

STANDARD SPECIFICATION FOR
PID PREPARATION

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STANDARD SPECIFICATION FOR PID PREPARATION

INTRODUCTION

The purpose of this document is to define the rules which have to be followed to prepare PID's, in the absence of specific requirements on the subject from Client in the Contract.

When such requirements exist, they have to be followed, and the present document shall be modified accordingly.

In case of licensed units, the rules of the process Licensor will be followed, unless otherwise dictated by Contractual requirements.

STANDARD SPECIFICATION FOR PID PREPARATION

1. INFORMATION TO BE INCLUDED ON PID

All information to be shown on PID shall include at least those reported herebelow:

1.1. EQUIPMENT

- Items and service description;
- elevation of bottom tangent line for:
vessels, towers, condensers and reboilers;
- main internals of vessels and towers, (demisters, coils, packed sections, vortex breakers, type and number of trays, etc.);
- details for pumps on process PID's, such as: warm-up piping, strainers, casing vents and drains, cooling water arrangement, flushing facilities, for auxiliary lines, etc.;
- lube and seal oil facilities for compressors, turbines and blowers;
- fuel arrangement for heaters and boilers on a separate process PID;
- snuffing steam and decoking facilities for heaters;
- purging of equipment and associated lines on process PID;
- listing of equipment (lower right-hand area);
- main equipment characteristics (at the issue for construction);
- external finish code (tracing, insulation).

1.2. INSTRUMENTATION

- Symbols in accordance with ISA Standards S 5.1 "INSTRUMENT SYMBOLS AND IDENTIFICATION";
- all instrument loops and auxiliary components;
- clear identification of software linkage and alarm shut-down logic systems;
- analyzer loop details;
- control and safety valves according to points 12. and 13. respectively.

1.3. PIPING FOR PROCESS AND UTILITIES PID'S

- Line number according to point 4;
 - description of process product entering or leaving;
 - continuation reference to subsequent drawing;
 - utilities lines identification (as per point 5.);
 - piping specialty items (figure 8 blinds, strainers, sample connections, car sealed or locked valves, etc.);
 - indications for piping arrangement, such as: slope, min./max distance, hydraulic seals, etc.;
 - types for all isolation valves according to process requirements and piping specifications;
 - pressure underground lines;
 - utility stations and safety showers;
 - process drains and vents;
 - heat tracing and jacketing arrangements.
-

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1.4. MISCELLANEOUS

- Sewage indications (white, oily, chemical);
- limit of supply;
- utility distribution drawings (geographical arrangement according to plot plan).

2. LIST OF PLANT & UNITS

The subdivision of the project into plants and units shall be done in accordance with the Project Basic Design Data.

3. DRAWING NUMBERING SYSTEMS

Process drawings shall be identified according to the attached reference drawings.

Guideline for Grouping Utilities in Utilities Distribution PID's (Notes 1 and 2)

Utilities will be grouped as follow:

- Steam
Condensate
Boiler Feed Water
Demineralized water
 - Cooling water
Raw water
Service water
Potable water
Potable water underground and aboveground
 - Plant and Instrument air
Nitrogen
Fuel gas
Fuel oil
 - Blow down and flare
LPG closed drain
 - Aboveground slops lines
 - Flushing Oil
 - Underground closed drains
(Process and chemical)
-

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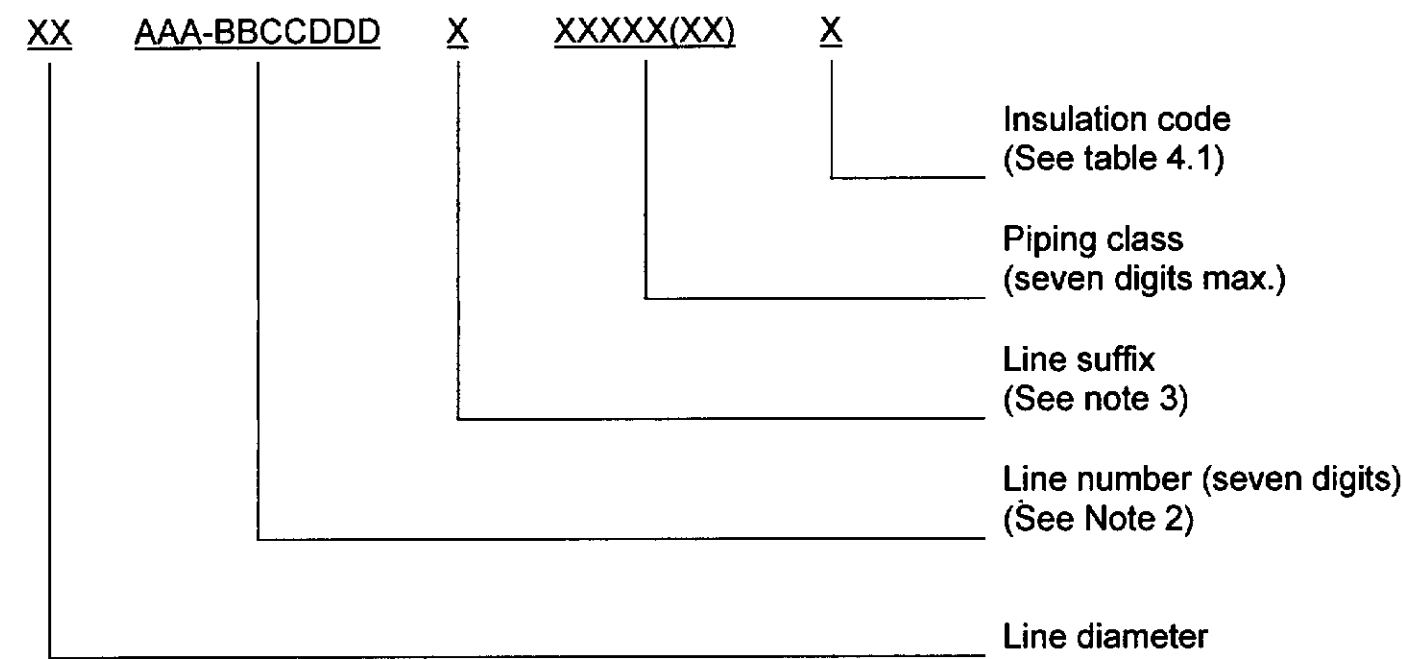
h. Fire fighting

NOTES:

- 1) For utilities geographical distribution PID's the range of numbering is from 51 to 99 and according to the sequence as mentioned.
(Valid for fire-fighting distribution also)
- 2) PID's sequential number range for each type of utility, shall be predefined to provide consistent progressive numbers.

4. LINES NUMBERING SYSTEM FOR PID'S AND LINE LIST

- 4.1. Unit number: see note 1.
- 4.2. Process and utility lines shall be identified by the following numbering system



NOTES:

- 1) In all cases the unit number is mentioned inside PID title block, line list, isometrics and bill of materials.
- 2) The digits, in general, are defined as follows:
 - AAA three digits refer to fluid identification code
 - BB two digits for unit number (according to point 2 above)
 - CC two digits refer to the PID where line is generated (see Note 4)
 - DDD three digits refer to the sequential line numbers.

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Example:

- Process and utilities generation lines from 001 up to 299
- Utilities and fire-fighting lines from 301 up to 399
- Equipment ancillaries from 401 up to 499
- Steam and Condensate manifold from 501 up to 799
- Utility stations from 801 up to 999

- 3) 0 = main line, 7 = partially traced line; 8 = jacketing line and 9 = full tracing line. Line suffixes 7-8-9 are indicated at least on line list only.
- 4) For P&ID drawings the numbering is splitted as follows:
- Process & utilities generation PID's: from 01 to XX (for each unit or block)
 - Utilities distrib. & fire fighting PID's: from XX to 99 (for each unit or block)
-

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TABLE 4.1
INSULATION CODES

CODE	TYPE
A	Acoustical insulation (Note 2)
H	Heat Conservation
E	Electrical Tracing
F	Cold Insulation
J	Jacketing
N	No Insulation
P	Personnel Protection ($t \geq 65^{\circ}\text{C}$)
S	Steam Tracing
V	Uninsulated Tracer (Note 3)
Z	Painting
C	Anticondensation
I	Winterizing/Antifreezing
T	Hot Oil Tracing

NOTES:

- 1) The available codes can be increased following the project requirements; in any case their choice must be done in conjunction with Engineering Department.
Insulation limit codes and tracing limit codes are shown only on line list.
Refer to Table 4.2 - Selection of insulation limit codes.
Refer to Table 4.3 - Selection of tracing limit code according to the temperature to be maintained.
- 2) Use code "A" in second position when other insulation is required.
Example: For Line "H" with insulation, the acoustical insulation is "HA"
- 3) Use this code on line list (LDL) only for lines with suffixes 7 and 9.

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TABLE 4.2

INSULATION LIMIT CODE (ON LDL LINE LIST ONLY)

1.

Insulated valves/Uninsulated flanges
2.

Insulated valves and flanges - Note 1
3.

Uninsulated valves and flanges - Note 1
4.

Traced and insulated valves, insulated flanges
5.

Traced and insulated valves, uninsulated flanges
6.

Traced and insulated line, untraced and uninsulated valves and flanges
7.

Jacketed and insulated valves – Insulated flanges – Note 1

Note 1 - Only in case of connecting flanges (Ex: on equipment)

TABLE 4.3

TRACING LIMIT CODE (ON LDL LINE LIST ONLY)

S1:	STEAM	TRAC.	TM	=	note 1
S2:	STEAM	TRAC.	TM	=	note 1
S3:	STEAM	TRAC.	TM	=	note 1
T1:	HOT OIL	TRAC	TM	=	note 1
T2:	HOT OIL	TRAC	TM	=	note 1

TM = Temperature to be maintained.

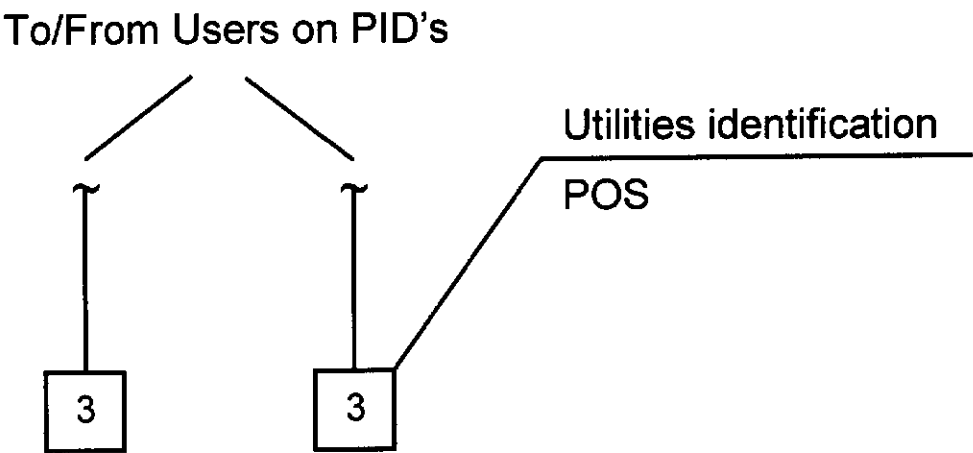
Note 1: To be defined

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5. UTILITIES IDENTIFICATION ON P&I DIAGRAMS

5.1. ALTERNATIVE 1

The utilities shall be identified by means of a numerical code in accordance with the following table.
In addition the number of the relevant utility distribution drawing shall be shown.

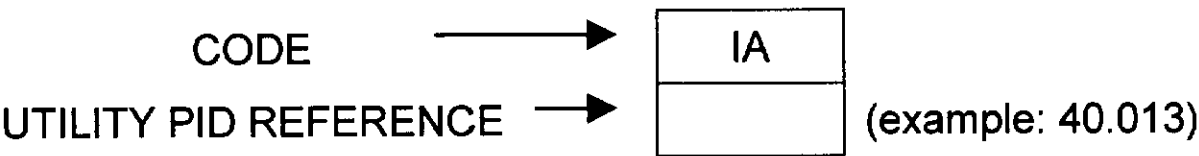


UTILITIES IDENTIFICATION							
POS.	DESCRIPTION	CODE	REF. DWG	POS.	DESCRIPTION	CODE	REF. DWG
1	FIRE WATER	FW		19	HOT OIL	HO	
2	SERVICE WATER	SW		20	FUEL OIL	FO	
3	COOLING WATER	CW		21	FUEL GAS	FG	
4	POTABLE WATER	PW		22	HOT FLARE	HF	
5	DEMINER. WATER	DW		23	COLD FLARE	CF	
6	TREATED WATER	TW		24	HOT BLOWDOWN	HB	
7	QUENCH WATER	QW		25	COLD BLOWDOWN	CB	
8	HHP STEAM	HH		26	CLOSED DRAIN	CD	
9	HP STEAM	HS		27			
10	MP STEAM	MS		28			
11	LP STEAM	LS		29			
12	HP CONDENSATE	HC		30			
13	MP CONDENSATE	MC		31			
14	LP CONDENSATE	LC		32			
15	BFW	BW		33			
16	PLANT AIR	PA		34			
17	INSTRUMENT AIR	IA		35			
18	NITROGEN	IG		36			

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5.2. ALTERNATIVE 2

The utilities identification shall be shown as follows to/from users on PID's:



6. PIPING AND INSTRUMENT SYMBOLS

The piping and instrument symbols to be used for P&ID preparation are shown on the attached drawings "Symbols & Standards for P&I Diagrams".

7. VESSELS AND TANKS

- 7.1. Unless otherwise dictated by process or licensor requirements, vessels connections shall be minimized by installing relief valves, TI's, vents, PI's and other connections on piping where possible instead of vessels.
- 7.2. Minimum size for vent and drain connections of vessels shall be as per para 14.1.3.

Minimum flanged connections size shall be 2".
- 7.3. Generally, the liquid nozzles connected to a pump suction, reboiler feed, side draw-off shall be provided with vortex breakers.
- 7.4. All tanks shall have isolating valves on process lines both at the tank nozzles and outside the tank dike.
- 7.5. When allowed, in order to minimize connection on vessels stand pipes for level instrument connections, (2"-300# min., valved or unvalved, stand pipe flanged connection) can be provided.

Isolating valves to be installed on single level transmitter or gauge glass.

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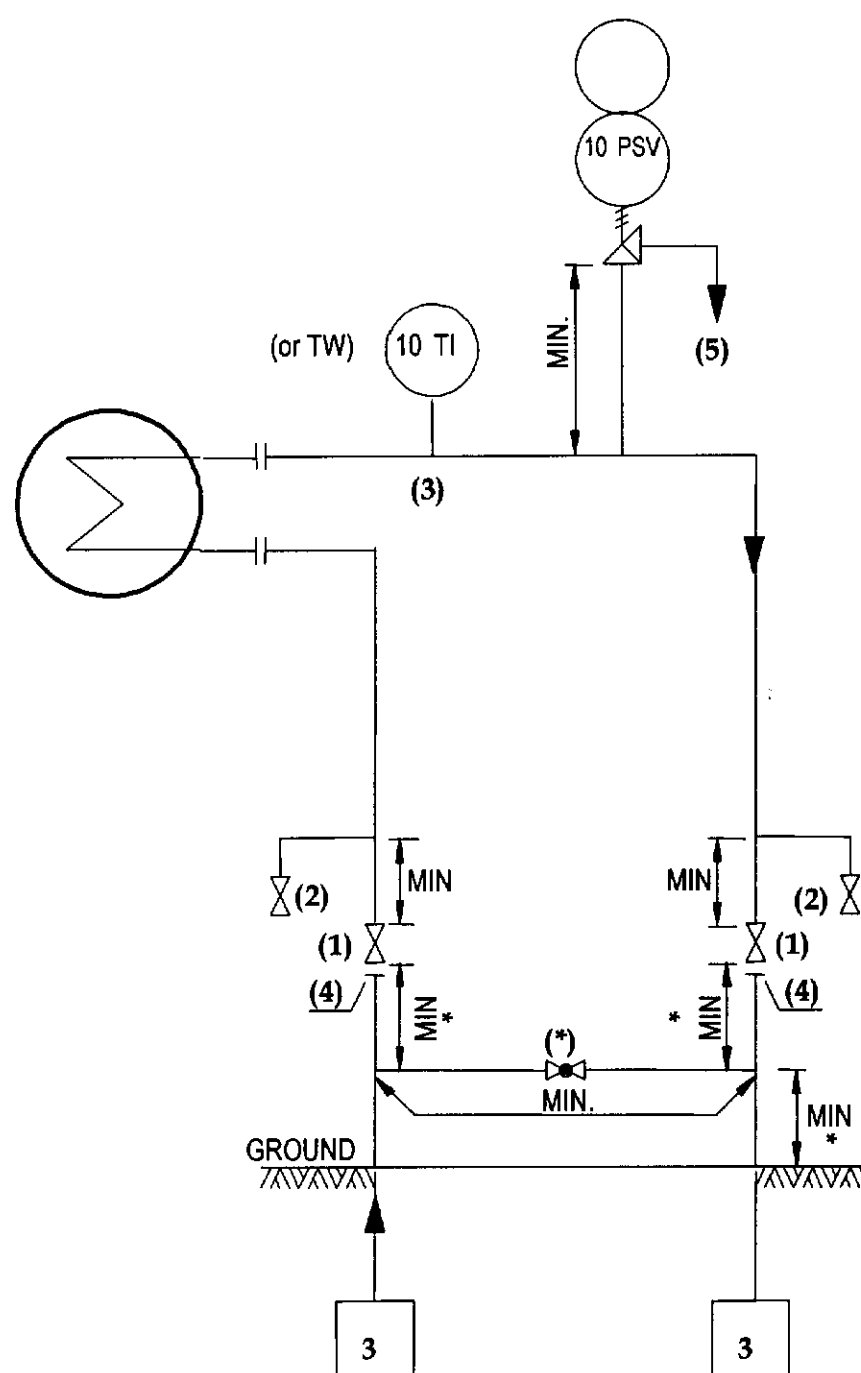
8. WATER COOLERS

- 8.1. Piping arrangement for water lines around coolers is shown in fig. 8.1.
- 8.2. Valves on cooling water service shall be as per piping class. Normal practice will be:
- Inlet side valves $\leq 1\frac{1}{2}"$: gate
 $\geq 2"$: butterfly
 - Outlet side valves $\leq 1\frac{1}{2}"$: globe
 $\geq 2"$: butterfly
- 8.3. Winterizing and protection against ambient temperature of water lines shall be done in accordance with para 26.
- 8.4. Water piping shall be arranged, as far as possible, so that the equipment remain full of water in case of water supply failure.

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WATER COOLER ARRANGEMENT

FIG. 8.1



NOTES:

- 1) Inlet and outlet valves according to point 8.2.
- 2) Drain size as per para 15.1.3 (Typically 3/4") - Plugged
- 3) Typically provide 6" or 4" min. for TI installation.
- 4) Cathodic protection to be provided if required
- 5) Discharge at grade or sewer, depending on ambient temperature
- * If required for winterizing, refer to para 27

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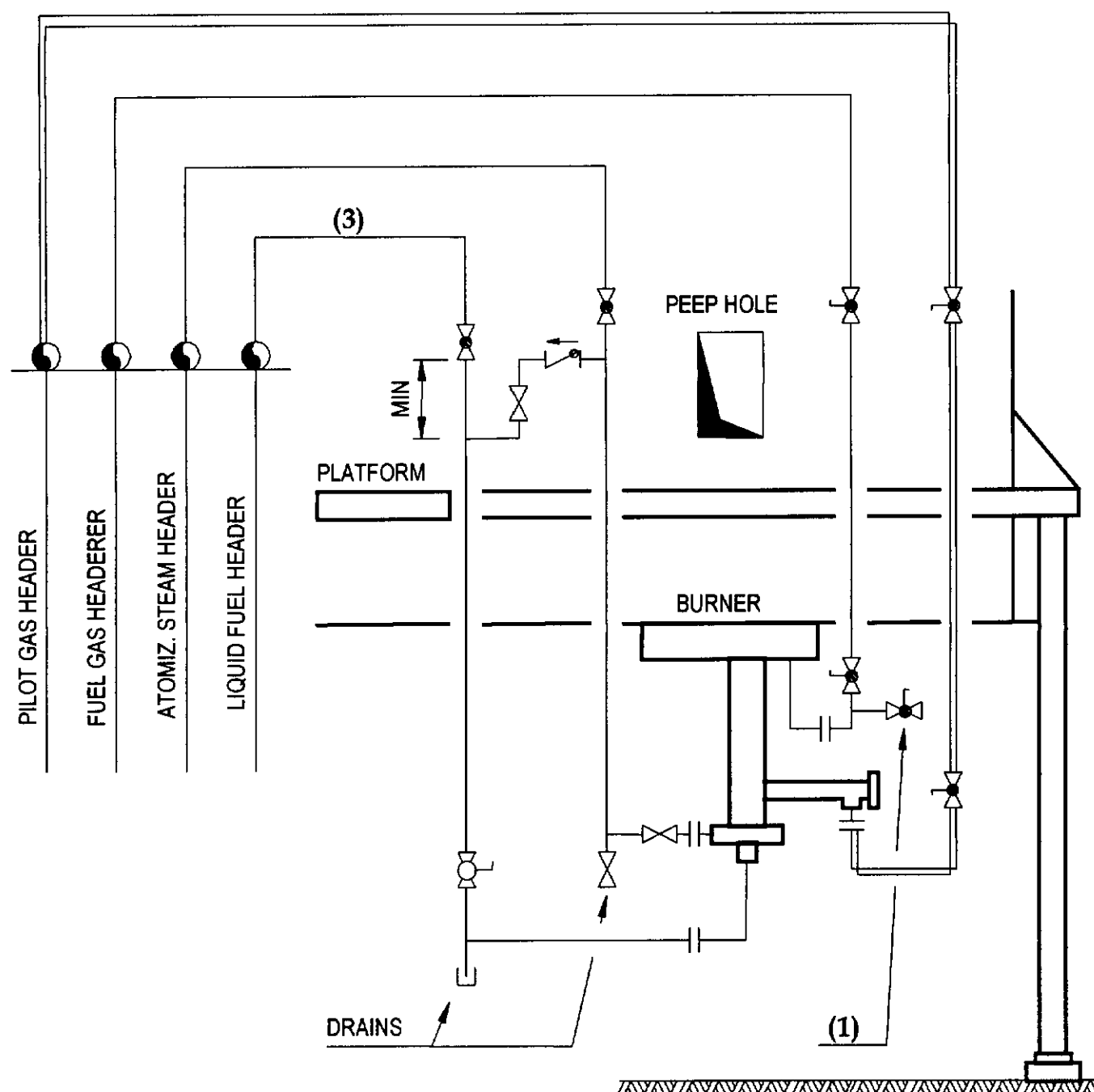
9. HEATERS

- 9.1. The fuel gas drum will not be insulated or heat traced and will normally not be provided with demister.
- 9.2. The pilot gas header shall be equipped with "Y" type strainer (30 mesh min.) and shall be picked up from fuel gas header upstream of main fuel gas control valve.
- Pilot gas header shall be heat-traced to the burners.
- 9.3. In general fuel gas header shall be heat-traced downstream of KO Drum.
- 9.4. Piping to individual burners shall be arranged as shown in fig. 9.1.
- Locate burner valves adjacent to observation door to permit burner adjustments while observing the flame.
- Flexible hose should be used in burner piping (Note 4).
- 9.5. Atomizing steam shall be provided for burners in liquid fuel service (except when mechanical atomizing is required). (Note 4)
- 9.6. Heater with burners in liquid fuel service shall be equipped with soot blowers supplied with steam. (Note 4)
- 9.7. Snuffing steam (.....) shall be provided at furnace header boxes and fireboxes. (Note 4)
- 9.8. Transfer lines from heaters to distillation columns shall, immediately upon leaving the heater, be led to an elevation above the one at which the column is to be entered to ensure free draining.
- The line shall slope towards the column and should be preferably straight over at least ten times its largest diameter before entering the column.
- 9.9. All manually operated isolation valves on pilot gas, fuel gas, fuel oil and snuffing steam lines must be located at safe location (e.g. behind a fire wall 15 m. min. away from the heater in an easily accessible position at grade).
-

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TYPICAL ARRANGEMENT FOR HEATER BURNERS

FIG. 9.1



NOTES:

- 1) Connection for portable manometer shall be provided for all burners.
- 2) Flexible hose shall be normally used in burner piping.
Use ball valves in all fuel lines just before the burner inlet.
- 3) Heat tracing to be provided as required.
- 4) To be checked with vendor requirements.

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10. PUMPS

10.1. Suction and discharge valves shall be line-size.

However, if the suction and discharge lines are two or more sizes larger than the pump nozzles, the valves can be the next size smaller (for suction line process checking is required).

If required, recycle lines shall be connected back to the suction vessel, preferably upstream of a cooling source.

When two or more pumps are manifolded, and only if by pass of check valve is installed, the suction valve and any components between the pump and the valve shall be specified for 2/3 full shut off pressure.

Blow down facilities shall be provided for pumps handling C4 and lighter fluids (see para 15.2.1)

Warm-up/cool-down facilities shall be required when pump is spare or out of service for either of the following conditions:

- the pump temperature exceeds 230°C or specific process cases
- the ambient temperature is below the pour or freezing point of the process fluid.
- cryogenic pumps.

10.2. Temporary strainers shall be installed on suction side of all pumps, unless permanent strainer are specified.

Permanent strainers installation shall be analysed in the following cases:

- pumps in dirty service
- suction line larger than 8" or smaller than 2"
- steam traced suction lines.

In general the strainer selection is:

- "Y" type for lines 2" and smaller
- "T" type for lines larger than 2"

They should not installed if not allowed by the handled fluid (slurries, etc.) or for jacketed lines.

Strainer body material shall be suitable for handled fluid.

Screen shall be made of S.S. for permanent strainers and carbon steel for temporary strainers, unless otherwise required by the operating temperature and fluid

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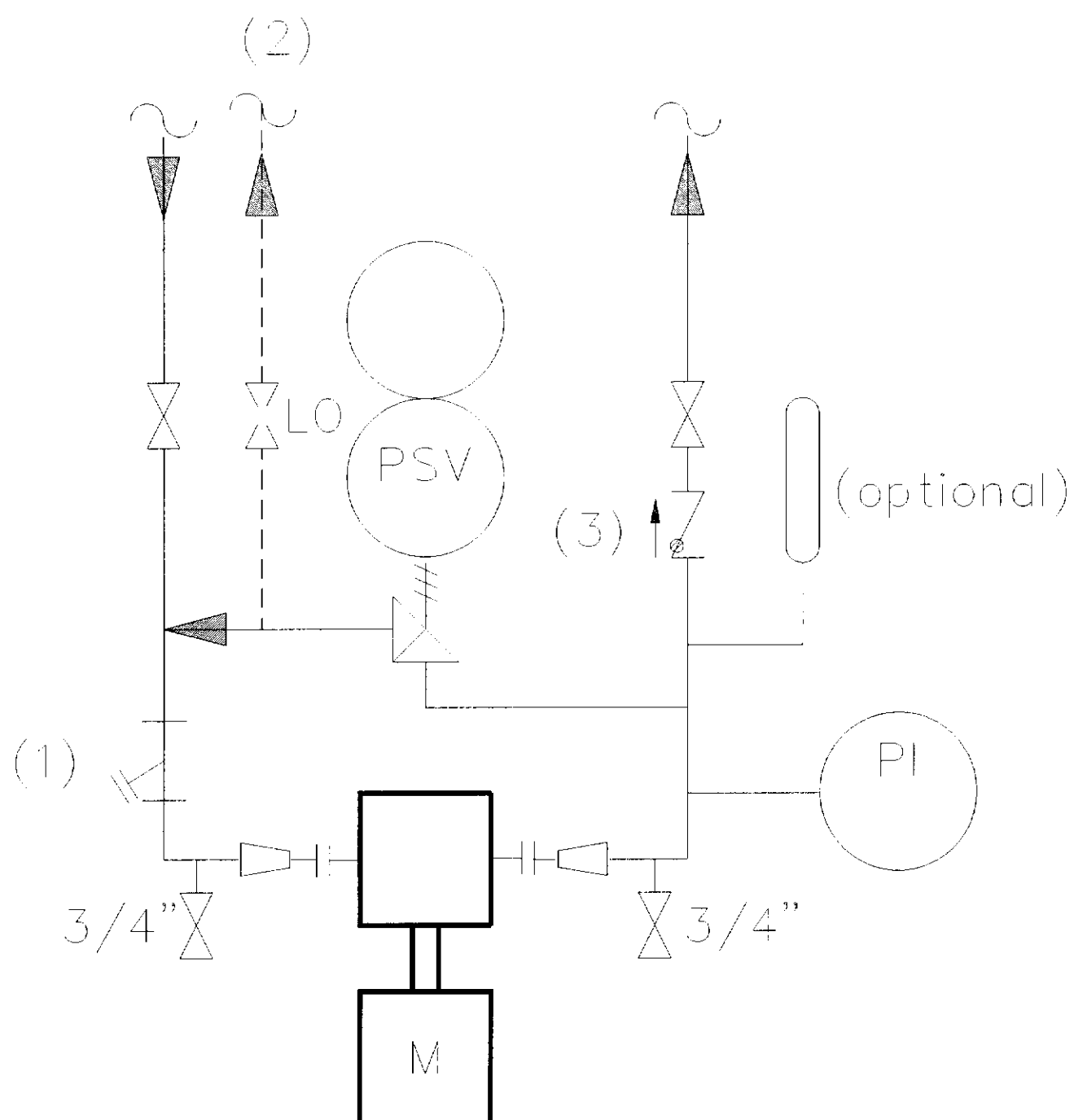
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- 10.3. On discharge side of pump where the pump differential pressure exceeds 70 bar, double check valves installation should be analysed, unless otherwise specified.
 - 10.4. Piping arrangement for centrifugal and reciprocating pumps are shown in fig. 10.1 and 10.2, respectively.
-

- 1) Normally temporary filter is provided. Filter type is by piping.
- 2) By-pass line for warm-up or cool-down (if required by process or licensor); $\frac{3}{4}$ " drain valve not required when warm-up is provided and by-pass line connected between block and check valve.
- 3) Vent and drain requirements, according to Vendor Supplier ($\varnothing \frac{3}{4}$ minimum), refer to para 15.2
- 4) The check valve by-pass can be connected either upstream or downstream the block valved at pump discharge.

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PROPORTIONING/RECIPROCATING PUMP

FIG. 10.2



NOTES:

- 1) Permanent type strainer
- 2) Safety valve piped back to pump suction line or suction drum
- 3) Check valve shall be installed (optional)
- 4) Pulsation dampener to be shown, if required, as per pump supplier

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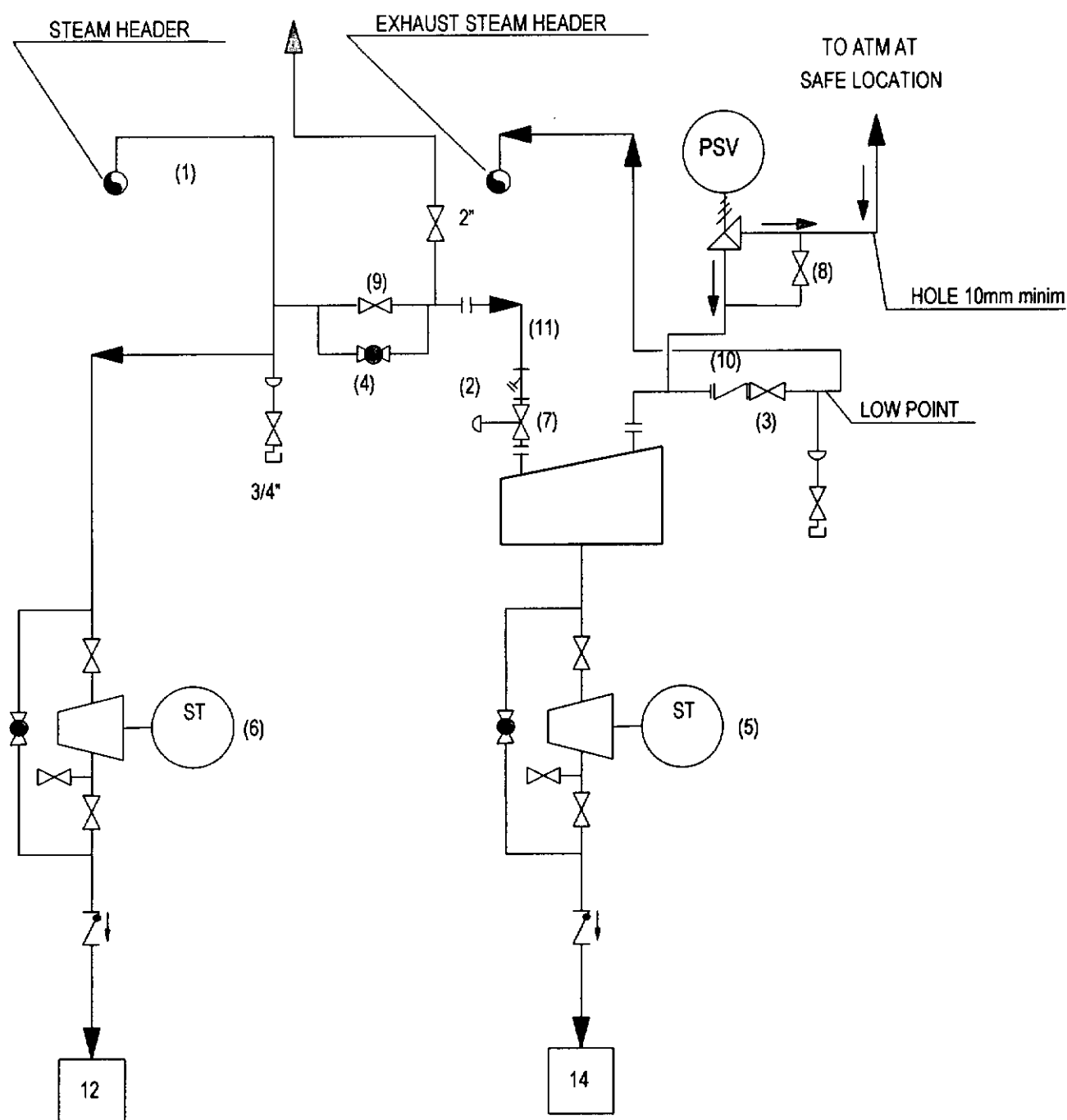
11. STEAM TURBINES

- 11.1. Steam feed pipe can be valved at branching off from the header and near the turbine; the latter is not necessary if on-off valve is provided for automatic start-up.
- A permanent "Y" type strainer shall be installed in vertical position as close to the turbine as possible if not included in Vendor supply.
- 11.2. If the exhaust steam is connected to a header, the turbine discharge shall be equipped with a safety valve and a block valve
- All low points of turbine casing shall be equipped with steam traps (on Vendor PID).
- 11.3. Piping arrangement for steam turbine is shown in Fig. 11.1.

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STEAM TURBINE ARRANGEMENT

FIG. 11.1



NOTES:

- 1) Locate block valve at min. distance from header (if required)
- 2) Strainer type according to Vendor requirements
- 3) For automatic start of turbine this valve must be LO
- 4) Turbine warm-up by-pass (3/4" min. size to be adapted)
- 5) Number and connection type for steam trap are in accordance with turbine supplier requirements
- 6) Steam trap to be located at low point of steam line
- 7) On/Off valve for automatic turbine start, globe valve for manual turbine start-up will be provided
- 8) By-pass to be sized for turbine start-up. Valve type as per piping class
- 9) Distance from inlet isolation valve to the turbine inlet to be minimized
- 10) Installed in horizontal position (Valve and check valve)
- 11) Piping arrangement to allow pipe cleaning test.

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12. RECIPROCATING COMPRESSOR

- 12.1. In general, suction line routing from K.O. Drum to compressor shall be sloped toward K.O. drum and pockets shall be avoided.

In case this would not be possible, drain pots with liquid traps devices shall be provided or tracing.

- 12.2. Tracing of the suction piping from K.O. drum to compressor suction pulsation damper is required when the minimum ambient temperature is equal or lower than gas dew point. In this case draining pots with automatic draining devices can be omitted but manual draining before start-up shall be allowed.

13. CONTROL VALVES

- 13.1. Control valves shall be provided with block and by pass valves if:

- 1) the size of the control valve is 2" and smaller; or
- 2) the manual control is possible and allowed;
- 3) the size of the control valve is larger than 2" and smaller than 8"; and
 - the control valve is in critical service (Process or Licensor requirement); or
 - cannot be dismantled without shutting down the whole unit.
 - foulant, corrosive, erosive service (vac. residue, slurry, etc).

Valves connected to interlock system shall be provided with block valves only (no by-pass).

When the by-pass is not provided, the control valve shall be fitted with hand wheel for manual operation, except if they are used as shutdown (SD) or automatic emergency shutdown (AES) valves or for equipment safety (anti-surge valve) (neither bypass or hand wheel).

- 13.2. A ¾" valved drain shall be provided for the control valve groups as follows:

- FO control valves: one bleed upstream CV
- FC control valves: one bleed at each side of the CV

Bleeds shall be installed on the larger diameter.

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- 13.3. Valves at control valve manifolds shall be sized as per table 13.1.
- 13.4. Where piping is expanded after control valve for flashing condition, the downstream block valve shall be equal to or one size smaller than the expanded piping (according to process or licensor requirements).
- 13.5. The bypass valve shall be globe type for 6" and smaller, and gate or butterfly type (or according to piping class) for sizes larger than 6".
- 13.6. Control valve shall be identified on PID with:
- tag number;
 - size and rating if different than piping class;
 - fail safe position (FO, FC, FL);
 - flashing service (FS).
- 13.7. Sizing of Control Valve Manifold
- Table 13.1 shows the recommendations for the sizing of control valves manifold. It shall be read in conjunction with the following remarks:
1. Indicated size is main line size;
 2. Size for by-pass line shall be as the by-pass valve;
 3. Block valve shall be selected as per piping class;
 4. By-pass valves shall be globe up to 6" and full bore for larger diameters;
 5. Reference diameter for block valves is the size of the line on which the valve is located; reference diameter for by-pass valve is the upstream line.
-

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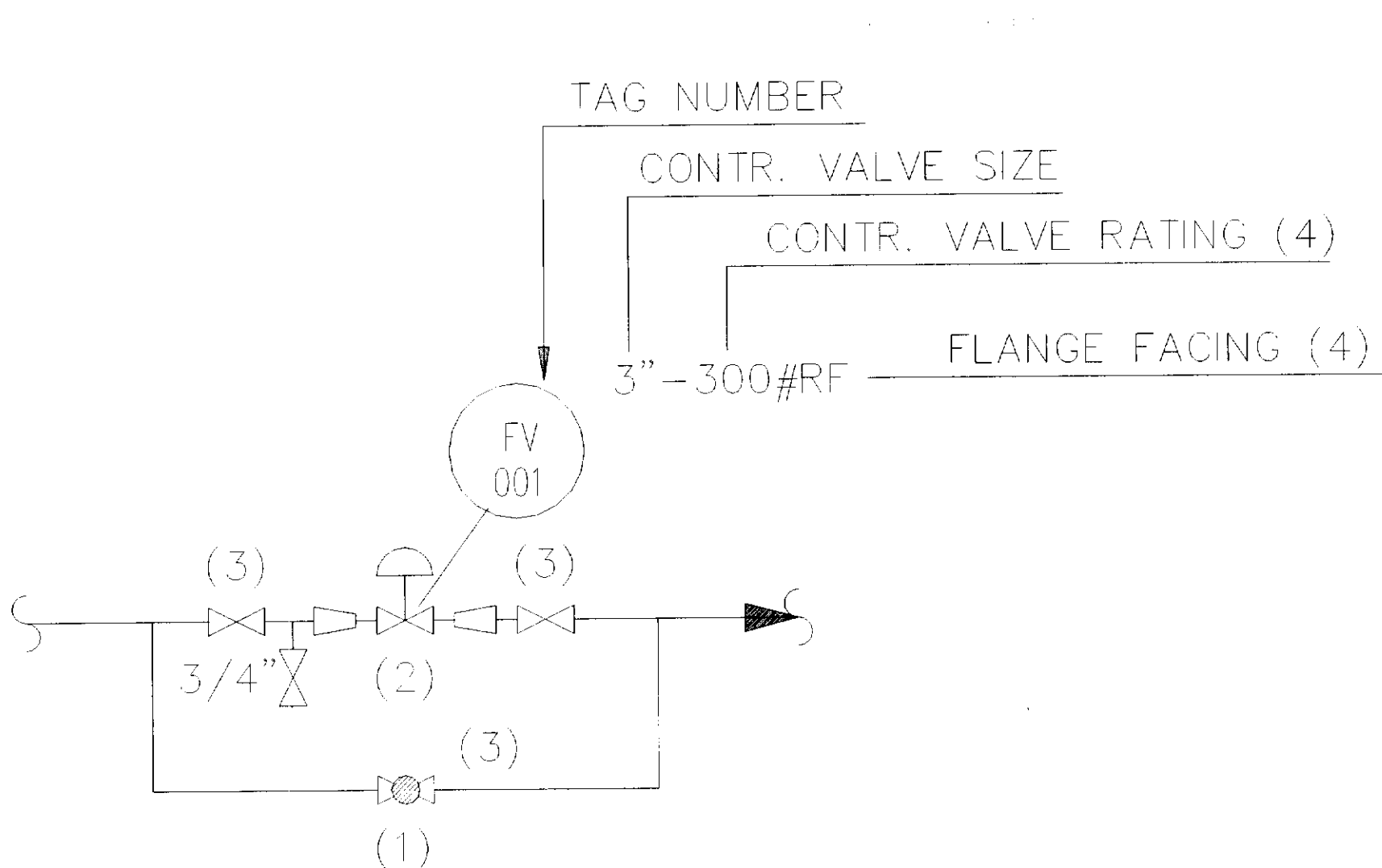
RECOMMENDED SIZING OF CONTROL VALVE MANIFOLD

TABLE 13.1

Line size	Valve size	Control Valve Size																
		1/2"	3/4"	1"	1,5"	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	28"
1/2"	Block	1/2"																
	By-pass	1/2"																
3/4"	Block	3/4"	3/4"															
	By-pass	3/4"	3/4"															
1"	Block	1"	1"	1"														
	By-pass	1"	1"	1"														
1,5"	Block	1,5"	1,5"	1,5"	1,5"													
	By-pass	1,5"	1,5"	1,5"	1,5"													
2"	Block		2"	2"	2"	2"			API 550 → ↓									
	By-pass		2"	2"	2"	2"												
3"	Block			2"	2"	3"	3"											
	By-pass			2"	2"	2"	3"											
4"	Block				3"	3"	4"	4"										
	By-pass				3"	3"	3"	4"										
6"	Block					4"	4"	6"	6"									
	By-pass					4"	4"	4"	6"									
8"	Block						6"	6"	8"	8"								
	By-pass						6"	6"	6"	8"								
10"	Block							8"	8"	10"	10"							
	By-pass							6"	6"	8"	10"							
12"	Block								10"	10"	12"	12"						
	By-pass								6"	10"	10"	12"						
14"	Block										12"	14"	14"					
	By-pass										10"	12"	14"					
16"	Block											14"	16"	16"				
	By-pass											12"	14"	16"				
18"	Block												16"	18"	18"			
	By-pass												14"	16"	18"			
20"	Block													18"	20"	20"		
	By-pass													16"	18"	20"		
24"	Block														20"	24"	24"	
	By-pass														18"	20"	24"	
28"	Block															24"	28"	28"
	By-pass															20"	24"	28"

In case of large difference between sizes of control valve and downstream line (due to flashing) in a range out of that given in the table, the downstream block valve shall be equal to or one size smaller than the pipe.

The size of the by-pass valve has to be selected carefully if it has an impact on a downstream relief valve.

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CONTROL VALVES ASSEMBLY
FIG. 13.1

NOTES:

- 1) Globe valve type for line size $\leq 6"$
 Gate valve type (or according to piping class) for line size $\geq 8"$
- 2) Indicate valve action as follows:
 - FC = closed for air failure
 - FO = opens for air failure
 - FL = fails locked (no change of position)
- 3) Block and bypass valves, if required, shall be sized as per table 13.1.
- 4) Rating and flange facing to be shown on PID only if different than piping class.

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14. SAFETY VALVES

- 14.1. Safety valves shall be located according to process requirements as close to the equipment as possible, in order to fulfill the API requirements on pressure drops through upstream piping, or on equipment, and be accessible for check and maintenance purposes.

Whenever the protected equipment is provided with a demister pad, the safety valve shall be installed on the vessel, upstream of the demister

Piping arrangements of safety valves are shown in Fig. 14.1, 14.2.

Full-area stop valves car seal open or car seal closed shall be installed upstream and/or downstream of safety valves only if dictated by process requirements. They shall be of such type and size that the increase in pressure should not reduce the relieving capacity below that required, nor adversely affect the proper operation of the pressure relieving devices.

Safety valves shall be free draining towards flare header; when such arrangement is not possible, facilities to prevent the stagnation of liquid shall be provided.

Preferably branching-off of a discharge pipe to blow down header shall always be at top of pipe and sloped 45° in the direction of flow.

Flare header shall be sloped, 2‰ min., towards the knockout drum, avoiding intermediate pockets.

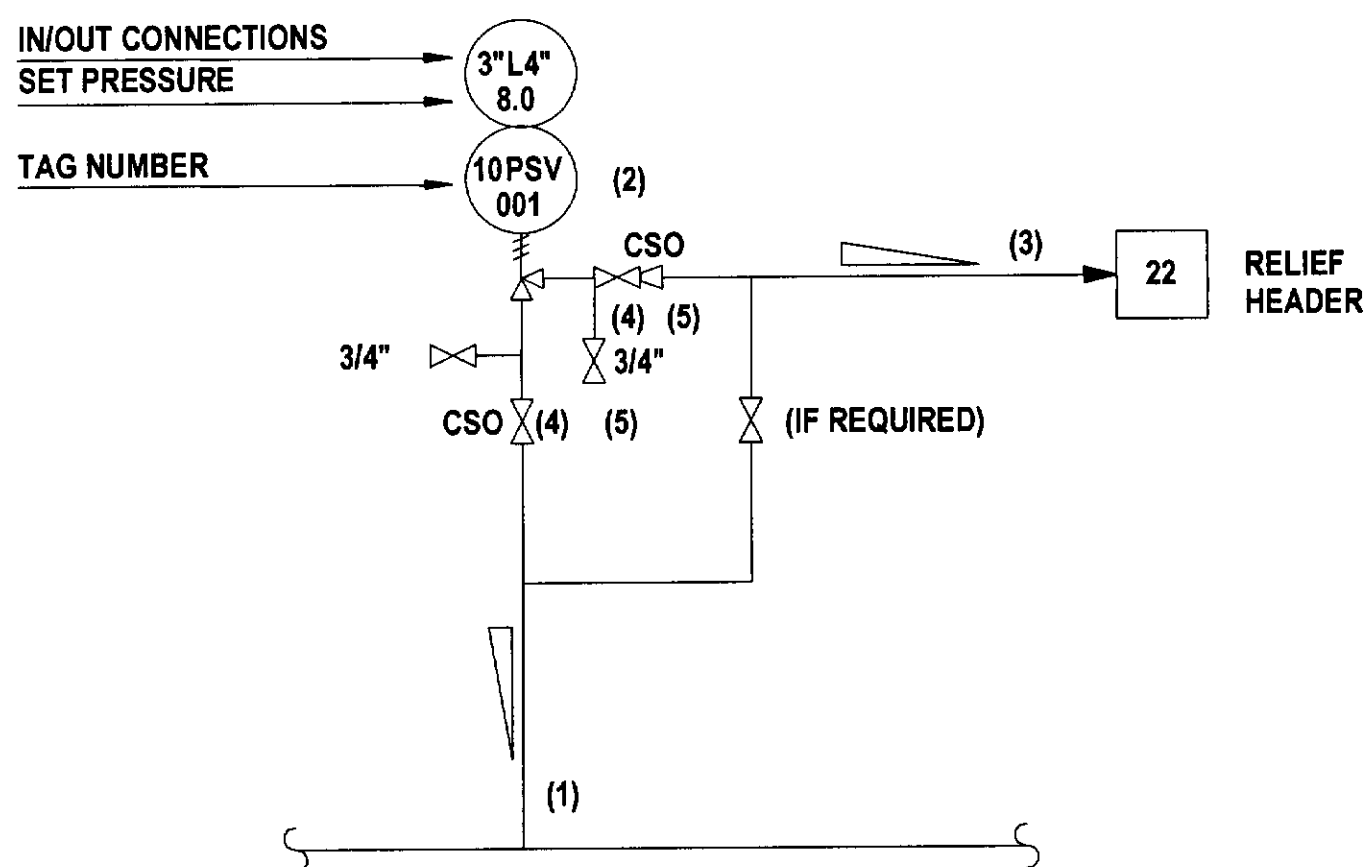
- 14.2. Safety valves shall be identified on PID with:

- tag number;
- orifice designation;
- inlet & outlet size;
- set pressure;
- rating of flange if different than piping class.

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SAFETY VALVE ASSEMBLY (DISCHARGE TO CLOSED SYSTEM)

FIG. 14.1



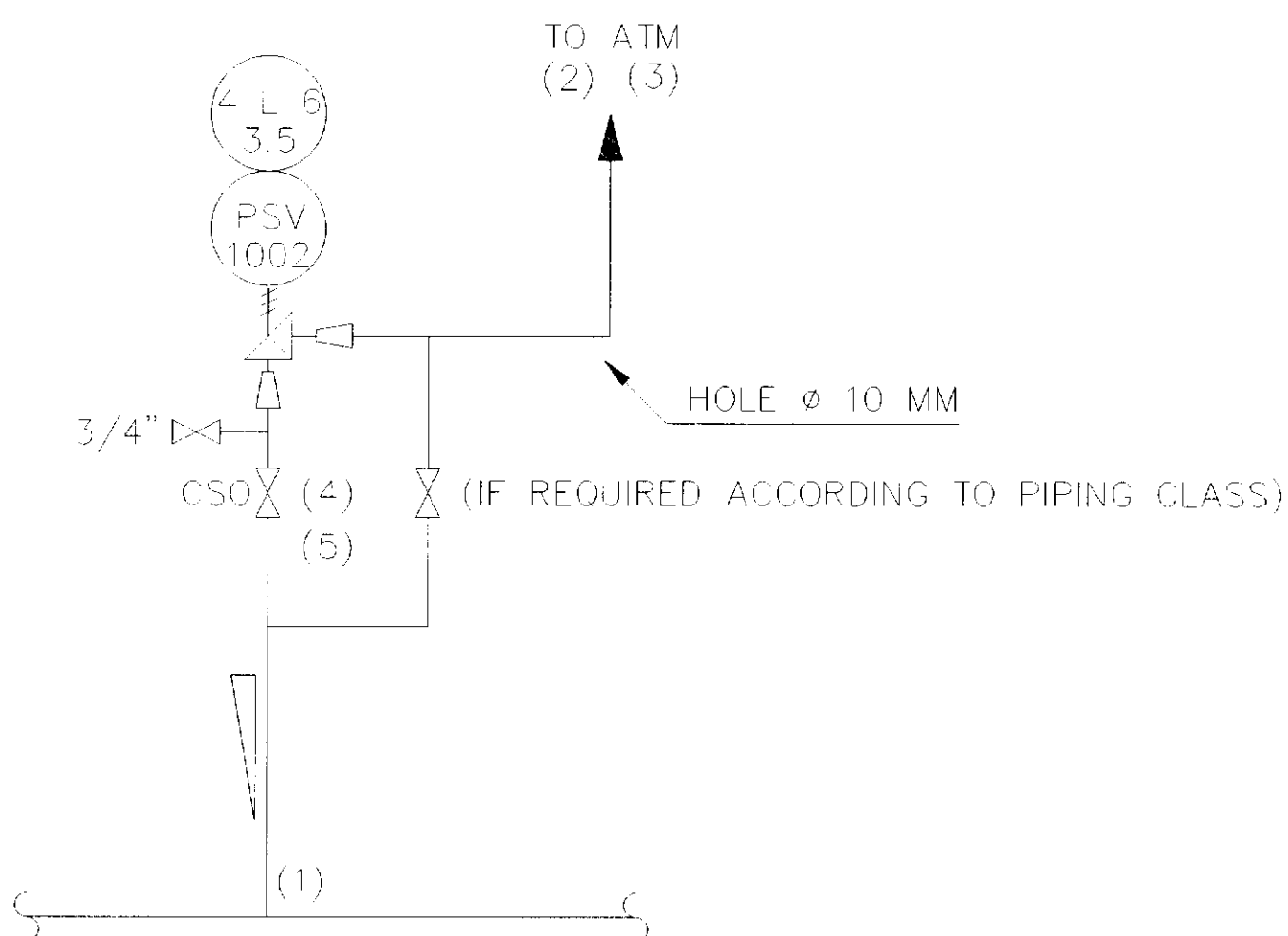
NOTES:

- 1) Connection on top of pipe
- 2) Locate safety valve above relief header (except thermal expansion)
- 3) The flare header shall be sloped, 2‰ min, towards knockout drum
- 4) Full-area stop valves (to be provided only if dictated by Process requirements)
- 5) CSO valves installed with stem oriented horizontal or downward.

STANDARD SPECIFICATION FOR PID PREPARATION

SAFETY VALVE ASSEMBLY (DISCHARGE TO ATMOSPHERE)

FIG. 14.2



NOTES:

- 1) Make connection on top of pipe.
- 2) The vapors vent line shall terminate at least 3 meters above equipment or any service platform located within a radius of 15 meters.
- 3) When safety valve discharge steam to the atmosphere at safe location, the vent line shall terminate at least 3 meters above any service platform located within a radius of 8 meters.
- 4) To be provided only if required by Process
- 5) CSO valves installed with stem horizontal or downward.

STANDARD SPECIFICATION FOR PID PREPARATION

15. VENTS AND DRAINS FOR EQUIPMENT

15.1. VESSELS

- 15.1.1. For maintenance and test purpose, all pressure vessels shall be provided with a vent and drain discharging to atmosphere
Not operating vents shall be located on top of vessel with valve blinded.
Drain shall be preferably located on the low point of the bottom outlet piping, outside the skirt. If there is no bottom line or said line does not allow complete drainage of the vessel, the drain shall be connected to a separate nozzle on the bottom head.
Vessels with internal baffling require special consideration (two separate drains or a drip hole on the baffle).
- 15.1.2. Pressure vessel handling flammable, toxic and highly corrosive fluids shall be provided with additional valved vents and drains enabling depressurization and disposal of contained fluid as follows:

Fluid	Operating Vent	Operating Drain
C ₄ and lighter	flare or suction vessel	flare or closed drain
Other hydrocarbons	flare or ATM at safe location	closed drain or oily sewer
Toxic and highly corrosive	dedicated venting system or closed drain	dedicated closed drain
Vacuum service	suction vessel	

For double valving requirements see para 22.3.

- 15.1.3. Minimum size for vent and drain valves for equipment shall be in accordance with the following, unless otherwise indicated on PID.

Vessel Volume (m ³)	Vent (inches)	Drain (inches)
< 1.5	1"	1"
1.5 ÷ 6	1"	1½"
6 ÷ 17	2"	2"
> 17	2"	3"

- 15.1.4. Drains from level gauges and level controllers shall be piped as follows per para 15.1.2 above.

STANDARD SPECIFICATION FOR PID PREPARATION

15.2. CENTRIFUGAL PUMPS

15.2.1. Drain and vent connections on pump casing shall be plugged except for service conditions listed below, for which they shall be valved and piped as follows, unless otherwise required by process considerations.

Fluid	Vent (1)	Drain
C ₄ and lighter	Flare or closed drain	Flare or closed drain
Hydrocarbons (with operating temperature above their flash point)	Closed drain or oily sewer	Closed drain
Hydrocarbons (with operating temperature below their flash point)	Atm, oily sewer or closed drain	Oily sewer or closed drain
Toxic and highly corrosive	Dedicated venting system or closed drain	Dedicated closed drain
Vacuum service	Suction vessel	-

NOTE (1) Valved vent connection is not applicable to self-venting pumps. Self-venting pumps are identified by the machinery specialist after pump selection.

15.2.2. Vent and drain size shall be as per Vendor standards (size ¾" minimum).

16. STRAINERS

16.1. Strainers shall be provided for the protection of the following equipment:

- all pumps at suction and flushing line.
- turbines;
- ejectors;
- steam traps;
- pilot gas line;
- showers & eyebaths;
- all compressors at suction line (screened intakes shall be provided for air compressor and air blower).

16.2. The body material shall conform to the requirements of the piping class.

The material of the screen shall be specified as para 10.2

STANDARD SPECIFICATION FOR PID PREPARATION

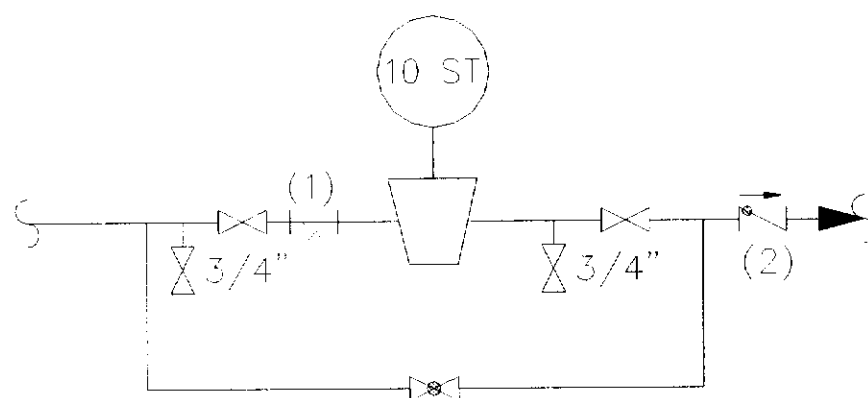
17. STEAM TRAPS

- 17.1. Steam traps are utilized to eliminate condensate accumulation at low points of equipment and steam lines.
 - 17.2. All steam traps shall be protected by a "Y" type strainer unless traps are supplied with an internal strainer (small diameters).
 - 17.3. Normally, float type steam traps shall be used for process service.
 - 17.4. The arrangement for traps is shown in the Fig. 17.1.
 - 17.5. On steam headers, at the lowest points and on the header ends, pot with steam trap will be provided normally not shown on PID. Pot assembly and dimensions are indicated in fig. 17.2 as standard in case they have to be shown on PID because of Client's requirement.
-

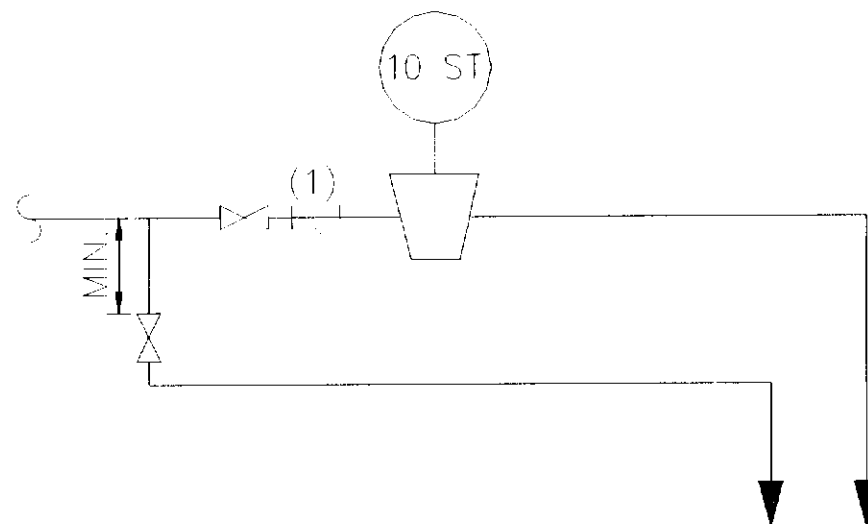
STANDARD SPECIFICATION FOR PID PREPARATION

PROCESS STEAM TRAP ASSEMBLY

FIG. 17.1



A = TRAPS DISCHARGING INTO RECOVERY SYSTEM



B = TRAPS DISCHARGING AT GRADE

NOTES:

- 1) Strainer to be required if not included in trap supply.
- 2) Check valve to be located at highest point as close as possible to condensate return header (for anti freezing purposes).

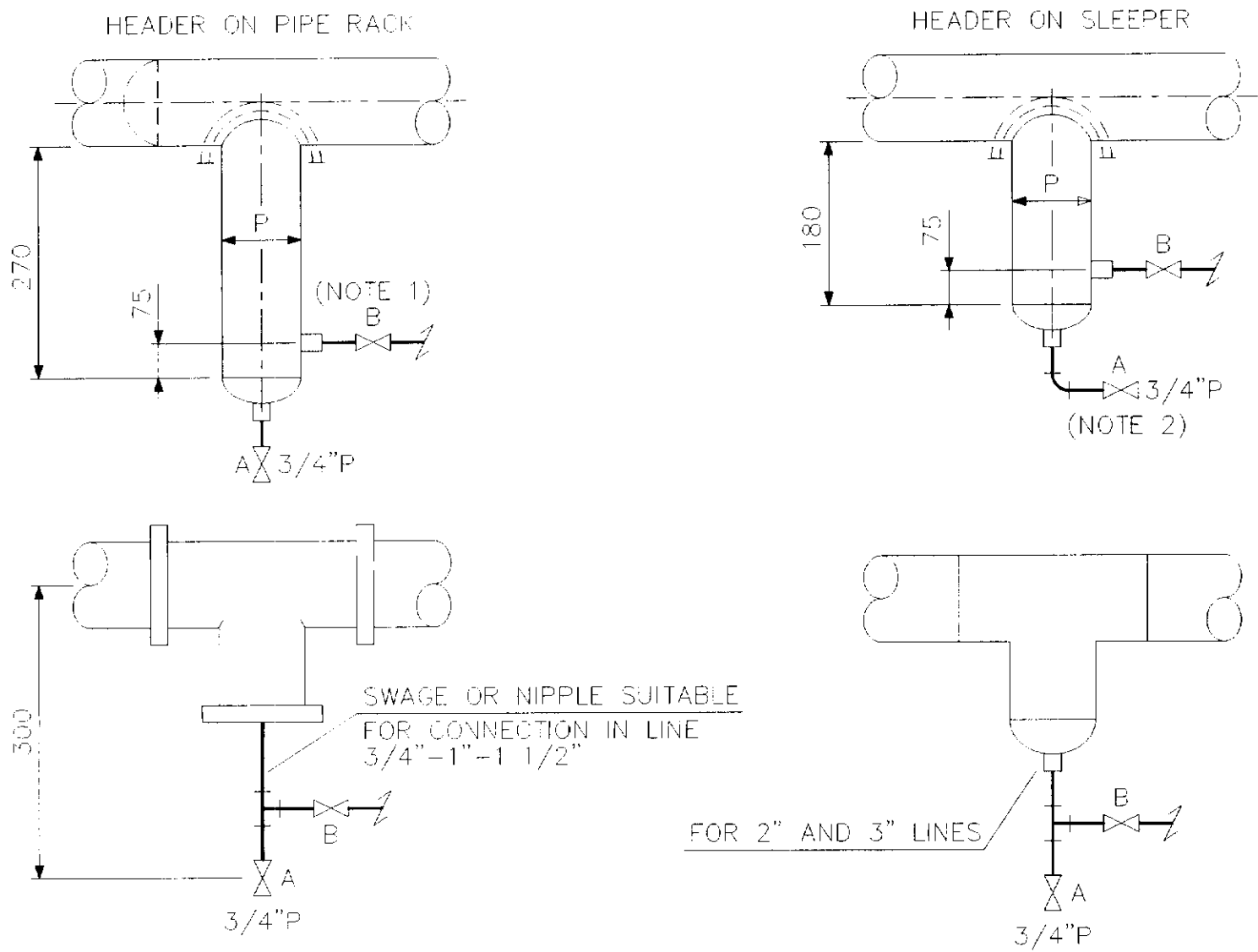
STANDARD SPECIFICATION FOR PID PREPARATION

POT ASSEMBLY

FIG. 17.2

TYPICAL ASSEMBLY FOR CONDENSATE POTS

STEAM HEADER 4" AND LARGER



HEADER	ø POT		
		A	B
2"	2"	3/4"	DIAM. EQUAL TO TRAP SIZE (MIN. 3/4")
3"	3"	3/4"	
4"	3"	3/4"	
6"	4"	3/4"	
8"	6"	3/4"	
10"	8"	3/4"	
12"	10"	3/4"	
14"	12"	3/4"	
16"	12"	3/4"	
18"	12"	3/4"	
20"	12"	3/4"	
24"	12"	3/4"	

- NOTES
- 1 - "B" SHALL BE INSTALLED ONLY IF STEAM TRAP IS 5 METERS AND OVER FROM STEAM POT.
 - 2 - ON SLEEPER WAY VALVE "A" SHALL BE INSTALLED IN HORIZONTAL.

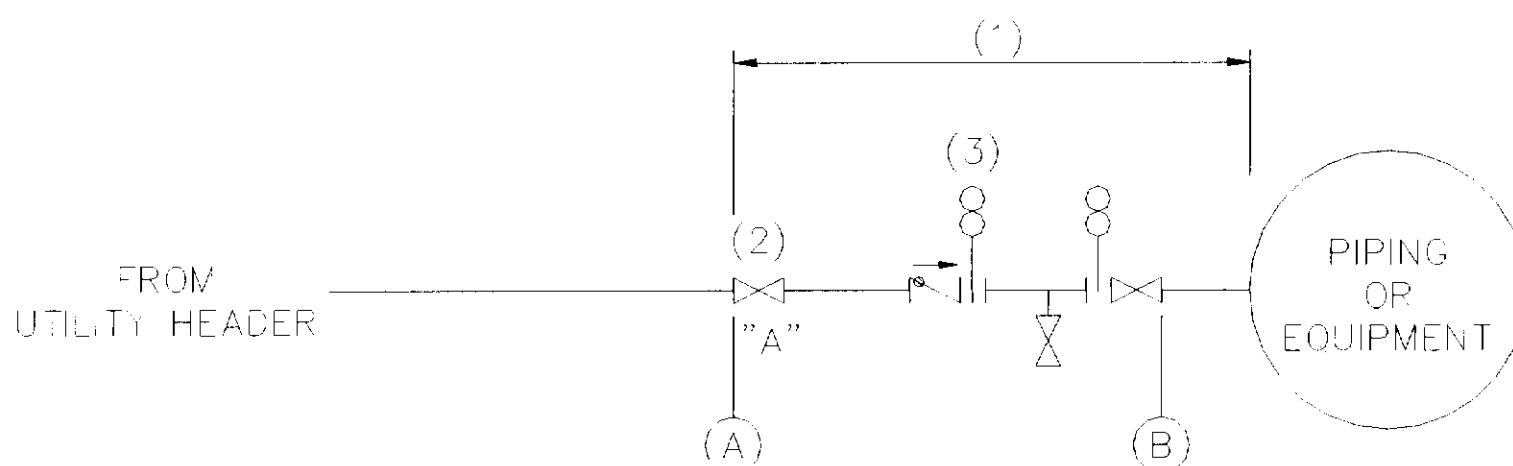
STANDARD SPECIFICATION FOR PID PREPARATION

18. UTILITY CONNECTIONS TO PIPING OR EQUIPMENT

- 18.1. Utility lines permanently connected to process piping or equipment, if required, shall be arranged as per Fig. 18.1.

UTILITY CONNECTION TO PIPING OR EQUIPMENT

FIG. 18.1



NOTES:

- 1) Block and check valve to be installed at min. distance from equipment. Material and rating for block and check valve shall be suitable for the more corrosive condition of the process or utility service.
Rating and piping class break in **A** or **B** according to stronger class.
Check valve shall be omitted for connections used only when equipment is not operating (e.g. steam out).
- 2) Deleted.
- 3) Spectacle blind to be provided for:
 - infrequent service (e.g. steam out);
 - water connections to piping or equipment operating above 100°C and water and steam connections to piping or equipment operating below 0°C.

A spool piece can be used instead of spectacle blind.
- 4) In case of multiple fluids to be provided as utilities (i.e. steam and nitrogen and water), but used one only at a time, one connection to piping/equipment will be provided.

STANDARD SPECIFICATION FOR PID PREPARATION

19. UTILITY STATIONS

19.1. Utility stations shall conform to contractual rules formalized by Piping and/or Process Specialists. The following rules are generally used.

19.2. Utility stations shall be installed in order to ensure low pressure steam, service water and plant air throughout the process area.

Locations shall be such that working area at grade and in structure can be reached with 15 m length of flexible hose.

19.3. Each point shall be equipped with a block valve according to the piping specification and with fast-acting fittings. The size of each line shall be 3/4".

19.4. Nitrogen stations can be required for equipment or line purging.

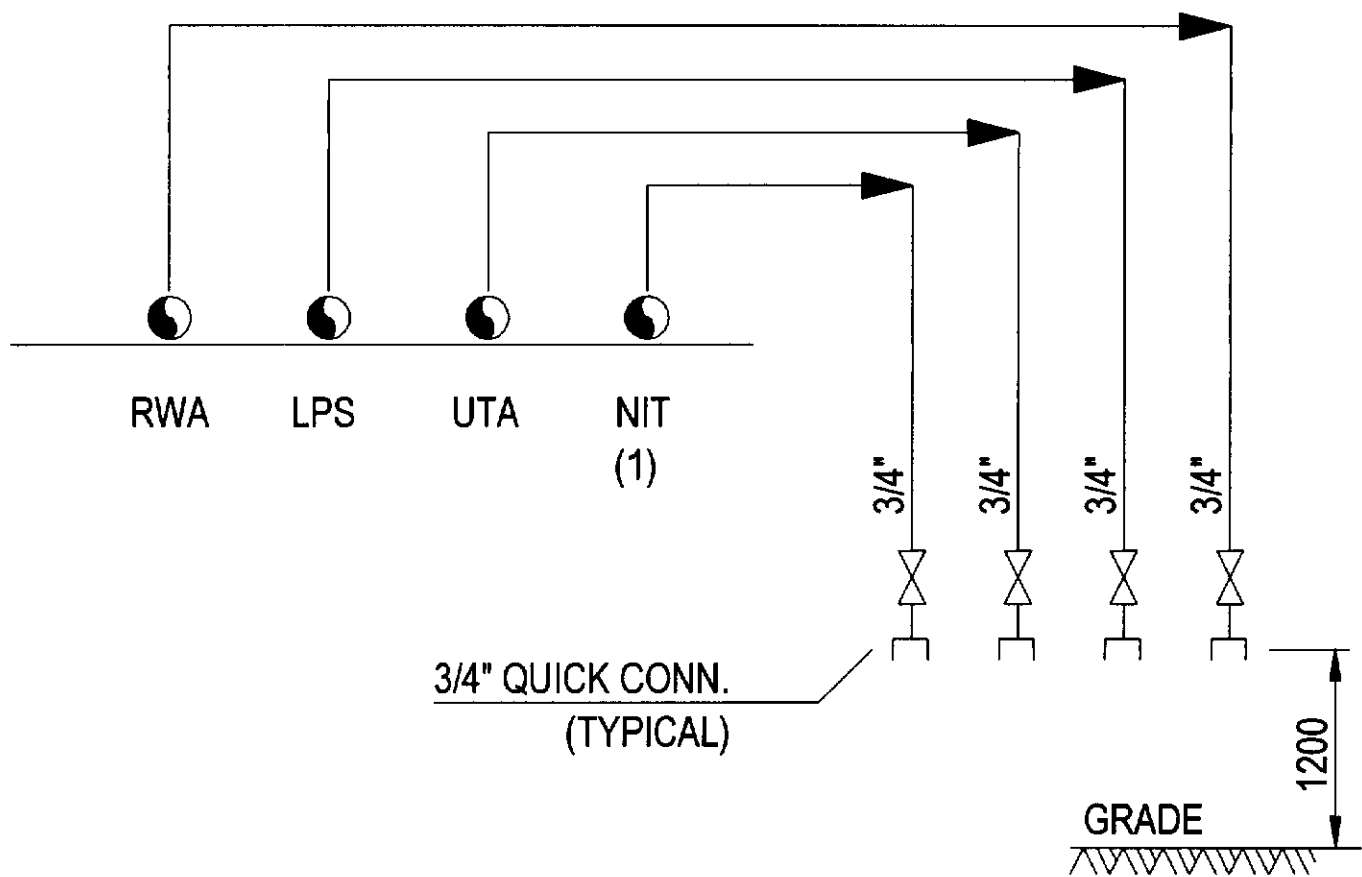
The size of hose connections shall be 3/4".

19.5. For utility station arrangement see Fig. 19.1.

STANDARD SPECIFICATION FOR PID PREPARATION

UTILITY STATIONS

FIG. 19.1



NOTE:

- 1) Nitrogen station only where required.

STANDARD SPECIFICATION FOR PID PREPARATION

20. SAMPLING

20.1. Sampling connection on piping shall be not less than 3/4". A first block valve shall be provided as close to the header as possible.

It shall be followed by a globe or needle valve ($\varnothing = \frac{1}{2}$ ").
The distance between these valves shall be as short as possible.

20.2. For liquefied gases the distance between the two valves shall be 600 mm min.

20.3. Where sampling is required for dangerous fluids, the sample outlet shall be connected to process line or to flare.

20.4. Sampling arrangements are shown in Figg. 20.1, 20.2, 20.3, 20.4, 20.5, 20.6 and 20.7.
20.8, 20.9, 20.10.

20.5. The sampling shall not be located at dead points of the process line.

20.6. Sample cooler shall be specified for a process temperature of ...°C and over, according to personnel protection requirements.

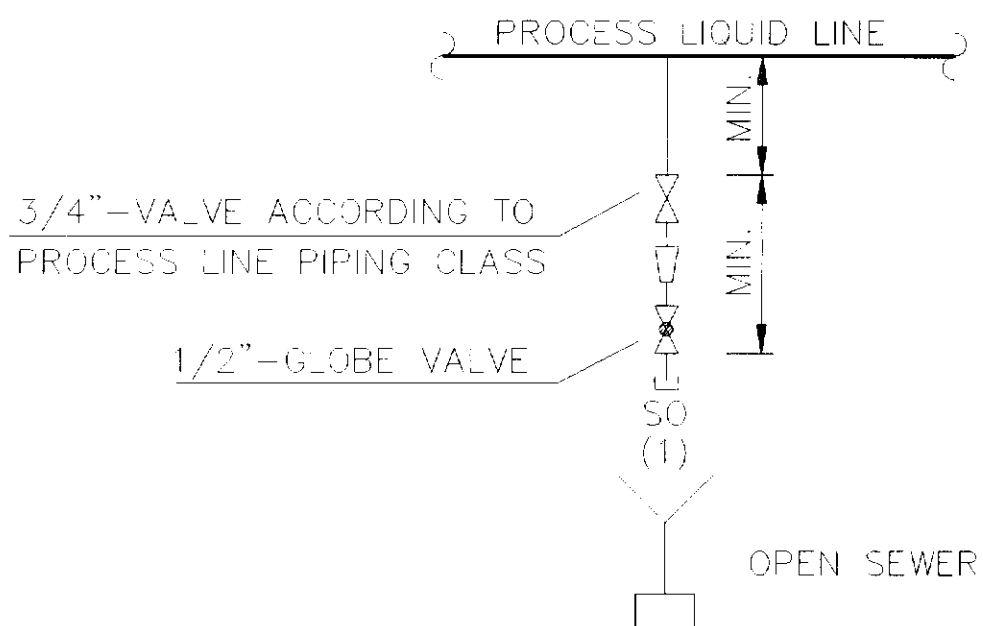
20.7. Sample outlet shall be located at grade or accessible from platform.

STANDARD SPECIFICATION FOR PID PREPARATION

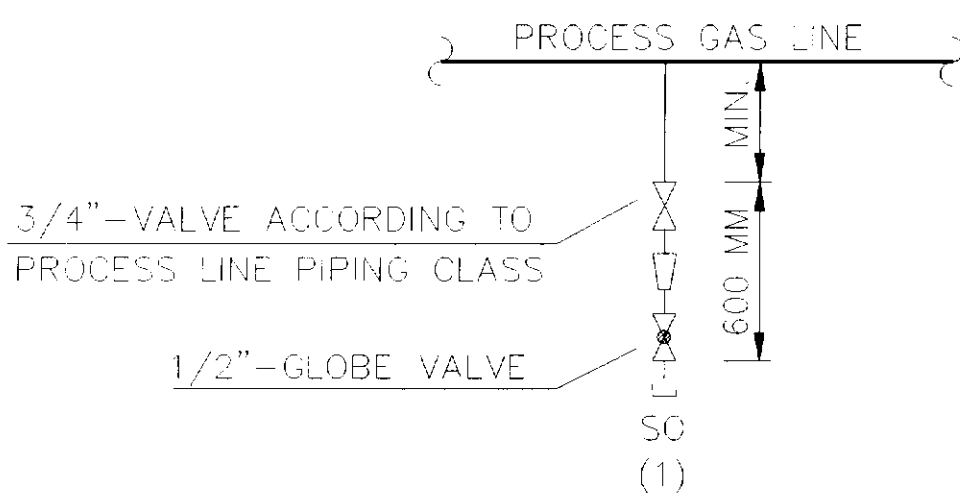
**SAMPLE CONNECTION ASSEMBLY
(for not dangerous liquid or gas service)**

FIG. 20.1

GENERAL SAMPLE FOR LIQUID SERVICE



GENERAL SAMPLE FOR GAS SERVICE (2)



NOTES:

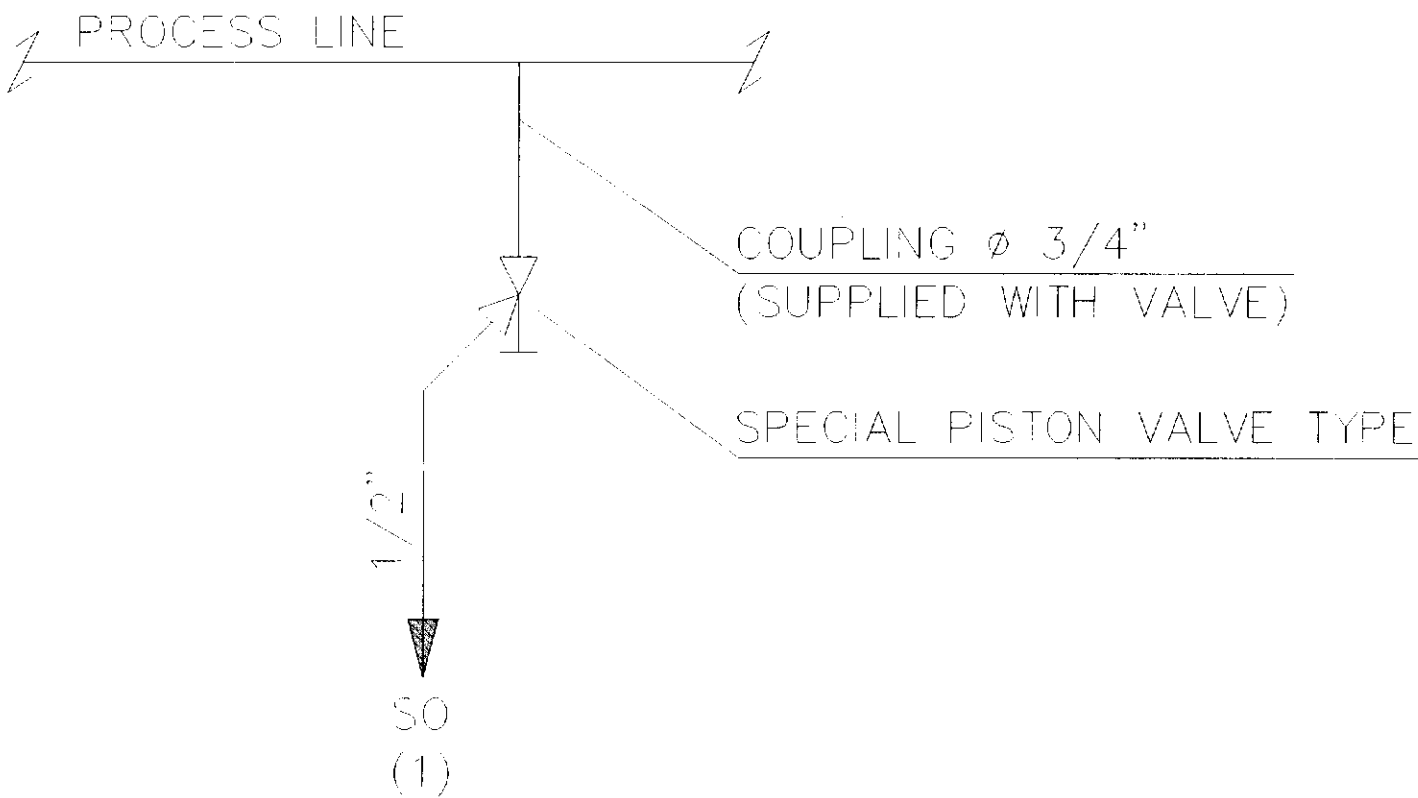
- 1) Locate sample outlet accessible from grade or service platform.
- 2) To be used only for sample that are very rarely used when connection to the flare is difficult to be done

STANDARD SPECIFICATION FOR PID PREPARATION

OPEN SAMPLE CONNECTION ASSEMBLY

FIG. 20.2

FOR DIRTY FLUIDS



NOTE:

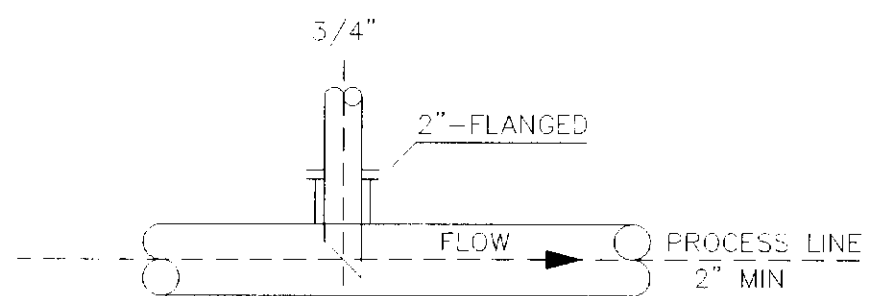
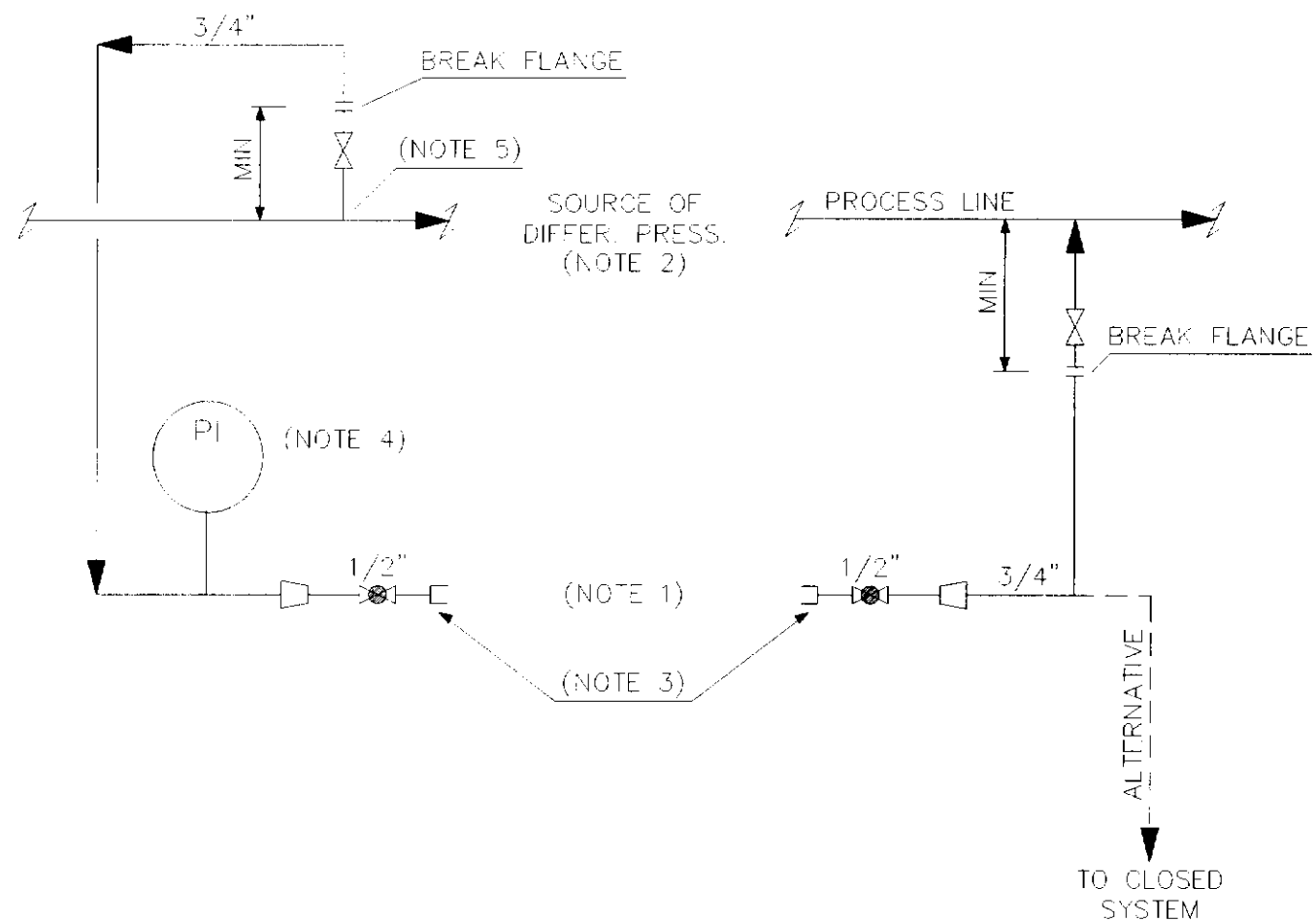
- 1) Locate sample outlet accessible from grade or service platform.

STANDARD SPECIFICATION FOR PID PREPARATION

CLOSED SAMPLE CONNECTION ASSEMBLY

FIG. 20.3

FOR GAS SERVICE



Detail "A"

NOTES:

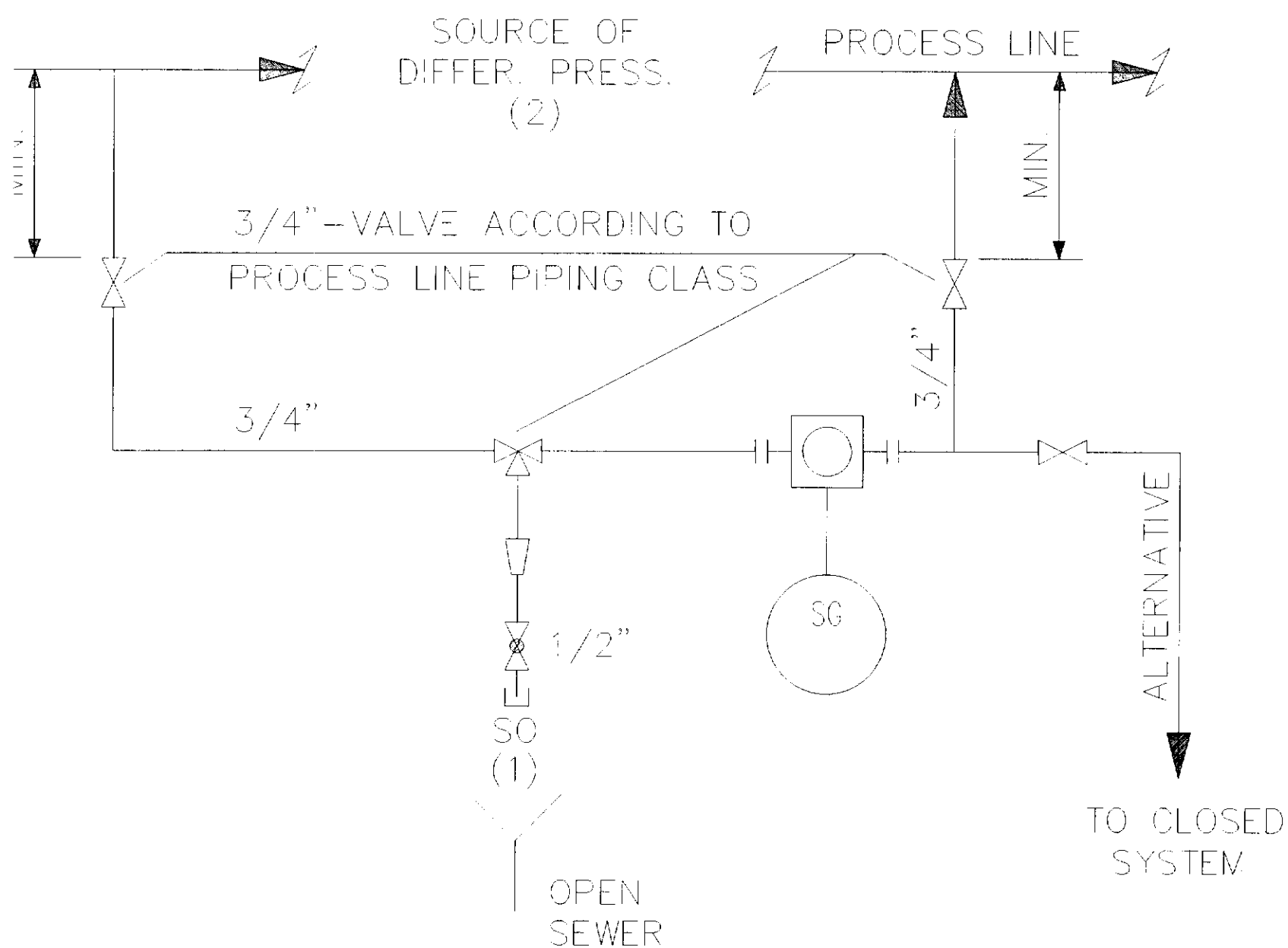
- 1) Locate sample outlet accessible from grade or service platform.
- 2) Any conveniently located source of differential pressure, control valve, heat exchangers, etc.
- 3) Threated female connection for sample cylinder
- 4) Manometer shall be located for reading by person operating needle valve (on cylinder)
- 5) Make connection on top of pipe as shown in detail "A"

STANDARD SPECIFICATION FOR PID PREPARATION

CLOSED SAMPLE CONNECTION ASSEMBLY

FIG. 20.4

FOR LIQUID SERVICE



NOTES:

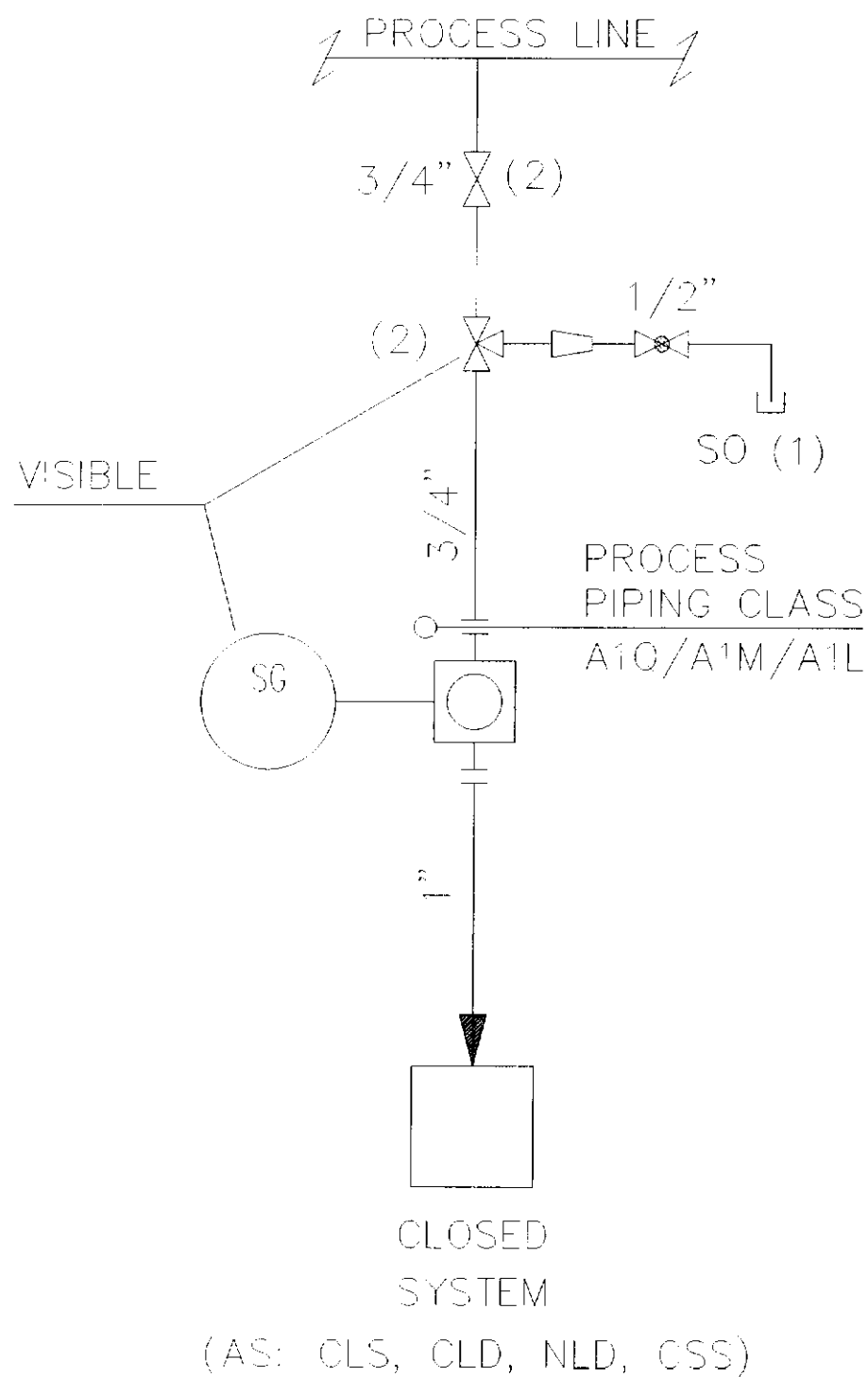
- 1) Locate sample outlet accessible from grade or service platform
- 2) Any conveniently located source of differential pressure, control valve, etc.

STANDARD SPECIFICATION FOR PID PREPARATION

SPECIAL SAMPLE CONNECTION ASSEMBLY

FIG. 20.5

FOR LIQUID SERVICE



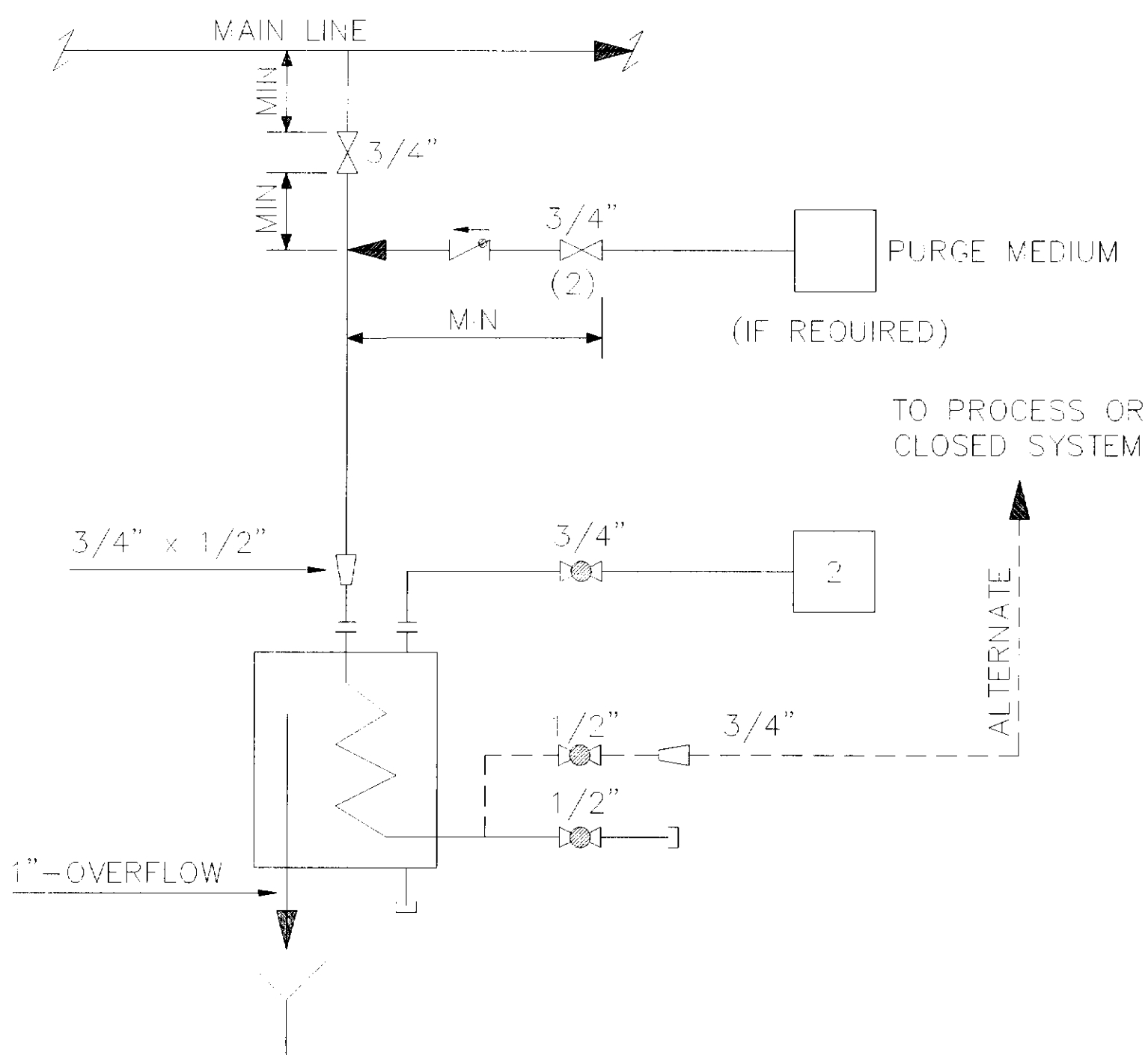
NOTES:

- 1) Locate sample outlet accessible from grade or service platform
- 2) Valve according to process line piping class.

STANDARD SPECIFICATION FOR PID PREPARATION

SAMPLE COOLER ASSEMBLY

FIG. 20.6



NOTES:

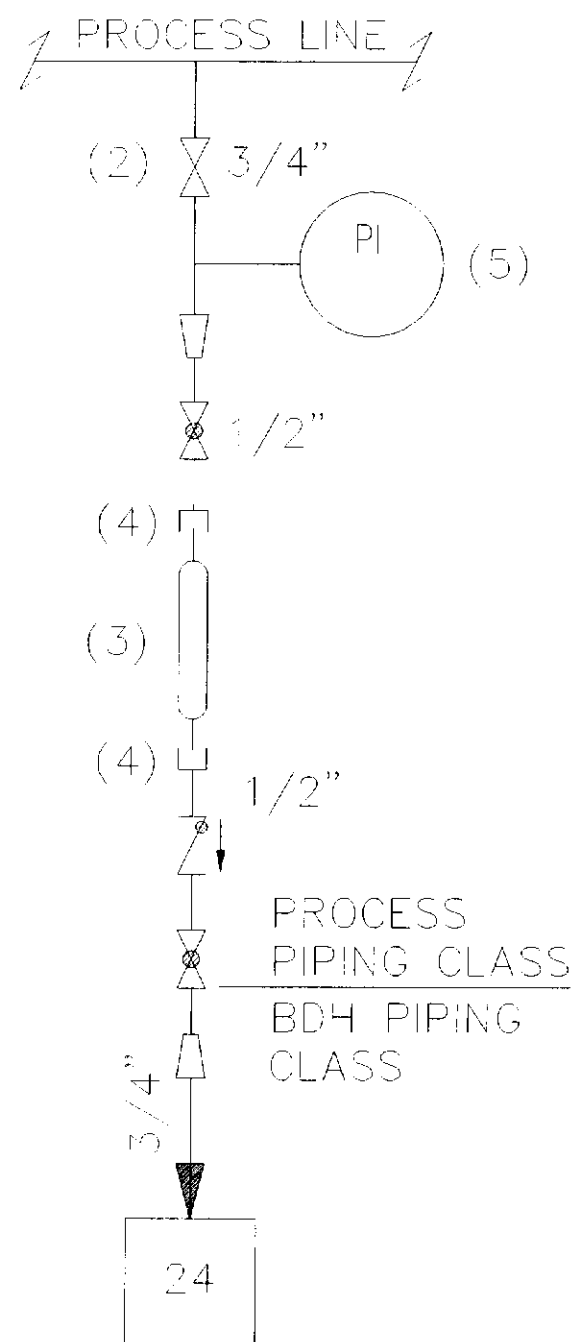
- 1) Locate sample outlet accessible from grade or service platform.
- 2) Locate valve in an accessible position.
- 3) To be specified for Process temperature >.....°C

STANDARD SPECIFICATION FOR PID PREPARATION

SPECIAL CONNECTION ASSEMBLY

FIG. 20.7

FOR GAS SERVICE



NOTES:

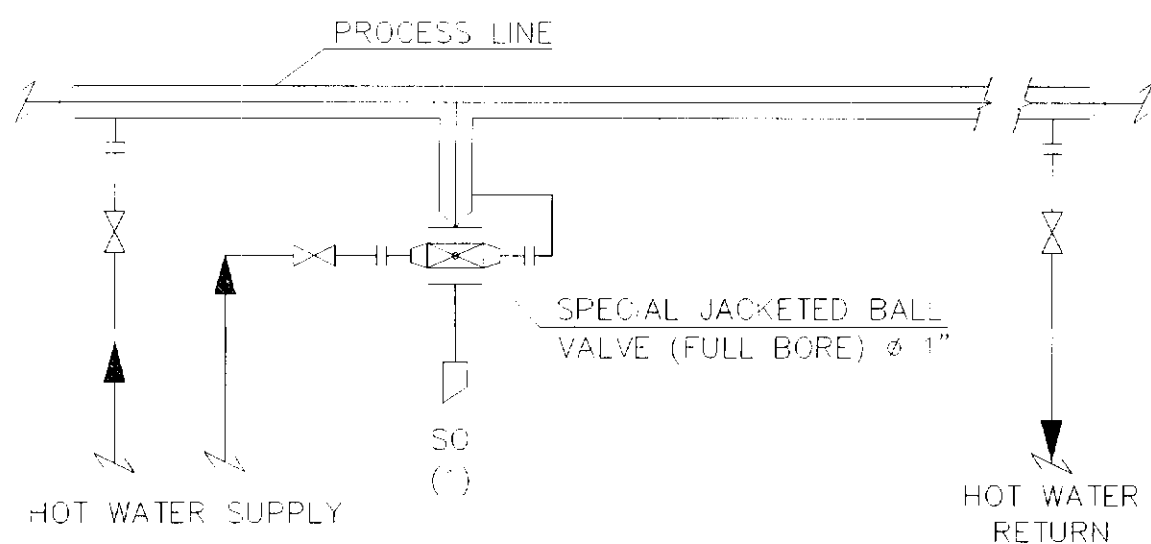
- 1) Manometer shall be readable from needle valve (on cylinder) operator
- 2) Valve according to process line piping class.
- 3) Provide adequate space for removable sample cylinder
- 4) Threaded female connections for sample cylinder.

STANDARD SPECIFICATION FOR PID PREPARATION

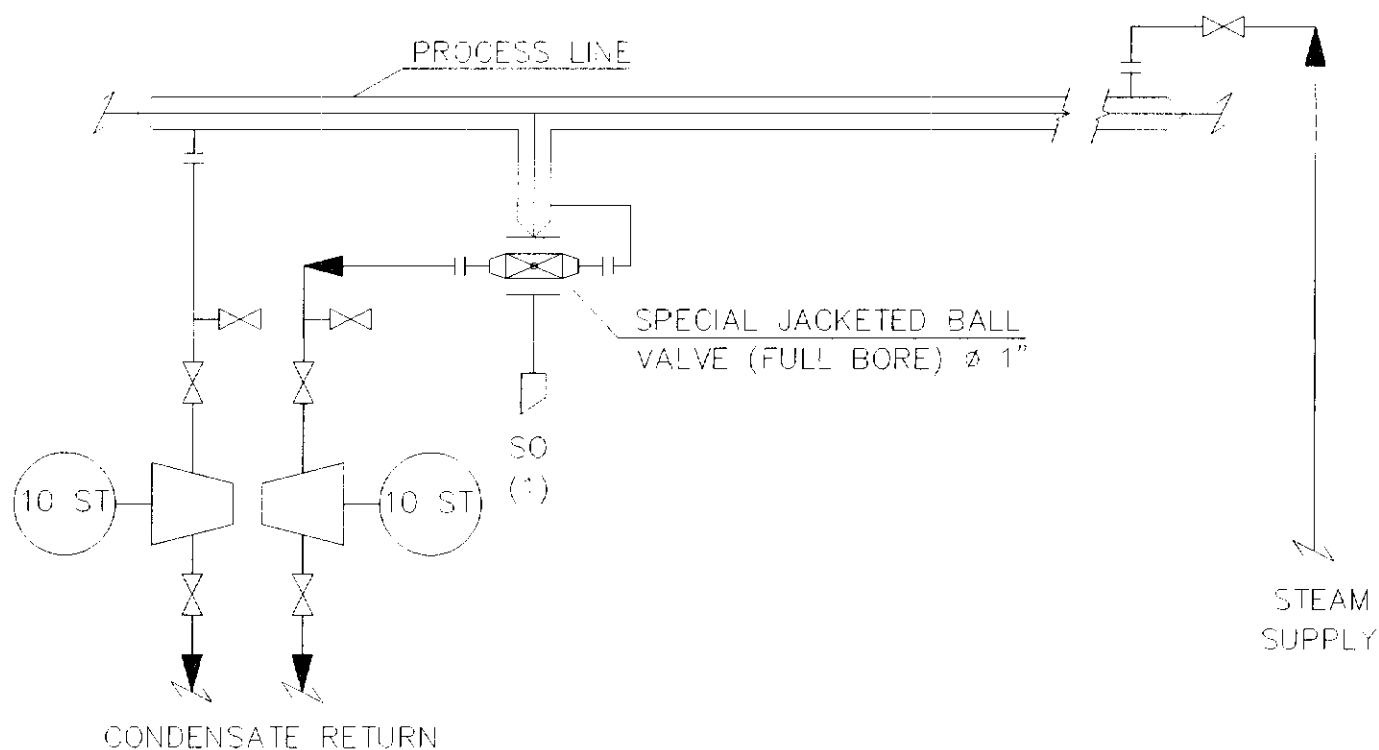
SPECIAL CONNECTION ASSEMBLY

FIG. 20.8

PC-2: For jacketed pipes with water.



PC-2: For jacketed pipes with steam.



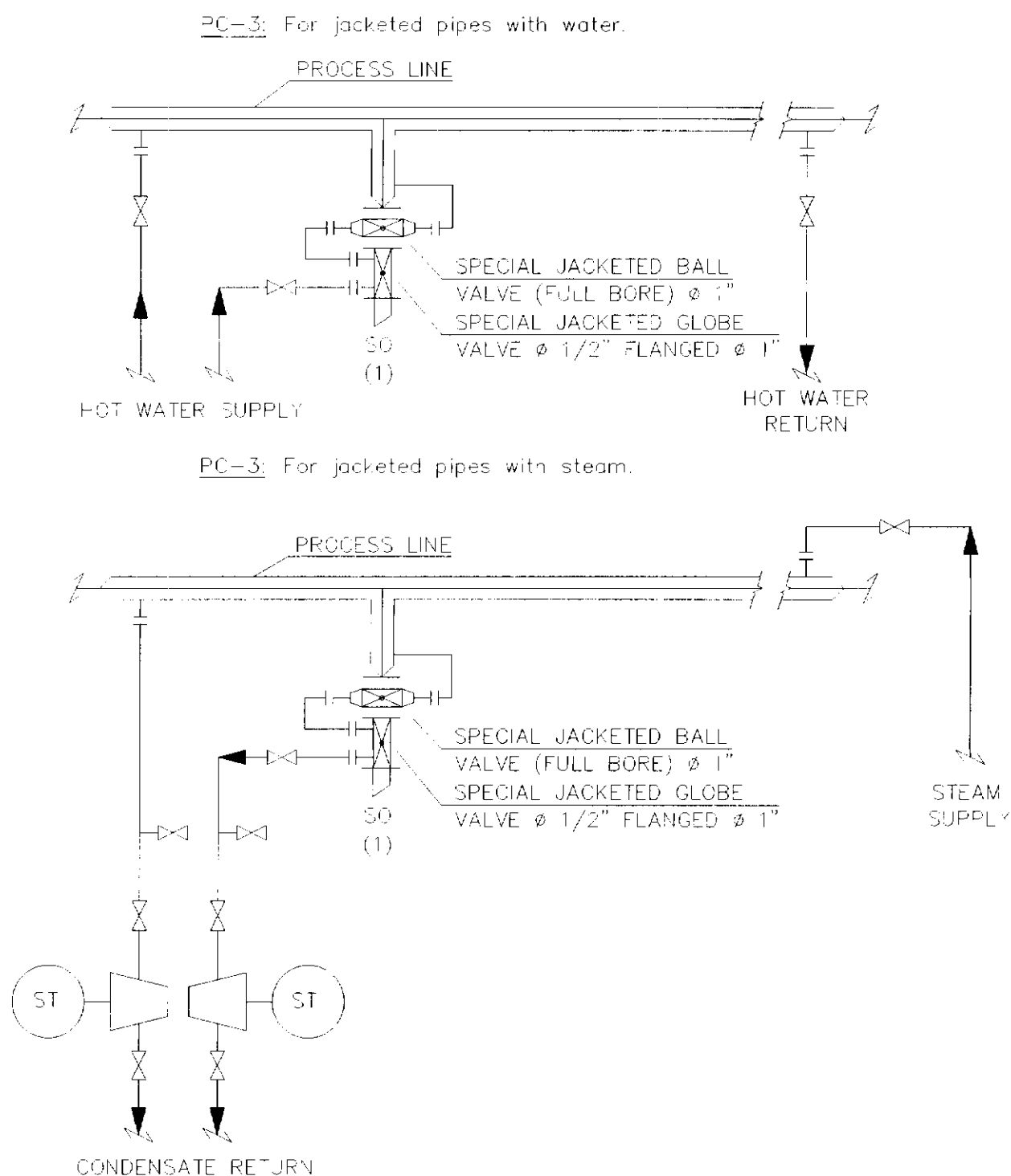
NOTE:

- 1) Locate sample outlet accessible from grade or service platform

STANDARD SPECIFICATION FOR PID PREPARATION

SPECIAL CONNECTION ASSEMBLY

FIG. 20.9



NOTE:

- 1) Locate sample outlet accessible from grade or service platform

STANDARD SPECIFICATION FOR PID PREPARATION

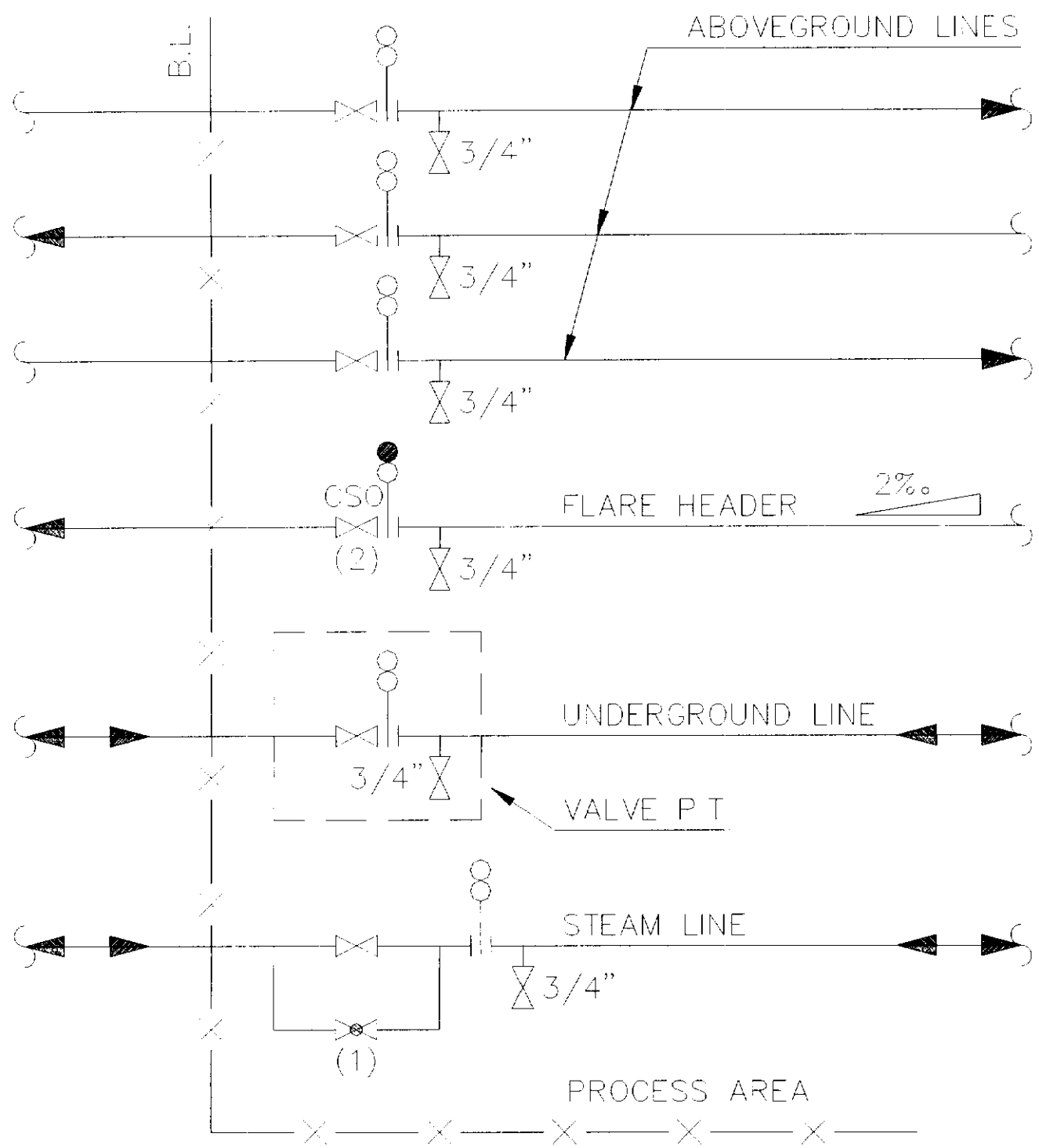
21. VALVES AT BATTERY LIMITS

- 21.1. All lines leaving or entering the plant battery limits shall be valved.
 - 21.2. The valves shall be grouped at plant battery limits into one or more manifolds.
 - 21.3. All block valves at battery limits shall be equipped with spectacle blinds toward plant side.
 - 21.4. A drain valve shall be installed between BL block valves and the unit.
 - 21.5. For typical arrangement of valves at B.L. refer to Fig. 21.1.
 - 21.6. All process lines leaving from units or block battery limit shall be valved.
 - 21.7. Generally, all utility lines leaving or entering the units or block battery limit shall be valved, unless otherwise shown on PID.
-

STANDARD SPECIFICATION FOR PID PREPARATION

VALVES AT PLANT BATTERY LIMITS

FIG. 21.1



STANDARD SPECIFICATION FOR PID PREPARATION

NOTES:

- 1) By-pass around steam block valve shall be provided if following conditions are met:
 - either steam operating pressure lower than 6 barg and pipe diameter equal to or larger than 10", or
 - steam operating pressure equal to or higher than 6 barg and pipe diameter equal to or larger than 6".

The by-pass valve will be sized as follows:

 - 1" for steam line from 6" to 12"
 - 1½" for steam line from 14" to 18"
 - 2" for steam line from 20" and larger
 - 2) The block valve, in the flare header, must be car seal open and the stem in horizontal position or with minimum angle downwards.
 - 3) Plugging devices will be shown or not on PID according to the procedure. If shown, plugging device shall comply with Piping classes.
 - 4) External by-pass is not required if main isolating valve is provided with an internal by-pass.
-

STANDARD SPECIFICATION FOR PID PREPARATION

22. VALVING CHECK LIST**22.1. Block valves shall be provided:**

- a) for all lines crossing plant battery limits (the valve on flare header shall be CSO stem downward);
 - b) at spared equipment;
 - c) at vessel with the following exceptions:
 - connections for overhead vapor lines, transfer lines, reboiler lines & side streams draw-off
 - pump suction & reflux lines
 - vents open to atmosphere
 - lines from/to safety valves (see point 14.1)
 - d) at pump and compressor suction and discharge lines
 - e) at steam turbine feed and exhaust lines
 - f) at utility lines connected to lines or process equipment
 - g) for isolation purpose of instruments (e.g. control valves) or equipment to be inspected during the normal operation of the plant
 - h) at utilities hose stations
 - i) at storage close to tank nozzles and outside the dikes
 - j) at heat exchangers process side, only if they can be maintained during the normal operation of the plant
 - k) at steam traps assembly
 - l) at sampling devices
 - m) for preventing flow (e.g. at drains, vents, steam out points) or diverting flow through an alternative route (e.g. by-passes)
 - n) at suitable points in fire water ring to allow isolation.
-

STANDARD SPECIFICATION FOR PID PREPARATION

22.2. Block valve type shall be according to piping class.

In case, however, of no specific requirements, the following recommended type shall be selected:

- plug valves for caustic and fuel gas service;
- butterfly valves for cooling water & sea water service (size ≥ 2 ");
- ball valves for liquid LPG service; gate for for gaseous LPG;
- needle valves at sampling points (open sample);
- globe valves for manual regulation flow;
- ball valve full bore for slurry service.

22.3. Double valving shall be provided for:

- a) Operating vents/drains, PSV by-passes and instrument connections for flammable and toxic services with rating 600# and higher.
- b) Utility lines permanently connected to process lines or equipment in all cases.
- c) Preventing product contamination where the use of spectacle blinds is not suitable.
- d) Dirty or cocking services as per licensor requirements.
- e) Sample connections
- f) Operating vents and drains on hydrogen service or LPG service where flashing and consequent freezing can occur.

22.4. Check valves shall be provided where necessary to prevent back flow:

- a) on the discharge of centrifugal and rotary pumps and compressors
- b) on the discharge of dosing and volumetric pumps (see fig. 10.2)
- c) on utilities and service lines permanently connected to process lines or equipment.

23. SPECTACLE BLINDS CHECK LIST

23.1. Spectacle blinds shall be provided:

- a) at battery limits, for all the lines entering or leaving geographical unit (refer to fig. 21.1). Spectacle blinds shall be installed towards plant side.
 - b) for isolating purpose at vessels to be inspected during normal operation of the plant.
 - c) to prevent contamination of process or utility lines, during normal or special (i.e. regeneration, etc.) operation
-

STANDARD SPECIFICATION FOR PID PREPARATION

24. STEAMING OUT/PURGING

24.1. The plant shall be designed with steamout/purging connections adequate in number and size, to enable inert flushing during startup, shutdown and maintenance operation.

Purge connection shall be preferably located on piping instead of equipment.

Whenever provided on vessels, purge connections shall be at min. distance from tangent line.

Vessel capacity (m ³)	Connection (inches)	Steam out connection
V < 75	2"	2"
75 < V ≤ 220	3"	2"
220 < V ≤ 420	4"	3"
V > 420	6"	4"

24.2. Steam out connection 3" and larger shall be permanently connected to steam header as per para 18.0.

24.3. Equipment and associated lines which will be steamed during start-up or shutdown operations, shall be designed for thermal expansion for the higher of:

- a. steam-out temperature 110°C
- b. design temperature of the line or equipment.

24.4. The extension of steam out in the plant will be general with the following exceptions:

- Air Service
- Nitrogen
- Water
-
-
-

STANDARD SPECIFICATION FOR PID PREPARATION

25. DRAINAGE SYSTEM

25.1. All the drains from equipment, lines or instruments, which for process reasons must be piped into an open sewer or a closed system, shall be shown on PID with the indication of the destination (oily sewer, chemical sewer, recovery system, etc...).

TYPES OF SEWERS	UNDERGROUND
- Oily water sewer	(OSW)
- Chemical sewer	(CSW)
- Amine closed drain	(AMW)
- Caustic closed drain	(CAW)
- Sanitary sewer	(SSW)
- Sour water sewer	(ASW)
- Waste water sewer	(WSW)
- Storm water drainage system	(SWS)

PROCESS CLOSED DRAINS

- LPG closed drain (A.G.)	(CLG)
- Hydrocarbon closed drain	(CLD)
- Aromatic closed drain	(ADH)
- drain	(.....)

26. WINTERIZING

26.1. The winterizing protection shall be based on the ambient temperature.

26.2. Piping shall be designed to avoid tracing whenever possible by circulation of the fluid within the piping.

Circulation can be maintained during equipment shut-down in piping such as cooling water by using a small by-pass between supply and return lines near the equipment. Piping shall be designed for normally flowing lines to eliminate stagnant pockets where freezing may occur. Where unavoidable, protection by insulation and steam tracing should be provided.

Non flowing lines, intermittent service, and dead ended lines should be avoided as far as possible. Where unavoidable, such lines should be insulated and steam traced.

STANDARD SPECIFICATION FOR PID PREPARATION

26.3. Winterizing by Draining

Utility lines such as water, condensate, steam etc. where liquid may collect and freeze during shut-down shall be designed for self-draining and provided with appropriate drains and vents.

During non-operating periods these lines may be completely drained.

26.4. Underground Lines

Underground piping and drains will be buried below the frost line.

Main header for the following services shall be underground:

fire water, drinking water, utility water and cooling water with the following limitations:

-
-
-

1. Where branch lines for single service rise from underground, block valves shall be provided in the risers just above the ground. The following arrangement will provide protection against freezing:

- (a) A by-pass shall be provided just under the block valves, from the supply back to the return for recirculation.
This by-pass shall be 3/4" for lines 3" and smaller, 1" for lines 4" to 8" and 1½" for lines larger than 8" to 20"; 2" for lines larger than 20".
- (b) A valved drain shall be provided in the line at minimum distance above the block valve.
- (c) 1" of insulation shall be provided around the piping, from the ground up to and including the block valves in the water risers. Dead legs longer than 500 mm shall be subject to specific analysis

2. Aboveground water supply and return headers shall be protected against freezing in the following manner:

- (a) A by-pass shall be provided between the extreme ends of the supply and return headers for recirculation.
- (b) Block valves shall be provided at the highest points of the branch lines in a horizontal position near to the headers. The line between the header and the block valve shall be of minimum length.
Alternately branch lines may be treated as headers as in (a) above.
- (c) Water lines for hose stations shall be insulated together with the steam line to the hose station.
- (d) Valved drains shall be provided at all low points and plugged vents at all high points.

STANDARD SPECIFICATION FOR PID PREPARATION

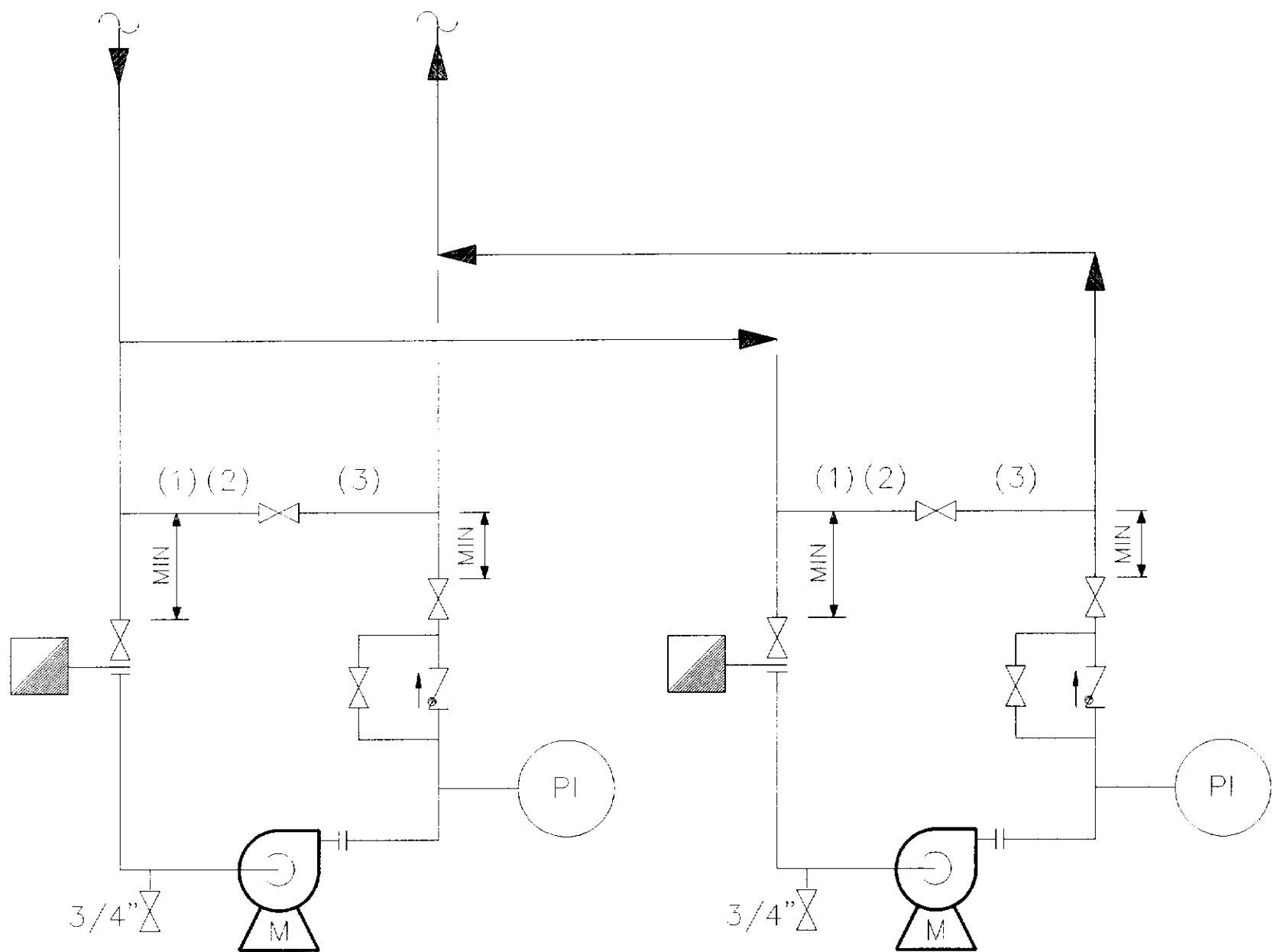
26.5. EQUIPMENT

- 1) A drum or vessel containing liquid hydrocarbon and water which may freeze shall be protected by heat tracing and by insulating nozzles, block valves and drain piping.
- 2) Exchangers and coolers containing liquids which may freeze shall have sufficient valved drain points to insure complete drainage upon shutdown.
- 3) Each water cooling system associated with a pump or a compressor shall have sufficient valved drain points to insure complete drainage upon shutdown.
- 4) For pumps winterizing facilities shall be provided alternatively as follows:
 - a) suction/discharge by-pass equipment with valves installed at min. distance from each other respectively, to avoid dead legs
 - b) as per fig. 26.1.

STANDARD SPECIFICATION FOR PID PREPARATION

PUMP SUCTION AND DISCHARGE LINE WINTERIZING ARRANGEMENT

FIG. 26.1



NOTES:

- 1) Circulation by pass for winterization purpose.
- 2) 1" of insulation shall be provided around the piping, from the block valves up to including, the by-pass, ensuring that dead legs are no longer than 500 mm (measured from the line with flowing fluid).
- 3) The dimensions of by-pass line are the following :
 $\frac{3}{4}$ " – for lines 3" and smaller; 1" – for lines from 4" to 8"; 1 $\frac{1}{2}$ " – for lines from 10" to 20"; 2" – for lines larger than 20".

STANDARD SPECIFICATION FOR PID PREPARATION

27. INSTRUMENTATION

- 27.1. The Instrumentation shall be shown in accordance with ISA-S5.1 "Instrumentation Symbols and Identification" and as per Client's requirements.

Instrument Tags shall conform to contractual rules formalised by Instrumentation specialists. The following criteria is normally adopted:

XX ZZ YY K

Where:

XX identify the plant unit

ZZ the first letter identifies the variable, as: L = Level, F = Flow etc.

The subsequent letter identifies the function, as: T = Transmitter, C = Controller, etc.

YY Sequential instrument number

K sub index

- 27.2. The valve installed in each instrument take-off connection shall be located as close to vessel or line as possible.

Take-off connections, including the first block valve, shall be compatible with the line service classification.

- 27.3. The take-off connection valves shall not be shown on PID, in general; for levels instrument

Only they may be shown if required for process reasons.

- 27.4. Instruments shall be sealed by any of the following process conditions:

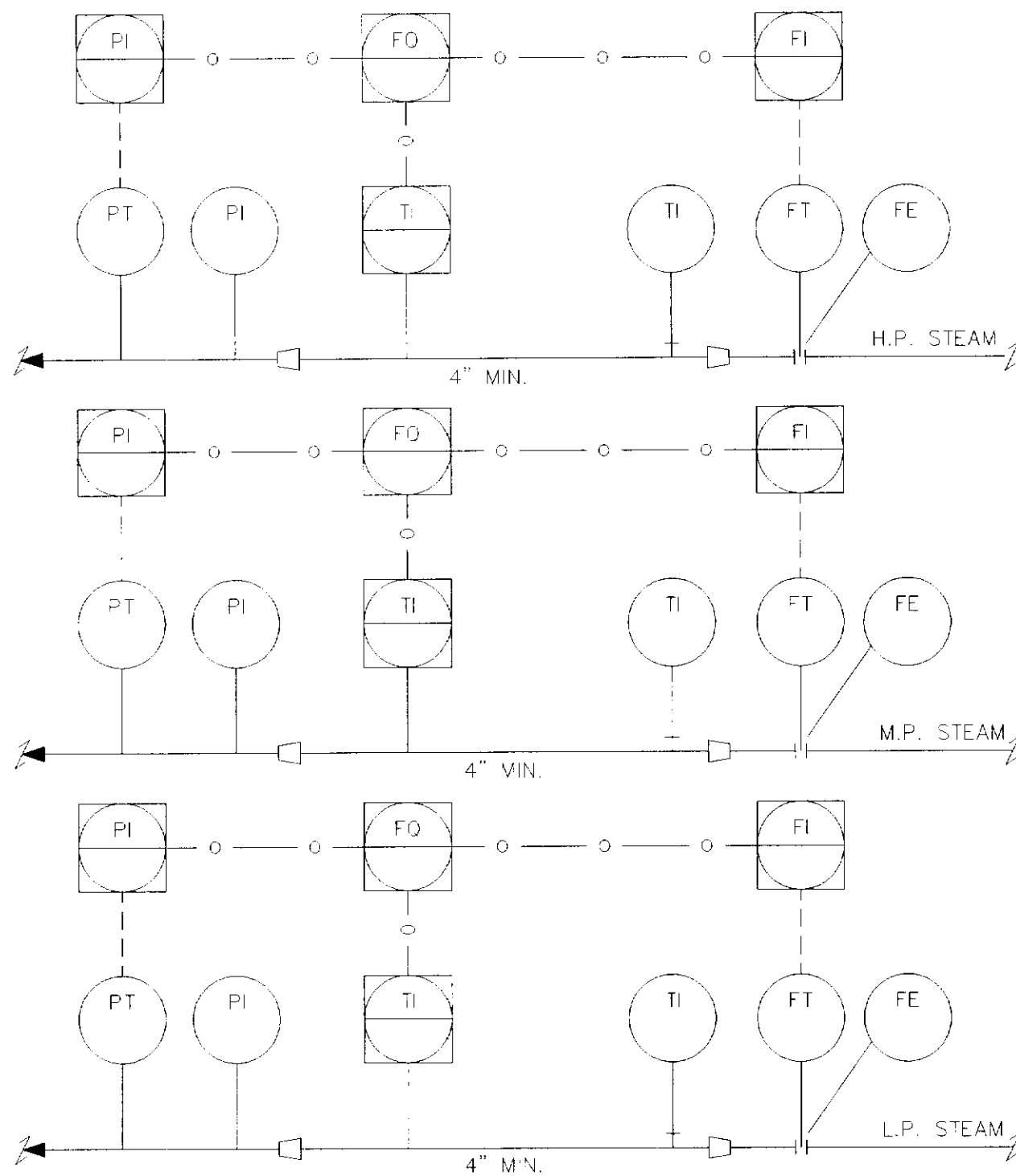
- corrosive fluids
- extremely viscous fluids and where heat tracing will be unsatisfactory
- slurries and fluidized solids.

- 27.5. The instrumentation located at units or Blocks B.L. will be provided as follow:

Process Lines: according to process or licensor requirements as per PID's

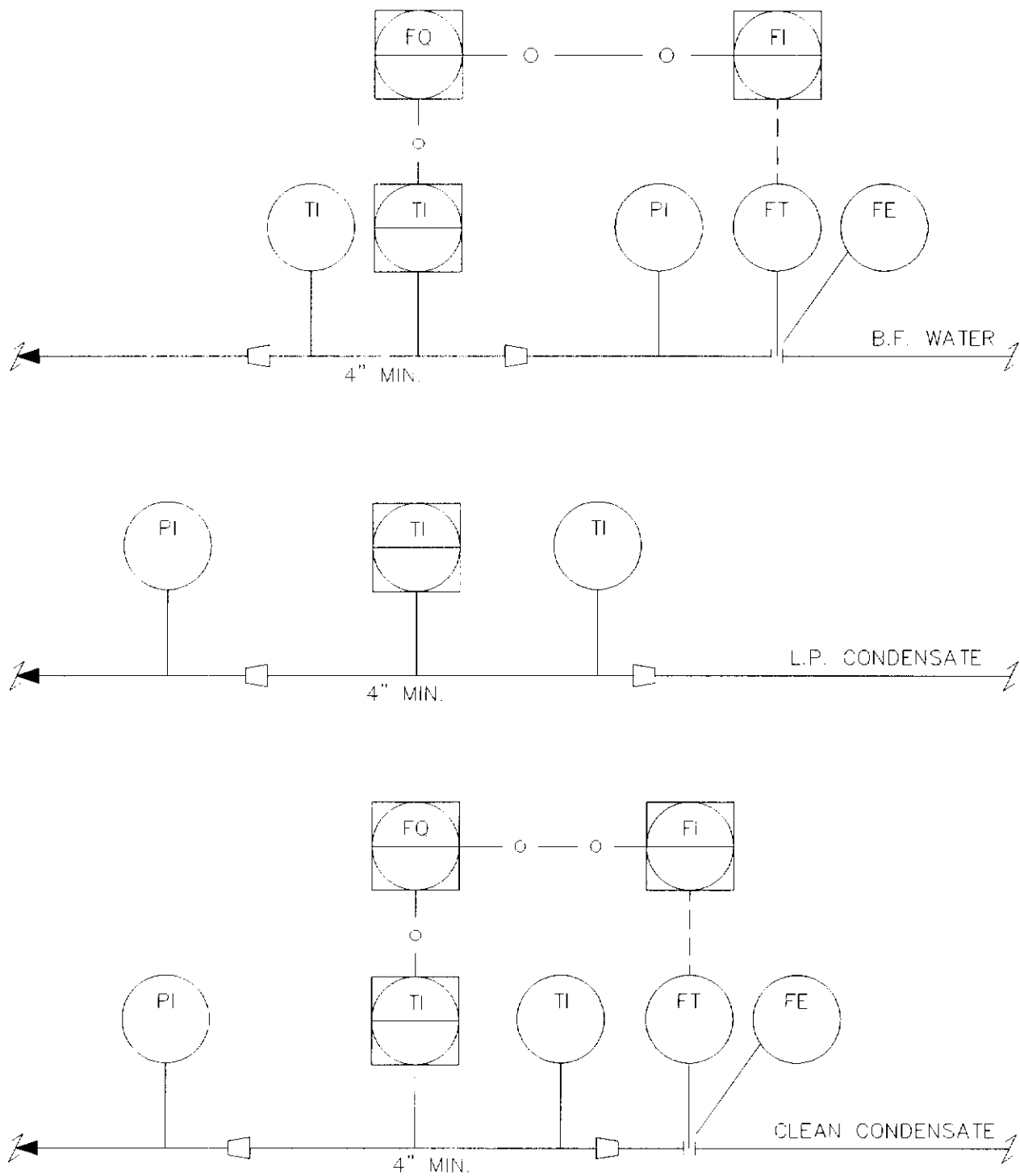
Utility Lines: as per here attached arrangements (for flare and slop headers, no measurement).

STEAM HEADERS



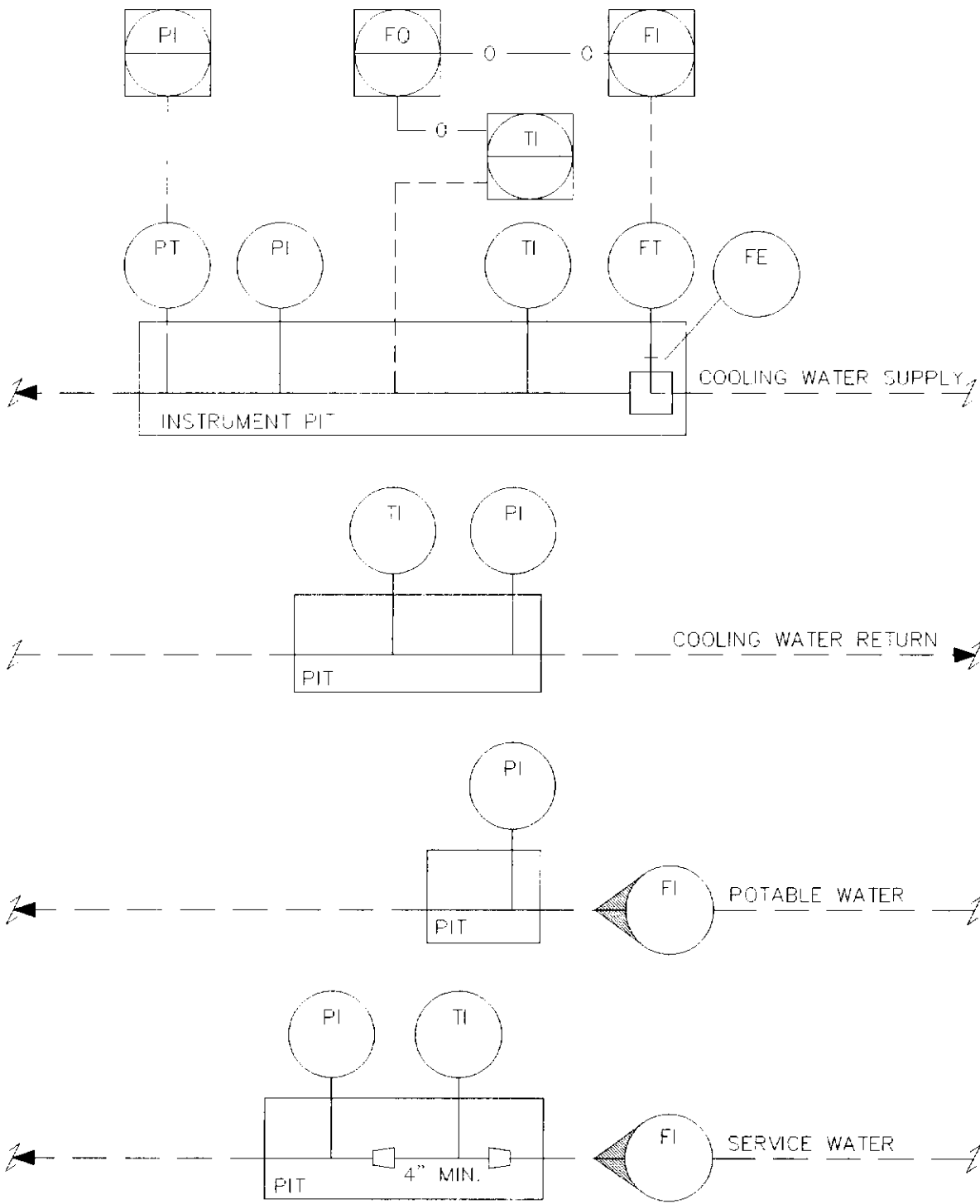
STANDARD SPECIFICATION FOR PID PREPARATION

B.F. WATER AND CONDENSATE HEADERS



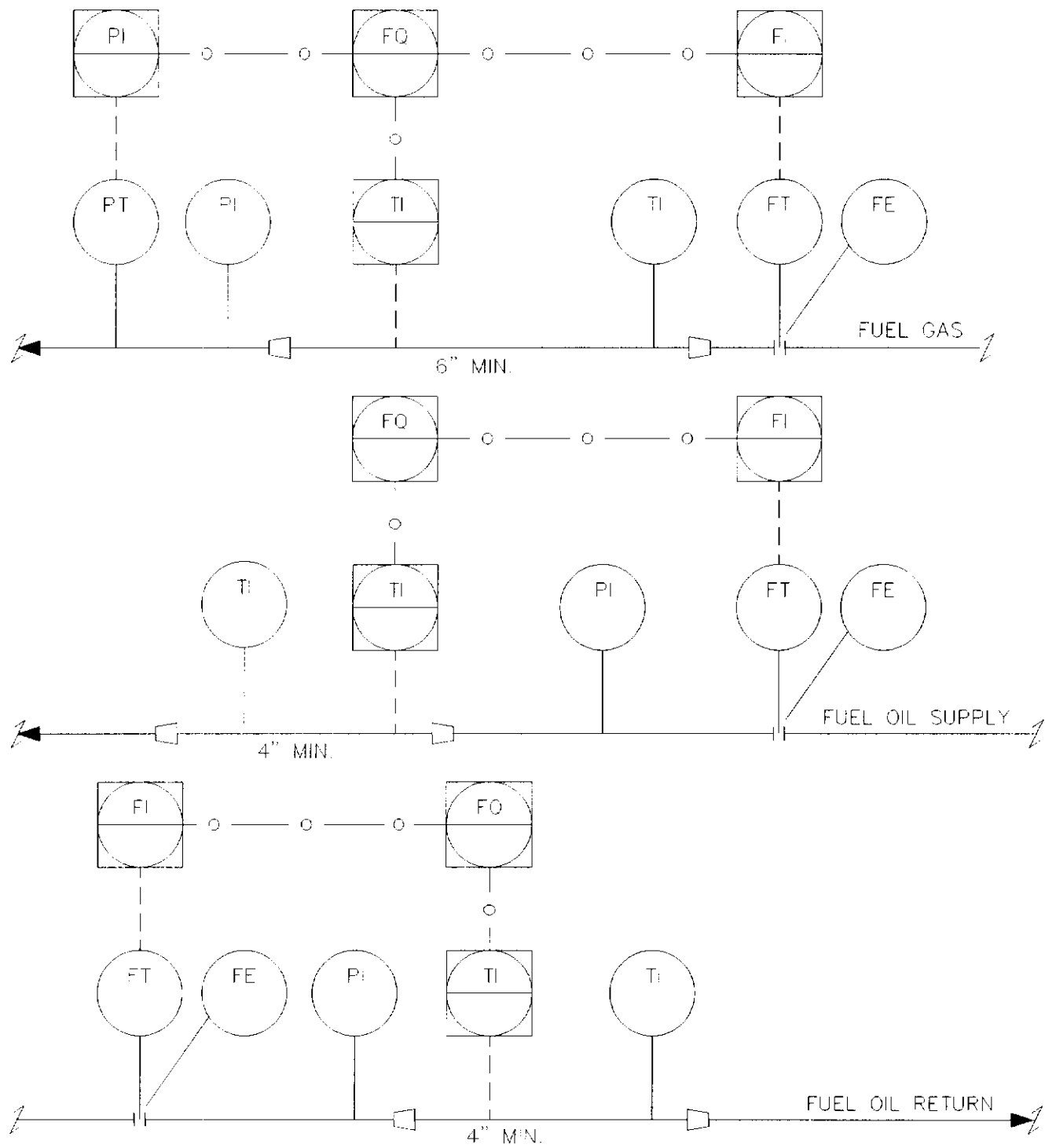
STANDARD SPECIFICATION FOR PID PREPARATION

WATER HEADERS



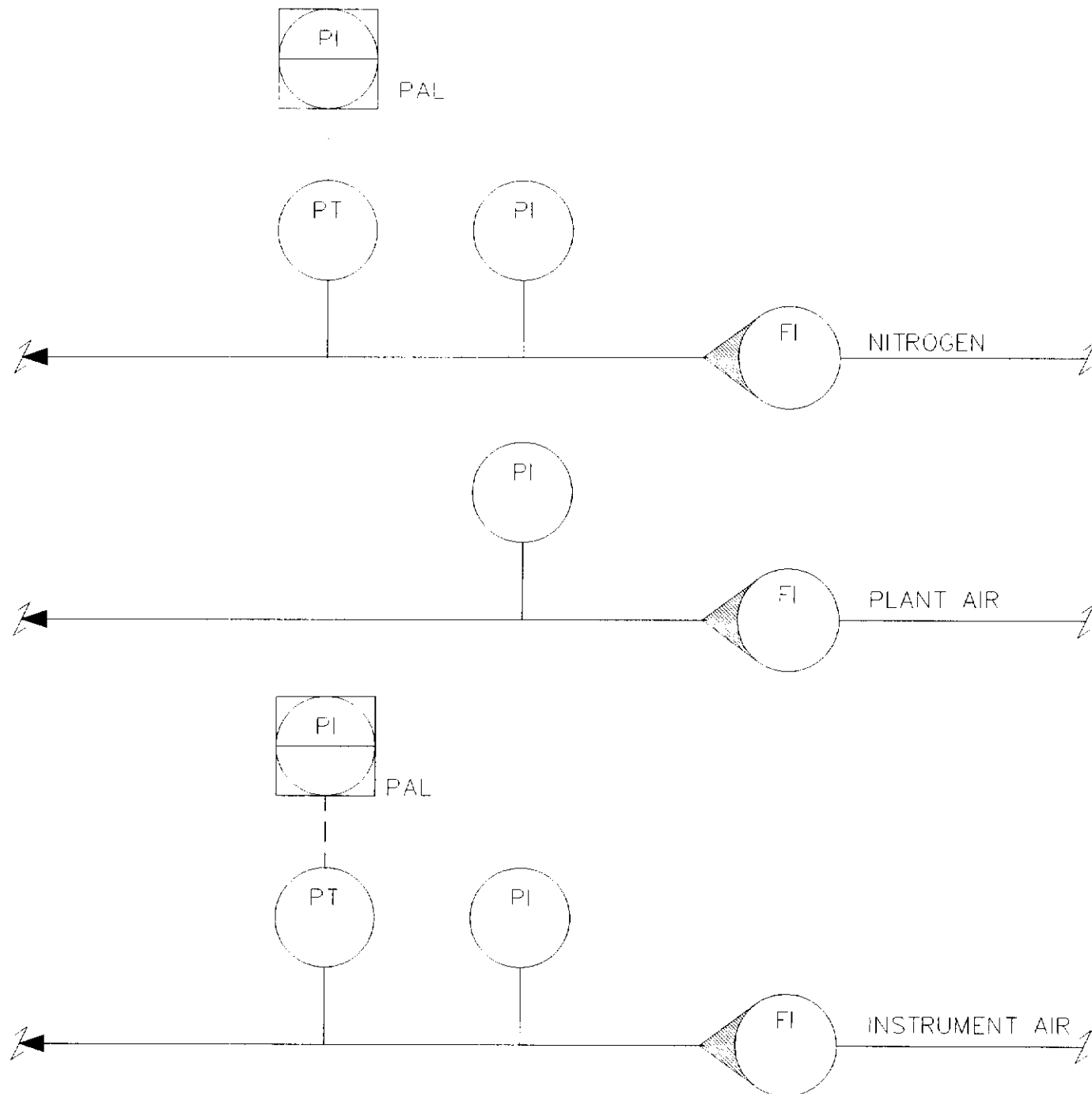
STANDARD SPECIFICATION FOR PID PREPARATION

FUELS HEADERS



STANDARD SPECIFICATION FOR PID PREPARATION

NITROGEN AND AIR HEADERS



ATTACHMENT

Project Reference Drawings "Symbols and Standards for P&ID Diagrams"

UNDER PREPARATION