

DRAWING STANDARD FOR P&I DIAGRAM PREPARATION

JGS 210-120-1-70E

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Notes in the use of standard symbols

- (1) Letter/symbol size herein given has been determined based on the A0 size sheet. Where other size sheet is used, letter/symbol size may be reduced according to the size of sheet used.
- (2) Letter/symbol size herein given has been established from the standpoint of being clearly readable even where the drawing size is reduced from A0 to A3 size.

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1. SCOPE

- (1) This practice provides the guidelines for the standard format of Piping and Instrument Diagram (hereafter referred to as P&ID) in petroleum, petrochemical and similar plants. The standard format of P&ID indicates the rules for drafting P&ID such as the line styles, standard symbols, allocation of space, etc..
- (2) This standard practice does not cover the technical requirements for P&ID preparation, which are described in JGS 210-120-1-71E "Design Criteria for P&ID Preparation".
- (3) Specific instructions given in the respective Project Specifications have priority over this standard practice.

2. CLASSIFICATION OF P&ID

P&IDs are classified into the following 6 types in view of time of issue, scope of vendors' work, and plot plans, and are prepared in due order in line with the project schedule.

- (1) P&ID for Individual Units
- (2) P&ID for Utility Flow Distribution
- (3) P&ID for Interconnecting Pipe Work
- (4) P&ID for Tie-in Connection
- (5) P&ID for Auxiliary Facilities
- (6) P&ID for Packaged Unit

It should be noted, however, that not all of the above P&IDs are prepared in each project. The types of P&IDs to be prepared in the specific project depend on the structure of units composing the project and size of the project.

The typical P&IDs of individual types except "P&ID for Packaged Unit" are illustrated in Appendix-3 for reference.

Of the classified 6 types of P&IDs, "P&ID for Interconnecting Pipework" and UFD are closely connected with plot plans. The relationship between the respective types of P&IDs and plot plans, therefore, has been illustrated in Fig. 1 of page 5.

2.1 P&ID for Individual Units

This is the P&IDs for the individual units composing the onsite and offsite facilities.

Headers for such as utility, flare, slop and flushing oil are not generally shown in this type of P&ID and they are shown altogether in "P&ID for Utility Flow Distribution (UFD)".

2.2 P&ID for Utility Flow Distribution (UFD)

This is called "UFD". UFDs show the distribution to/from each users on headers and subheaders for the utilities to be consumed/generated by units composing onsite and utility facilities, showing also the distribution of headers and subheaders for such as flare, slops and flushing oil.

UFDs further cover P&IDs for hose stations.

To efficiently proceed with piping layout work, it is necessary to prepare UFDs in line with the actual plot plan as practical as possible.

UFDs are not generally prepared for the offsite facilities other than the utility facilities, because these facilities do not use many types of utility. P&IDs equivalent to UFD are shown altogether in "P&ID for Interconnecting Pipework".

2.3 P&ID for Interconnecting Pipework

This is also called "Coordination Flow Diagram", showing the interconnections between units and between onsite and offsite facilities.

To effectively perform piping layout work, it is necessary to prepare this P&ID in accordance with the overall plot plan.

2.4 P&ID for Tie-in Connection

This P&ID is prepared to show in detail points to be tied-in with the existing units.

2.5 P&ID for Auxiliary Facilities

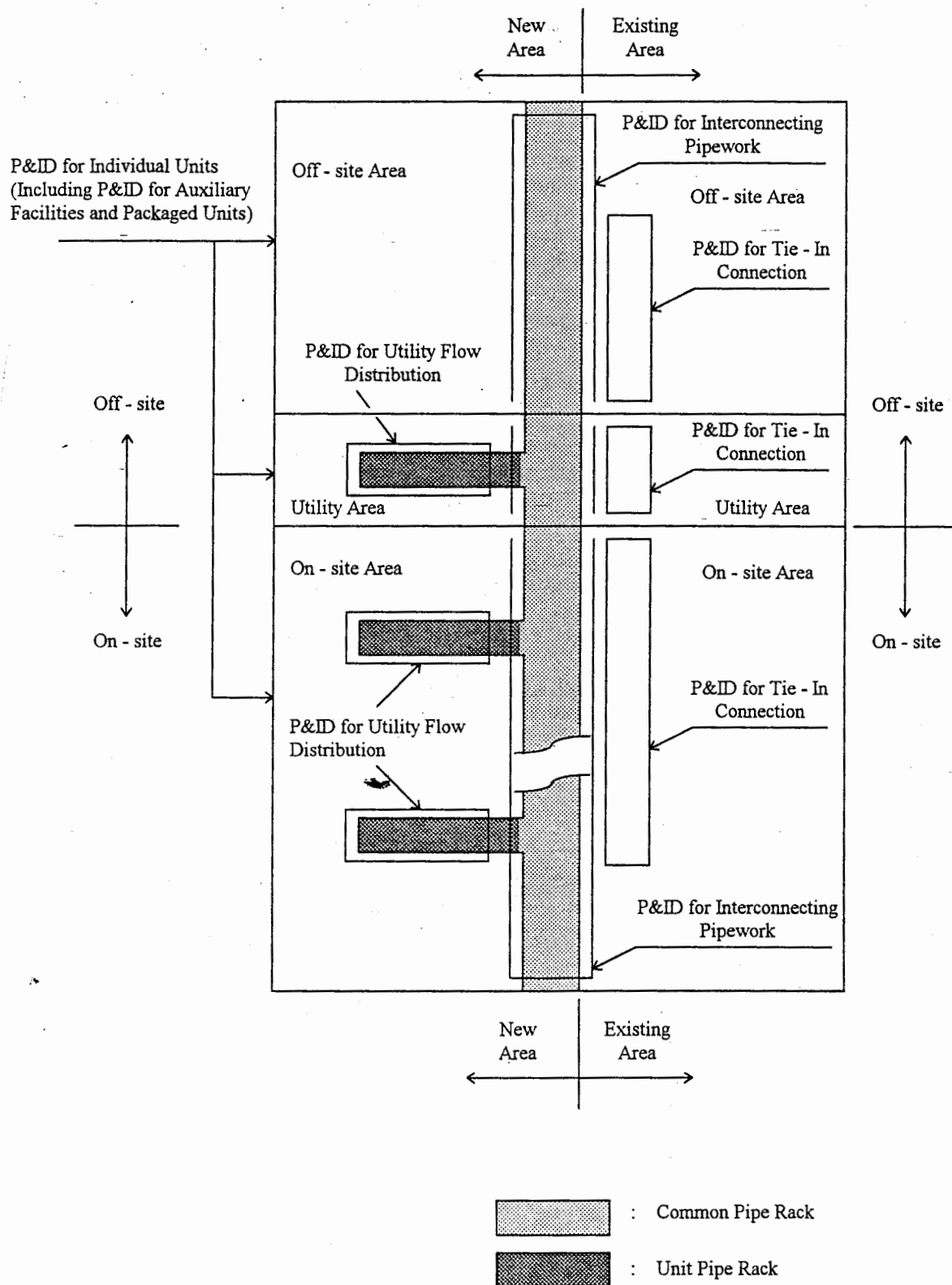
There are many cases where detailed information on items around equipment (e.g. vents, drains, and utility connections for rotary machines such as pumps and turbines) cannot be shown on a "P&ID for Individual Units" due to the space limitations. In such cases, "P&ID for Auxiliary Facilities" is separately prepared.

2.6 P&ID for Packaged Unit

This covers P&ID prepared by package vendors, such as compressors, refrigeration, pure water, neutralization, etc..

It is necessary to clearly show the scope of JGC's and vendor's work on this P&ID and also on package unit-related "P&ID for Individual Units".

Before the vendor starts P&ID preparation, it is necessary for JGC to provide the vendor with the instructions given in this Practice, sections 3 and 4, in order to coordinate formats, symbols, configurations, etc. between the parties.

Fig.1 Typical Relationship between Respective Types of P&ID and Plot Plan

3. STANDARD FORMAT

3.1 Forms and Sheet Size

JGS standard forms with frame and title block shall be used. A0 or A1 (ISO) size sheet shall be used for the drawing as a standard, however the use of both size sheets in the same project shall be avoided as far as practicable.

3.2 Title Block

The title block shall be completed to contain the followings and an example of title block is illustrated.

- (1) Client Name
- (2) Unit Name
- (3) Section Name
- (4) Project Name

◇						
◇						
◇						
◇						
◇						
No.	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D	現場
REVISIONS						
 JGC CORPORATION (Japanese Name) NIKKI KK						
(1) ABC CO., LTD.						
PIPING AND INSTRUMENT DIAGRAM						
OF						
(2) CRUDE DISTILLATION UNIT						
(3) (FIRED HEATER SECTION)						
(4) XYZ PROJECT						
DATE			SCALE			
PREP'D		CHK'D		APP'D		
JOB CODE □ - □ - □ - □ - □ - □ - □ - □						
DWG No.			SIZE		REV.	
			B		◇	
					顧客 現場	
					客 本社	
					配布 先	

3.3 Note Column

Space for the note column shall be provided on the right and above the title block to show specific notes for each sheet.

3.4 Equipment Design Data

The design data for pumps, heat exchangers, vessels and all other major equipment items shall be indicated in the data box at the bottom of the P&IDs.

The typical contents of the data box shall be as follows;

Pumps:

- (1) Item No.
- (2) Service Name
- (3) SPGR @ pumping temperature
- (4) Differential Press.
- (5) Design Capacity
- (6) Insulation Thickness

Vessels:

- (1) Item No.
- (2) Service Name
- (3) Diameter × Length
- (4) Design Press. / Temp.
- (5) Operating Press. / Temp.
- (6) Insulation Thickness

S/T Heat Exchangers:

- (1) Item No.
- (2) Service Name
- (3) TEMA Type
- (4) Surface Area × No. of shell
- (5) Diameter × Tube Length
- (6) Shell Design Press. / Temp.
- (7) Tube Design Press. / Temp.
- (8) Insulation Thickness, Shell / Tube

Air Fin Cooler:

- (1) Item No.
- (2) Service Name
- (3) Surface Area × No. of Bundle
- (4) Design Press. / Temp.
- (5) No. of Fans

Compressor:

- (1) Item No.
- (2) Service Name
- (3) Molecular Weight
- (4) Differential Press.
- (5) Design Capacity
- (6) Driver Power

Fired Heater:

- (1) Item No.
- (2) Service Name
- (3) Design Duty
- (4) Normal Duty
- (5) Design Press./Temp.

The data box of S/T heat exchangers is illustrated below, as an example.

Item No.	E-101A, B	
Service Name	STAB. Feed / Btm's Exchanger	
TEMA Type	AES	
Surface Area (m ²) × No. of Shell	95 × 2	
Dia. × Tube Length (mm)	900 × 6,000	
Shell D.P. (kg/cm ²) / Temp. (°C)	15.0 / 150	
Tube D.P. (kg/cm ²) / Temp. (°C)	20.0 / 200	
Insulation Thickness (mm)	50 / No Insul.	

3.5 Equipment Arrangement

- (1) The sheet is divided into four horizontal sections and equipment such as towers, drums, tanks, air fin coolers and fired heaters will be shown in the upper two sections.
Heat exchangers will be placed in the third quarter, and pumps and compressors in the lower section.
Such arrangement is a typical model and the flexibility to suit particular situations and obtain a more realistic representation is permitted.
- (2) The equipment number and service name for each major equipment item shall be placed on the top of the sheet and directly over the equipment as nearly as practicable. The equipment number shall also be shown alongside the equipment.
- (3) In arranging equipment in a drawing, sufficient space shall be prepared.
Such space makes further detailings and modifications easy at a P&ID developing stage.

3.6 Line

- (1) A process line entering or leaving a unit or battery limits shall be terminated at the top or the bottom of a sheet, whichever is nearer, with sheet connection symbol to indicate the fluid name and the source or destination unit name and drawing number on which it is continued.
For the sheet connection symbols, refer to section 4 of this practice.
- (2) A process line entering or leaving a sheet within a unit shall be terminated at the side of a sheet with sheet connection symbol.
If the process line is going to the sheet with a higher drawing number, the process line shall go to the right, and if it is a lower drawing number it shall go to the left.
The fluid name, the origin or destination equipment item number and the drawing number on which it is continued shall be indicated in sheet connection symbols.
Continuation lines between sheets shall match up positionally from sheet to sheet.
- (3) A utility line which is continued on a "P&ID for Utility Flow Distribution" may terminate at any convenient location on the sheet, with a sheet connection symbol.
- (4) Flow arrows shall be shown sufficiently to readily indicate direction of flow.
- (5) The main process lines shall be emphasized by heavier lines.

(6) Line crossover

Unnecessary line crossover shall be avoided as far as practicable. However, if it is unavoidable, line shall break according to the priority described hereunder.

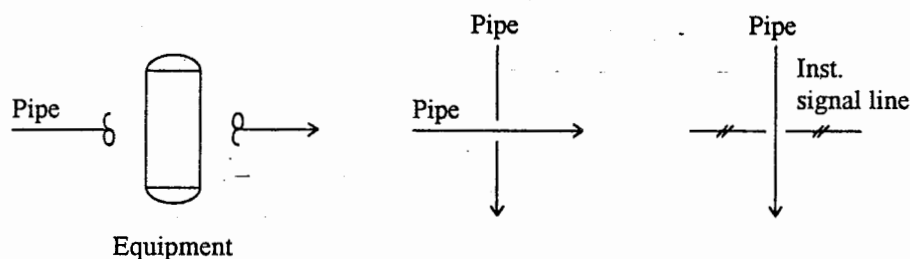
(a) Priority by Item

Equipment > Pipe > Instrument

(b) Priority by line

Horizontal > Vertical

Example



3.7 Standard Symbols

JGC's standard symbols including line style and letter sizes used for P&ID preparation are attached in Appendix-1.

Unless the client has specific standard symbols, Appendix-1 may be applied to P&ID preparation, with client's approval.

4. GENERAL NOTES AND SYMBOLS

A drawing showing "General Notes and Symbols" shall be prepared and approved by the client to standardize and simplify P&ID's before commencing P&ID preparation work.

This is equivalent to a cover sheet of P&IDs and at least the following items shall be contained.

- (1) General Notes (Applicable notes to all P&IDs)
- (2) Standard Symbols
- (3) Abbreviations
- (4) Functional Identification Letters of Instrument
- (5) Line Numbering System
- (6) Simplified symbols to represent the piping configurations which are frequently repeated throughout the project.

JGC's standard drawings showing "General Notes and Symbols" are attached in Appendix-2.

5. RELATED DOCUMENTS

In addition to this practice, the following standard practices are to be referred to in P&ID preparation.

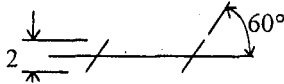
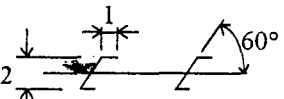
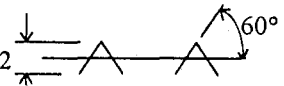
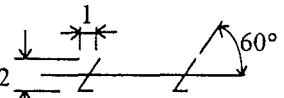
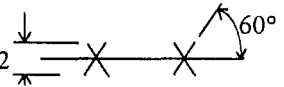
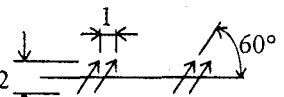
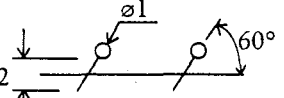
JGS (JGC Standard Practices)

JGS 210-120-1-46E	Execution Procedure of P&ID
JGS 210-120-1-49E	Preparation of Process Operation Diagram
JGS 210-120-1-55E	Up-Dating Procedure of P&ID
JGS 210-120-1-71E	Design Criteria for P&ID Preparation

APPENDIX-1 STANDARD SYMBOLS**A1.1 Line and Letter****A1.1.1 Line Style and Line Thickness****A1.1.1.1 Pipe**

Item	Line Style	Line Thickness (mm)
Main Process Line		0.7
Secondary Process and Utility Line		0.3
Existing Line		0.3
Future Line		0.3
Trace Line		0.3
Jacket Line		0.3

A1.1.1.2 Instrument Signal Line

Item	Line Style	Line Thickness (mm)
Undefined Signal		0.3
Electric Signal		0.3
Pneumatic Signal		0.3
Hydraulic Signal		0.3
Capillary Tube		0.3
Conducted Radiation (Radiowave, Visible Light)		0.3
Internal System Link (Software or Data Link)		0.3

The following line styles are also applicable instead of those specified in the previous table. In the same project, however, only one of those line styles shall be used.

Item	Line Style
Electric Signal	-----
Pneumatic Signal	---//---//---//---
Hydraulic Signal	---/---/---/---
Capillary Tube	---X---X---X---
Conducted Radiation	---〰---〰---〰---

A1.1.1.3 Symbol

Item	Line Style	Line Thickness (mm)
All Items	Solid Line	0.3

A1.1.2 Letter Size (Based on A0 sheet size)

Item		Size (mm)
Equipment	Item No.	3.5
	Service Name	3.0
Title Block		2.5 ~ 4.0 (Note 1)
Line No.		3.0
Instrument Tag Number and Letter Code		2.5 ~ 3.0
Other Text		2.5

Note 1 Letter Size in Title Block

(1) Project Name	4mm
(2) Client Name	4mm
(3) Job Code	4mm
(4) DWG No.	4mm
(5) Unit Name	4mm
(6) Section Name	4mm
(7) Date	2.5mm
(8) Signature	2.5mm
(9) Revision Column	4mm

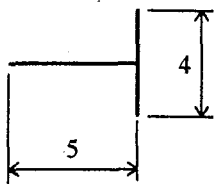
A1.2 Equipment

The configuration of equipment such as tower, reactor, drum, tank and furnace including internals shall be described to represent actual configuration as closely as possible.

Dimensions shall also be determined with consideration given to the balance within each drawing as well as to the limited space. Basic rules in indicating equipment, therefore, have been enumerated below, together with the typical configuration and examples of use.

A1.2.1 Vessel and Fired Heater**A1.2.1.1 Vessel****(1) Nozzle:**

All nozzles attached to equipment shall be indicated. For their configuration and dimensions, the following shall be used.



(2) Type of Head (e.g. 2:1 ellipse, spherical, flange, etc.) shall be specified.

(3) Internals (e.g. tray, packing, weir, distributor, demister, voltex breaker, etc.) shall be simplified for indication.

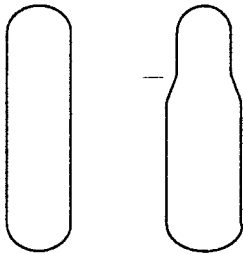
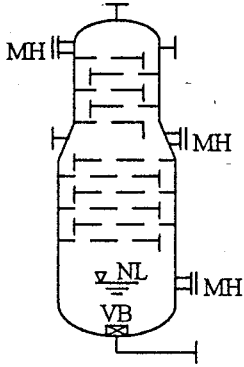
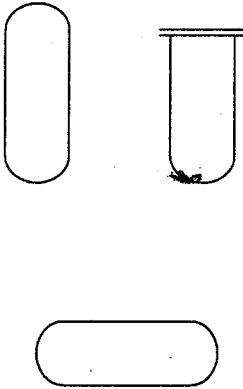
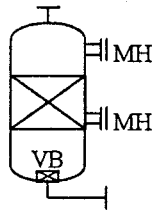
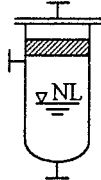
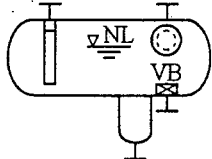
(4) Indication of Trays

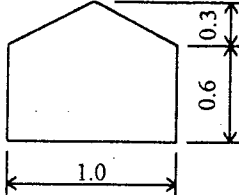
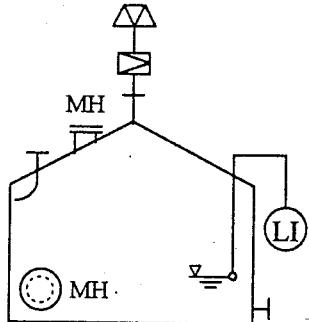
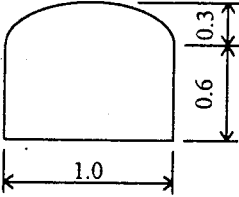
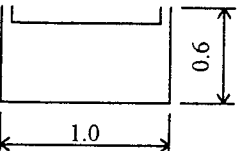
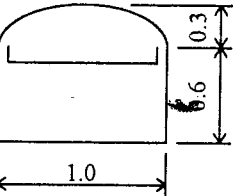
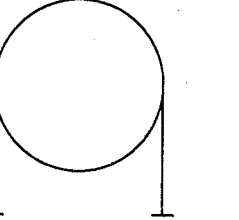
- Show the trays including tray number which fluid incomes into or outgoes from.
- Trays will be numbered from the top downwards.
- Show the number of passes.

(5) Elevation

Show elevations above base line to bottom tangential line of vertical vessels or to bottom of horizontal vessels.

Basic Symbol and Usage

No.	Item	Graphic Symbol	Usage
1	Tower and Reactor		 <u>Tray Type</u>
2	Drum		 <u>Packing Type</u>  <u>Vertical Type</u>  <u>Horizontal Type</u>

No.	Item	Graphic Symbol	Usage
3	Tank	 Cone Roof Type	
		 Dome Roof Type	
		 Floating Roof Type	
		 Inner Float Type	
		 Spherical Type	

Remarks : Each figure shows the ratio of height to width.
For the standardization of symbols, follow this ratio as closely as possible.