

SCOPE

- I 1.1 This practice covers:
 - a. Equipment, Piping, and Instrument designations (letters, numbers, and symbols) to be used on drawings and other project documents, such as loop, logic, or system diagrams.
 - ↗ b. Information that is typically shown on Flow Plans produced by Exxon and information to be shown on Piping & Instrument (P&I) diagrams and piping line lists produced by Contractors.
 - c. Graphic symbols to be used on control system visual display units (VDUs) to depict processes and process equipment.
- I 1.2 It also explains the instrument designations used on Flow Plans prepared by Exxon.
- I 1.3 **An asterisk (*)** indicates that either a decision by the Owner's Engineer is required, that additional information is to be furnished by the Owner's Engineer, or that information for Owner's Engineer approval is to be supplied by the Contractor.

SUMMARY OF ADDITIONAL REQUIREMENTS

- I 2.1 **Table 1** lists the code and standards which shall be used with this practice, and lists the practices that shall be used as specified.

TABLE 1

PRACTICES	
IP 1-1-2	CAD Drawing Standards
IP 15-7-3	Alarm Systems
CODE AND STANDARDS	
ASME Code	
B31.3	Process Piping
ANSI Standard	
Y32.11	Graphical Symbols for Process Flow Diagrams
ANSI / ISA Standards	
S5.1	Instrumentation Symbols and Identification
S5.2	Binary Logic Diagrams for Process Operations
S5.4	Instrument Loop Diagrams
S5.5	Graphical Symbols for Process Displays

- I * 2.2 **Any designation** used which is not specified or otherwise covered in this practice, in **ANSI Y32.11**, or **ANSI / ISA S5.1** shall be explained on the drawings, diagrams, and line lists.

EQUIPMENT AND INSTRUMENTATION DESIGNATIONS

INSTRUMENTATION DESIGNATIONS

- I 3.1 Whether local or transmitted, each instrument measurement or control loop shall be designated by an alphanumeric code or tag number. Instrument designations shall consist of letters, symbols, and numbers as follows:
 - a. Instrument functionality shall be defined using the **VARIABLE** identification letters in [Table 2](#).
 - b. Graphic representation of instrumentation for Exxon Flow Plans shall typically be in accordance with standard symbols and notation shown in [Tables 3](#) and [4](#).
 - * c. All instrumentation shall be consecutively numbered within each process unit by **VARIABLE** type ([Table 2](#)). Numbers shall range from 001 to 999. The Owner's Engineer shall be responsible for supplying all final tag numbers.

Each instrument of similar **VARIABLE** type (flow, pressure, level, etc.) shall have a unique number in that unit. The use of sequence letters (A, B, C, etc.) should be avoided, but where used must be approved by the Owner's Engineer.

IP 1-1-1	Drawings, Diagrams, and Line Lists	 INTERNATIONAL PRACTICE
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(This practice is appropriate for attachment to Inquiry or Purchase Document)

EQUIPMENT AND INSTRUMENTATION DESIGNATIONS (Cont)

- d. Local gauges (i.e., PIs, TIs, Gauge Glasses, etc.) and restriction orifices shall also be numbered in accordance with sub-paragraph 3.1c.
- e. Individual instruments within an instrument or control loop, such as transmitters, alarms, recorders, and control valves, shall have the same variable type and number designation as the primary instrument. In the case of a loop containing two or more actuating devices (e.g., split-range control valves), each actuating device shall have the same number as the primary instrument, followed by suffix letters as required (example: "A," "B," "C," etc.).

I 3.2 **Auxiliary instrument components**, such as transmitters, alarm switches, transducers, types of transmission lines, and similar components, do not appear on flow plans prepared by Exxon. The Contractor shall engineer these components and show them on all P&I drawings.

I * 3.3 **The instrument identification tag** shall be written as:
(UNIT) (VARIABLE) (FUNCTION) (INSTRUMENT NUMBER)

For example:

- ✦ a. Flow (Indicating) Controller: S1FC001
- b. Control Valve associated with this Flow Controller: S1FV001
- c. Low Flow Alarm associated with this Flow Controller: S1FAL001
- d. Flow Recorder Controller (dedicated pen): S1FRC001

I 3.4 **Flow plan designations** shall be according to **ANSI/ISA S5.1** except as modified in [Tables 3, 4, and 5](#).

PROCESS ALARM DESIGNATIONS

I ✦ 3.5 **Process alarms have three priority levels** as defined in [IP 15-7-3](#). **Priority 1** alarms are displayed on an independent annunciator system. **Priority 2** alarms are typically only displayed in the DCS. **Priority 3** alarms are typically computer control applications-generated alarms or messages and do not show up on Exxon Flow Plans. The alarm set point shall be indicated and located adjacent to the appropriate loop symbol.

I 3.6 For application examples of process alarms, see [Table 6](#).

EQUIPMENT DESIGNATIONS

I 3.7 **Process equipment designations** consist of letters, symbols, and numbers as follows:

- a. Piping and valve symbols are given in [Table 3](#).
- b. Identification letters shall be per [Table 7](#).
- c. Equipment symbols used on flow plans prepared by Exxon are illustrated in [Table 8](#).

I 3.8 **Sequence number of equipment** shall be as follows:

- a. Each type of equipment, such as pumps, exchangers, and drums to be numbered consecutively within each unit or established section.
- b. If two or more pieces of similar equipment are in the same service, each is designated with a sequence letter (A, B, C, etc.) following the equipment letter.

P&I DIAGRAMS

I 4.1 **P&I diagrams shall show all equipment to be installed** in the plant and all base regulatory controls of the unit. As a minimum, the details and identifying information given in [Table 10](#) shall appear on the diagrams for the listed equipment and facilities. The symbology used on the P&I diagrams shall be per **ANSI/ISA S5.1** with the addition of the supplements shown in [Table 5](#).

I 4.2 Piping and equipment representation on P&I diagrams shall be per the following:

- a. **Within process boundary lines:** Flow representation for process streams.
- b. **Utility and chemical piping within process plant areas:** If not specified, either flow or geographical representation is acceptable.
- c. **Outside process plant boundary lines:** Geographic representation for piping, and interconnecting piping between process plants and tankage.

LOGIC DIAGRAMS

- I ♦ 5.1 **Logic diagrams** and equivalent Cause & Effect or Event diagrams, shall be produced for all applications where instrument equipment performs logic functions. Logic diagrams shall be separate from P&I diagrams.
- I 5.2 Logic diagrams shall show the interlocking and sequencing of switching systems for the start-up, operation, and shutdown of equipment and processes.
- I ♦ * 5.3 Logic diagrams shall be drawn using the symbols shown in **ANSI/ISA S5.2**.
- I * 5.4 Logic diagrams show the flow of information and do not imply the type of equipment to be used to implement them. Implementation may be by programmable logic controller, relay logic, computer, or a combination of any of these.

LOOP AND SYSTEM DIAGRAMS

- I 6.1 **A loop or system diagram** shall be provided for every instrument loop (control, indicating, protective, etc.) to illustrate its operating philosophy. This is an extension of P&Is, which shows the components and accessories of the instrument loop, connections between devices, cable, junction box and terminal numbering codes, and identification of component action.
- I ♦ * 6.2 Loop or system diagrams shall appear from P&I diagrams and Logic diagrams. An example of a typical loop or system diagram layout is shown in **ISA S5.4, Figure 6**.
- I 6.3 As a minimum, the loop or system diagram shall contain the following information:
 - a. Identification of the loop and loop components.
 - b. Indication of interrelationships to other instrumentation loops, including overrides, interlocks, cascaded set points, etc.
 - c. All point-to-point interconnections with identifying numbers or colors of electrical cables, conductors, pneumatic tube bundles, and individual pneumatic and hydraulic tubing. This identification of interconnections includes junction boxes, bulkheads, ports, and grounding connections.
 - d. General location of equipment such as field, panel, rack termination cabinet, etc.
 - e. Energy sources of equipment such as electrical power, air supply, and hydraulic fluid supply. Identify voltage, pressure, and other applicable requirements. For electrical sources, identify circuit or disconnect numbers.
 - f. Actions or fail-safe positions of devices such as switches, control valves, and solenoid valves.
 - ♦ g. Identification of all auxiliary components used to make up the full functionality of an instrument loop shall be shown even when the equipment has been designed and provided in whole or in part by different Vendors/Contractors and is detailed across more than one P&I diagram.

ELECTRONIC DESIGN TOOLS

- I ♦ * 7.1 If the Contractor uses a Computer-Aided Design Documentation (CADD) package to generate project P&I diagrams, the Owner's Engineer shall be contacted to assure compatibility between the Contractor's system and the Owner's.
- I ♦ 7.2 If the Contractor uses an Instrument Design and Documentation System (IDDS) package to generate project documentation (loop diagrams, spec. sheets, cable schedule, etc.), the Owner's Engineer shall be contacted to assure compatibility between the Contractor's system and database format and the Owner's.
- I ♦ 7.3 Logic system Vendors/Contractors will provide logic diagrams and associated documentation according to **ANSI/ISA S5.2**.

PIPING LINE LISTS

- I 8.1 **Line tabulation sheets** shall contain the following identifying information for each line:
 - a. Line number.
 - b. Piping material classification (if referenced to a piping material specification, a symbol shall be used).
 - c. Nominal pipe size and wall thickness (schedule number).
 - d. Origin and termination.

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PIPING LINE LISTS (Cont)

- e. Design temperature and pressure.
- f. Specified corrosion allowance.
- g. Heat tracing (indicate steam or electric). Indicate whether tracing is for **process protection or winterization**.
- h. Insulation type and thickness.
- i. Test pressure (indicate hydrostatic or pneumatic).
- j. If allowances for variations from normal operations are being made, per **ANSI B31.3**, Par. 302.2.4, indicate the pressure-temperature condition which governs the design, and identify the situation (i.e., regeneration, decoking, etc.) causing these conditions.

The following information may be shown on supplemental data sheets:

- k. Piping metal temperatures used for flexibility check (indicate more than one temperature if multiple temperature conditions apply).
- l. Identify the governing condition for piping flexibility design such as max. or min. operating temperature, equipment steam-out or line steam-out, line bypassed, regeneration, decoking, steam tracing, and tank nozzle rotation.

Revision Memo

1/69	Original Issue of Basic Practice
1/71	Revision 1
6/71	Revision 2
6/74	Revision 3
1/77	Revision 4
1/81	Revision 5
1/85	Revision 6
12/92	Revision 7
6/93	Revision 8
6/96	Revision 0 - Original Issue of International Practice
3/98	Revision 1
	This is a reaffirmation of IP 1-1-1 with only minor editorial changes.

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Documents

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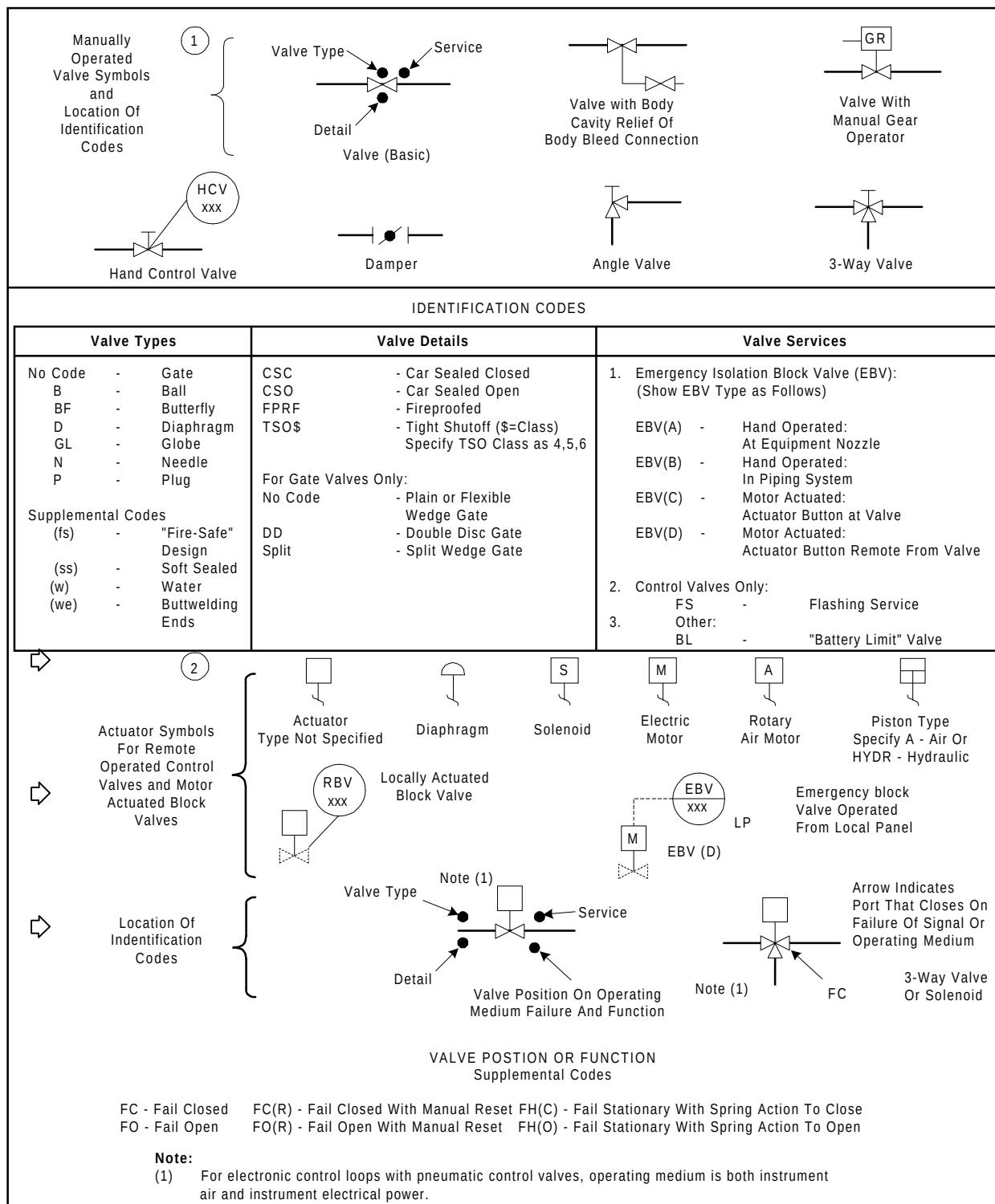
TABLE 2 ⁽³⁾
INSTRUMENT OR LOOP TAG IDENTIFICATION LETTERS

LETTER	VARIABLE TYPE	FUNCTION CODES		
		POSITION 1	POSITION 2	POSITION 3
A	Analysis	Alarm	Alarm	Alarm
B	Burner Flame	Block		
C	Corrosion	Controller Closed	Controller Closed	Controller Closed
			Cut In (CI)	Cut In (CI)
			Cut Out (CO)	Cut Out (CO)
D	Density Draft	Dial (Indicator) Differential	Dial (Indicator)	
E	Voltage Emergency	Element (Primary)	Element (Primary)	
F	Flow	Ratio (Fraction)		
G		Glass/Gauge		
H	Hand Actuated	High	High	
I	Current	Indicating Indicator (5)	Indicating Indicator (5)	
J	Power			
K	Time Frequency	Rate of Change		
L	Level	Low Light/Lamp	Low Light/Lamp	
M	(1)		Metal	
N	(1)			
O	(1)	Open	Open	Open
P	Pressure			
Q	(1)	Integrator/Totalizer	Integrator/Totalizer	Integrator/Totalizer
R	Radiation Remote Operated	Recorder Pan (2)	Recorder Pan (2)	
S	Speed	Switch/Pushbutton	Switch/Pushbutton	
T	Temperature	Transmitter (4)	Transmitter (4)	
U	Digital Temperature Indicator			
V	Vibration	Valve/Damper/Louver	Valve/Damper/Louver	Valve/Damper/Louver
W	Weight	Well		
X	Unclassified	Auxiliary Instrument (Protective Systems Only)		
Y	Event/State	Relay/Computation Function/Other Auxiliary Instrument		
Z	Position (Displacement)			

Notes:

- (1) Variable type to be specified as required for individual project.
- (2) Where pen is permanently connected to process variable.
- (3) This table replaces **Table 1** of **ANSI/ISA S5.1**.
- (4) Modifier code typically not used on flow plan drawings prepared by Exxon.
- (5) Indicator function code is implied for DCS loops.

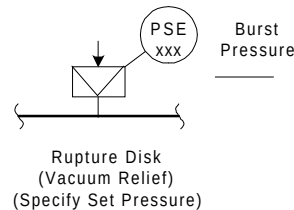
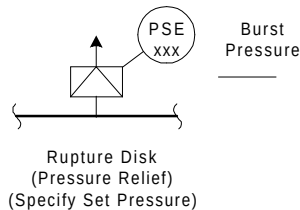
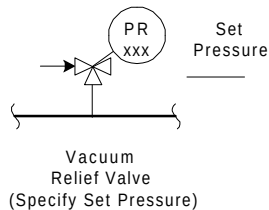
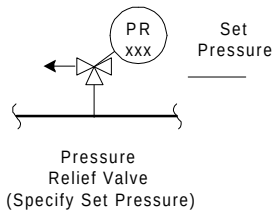
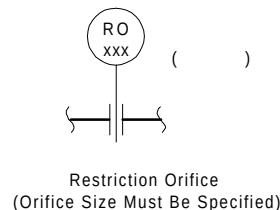
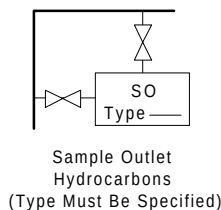
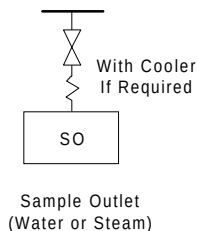
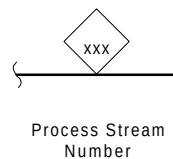
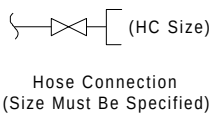
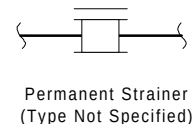
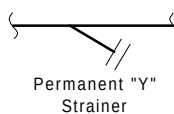
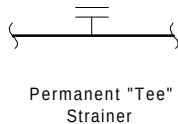
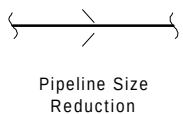
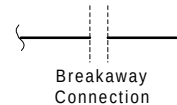
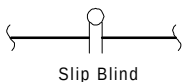
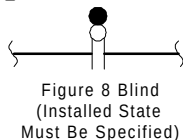
TABLE 3
PIPING AND VALVE SYMBOLS USED ON EXXON FLOW PLANS
(FOR ADDITIONAL SYMBOLS, SEE ANSI Y32.11 AND ANSI/ISA S5.1)



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TABLE 3 (Cont)
PIPING AND VALVE SYMBOLS USED ON EXXON FLOW PLANS
(FOR ADDITIONAL SYMBOLS, SEE ANSI Y32.11 AND ANSI/ISA S5.1)

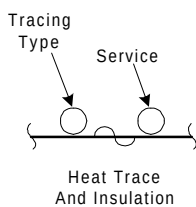
3 Miscellaneous Piping And Valve Symbols



(Relief Valve Type Specified On Spec. Sheet)

Corrosion Monitoring
Probes And Coupons

Identification Codes:



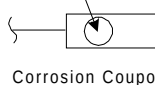
Tracing Type

E - Electric
H - TR-Type Not Specified
S - Steam

Service

PRO - Process
W - Winterization

Location Of
Identification Code

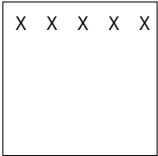


Identification Codes:

H ₂ P	-	Hydrogen Probe (Through-Wall)
PH ₂ P	-	Hydrogen "Patch Probe"
CPP	-	Polarization Resistance Probe
CC	-	Corrosion Coupon
CRK	-	Corrosion Rack

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TABLE 4
PRIMARY ELEMENT AND INSTRUMENT FUNCTION SYMBOLS USED ON EXXON FLOW PLANS

INSTRUMENT FUNCTION SYMBOLS (STANDARD ANSI/ISA S5.1 SYMBOLS)			
			
Local (Field Mounted) Instrument	Panel Mounted Instrument On Local Control Panel (Includes Local Panel Alarms)	Panel Mounted Instrument In Remote Instrument Building	Panel Mounted Instrument In Control House (Includes Priority 1 or Hardwired Alarms)
			
Instrument Function In DCS System	Temperature Signal Through Independent Digital Temperature Indication System	Instrument Function In Logic System (i.e., PLC)	Tied To An Emergency Shutdown System (Protective System) (n Designates System Number)
			
General Interlock Input Or Output	Safety Critical Instrument Or Loop Designation	Descriptive Text For Complex Control Systems (i.e., Air/Fuel Ratio)	

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