

Selected Pages
(Example of Information
contained in Practice)

Process Industry Practices
P&ID

SAMPLE

PIP PIC001

Piping and Instrumentation Diagram Documentation Criteria

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COMMERCIAL USE

PURPOSE AND USE OF PROCESS INDUSTRY PRACTICES

In an effort to minimize the cost of process industry facilities, this Practice has been prepared from the technical requirements in the existing standards of major industrial users, contractors, or standards organizations. By harmonizing these technical requirements into a single set of Practices, administrative, application, and engineering costs to both the purchaser and the manufacturer should be reduced. While this Practice is expected to incorporate the majority of requirements of most users, individual applications may involve requirements that will be appended to and take precedence over this Practice. Determinations concerning fitness for purpose and particular matters or application of the Practice to particular project or engineering situations should not be made solely on information contained in these materials. The use of trade names from time to time should not be viewed as an expression of preference but rather recognized as normal usage in the trade. Other brands having the same specifications are equally correct and may be substituted for those named. All Practices or guidelines are intended to be consistent with applicable laws and regulations including OSHA requirements. To the extent these Practices or guidelines should conflict with OSHA or other applicable laws or regulations, such laws or regulations must be followed. Consult an appropriate professional before applying or acting on any material contained in or suggested by the Practice.

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1. Introduction

1.1 Purpose

This Practice provides criteria for the development of Piping and Instrumentation Diagrams (P&IDs).

1.2 Scope

This Practice addresses the format and content shown on a P&ID. The Practice is independent of time in a facility life cycle and encompasses design, construction, operations and maintenance.

This Practice covers the generation of new P&IDs and does not apply to the revision of existing P&IDs. It also applies to P&IDs provided by packaged equipment vendors.

A P&ID is a detailed graphical representation of a process including the hardware and software (e.g., piping, equipment, instrumentation) necessary to design, construct and operate the facility. Common synonyms for P&IDs include EFDs (Engineering Flow Diagrams), UFDs (Utility Flow Diagrams) and MFDs (Mechanical Flow Diagrams). This Practice applies to all diagrams that fit the definition of a P&ID.

The criteria presented in this practice can be applied to whichever CAD system is employed for developing the P&IDs and are not vendor, hardware or software specific.

The example P&IDs included in the Appendices are not intended to recommend specific design details or requirements. Example P&IDs are included to provide an illustration of how the elements of the recommended Practice are combined into a P&ID.

2. References

Applicable requirements in the latest edition (or the edition indicated) of the following industry standards and Process Industry Practices shall be considered an integral part of this Practice. Short titles will be used herein when appropriate.

2.1 Process Industry Practices (PIP)

- PIP INEG1000 - *Insulation Design and Type Codes*
- PIP PCCIP001 - *Instrument Piping and Tubing Systems Criteria*
- PIP PCCPS001 - *Instrument and Control Systems Criteria for Packaged Equipment*
- PIP PCEDO001 - *Guidelines for Control Systems Documentation*
- PIP PCSIP001 - *Instrument Piping and Tubing Systems Specifications*
- PIP PNE00001 - *Design of ASME B31.3 Metallic Piping Systems*
- PIP PNSM0001 - *Piping Line Class Designator System*

2.2 Industry Codes and Standards

- American National Standards Institute (ANSI)
 - ANSI/FCI 70-2-1991 - *Quality Control Standard for Control Valve Seat Leakage*
- American Society of Mechanical Engineers (ASME)
 - *ASME Boiler and Pressure Vessel Code*
Section VIII - *Pressure Vessels*
- ISA
 - ISA S5.1 - *Instrumentation Symbols and Identification* (R1992)
 - ISA S5.2 - *Binary Logic Diagrams for Process Operations* (R1981)
 - ISA S5.3 - *Graphic Symbols for Distributed Control / Shared Display Instrumentation, Logic and Computer Systems*
 - ISA S84.01 - *Application of Safety Instrumented Systems for the Process Industries*
 - ISA S91.01 - *Identification of Emergency Shutdown Systems and Controls That Are Critical to Maintaining Safety in Process Industries*
- Tubular Exchanger Manufacturers Association (TEMA)
 - TEMA Standards

2.3 Government Regulations

- Occupational Safety and Health Administration (OSHA)
 - OSHA 29 CFR 1910.119 - *Occupational Safety and Health Standards, Process Safety Management of Highly Hazardous Chemicals*

3. Definitions

For the purposes of this Practice, the following definitions apply:

Accessible: A term applied to a device or function that can be used or be seen by an operator for the purpose of performing control actions (e.g., set point changes, auto-manual transfer or on-off actions) (Reference *ISA S5.1*.)

Automated Valve: Any valve with a locally or remotely controlled actuator. Examples are throttling control valves and on/off block valves. Actuators are typically air-operated (diaphragm or piston), electric or hydraulic, some with spring return function. Manually-operated valves are sometimes also tagged as automated valves such as when a manual valve is fitted with position switches.

Auxiliary P&ID: P&ID used to show details in order to unclutter other P&IDs (e.g., lube oil system, sample systems, instrument details)

Basic Process Control System (BPCS): The Basic Process Control System is the control equipment and system that is installed to regulate normal production functions. The BPCS may contain combinations of single loop pneumatic controllers, single loop electronic

4. Requirements

Practice requirements are divided into five sections (General, Format, Equipment, Piping and Instruments & Controls). Reference the appropriate section for the specific area of interest.

4.1 General

Practice requirements are intended to provide a balance between the desire to show all data on P&IDs with the need to make P&IDs legible and easy to read. Most details that are available from other types of documentation (e.g., instrument loop diagrams, vessel data sheets) are not recommended for inclusion on P&IDs.

The Practice utilizes the concept of typical details with implied components whenever appropriate to simplify P&IDs. See the cover sheet in Appendix B Page 4 for example. Additional examples may be added as required.

4.2 Format

4.2.1 Layout

4.2.1.1 Criteria contained herein apply to reading a P&ID from the bottom or right side of the drawing. The top of a horizontal line and the left side of a vertical line is the top of a pipe. The bottom of a horizontal line and the right side of a vertical line is the bottom of a pipe. Use a note to clarify as required.

4.2.1.2 Drawing size is 22" x 34" (560 mm x 864 mm).

4.2.1.3 Layout each P&ID to avoid clutter and allow future modifications. Show no more than three pieces of major equipment per P&ID. A set of pumps in the same service is one piece of equipment for the purpose of P&ID layout per Appendix C Page 1.

4.2.1.4 Show primary flow on each P&ID from left to right.

Show flow through equipment relative to actual arrangement (e.g., cooling water supply in bottom of exchanger tube bundle and cooling water return out top).

4.2.1.5 Show primary process lines heavier than secondary and utility lines as described in Section 4.2.3.

4.2.1.6 Show off-page connector arrows for primary, secondary and instrumentation lines entering the P&ID horizontally 0.25" (6.4 mm) from the left inside borderline and exiting 0.25" (6.4 mm) horizontally from the right inside borderline per Appendix C Page 1.

Utility connectors may be shown at any convenient location on the body of the P&ID.

- 4.2.1.16 Show the center point of a PSE (Pressure Safety Element) identification bubble 0.5" (12.7 mm) above a horizontal line or left of a vertical line and 0.5" (12.7 mm) away from the rupture disc or equipment.

4.2.2 Symbology

- 4.2.2.1 Show format, equipment, piping and instrument symbols per Appendices A-1, A-2, A-3 and A-4.

Show equipment internals using a short dash/space line at a weight of 0.02" (0.5 mm).

SAMPLE

Show a mating piping flange to an equipment nozzle at a distance of 0.06" (1.5 mm).

Show a connection to an equipment nozzle when the connection is welded per Appendix A-3 Page 6.

- 4.2.2.2 Show a note reference symbol per Appendix A-1 Page 2 at a weight of 0.03" (0.8 mm).

Show a note number in the symbol at a weight of 0.02" (0.5 mm).

- 4.2.2.3 Show normally closed manual valves using a darkened solid symbol.

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When darkened in valves cannot be used because of symbol type (e.g., butterfly valve), use the abbreviation for Normally Closed (NC) directly below the valve in a horizontal line or to the right of the valve in a vertical line.

Show on-off valves in normal operating position.

Do not show control valves or relief valves normally closed.

4.2.3 Lines

- 4.2.3.1 Show primary process lines per Appendix A-3 Page 3 at a weight of 0.06" (1.5 mm).
- 4.2.3.2 Show secondary, utility, future or existing lines per Appendix A-3 Page 3 at a weight of 0.02" (0.5 mm).
- 4.2.3.3 Show instrument line symbols per Appendix A-4 Page 4 at a weight of 0.01" (0.3 mm).
- 4.2.3.4 Show packaged equipment limit lines per Appendix A-1 Page 2 at a weight of 0.03" (0.8 mm).
- 4.2.3.5 Show line class and insulation breaks per Appendix A-1 Page 2 at a weight of 0.02" (0.5 mm).
- 4.2.3.6 Minimize "dog legged" lines.
- 4.2.3.7 Maintain a minimum of 0.5" (12.7 mm) spacing between lines.
- 4.2.3.8 Show flow arrows at corners and intersecting lines, where there is a change in direction of majority of flow.

4.3.1.5 Show Equipment Item Number and Title/Service as a minimum. Reference Section 4.3.13 for a complete list of equipment data for all equipment addressed in this Practice. For equipment not covered in this Practice, show equipment data as necessary.

4.3.1.6 Show internals for equipment as dashed lines as described in Section 4.2.2.1. Omit details of internals that have no significant bearing on the piping design and layout or equipment operation.

4.3.1.7 Do not show equipment elevations unless they are necessary to specify process requirements for associated equipment location or orientation relative to one another.

4.3.1.8 Show associated trim (e.g., vent and drain valves, instrument saddles) for equipment.

4.3.1.9 Show auxiliary system requirements for individual pieces of equipment (e.g., lube oil systems, seal flush systems, turbine gland leak-off piping, sample systems) on auxiliary P&IDs.

4.3.1.10 Show jacketing requirements for equipment.

4.3.1.11 Show the type of insulation (e.g., personnel protection, heat conservation) for equipment as part of the equipment data. Show insulation thickness where applicable.

4.3.2 Agitators

4.3.2.1 The term agitator applies to mechanical mixers and aerators.

4.3.2.2 Show agitators per Appendix A-2 Page 3.

4.3.3 Blowers

4.3.3.1 Show blower symbols as centrifugal or positive displacement as required.

4.3.3.2 Show blowers per Appendix A-2 Page 2.

4.3.4 Compressors

4.3.4.1 Show the compressor symbol for each stage of multistage compressors. Multi-staged compressors may be shown on multiple P&IDs.

4.3.4.2 Show compressors per Appendix A-2 Page 2.

4.3.5 Drivers

4.3.5.1 Show drivers with driven equipment using the symbols for motors, diesel engines and turbines. Equipment numbers for drivers are normally not required since equipment data for the drivers is shown as an integral part of the associated driven component. Show equipment number for driver if it drives more than one piece of equipment or if the driver number is different from the equipment it drives.

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4.3.12 Classification of Equipment

The equipment classifications listed below are used on the example P&IDs contained in the Appendices for illustrative purposes only. These equipment classifications are only one example of classifications allowed by this Practice.

CLASS	SUBJECT	DESCRIPTION
A	Mixing Equipment	Agitators, Aerators, Mechanical Mixers
B	Blowers	Centrifugal Blowers, Positive Displacement Blowers, Fans
C	Compressors	Centrifugal, Reciprocating, Screw, Vacuum
D	Mechanical Drivers	Electric and Pneumatic Motors, Diesel Engines, Steam and Gas Turbines
E	Heat Exchangers	Unfired Heat Exchangers, Condensers, Coolers, Reboilers, Vaporizers and Heating Coils, Double Pipe, Spiral, Plate & Frame, Air Coolers
F	Furnaces	Preheaters, Furnaces, Boilers, Kilns
P	Pumps	Horizontal and Vertical Centrifugal, Positive Displacement, Vertical Canned, Screw, Gear, Sump
R	Reactors	
T	Towers / Columns	
TK	Tanks	API atmospheric and low pressure
U	Miscellaneous Equipment	Filters, Bins, Silos
V	Drums	Separators, Driers, Accumulators

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4.3.13 Equipment Data

This section lists the data to be shown on the P&ID for types of equipment. Show this information on the P&ID in relation to the appropriate equipment symbol per Section 4.2.4.5. Show units of measure (e.g., GPM, PSIG, BTU/hr) for equipment data as required. Equipment not listed should be described as appropriate to convey important data.

4.3.13.1 Agitators, Mixers

- Equipment/Item Number
- Title/Service
- Power Requirements
- Materials of Construction

4.3.13.7 Vessels/Tanks

- Equipment/Item Number
- Title/Service
- Size, Capacity
- Design Pressure @ Temperature
- Materials of Construction
- Trim
- Insulation

4.4 Piping

4.4.1 Line Data Identification

4.4.1.1 Show the line data identification per Appendix A-3 Page 1.

Do not use suffixes as part of the sequence number.

Sequence numbers typically originate and terminate at equipment. Assign different sequence numbers to line branches that terminate at different equipment numbers or lines.

Do not change the sequence number when the line flows through a piping specialty item or a control valve or when there is a line class break.

Assign different sequence numbers to the inlet and outlet of pressure relief valves.

4.4.1.2 The size and insulation thickness fields accommodate either English or metric units.

Show insulation code changes using the point of change symbol referenced in Appendix A-1 Page 2.

4.4.1.3 Show special layout requirements (e.g., No Pockets) with a note.

4.4.2 Line Service Codes

4.4.2.1 Line service codes are listed in Appendix A-3 Page 2. Additional line service codes can be added as required.

4.4.2.2 Each line service code consists of one to three alpha characters.

4.4.3 Piping Line Symbols

4.4.3.1 Show piping for primary, secondary, utility, jacketed or double containment, and future lines per Appendix A-3 Page 3.

4.4.3.2 Show piping for existing lines depicted on new P&IDs per Appendix A-3 Page 3.

4.4.3.3 Piping for new lines depicted on existing P&IDs are not covered by this Practice.

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4.5.4 Safety/Relief Devices

4.5.4.1 Show and tag relief devices and conservation vents per Appendix A-4 Page 7 (e.g., PSE and PSV). Use optional explanatory text for clarification of the type and function of the device (e.g., “Emergency Relief,” “Conservation Vent,” “Explosion Panel”) located next to the tag. Reference Sections 4.2.1.15 and 4.2.1.16.

PSV typically refers to reclosing devices. PSE typically refers to non-reclosing devices.

Use PSE only for safety related service. Use PCV or PCE for non-safety conservation vents.

SAMPLE

Comment: per ISA 55.1 (Table 1, Note 8), “The designation PSV applies to all valves intended to protect against emergency pressure conditions regardless of whether the valve construction and mode of operation place them in the category of the safety valve, relief valve or safety relief valve.”

4.5.4.2 Show relief device set pressures.

4.5.4.3 Show the relief device size:

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- PSV - inlet size and outlet size
- Rupture discs - disc diameter

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- Conservation vents - inlet nozzle size if there is not a pipe away or tail piece, or otherwise show inlet size and outlet size
- Explosion panels - surface area or dimensions

4.5.4.4 Show the orifice size letter designation for relief valves between the inlet and outlet sizes (e.g., 3K4). Do not show the relief device sizing basis or flow capacity.

4.5.4.5 Do not show the materials of construction for relief devices.

4.5.5 Equipment Start/Stops

4.5.5.1 Do not show the local start/stop hand switch for motors without remote controls.

Show local (field) hand switches (bubble and tag) that:

- Are part of an operator control panel
- Interface with other systems (e.g., interlocks)
- Otherwise need explanation

4.5.5.2 Show all control room (DCS or panel board) hand switches with the appropriate bubble symbol and tag.

4.5.5.3 Label all hand switch positions or functions. Locate the labels outside the bubble symbol, on the upper right, using the standard text abbreviations shown in the Appendices. All others must be spelled out.

Appendices

The Appendices of this Practice contain tables of commonly used symbols, abbreviations and other identifiers, as well as typical details and example P&IDs.

Appendix A contains symbols and text grouped by function. The symbols and text are shown the same size as would be utilized for a standard full size (22" x 34") P&ID.

Appendix B contains the same data as Appendix A, organized into cover sheets. Cover sheets are also commonly referred to as lead sheets or legend sheets.

Electronic native files for the text, symbols and cover sheets are available from PIP for input to member CAD systems. Development of project specific cover sheets is recommended using the PIP native files as a starting point. Additions and/or deletions are allowed to meet requirements. Cover sheet borders and title blocks may be altered.

Appendix C contains example P&IDs that illustrate the text and utilize the symbols and legends on the cover sheets.

Comment: The cover sheets and P&IDs are drawn as standard full size (22" x 34") P&IDs, but reduced to standard PIP Practice 8 1/2" x 11" pages for electronic distribution purposes. It is recommended that the cover sheets and P&IDs be printed on 11" x 17" pages. This requires use of a PostScript printer driver.

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Appendix A – Tables & Symbols

A-1 Format Tables & Symbols

1. Abbreviations
2. Miscellaneous Symbols

A-2 Equipment Tables & Symbols

1. Pumps
2. Compressors & Blowers
3. Drivers & Agitator/Mixer
4. TEMA Type Exchangers
5. Miscellaneous Exchangers
6. Storage Tanks
7. Storage Tanks
8. Storage Sphere and Furnace
9. Miscellaneous Vessel Details

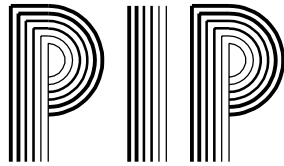
A-3 Piping Tables & Symbols

1. Line Data Identification
2. Line Service Codes
3. Piping Line Symbols
4. Valve Symbols
5. Piping Specialty Items
6. Piping Fittings
7. Off-Page Connectors and Tie-In Symbol
8. Drain Connectors
9. Notes

A-4 Instruments & Controls Tables & Symbols

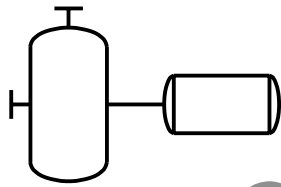
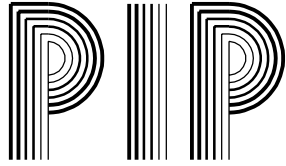
1. Instrument Identification Letters
2. General Instrument Symbols
3. Instrument Function Symbols
4. Instrument Line Symbols
5. Primary Element Symbols (Flow)
6. Control Valve Actuator Symbols
7. Self-Actuated Devices
8. Miscellaneous Instrument Symbols.

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ABBREVIATIONS

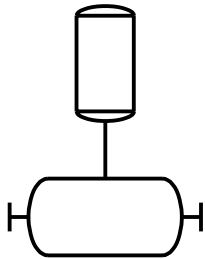
AG	ABOVE GROUND	MTL	MATERIAL
ATM	ATMOSPHERE	MAX	MAXIMUM
BL	BATTERY LIMIT	MIN	MINIMUM
BTL	BOTTOM TANGENT LINE	MOV	MOTOR OPERATED VALVE
BYP	BYPASS	MW	MANWAY
CC	CHEMICAL CLEANOUT	NC	NORMALLY CLOSED
CL	CENTERLINE	NNF	NORMALLY NO FLOW
CO	CLEANOUT	NO	NORMALLY OPEN
CONN	CONNECTION	NOZ	NOZZLE
CSC	CAR SEAL CLOSED	O/C	OPEN/CLOSE
CSO	CAR SEAL OPEN	O/O	ON/OFF
CTR	CENTER	OP	OUTPUT
DCS	DISTRIBUTED CONTROL SYSTEM	OSBL	OUTSIDE BATTERY LIMITS
DES	DESIGN	OVHD	OVERHEAD
DIA	DIAMETER	PLC	PROGRAMMABLE LOGIC CONTROLLER
DP	DESIGN PRESSURE	PRESS	PRESSURE
D/P	DIFFERENTIAL PRESSURE	PV	PROCESS VARIABLE
DRN	DRAIN	(R)	RELOCATED
DT	DESIGN TEMPERATURE	REQD	REQUIRED
DWG	DRAWING	RTD	RESISTANCE TEMPERATURE DETECTOR
(E)	EXISTING	SC	SAMPLE CONNECTION
EL	ELEVATION	SCH	SCHEDULE
ESD	EMERGENCY SHUTDOWN	SD	SHUTDOWN
FOF	FACE OF FLANGE	SG	SPECIFIC GRAVITY
(F)	FURNISHED	SIS	SAFETY INSTRUMENTED SYSTEM
FC	FAIL CLOSED	SO	STEAM OUT
FI	FAIL INDETERMINATE	SP	SET POINT
FL	FAIL LOCKED (AS POSITION)	SS	STAINLESS STEEL
FLG	FLANGE	S/S	START/STOP
FO	FAIL OPEN	STD	STANDARD
FP	FULL PORT	T/C	TEMPERATURE COUPLER
FV	FULL VACUUM	TDH	TOTAL DIFFERENTIAL HEAD
GO	OPERATED	TEMP	TEMPERATURE
GR	GRADE	THRD	THREADED
HC	HOSE CONNECTION	TL	TANGENT LINE
HDR	HEADER	TSO	TIGHT SHUT-OFF
HH	HAND HOLE	T/T	TANGENT TO TANGENT
HOA	HAND/OFF/AUTOMATIC	TYP	TYPICAL
HP	HIGH PRESSURE	UG	UNDERGROUND
HPT	HIGH POINT	VNT	VENT
IAS	INSTRUMENT AIR SUPPLY	VAC	VACUUM
ISBL	INSIDE BATTERY LIMITS	VB	VORTEX BREAKER
LC	LOCKED CLOSED	W/	WITH
LO	LOCKED OPEN	W/O	WITHOUT
LP	LOW PRESSURE		
LPT	LOW POINT		



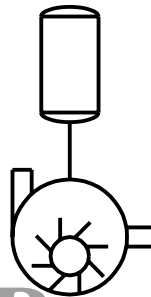
HORIZONTAL
CENTRIFUGAL PUMP



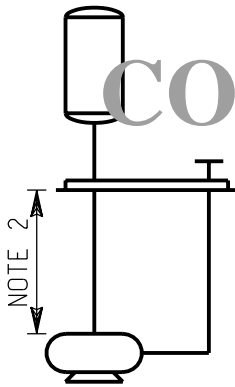
POSITIVE
DISPLACEMENT PUMP



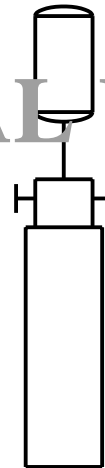
VERTICAL
INLINE PUMP



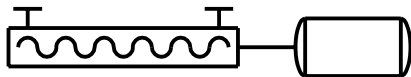
LIQUID RING
VACUUM PUMP



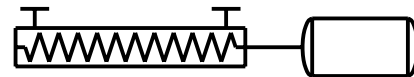
CENTRIFUGAL
SUMP PUMP



VERTICAL CAN PUMP

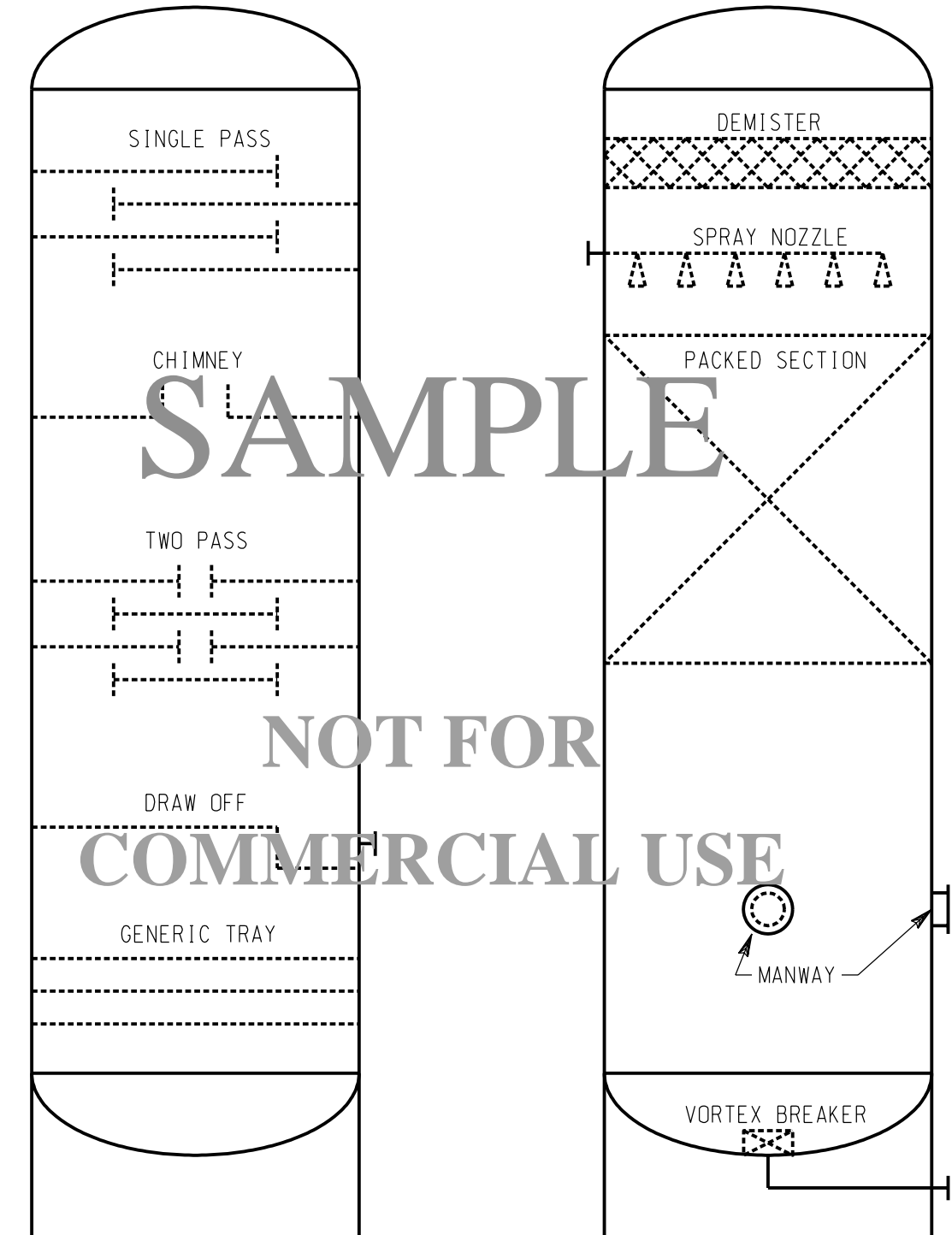
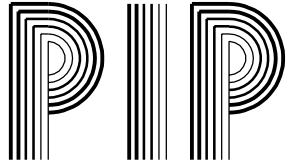


PROGRESSIVE CAVITY PUMP

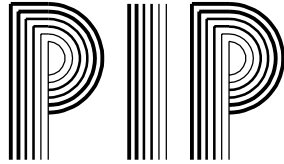


SCREW PUMP

- NOTES:
1. SYMBOLS ARE SHOWN HERE AT ACTUAL SIZE USED ON 22"x34" DOCUMENTS.
 2. LENGTH VARIES DEPENDING UPON DEPTH OF SUMP.
 3. MOTORS SHOWN HERE TO ILLUSTRATE DRIVER ORIENTATION. FOR DRIVER SYMBOLS, SEE APPENDIX A-2, p.3.



NOTE: ACTUAL SIZE WILL VARY.



SAMPLE

UNIT/AREA (NUMERIC)	SERVICE (ALPHA)	SEQUENCE (NUMERIC)	SIZE (NUMERIC)	LINE CLASS (NOTE 1)
------------------------	--------------------	-----------------------	-------------------	------------------------

XX - XXX - XXXXX - XXXX - XXXXXXXXXXXX

XXXX - XXXX - XXXX

INSUL. TYPE (NOTE 2)	THICKNESS (NOTE 1)	OPTIONAL (USER DEFINED)
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NOTES:

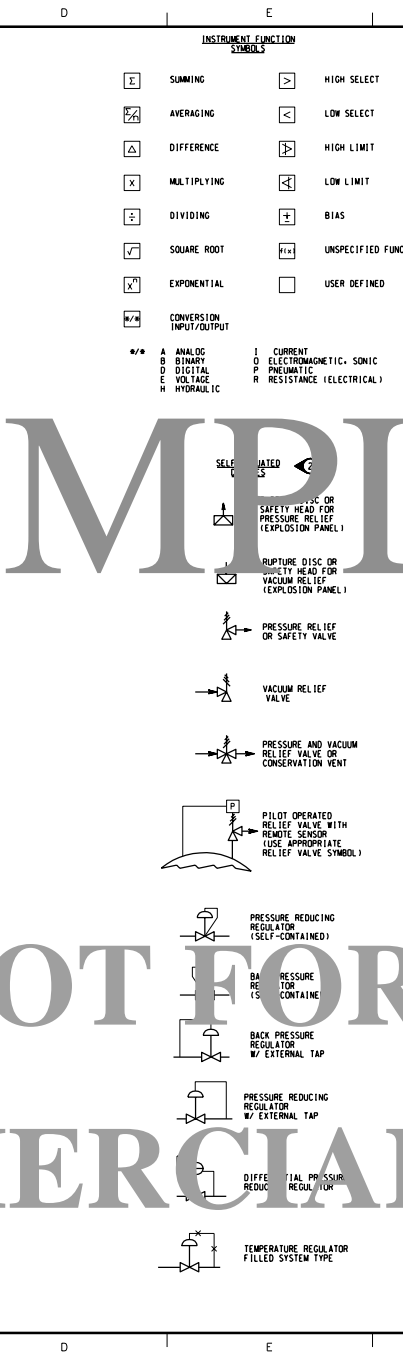
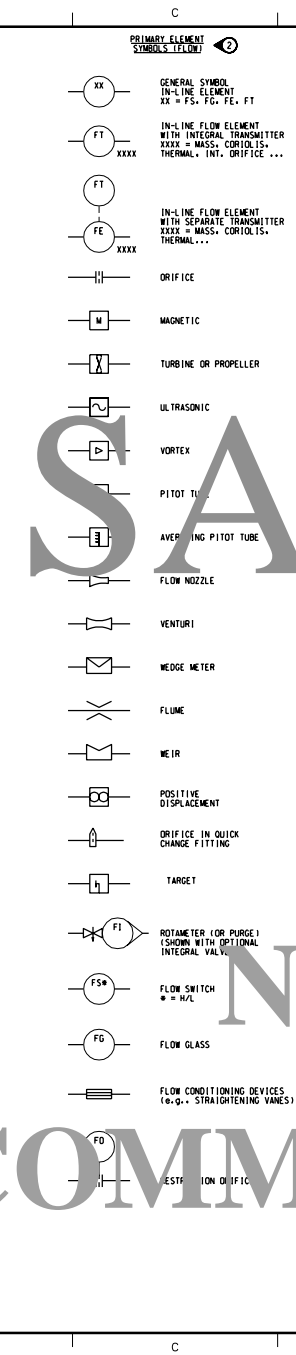
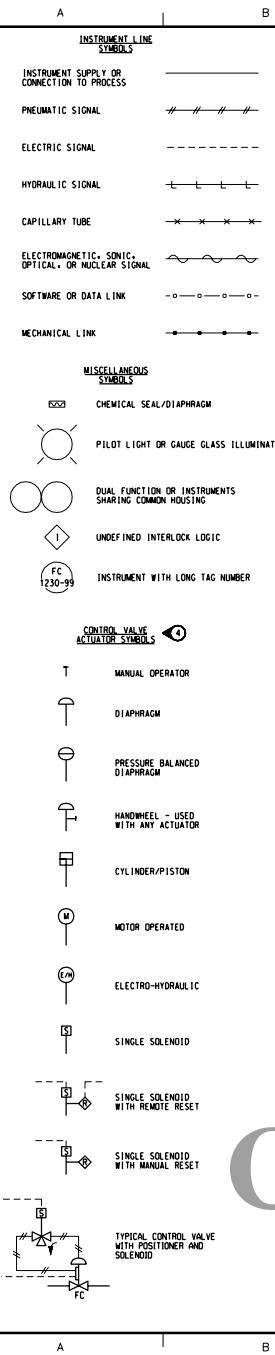
1. DEFINED BY PIP PNSM0001; PIPING LINE CLASS DESIGNATOR SYSTEM. FOR INSTRUMENT PIPING AND TUBING SPECIFICATION, SEE PIP PCSIP001.
2. DEFINED BY PIP INEG1000; INSULATION DESIGN AND TYPE CODES.

Appendix B – Cover Sheets

- Symbols & Nomenclature - Typical Piping
- Symbols & Nomenclature - Typical Instrumentation
- Symbols & Nomenclature - Typical Equipment
- Typical Details with Implied Components

SAMPLE

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GENERAL INSTRUMENT SYMBOLS

LOCATION/ACCESSIBILITY	DISCRETE INSTRUMENTS	SHARED DISPLAY AND LOGIC (DCS)	PLC	DISCRETE HARDWARE INTERLOCK
FIELD MOUNTED 1. FIELD OR LOCALLY MOUNTED. 2. ACCESSIBLE TO AN OPERATOR AT DEVICE.	○	◻	◻	◻
PRIMARY LOCATION NORMALLY ACCESSIBLE TO AN OPERATOR 1. CENTRAL OR MAIN CONTROL ROOM. 2. FRONT OF MAIN PANEL OR CONSOLE MOUNTED. 3. VISIBLE ON VIDEO DISPLAY. 4. ACCESSIBLE TO AN OPERATOR AT DEVICE OR CONSOLE.	◐	◐	◐	◐
PRIMARY LOCATION NORMALLY INACCESSIBLE TO AN OPERATOR 1. CENTRAL OR MAIN CONTROL ROOM. 2. REAR OF PANEL OR CABINET MOUNTED. 3. NOT VISIBLE ON VIDEO DISPLAY. 4. NOT NORMALLY ACCESSIBLE TO AN OPERATOR AT DEVICE OR CONSOLE.	◑	◑	◑	◑
AUXILIARY LOCATION NORMALLY ACCESSIBLE TO AN OPERATOR 1. CENTRAL OR LOCAL CONTROL ROOM. 2. FIELD OR LOCAL CONTROL PANEL MOUNTED. 3. FRONT OF SECONDARY OR LOCAL PANEL MOUNTED. 4. VISIBLE ON VIDEO DISPLAY. 5. ACCESSIBLE TO AN OPERATOR AT DEVICE OR CONSOLE.	◒	◒	◒	◒
AUXILIARY LOCATION NORMALLY INACCESSIBLE TO AN OPERATOR 1. CENTRAL OR LOCAL CONTROL ROOM. 2. FIELD OR LOCAL CONTROL PANEL MOUNTED. 3. REAR OF SECONDARY OR LOCAL PANEL OR CABINET MOUNTED. 4. NOT VISIBLE ON VIDEO DISPLAY. 5. NOT NORMALLY ACCESSIBLE TO AN OPERATOR AT DEVICE OR CONSOLE.	◓	◓	◓	◓

INSTRUMENT IDENTIFICATION LETTERS

FIRST LETTER		SUCCEEDING LETTERS		
MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A ANALYSIS		ALARM		
B BURNER, FLAME, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C USER'S CHOICE (TYPICALLY CONDUCTIVITY - ELECTRICAL)			CONTROL	CLOSED
D USER'S CHOICE (TYPICALLY DENSITY OR SPECIFIC GRAVITY)	DIFFERENTIAL			DIVERT
E VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F FLOW RATE	RATIO (FRACTION)			
G USER'S CHOICE OR GAUGING (DIMENSIONAL)		GLASS VIEWING DEVICE		HIGH
H HAND				
I CURRENT (ELECTRICAL)		INDICATE		
J POWER	SCAN			
K TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L LEVEL		LIGHT		LOW
M USER'S CHOICE (TYPICALLY MEASURE OR HUMIDITY)	MOMENTARY			MIDDLE-INTERMEDIATE
N USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O USER'S CHOICE		ORIFICE, RESTRICTION		OPEN
P PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q QUANTITY OR HEAT DUTY	INTEGRATE, TOTALIZE			
R RADIATION		RECORD		
S SPEED, FREQUENCY	SAFETY		SWITCH	
T TEMPERATURE			TRANSMIT	THROUGH
U MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V VIBRATION, MECHANICAL ANALYSIS			VALVE - DAMPER, LOUVER	
W WEIGHT, FORCE		WELL		
X UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y POSITION, POSITIONER, PROPORTIONAL AXIS			RELAY, CONVERTER	
Z POSITION, POSITIONER, PROPORTIONAL AXIS	Z AXIS		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

- NOTES:**
1. REFERENCE ISA SS-1, SS-2 & SS-3.
 2. FLOW ASSUMED LEFT TO RIGHT AS SHOWN.
 3. MULTIPLE LOCATIONS OF THE SAME TYPE CAN BE DISTINGUISHED BY ADDING A TEXT LABEL OR NOTE.
 4. FOR VALVE SYMBOLS, SEE APPENDIX B, D-1.

NOT FOR COMMERCIAL USE

REFERENCE DRAWINGS

1	06/98								
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SCALE	NONE	DRAWN	PIPING, DGM
			REV

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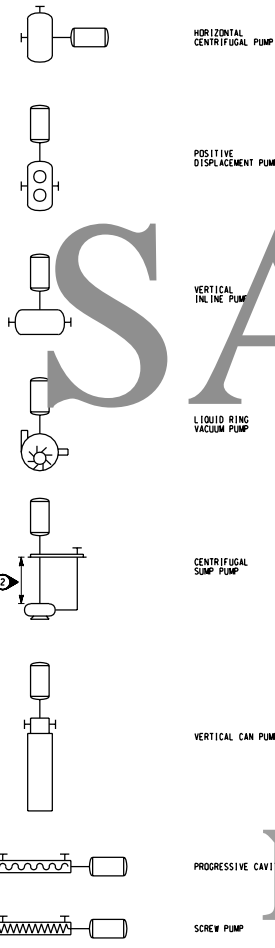
PROCESS INDUSTRY PRACTICES
PIPING AND INSTRUMENTATION DIAGRAM

SYMBOLS AND NOMENCLATURE
TYPICAL INSTRUMENTATION COVER SHEET
APPENDIX B, PAGE 2

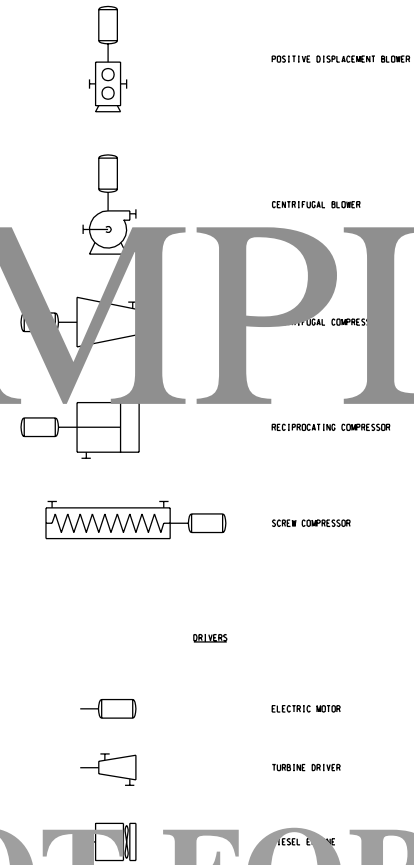
PROJECT	PLANT	DRAWING NUMBER	REV. NO.
		PIP-00-002	1

PIIP PRACTICE REF P1001

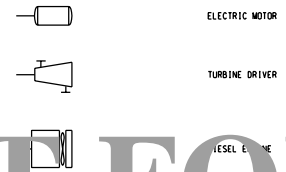
PUMPS ①



COMPRESSORS & BLOWERS ①



DRIVERS



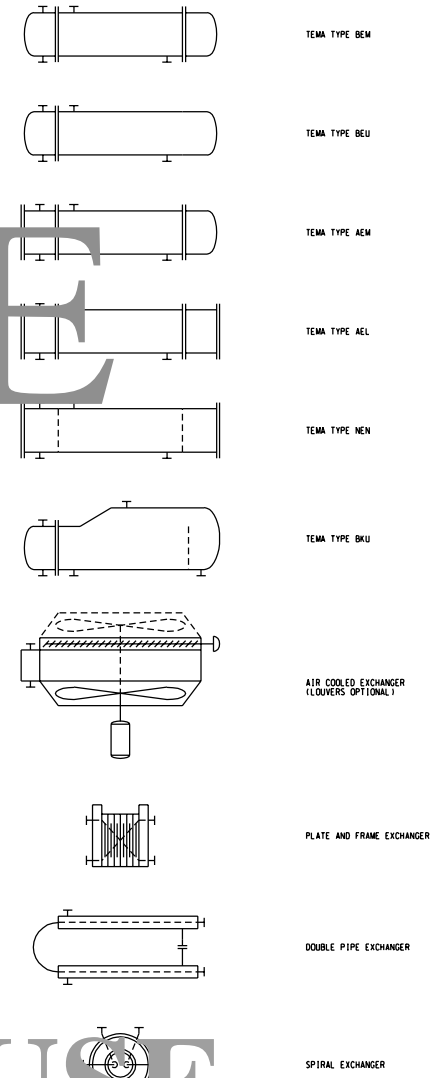
VESSEL



MISCELLANEOUS



HEAT EXCHANGERS ③



- NOTES:
1. MOTORS ARE SHOWN HERE TO ILLUSTRATE DRIVER ORIENTATION.
 2. LENGTH VARIES DEPENDING UPON DEPTH OF SUMP.
 3. CONSULT TEMA FOR TYPES OTHER THAN THOSE SHOWN.
 4. EXCHANGERS SHOWN HERE REPRESENT SINGLE PASS SHELL AND EVEN NUMBER OF TUBE PASSES.

REFERENCE DRAWINGS

1	06/98										
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SCALE	NONE	DESIGNED BY	PIPING	DRAWN BY	GAM
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PROCESS INDUSTRY PRACTICES
 PIPING AND INSTRUMENTATION DIAGRAM

PIP
 PRACTICE REF P10001

SYMBOLS AND NOMENCLATURE
 TYPICAL EQUIPMENT COVER SHEET
 APPENDIX B, PAGE 3

PROJECT	PLANT	DRAWING NUMBER	REV. NO.
		PIP-00-003	1

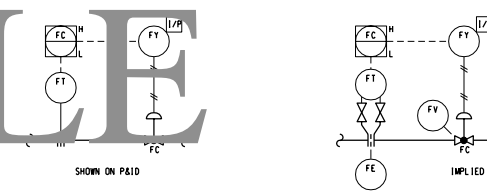
SAMPLE

NOT FOR

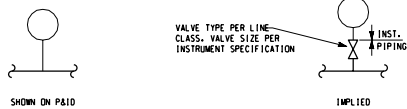
COMMERCIAL USE

SAMPLE

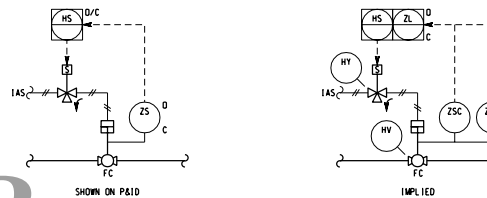
TYPICAL FLOW LOOP WITH SEPARATE I/P



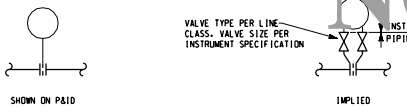
FIELD MOUNTED PRESSURE INSTRUMENT
(PI, PT, PS)



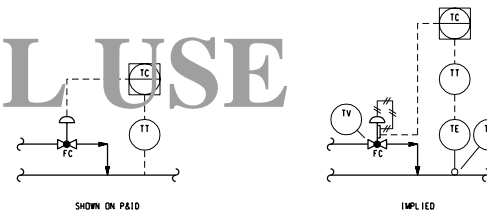
TYPICAL VALVE DETAIL



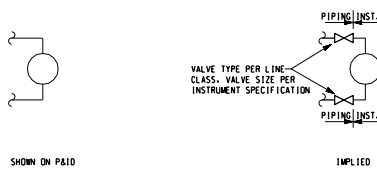
ORIFICE FLANGE - MOUNTED FLOW INSTRUMENT
(FI, FT)



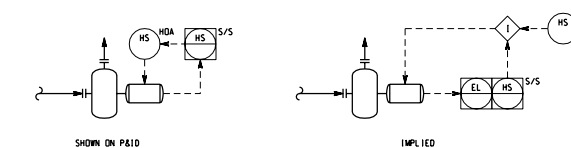
TYPICAL TEMPERATURE LOOP WITH VALVE POSITIONER



LEVEL OR D/P INSTRUMENT
(PDI, PDT, LC, LG, LT, LS)



TYPICAL PUMP MOTOR CONTROLS



NOTES:

- FOR NOTES, SYMBOLS AND ABBREVIATIONS, SEE "SYMBOLS AND NOMENCLATURE", PIP-00-001 THROUGH 003.

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REFERENCE DRAWINGS

1	06/98	FILENAME	DRAWN
		PIPB4.DGN	GAM

SCALE NONE
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 PIPING AND INSTRUMENTATION DIAGRAM
PIP
 PRACTICE REF P1C001

TYPICAL DETAILS WITH IMPLIED COMPONENTS
 APPENDIX B, PAGE 4

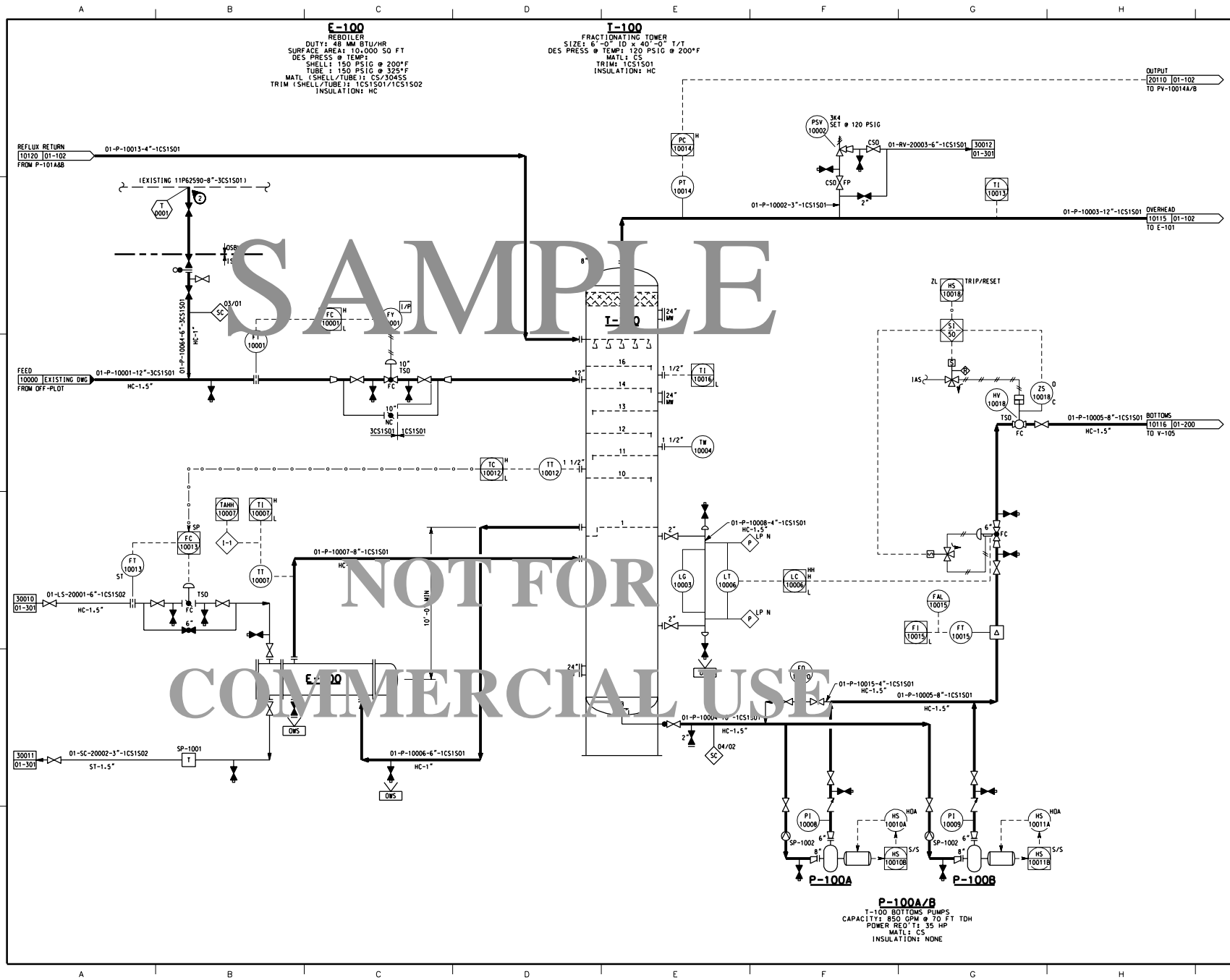
PROJECT	PLANT	DRAWING NUMBER	REV. NO.
		PIP-00-004	1

Appendix C – Example P&IDs

1. Example P&ID 1
2. Example P&ID 2
3. Example Utility P&ID

SAMPLE

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E-100
 REBOILER
 DUTY: 48 MM BTU/HR
 SURFACE AREA: 10,000 SQ FT
 DES PRESS @ TEMP: 120 PSIG @ 200°F
 SHELL: 150 PSIG @ 200°F
 TUBE: 150 PSIG @ 225°F
 MATL (SHELL/TUBE): CS/304SS
 TRIM (SHELL/TUBE): 1CS1501/1CS1502
 INSULATION: HC

T-100
 FRACTIONATING TOWER
 SIZE: 6'-0" ID x 40'-0" T/T
 DES PRESS @ TEMP: 120 PSIG @ 200°F
 MATL: CS
 TRIM: 1CS1501
 INSULATION: HC

- NOTES:**
- FOR NOTES, SYMBOLS AND ABBREVIATIONS, SEE "SYMBOLS AND NOMENCLATURE", PIP-00-001 THROUGH 003, AND "TYPICAL DETAILS WITH IMPLIED COMPONENTS", PIP-00-004.
 - CONNECT TO TOP OF LINE.

SAMPLE

NOT FOR
COMMERCIAL USE

P-100A/B
 T-100 BOTTOMS PUMPS
 CAPACITY: 850 GPM @ 70 FT TDH
 POWER REQ: 1/2 35 HP
 MATL: CS
 INSULATION: NONE

REFERENCE DRAWINGS

1	06/98	FILENAME	DRAWN
SCALE	NONE	PIPC1.DGN	GAM

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 PIPING AND INSTRUMENTATION DIAGRAM

PIP
 PRACTICE REF P1C001

EXAMPLE PAID 1
 APPENDIX C, PAGE 1

PROJECT	PLANT	DRAWING NUMBER	REV. NO.
	01	PIP-01-101	1