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KLM Technology Group #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia	<b>SPECIFICATION FOR PREPARATION OF PIPING          AND INSTRUMENT DIAGRAMS</b>  <b>(PROJECT STANDARDS AND SPECIFICATIONS)</b>	

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## SCOPE

This Project Standard and Specification outlines the requirements for the preparation of P&ID's and shall be followed by Contractor. Deviations from this specification may be made only in order to conform to a specific project and shall be issued as an amendment to this specification.

## TYPES OF P&ID's

Piping and Instrument Diagrams will be sub-divided between the categories described below. However combination is permissible when a unit is of such a size and design that for example, the utilities and auxiliaries can be shown on one type of diagram with clarity.

### 1. Process Unit P&ID's

P&ID's of a particular unit such as a compressor, and inlet filter scrubber unit are called Process Unit P&ID's.

### 2. Utility P&ID's

P&ID's of utilities such as instrument air and oil system, oily water and waste water, and tempered water are called Utility P&ID's.

### 3. Distribution P&ID's

P&ID's of header distribution systems shown geographically are called Distribution P&ID's. It should be noted that the system need not necessarily be limited to utility distribution and can be used for process distribution.

### 4. Auxiliary P&ID's

P&ID's of the equipment piping and instrumentation associated with an item of equipment are called Auxiliary P&ID's. A typical example would be the auxiliary equipment, piping and instrumentation necessary for a large compressor. The intent is to keep the Process Unit P&ID's as uncluttered as possible.

### 5. Packaged Unit P&ID's

P&ID's provided by equipment suppliers for a packaged unit e.g. large centrifugal compressor unit etc. are called Packaged Unit P&ID's.

### 6. Symbols P&ID's

P&ID's containing general notes, symbols, nomenclature and piping details are called Symbols P&ID's.

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## **BASIC REQUIREMENTS**

### **General**

The size, service, line number, Piping Material Specification, type of tracing and whether insulated shall be indicated for each line on the P&ID's. Where lines leave/enter a P&ID the destination/origin equipment tag shall be indicated. If any special attention in piping layout and design is required, special notes shall be made on the P&ID's. The P&ID's shall show the keywords and symbology which are mentioned in each illustration.

Other notes to clarify the P&ID's shall be added as required. For example, if a valve is required to be located against a vessel nozzle, it shall be so stated on the P&ID. The Contractor shall pay particular attention to the sequence of take-offs of several lines from headers when the sequence is important from a process standpoint. Appropriate notes shall be added to clarify these conditions. Notes which are commonly required include such items as "slope" and "symmetrical piping".

### **Process Unit P&ID's and Utility P&ID's**

Headers are not normally shown on the Process Unit/ Utility P&ID's. A line to or from a header shall be terminated with a number enclosed in an arrow boxes. When a header serves only two or three users within a unit and can be shown with the correct sequence of branches, it shall be completely shown on the Process Unit/Utility P&ID.

Where a system or arrangement of valves is repeated frequently, a typical detail showing the arrangement shall be shown on the Symbols P&ID. A letter (A, B, C, etc) enclosed in a rectangle shall refer to this arrangement as a detail on the P&ID. This treatment shall be applied to flushing connections, drains and vents at exchangers and pumps, steam out connections, steam trap assemblies, etc.

General Notes, reference drawings, typical details, etc. applicable to all P&ID's shall be shown designated by letter and shall be shown on the Symbols Flow Diagram unless space requirements dictate otherwise. Notes applying to a specific P&ID shall be designated by number and be shown on that P&ID only.

Showing piping or ducting in elevation. e.g. Processes involving slurries, solids or high freezing point fluids or where such flow is by gravity.

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Tankage, blending, pump-house and other similar areas containing equipment shall generally be presented on a schematic basis with the tanks shown in elevations.

### **Distribution P&ID's**

Distribution P&ID's shall show the correct sequence of take-offs from the headers in accordance with the physical arrangement of the equipment to assist in piping layout and line sizing, so that an economical piping layout can be accomplished.

The Distribution P&ID's shall show all take-offs which are referenced on the Process Unit P&ID's.

Each header system shall occupy a separate space on the Distribution P&ID's, with similar systems grouped on the same sheet (e.g. all steam headers shall be in the same sheet where practical). The headers, sub-headers and branches are to be shown geographically to the Plot Plan, but not necessarily to scale. A listing of the services displayed should be placed in the Title Block of each Distribution P&ID.

The Distribution P&ID shall not duplicate any valving or instrumentation already shown on other P&ID's. The Distribution P&ID for each system shall contain the following information:

- Size, service, line number, whether insulated and type of tracing and Piping Material Specification of headers, sub-headers and lines to individual equipment items.
- Valves at headers (usually for isolation purposes).
- Instruments for header system control.
- Battery limit identification to show proper connection to offsite lines.
- P&ID number and equipment tag number for lines going to Process Unit/Utility P&ID's.

Care shall be exercised to assure a complete cross-reference of lines which appear both on the Distribution and Process Unit P&ID's.

### **Auxiliary P&ID's**

Auxiliary P&ID's shall be prepared for rotating equipment such as compressors, turbines, pumps, and centrifuges where equipment is sufficiently complicated to warrant this treatment.

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Alternatively the auxiliary piping and any details or tabulations required, may be shown on the Process Unit or Utility P&ID's if space is available.

The Auxiliary P&ID's shall show auxiliary equipment, utility piping etc. and the following information:

- Piping, instrumentation etc. to be supplied by Vendor.
- Cross references to the vendor's terminal connection designation.

The foregoing treatment is also applicable to other complicated equipment where multiple connections to Contractor designed services would obscure the Process Unit P&ID.

### **Packaged Unit P&ID's**

Contractor's requisition for the purchase of a package unit shall request the Vendor to provide P&ID's for the entire package unit according to Project standards.

Contractor P&ID's shall indicate the package unit by enclosing the appropriate part of the P&ID concerned with a dash-dot line to show the exact scope of supply. The space enclosed shall state the package unit tag number and the titles of all equipment included with the suppliers name and drawing number.

The Vendor P&ID shall be marked up by Contractor to show:

- Package unit tag number
- Tag numbers of all equipment (where allocated) and instruments
- Drawing number allocated by Contractor
- The letters "Contractor's name" in brackets shown against any items supplied by Contractor
- All other comments required to bring the P&ID into line with Project standards

The Vendor P&ID shall be issued and distributed exactly as if it were a Contractor's P&ID.

### **Symbols P&ID**

The Symbols P&ID shall show standard symbols and notes applicable to all P&ID's.

The Symbols P&ID shall show, via typical details, piping configurations that are repeated throughout the project. All other P&ID's shall refer to these typical details rather than repeat the arrangement.

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Where additional/amend symbology required. Contractor shall request an approval prior to add/amend the Symbols P&IDs.

## PREPARATION DETAILS

### Title Box

The Title Box of P&ID's shall contain the following:

1. The first line shall always be "PIPING AND INSTRUMENT DIAGRAM".
2. The second line shall identify the specific subject covered in accordance with the following examples:

Type of P&ID	Example of second Line
Process unit P&ID	Compressor unit
Utility P&ID	Instrument and utility system
Distribution P&ID	Sewer system

3. Main equipment data shall be given at below the equipment number which stated at the base of P&ID. Revision/issue/signature boxes provided at the base of the P&ID. Note boxes provided at the right side of the P&ID.

### Equipment Arrangement

1. P&ID's shall be divided into four horizontal sections. Equipment such as towers, drums, heaters and tanks shall be placed in the two upper sections. Heat exchangers shall be shown in the third section and pumps in the lower section.
2. The divisions into sections may be altered to suit particular situations. For example, if a condenser is to be located over an accumulator, it shall be indicated in that manner on the P&ID. When a unit has many interconnecting lines between heat exchangers, the P&ID's may be simplified by placing some exchangers on the same line with the towers or pumps. Such exceptions are justifiable in order to obtain a more realistic representation and an orderly arrangement of piping. Another example where flexibility is permitted is chemical type plants where piping or ducting may be better shown in elevation.
3. The minimum elevation shall be specified by the Contractor at the lower tangent line of all vertical vessels, at the bottom of all horizontal vessels and for other equipment items where the elevation is critical to the process.

Where several items are interrelated, with respect to elevation, the minimum elevation will be noted for only one of the items and dimensions used to show the relationship with the other items. An example of the foregoing is a reboiler which must have a definite relation to its associated tower. In this case, the