves

Start-up
- Pressurization
- warm-up / purge lines

Maintenance
- Equipment isolation & bypass: valves, spectacle/blind
- Nitrogen injection, vent
- Drains
- Control and ON/OFF valves isolation
- Instrument isolation
It includes:

1. All itemized equipment,

2. Item number and service description of each equipment with relevant design condition

3. All process and utilities lines, with indication of
   - Diameter
   - Rating
   - Material
   - Service
   - Line number (if applicable)
   - Piping class
   - Piping class break / change
   - External finishing (such as insulation, personal protection, tracing...)

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4. Battery limits between Parties, e.g. contractor and vendor

5. All valves and fittings on lines (including block valves, check valves, strainers), connections on equipment and vessels,

6. All instruments with detailed control loops:
   - All instruments shall be tagged as per united numbering system,
   - Local instruments or instruments on local panel,
   - Sequences and interlocks (with brief description e.g.: comp. start / stop, permissive to start, etc.),

7. Control valves,

8. Safety valves (with set point and inlet/outlet size),
9. Particular data or notes relevant to equipment/instruments installation, such as:
   - Max or mini length of piping (requirement regarding suction / discharge piping straight length, etc.),
   - Slope of piping
   - Elevation of equipment
   - Safe location requirement
   - Control and monitoring signals for rotating equipments and electrical motors (if applicable),

10. Item number and service description of each equipment with relevant design condition

It shall be drawn-up according to ISA 6.12 requirements.
Various types of P&IDs

- Legend and Symbols
- Details and Typicals
- Process or Utility P&ID
- Distribution P&ID
- Interconnection P&ID
- Pumps auxiliary P&ID
- Package P&ID
Various types of P&IDs

• Legend and Symbols
  – Identification and numbering system
  – General Symbols
  – Equipment symbols
  – Piping Symbols
  – Instrument Symbols
Various types of P&IDs

- Legend and Symbols
  - Identification and numbering system
  - General Symbols
  - Equipment symbols
  - Piping Symbols
  - Instrument Symbols
### Identification and numbering system

#### Equipment Identification

<table>
<thead>
<tr>
<th>YY-P XX XX-YY</th>
<th>MAIN EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUXILIARY EQUIPMENT FOR MAIN EQUIPMENT</td>
<td></td>
</tr>
<tr>
<td>YY-P XX XX-YY</td>
<td>JACKETED LINE</td>
</tr>
</tbody>
</table>

#### Instrument Identification

<table>
<thead>
<tr>
<th>YY-P XX XX-YY</th>
<th>LINE IDENTIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINE SERVICE CODE</td>
<td></td>
</tr>
</tbody>
</table>

#### Intended Equipment Class

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>EQUIPMENT</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>AUXILIARY</td>
</tr>
<tr>
<td>B</td>
<td>MAIN</td>
</tr>
<tr>
<td>C</td>
<td>COLUMN</td>
</tr>
<tr>
<td>D</td>
<td>CONDUIT</td>
</tr>
<tr>
<td>E</td>
<td>ENCLOSURE</td>
</tr>
<tr>
<td>F</td>
<td>FORMATE</td>
</tr>
<tr>
<td>G</td>
<td>FILTER</td>
</tr>
<tr>
<td>H</td>
<td>FILTERING</td>
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<td>I</td>
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<td>J</td>
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<td>FILTERING</td>
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<tr>
<td>M</td>
<td>FILTERING</td>
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<td>N</td>
<td>FILTERING</td>
</tr>
<tr>
<td>O</td>
<td>FILTERING</td>
</tr>
<tr>
<td>P</td>
<td>FILTERING</td>
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<tr>
<td>Q</td>
<td>FILTERING</td>
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<tr>
<td>R</td>
<td>FILTERING</td>
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<tr>
<td>S</td>
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<td>V</td>
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<td>W</td>
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<td>X</td>
<td>FILTERING</td>
</tr>
<tr>
<td>Y</td>
<td>FILTERING</td>
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<tr>
<td>Z</td>
<td>FILTERING</td>
</tr>
</tbody>
</table>

#### Functional Identification

<table>
<thead>
<tr>
<th>YY-P XX XX-YY</th>
<th>INSTRUMENT IDENTIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINE IDENTIFICATION</td>
<td></td>
</tr>
<tr>
<td>INTENDED EQUIPMENT CLASS</td>
<td></td>
</tr>
</tbody>
</table>

---

**Notes:**
- **Equipment:** The equipment identification includes main equipment and auxiliary equipment for main equipment.
- **Intended Equipment Class:** Classes include various functions such as auxiliary, main, column, conduit, enclosure, formate, filter, filtration, and more.
- **Functional Identification:** This includes instrumentation and identification, with specific details on intended equipment classes.
# Identification and numbering system

## Equipment Identification

### Main Equipment

YY - P ZZ XX A/B

- **Secondary Identifier as Required**
- **Equipment Number**
- **Unit Number**
- **Intended Equipment Class**
- **System Number**

<table>
<thead>
<tr>
<th>Designation</th>
<th>Equipment</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>FOND, BASIN, CONCRETE PIT</td>
</tr>
<tr>
<td>B</td>
<td>BOILERS</td>
</tr>
<tr>
<td>C</td>
<td>COLUMNS</td>
</tr>
<tr>
<td>D</td>
<td>DESUPERHEATERS</td>
</tr>
<tr>
<td>E</td>
<td>HEAT EXCHANGERS, AIR COOLED EXCHANGERS</td>
</tr>
<tr>
<td>EM</td>
<td>AIR COOLER MOTORS</td>
</tr>
<tr>
<td>F</td>
<td>FURNACE</td>
</tr>
<tr>
<td>FL</td>
<td>FLARE</td>
</tr>
<tr>
<td>G</td>
<td>ELECTRIC GENERATOR</td>
</tr>
<tr>
<td>GD</td>
<td>GENERATOR DIESEL ENGINES</td>
</tr>
<tr>
<td>GT</td>
<td>GENERATOR TURBINES</td>
</tr>
<tr>
<td>H</td>
<td>ELECTRIC HEATER</td>
</tr>
<tr>
<td>K</td>
<td>COMPRESSOR, BLOWER</td>
</tr>
<tr>
<td>KD</td>
<td>COMPRESSOR DIESEL ENGINES</td>
</tr>
<tr>
<td>KM</td>
<td>COMPRESSOR MOTORS</td>
</tr>
<tr>
<td>KT</td>
<td>COMPRESSOR GAS TURBINES</td>
</tr>
<tr>
<td>L</td>
<td>LOADING ARM</td>
</tr>
<tr>
<td>LB</td>
<td>LIQUID BURNER</td>
</tr>
<tr>
<td>P</td>
<td>PUMP</td>
</tr>
<tr>
<td>PD</td>
<td>PUMP DIESEL ENGINES</td>
</tr>
<tr>
<td>PM</td>
<td>PUMP MOTORS</td>
</tr>
<tr>
<td>S</td>
<td>FILTER</td>
</tr>
<tr>
<td>T</td>
<td>TANK, PIT, SILO, HOPPER</td>
</tr>
<tr>
<td>V</td>
<td>VESSEL, DRUM, CONVERTER, REACTOR</td>
</tr>
<tr>
<td>X</td>
<td>MISCELLANEOUS</td>
</tr>
</tbody>
</table>

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Identification and numbering system

LINE IDENTIFICATION

NG Y XXX - 24" (1C3AS1)- 1 ( )

- Insulation thickness (mm)
- Normal operating temp.
- Insulation type
- Piping service class
- Line size
- Line serial number
- System number
- Line service code

LINE SERVICE CODE

Process fluid

A : Air
AG : Acid Gas
BT : Butane
DG : Defrost Gas
ET : Ethane
GL : Natural Gas Liquid
HG : Helium
LG : Liquefied Natural Gas
LP : Liquefied Petroleum Gas
NG : Natural Gas
OX : Oxygen
P : General process
PP : Propane
PC : Process Condensate
PW : Process Water
RS : Recovered Slops
SU : Sour Condensate
SL : Liquid Sulfur

Refrigerant

MR : Mixed Refrigerant
NR : Nitrogen Refrigerant
PR : Propane Refrigerant
## Identification and numbering system

<table>
<thead>
<tr>
<th>FIRST LETTERS</th>
<th>MEASURED OR INITIATING VARIABLE</th>
<th>MODIFIER</th>
<th>SUCCEEDING LETTERS</th>
<th>READOUT OR PASSIVE FUNCTION</th>
<th>OUTPUT FUNCTION</th>
<th>MODIFIER</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>ANALYSIS</td>
<td></td>
<td>ALARM</td>
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<tr>
<td>B</td>
<td>BURNER</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>BD</td>
<td>BLOWDOWN</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td>CONTROL</td>
<td></td>
<td>CLOSE</td>
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<tr>
<td>D</td>
<td></td>
<td></td>
<td>DIFFERENTIAL</td>
<td></td>
<td>DEVIATION</td>
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<tr>
<td>E</td>
<td>VOLTAGE</td>
<td></td>
<td></td>
<td>SENSOR</td>
<td>(PRIMARY ELEMENT)</td>
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<td></td>
<td>EMERGENCY</td>
<td>SHUTDOWN</td>
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<tr>
<td>F</td>
<td>FLOW RATE</td>
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<td>RATIO</td>
<td></td>
<td>(FRACTION)</td>
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</tr>
<tr>
<td>G</td>
<td>FIRE &amp; GAS</td>
<td></td>
<td>GAGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>HAND</td>
<td></td>
<td></td>
<td></td>
<td>HIGH</td>
<td></td>
</tr>
<tr>
<td>HH</td>
<td></td>
<td></td>
<td></td>
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<td>HIGH HIGH</td>
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</tr>
<tr>
<td>I</td>
<td>CURRENT</td>
<td></td>
<td></td>
<td></td>
<td>INDICATE</td>
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<tr>
<td>J</td>
<td>POWER</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>SEQUENCE RELATED TIME RATE OF CHANGE</td>
<td></td>
<td>PILOT LAMP STATUS INDICATE</td>
<td>LOW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>LEVEL</td>
<td></td>
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</tr>
<tr>
<td>LL</td>
<td></td>
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<td>LOW LOW</td>
<td></td>
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<tr>
<td>M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MIDDLE</td>
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<tr>
<td>MO</td>
<td>MOTOR OPERATED</td>
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<td></td>
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<td>O</td>
<td>ORIFICE</td>
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<td></td>
<td></td>
<td>OPEN</td>
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<tr>
<td>P</td>
<td>PRESSURE VACUUM</td>
<td></td>
<td>POINT</td>
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<td>(TEST CONNECTION)</td>
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<tr>
<td>PR</td>
<td>PRESSURE RELIEF</td>
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</tr>
</tbody>
</table>

**INSTRUMENT IDENTIFICATION**

- **Y**
  - FC
  - Z
  - XXX
  - B
  - A

- **Letter suffix** for functional identification or parallel elements as required
- **Sequence suffix** for identical system/equipment when specified
- **Unit code**
- **Functional identification**
- **System number**

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Various types of P&IDs

- Legend and *Symbols*
  - Identification and numbering system
  - General Symbols
  - Equipment symbols
  - Piping Symbols
  - Instrument Symbols
Valve type, position
Valve type, position
Valve type, position
Valve type, position
What is the function of this valve?
How is it called?
What is the function of this valve? To control the downstream pressure

How is it called? Pressure reducing self regulated valve
What is the difference between these 2 valves?
What is the difference between these 2 valves? The 2nd one has external pressure tap.
What do these symbols represent?
What do these symbols represent?

Rupture disk, Fail Open valve, Flow sight glass, Hydraulic signal
Instrument function, location and system to which they belong
Instrument function, location and system to which they belong.
Instrument function, location and system to which they belong
**Piping & Instrumentation Diagrams (P&IDs)**

<table>
<thead>
<tr>
<th>INSTRUMENT FUNCTION</th>
<th>MEASURED VARIABLE</th>
<th>ANALYSIS</th>
<th>DENSITY</th>
<th>FLOW</th>
<th>HAND</th>
<th>LEVEL</th>
<th>MOTOR</th>
<th>PRESSURE</th>
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<tbody>
<tr>
<td>ALARM</td>
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<td>MXA</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>CONTROLLER</td>
<td>AC, LC</td>
<td>FC, HC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PC</td>
</tr>
<tr>
<td>CONTROL VALVE</td>
<td>AV, LY, PV</td>
<td>FV, HV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PV</td>
</tr>
<tr>
<td>SWITCH</td>
<td>AS, FS, LS, MXS</td>
<td>HS, LS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PS</td>
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<tr>
<td>HIGH SWITCH</td>
<td>ASH, FSH, LSH</td>
<td>LSH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PSH</td>
</tr>
<tr>
<td>HIGH HIGH SWITCH</td>
<td>ASHH, FSHH, LSHH</td>
<td>LSHH</td>
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<td></td>
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<td>PSHH</td>
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<tr>
<td>LOW SWITCH</td>
<td>ASL, FSL, LSL</td>
<td>LSL</td>
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<td>PSL</td>
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<tr>
<td>LOW LOW SWITCH</td>
<td>ASLL, FSLL, LSLL</td>
<td>LSLL</td>
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<td></td>
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<td></td>
<td></td>
<td>PSLL</td>
</tr>
</tbody>
</table>

Instrument function, location and system to which they belong.
Instrument function, location and system to which they belong.
Instrument function, location and system to which they belong.
Piping & Instrumentation Diagrams (P&IDs)

Instrument function, location and system to which they belong
Instrument function, location and system to which they belong
Instrument function, location and system to which they belong
Instrument function, location and system to which they belong.
Piping & Instrumentation Diagrams (P&IDs)

Instrument function, location and system to which they belong
Piping & Instrumentation Diagrams (P&IDs)

Instrument function, location and system to which they belong
What information is shown in the red frame?
What information is shown in the red frame?
What information is shown in the red frame?
VENT TO ATMOSPHERE (DISCHARGING TO SAFE AREA)

OPEN MANUAL DRAIN (BY MOBILE EQUIPMENT OUT OF SCOPE OF SUPPLY)
What information is shown in the red bubble?
Various types of P&IDs

- Legend and Symbols
- Details and Typicals
- Process or Utility P&ID
- Distribution P&ID
- Interconnection P&ID
- Pumps auxiliary P&ID
- Package P&ID
Various types of P&IDs

- Legend and Symbols
- Details and Typicals
  - Piping Details
  - Piping typical arrangements
  - Instrument Details
  - ON/OFF valves Typicals
  - Motors Typicals
  - Sample Connection Details
Various types of P&IDs

- Legend and Symbols
- Details and Typicals
  - Piping Details
  - Piping typical arrangements
  - Instrument Details
  - ON/OFF valves Typicals
  - Motors Typicals
  - Sample Connection Details
Various types of P&IDs

- Legend and Symbols
- Details and Typicals
  - Piping Details
  - Piping typical arrangements
  - Instrument Details
  - ON/OFF valves Typicals
  - Motors Typicals
  - Sample Connection Details
Piping & Instrumentation Diagram

Piping typical arrangements

DETAIL 1: DRAIN ON LINE

VEssel/COlumn OR
PRocess LIINE

DRAIN HEADER

NOTES 2, 4

SY

DETAIL 3: DRAIN ARRANGEMENT FOR LPG SERVICE

DRain HEADER

NOTES 2, 4

SY

© 2013 – Hervé Baron
What is the meaning of this symbol, why is it in this position?
What is the meaning of this symbol, why is it in this position?

Spacer/blind (also called “figure 8”, spectacle/blind) in *closed* position.

It is in closed position to prevent miss-operation of drain by operator, such as draining before depressurizing.
DETAIL 1: GENERAL PSV’S INSTALLATION

NOTE 15

FLARE HEADER

NOTE 5

0.75”

NOTES 3, 9

NOTE 1

0.75”

NOTES 3, 9

NOTE 1

0.75”

NOTE 12

NOTES 9, 13

NOTE 4

0.75”

NOTES 9, 13

LC

0.75”

LO

NOTE 9, 13

LO

V1

V1

V1
What do these indications mean?
What do these indications mean? That the line shall be sloped, without pocket, to prevent accumulation of condensed gas.
What do these indications mean? That the line shall be sloped, without pocket, to prevent accumulation of condensed gas.
On which other lines do you find similar requirements pertaining to the routing of the line?
On which other lines do you find similar requirements pertaining to the routing of the line? Gravity/Free draining line, line with no pocket, e.g., compressor suction line
What is the difference between these two drain typicals?
What is the difference between these two drain typicals? A minimum distance between valves and heat tracing are specified on the right one, the type of valves is different.
Why is there a minimum distance specified between the valves?
Why is there a minimum distance specified between the valves? To prevent freezing of the second (downstream) valve due to flashing liquid in the first one. This would prevent the closing of the second valve. This is what happened in the Feyzin refinery accident in France and this minimum distance has been specified ever since.
Various types of P&IDs

- Legend and Symbols
- Details and Typicals
  - Piping Details
  - Piping typical arrangements
  - Instrument Details
  - ON/OFF valves Typicals
  - Motors Typicals
  - Sample Connection Details
Depiction on P&ID

Corresponding details
Various types of P&IDs

- Legend and Symbols
- Details and Typicals
  - Piping Details
  - Piping Arrangements
  - Instrument Details
  - ON/OFF valves Typicals
  - Motors Typicals
  - Sample Connection Details
Piping & Instrumentation Diagram

ON/OFF valves Typicals
Various types of P&IDs

- Legend and Symbols
- Details and Typicals
  - Piping Details
  - Piping Arrangements
  - Instrument Details
  - ON/OFF valves Typicals
  - Motors Typicals
  - Sample Connection Details
Various types of P&IDs

- Legend and Symbols
- Details and **Typicals**
  - Piping Details
  - Piping typical arrangements
  - Instrument Details
  - ON/OFF valves Typicals
  - Motors Typicals
  - Sample Connection Details

**In your opinion, why such standardization is made?**
Various types of P&IDs

- Legend and Symbols
- Details and Typicals
  - Piping Details
  - Piping typical arrangements
  - Instrument Details
  - ON/OFF valves Typicals
  - Motors Typicals
  - Sample Connection Details

Standardization is made

- For safety
- For quality
- For consistency for operator
- For cost (CAPEX: bulk order + OPEX: spare parts)
Various types of P&IDs

- Legend and Symbols
- Details and Typicals
- Process or Utility P&ID
- Distribution P&ID
- Interconnection P&ID
- Pumps auxiliary P&ID
- Package P&ID
What type of P&ID is this?
What type of P&ID is this?
What type of P&ID is this:
• Process/Utility unit?
• Package?
• Auxiliary?
• Distribution?
• Interconnecting?
What type of P&ID is this:

- Process/Utility unit?
- Package?
- Auxiliary?
- Distribution?
- Interconnecting?
The Process Diagrams

- The Block Flow Diagram (BFD)
- The Process Flow Diagram (PFD)
- The Piping & Instrumentation Diagram (P&ID)
  - The various types of P&IDs
  - The different revisions of the P&IDs
- Other Process diagrams
- Quiz
P&IDs are typically issued 3 times, as designed progresses
P&IDs are typically issued 3 times, as designed progresses
P&IDs are typically issued 3 times, as designed progresses.
P&IDs are typically issued 3 times, as designed progresses

P&ID work sequence

IFR → P&ID Review → IFD → IFC
P&IDs are typically issued 3 times, as designed progresses
### Quiz
Which revision of P&IDs has the following purpose/contents?

<table>
<thead>
<tr>
<th>Purpose</th>
<th>IFR</th>
<th>IFD</th>
<th>IFC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collect Client comments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perform PID review</td>
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<tr>
<td>Perform HAZOP</td>
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<tr>
<td>Perform Piping MTO for 1st Piping purchase</td>
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<tr>
<td>Freeze Control system I/O list</td>
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<tr>
<td>Issue Piping ISOs</td>
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<tr>
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<tr>
<td>Comments from all disciplines</td>
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<tr>
<td>Comments from Piping, I&amp;C disciplines</td>
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<tr>
<td>Finalized interfaces with eqt/package</td>
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<tr>
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<tr>
<td>Size, number of PSVs and CVs</td>
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<td>Diameter of process lines</td>
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<td>Diameter of utility lines</td>
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<td>HAZOP comments incorporated</td>
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<td>Client comments incorporated</td>
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<tr>
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<td>X</td>
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</tbody>
</table>
For more information and...

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The Process Diagrams

- The Block Flow Diagram (BFD)
- The Process Flow Diagram (PFD)
- The Piping & Instrumentation Diagram (P&ID)
  - The various types of P&IDs
  - The different revisions of the P&IDs
- Other Process diagrams
- Quiz
Other type of diagrams issue by Process

What diagram is this?
What diagram is this?

The ESD simplified diagram (or sectionalisation diagram)
The Process Diagrams

- The Block Flow Diagram (BFD)
- The Process Flow Diagram (PFD)
- The Piping & Instrumentation Diagram (P&ID)
  - The various types of P&IDs
  - The different revisions of the P&IDs
- Other Process diagrams
- Quiz
Which document is this?
Which document is this? A PFD
Which process diagram is produced for each operating case?

Which Process Diagram shows the entire Plant?

The indication “NNF” (Normally Non Flowing) is shown on which Process Diagram?

Which Process Diagram shows a Process (or utility) unit?
Which process diagram is produced for each operating case?

The PFD

Which Process Diagram shows the entire Plant?

The BFD

The indication “NNF” (Normally Non Flowing) is shown on which Process Diagram?

PFD

Which Process Diagram shows a Process (or utility) unit?

PFD
Whose legend sheet is this?

<table>
<thead>
<tr>
<th>EQUIPMENT IDENTIFICATION</th>
<th>FLUID SYMBOLS</th>
<th>LINE SYMBOLS</th>
<th>INSTRUMENT SYMBOLS</th>
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<tbody>
<tr>
<td>MAIN EQUIPMENT</td>
<td></td>
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</tr>
<tr>
<td>YY - ZZ</td>
<td>DD : BLOWDOWN</td>
<td>---</td>
<td>ASC : ANTI-SURGE CONTROLLER</td>
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<tr>
<td></td>
<td>BOG : BOIL OFF GAS</td>
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<td>A : ANALYSER</td>
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<tr>
<td></td>
<td>BM : BOILER FEED WATER</td>
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<td>CC : CORROSION COUPLON</td>
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<tr>
<td></td>
<td>CV : DRY GAS FLARE</td>
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<td>CP : CORROSION PROBE</td>
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<td></td>
<td>CW : COOLING WATER SUPPLY</td>
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<td>TC : FLOW CONTROLLER</td>
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<td>DB : DRY LIQUID BLOWDOWN</td>
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<td>PI : FLOW INDICATOR</td>
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<td>DW : DRAYING WATER</td>
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<td>FQ : FLOW TOTALIZER</td>
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<td>EFG : END FEED GAS</td>
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<td>LC : LEVEL CONTROLLER</td>
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<td>FTT : FUEL STOP FEED</td>
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<td>PC : PRESSURE CONTROLLER</td>
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<td>HWB : HIGH PRESSURE BOILER FEED WATER</td>
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<td>TC : TEMPERATURE CONTROLLER</td>
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<td>II : RESTIRUTION ORIFICE</td>
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<td>HK : COOLING WATER RETURN</td>
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<td>VENTURI</td>
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<td>IA : INSTRUMENT AIR</td>
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<td>C : COROLES</td>
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<td>LS : LOW PRESSURE STEAM</td>
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<td>MS : MEDIUM PRESSURE STEAM</td>
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<td>N : NITROGEN</td>
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<td></td>
<td>RV : RESIDUAL FUEL</td>
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<td>RW : RAW WATER</td>
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<td>SA : SERVICE AIR</td>
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<td>SC : STEAM CONDENSATE</td>
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<td>SF : SOUR GAS FLARE</td>
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<td>SR : SEA WATER RETURN</td>
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<td>SS : SEA WATER SUPPLY</td>
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<td>SU : SOUR CONDENSATE</td>
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<td>SW : SERVICE WATER</td>
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<td></td>
<td>WB : WET LIQUID BLOWDOWN</td>
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</tbody>
</table>

PIPING AND INSTRUMENT SYMBOLS

- OFF PAGE CONNECTION
- STREAM NUMBER
- SEQUENCE NUMBER
- UNIT CODE
- SYSTEM CODE

ABBREVIATIONS

- NC : NORMALLY CLOSED
- NO : NORMALLY OPEN
- NNO : NORMALLY NO FLOW
- CV : CONTROL VALVE
- MV : MANUAL VALVE
Whose legend sheet is this?

That of PFDs, as, among other things, no line designation, no other instruments than controllers.
You just arrived at a new facility. What document will you ask to see first to get an overall view of the Plant Process?
You just arrived at a new facility. What document will you ask to see first to get an overall view of the Plant Process? The Block Flow Diagram
You enjoyed this presentation?
Share my experience on other topics:
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- Contract Management
- Project Control

Attend my **classroom training**
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