ENGINEERING STANDARD

FOR

PROCESS FLOW DIAGRAM

CONTENTS :

PAGE No.

TABLES :

FIGURES:

APPENDICES:

0. INTRODUCTION

The Standard Practice Manual titled as "Fundamental Requirements for the Project Design and Engineering" is intended for convenience of use and a pattern of follow-up and also a guidance.

These Standard Engineering Practice Manuals, also indicate the check points to be considered by the process engineers for assurance of fulfilment of prerequisitions at any stage in the implementation of process plant projects.

It should be noted that these Iranian Petroleum Standards (IPS), as a Practice Manual does not profess to cover all stages involved in every process project, but it reflects the stages that exist in general in process projects of oil, gas and petrochemical industries of Iran.

These preparation stages describes the following three main phases which can be distinguished in every project & includes, but not limited to:

Phase I) Feasibility Studies, Process Evaluation and the Basic Design Stages (containing eleven standards).
Phase II) Detailed Design, Engineering and Procurement Stages (containing three Standards).
Phase III) Start-up Sequence and General Commissioning Procedures (containing two Standards).

The process engineering standards of this group includes the following 16 Standards:

STANDARD CODE	STANDARD TITLE
I) Manuals of Phase I (Numbers 1-11)	
IPS-E-PR-110	"Introduction to IPS Codes and Standards"
IPS-E-PR-120	"Feasibility Studies and Basic Design Philosophies"
IPS-E-PR-130	"Process Evaluation and Selection"
IPS-E-PR-140	"Execution of Basic Design"
IPS-E-PR-150	"Basic Design Package"
IPS-E-PR-170	"Process Flow Diagram"
IPS-E-PR-190	"Layout and Spacing"
IPS-E-PR-200	"Basic Engineering Design Data"
IPS-E-PR-220	"Process Control"
IPS-E-PR-230	"Piping & Instrument Diagrams (P&IDs)"
IPS-E-PR-250	"Performance Guarantee"
II) Manuals of Phase II (Numbers 12-14)	
IPS-E-PR-260	"Detailed Design, Engineering and Procurement"
IPS-E-PR-300	"Plant Technical and Equipment Manuals (Engineering Dossiers)"
IPS-E-PR-308	"Numbering System"
III) Manuals of Phase III (Numbers 15-16)	
IPS-E-PR-280	"Start-up Sequence and General Commissioning Procedures"
IPS-E-PR-290	"Plant Operating Manuals"

This Engineering Standard Specification covers:

"PROCESS FLOW DIAGRAM"

1. SCOPE

This Basic Design Manual outlines general requirements for the contents of the process flow diagram (hereinafter called PFD). In the process plant construction project, process engineering work comprises basic design and detailed design. PFD is a product at the first stage of basic design and forms the basis for the subsequent basic design and detailed design.

PFD begins by a conceptual simplified Process Flow Diagram and developes depending on different concepts and assumption. This simplified PFD outlines the main feedstocks and products. On a clear basis of Basic Design and stage assumptions, PFD can be developed to its complete indications.

2. REFERENCES

ANSI (AMERICAN NATIONAL STANDARD INSTITUTE)

Process Charts, Y 15.3 M, 1979

ISO (INTERNATIONAL ORGANIZATION FOR STANDARDIZATION)

ISO 7000-1984 (E/F), "Graphical Symbols for Use on Equipment-Index and Synopsis"
1st. Ed. 1984-03-15

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-PR-230	"Piping & Instrument Diagrams (P&IDs)"
IPS-E-PR-290	"Plant Operating Manuals"
IPS-E-PR-308	"Numbering System"

3. DEFINITION OF PROCESS FLOW DIAGRAM (PFD)

Process flow diagram is a schematic representation of the sequence of all relevant operations occurring during a process and includes information considered desirable for analysis.

a) The process presents events which occur to the material(s) to convert the feedstock(s) to the specified products.

b) An operation occurs when an object (or material) is intentionally changed in any of its physical or chemical characteristics, is assembled or disassembled from another object or is arranged or prepared for another operation, transportation, inspection or storage.

4. PURPOSE OF PFD

The purpose of PFD is generally as follows:

a) Plant design basis

PFD shows the plant design basis indicating feedstock, product and main streams flow rates and operating conditions.

b) Scope of process

PFD serves to identify the scope of the process.

c) Equipment configuration

PFD shows graphically the arrangement of major equipment, process lines and main control loops.

d) Required utilities

PFD shows utilities which are used continuously in the process.

5. CONTENTS OF PFD

5.1 Items

This manual specifies the design philosophy and basic design procedures for a construction project.

Accordingly, PFD shall comprise but not limited to the following items:

1) All process lines, utilities and operating conditions essential for material balance and heat and material balance.

2) Type and utility flow lines which are used continuously within the battery limits.

3) Equipment diagrams to be arranged according to process flow, designation, and equipment number.

4) Simplified control instrumentation pertaining to control valves and the likes to be involved in process flows.

5) Major process analyzers.

6) Operating conditions around major equipment.

7) Heat duty for all heat transfer equipment.

8) Changing process conditions along individual process flow lines, such as flow rates, operating pressure & temperature, etc.

9) All alternate operating conditions.

10) Material balance table.

5.2 Omissions

Items which must be decided during the subsequent basic design should not be shown in PFD except in special cases, are as follows:

1) Minor process lines which are not usually used in normal operation and minor equipment, such as block valves, safety/relief valves, etc.

2) Elevation of equipment.

3) All spare equipment.

4) Heat transfer equipment, pumps, compressor, etc., to be operated in parallel or in series shall be shown as one unit.

5) Piping information such as size, orifice plates, strainers, and classification into hot or cold insulated of jacket piping.

6) Pressure conditions which must be determined by hydraulic calculations, such as discharge pressure of pump and compressor. This item, however, is not applicable to cases where such pressure conditions are considered to be particularly important from the process point of view.

7) Instrumentation not related to automatic control.

8) Instrumentation of trip system, (because it cannot be decided at the PFD preparation stage).

9) Drivers of rotating machinery except where they are important for control line of the process conditions.

1**0)** Any dimensional information on equipment, such as internal diameter, height, length, and volume. Internals of equipment shall be shown only if required for a clear understanding of the working of the equipment.

6. GENERAL DRAFTING INSTRUCTIONS

6.1 Scale

PFDs should not be drafted to scale. However, their size should be compatible with that of equipment drawings.

6.2 Flow Direction

As a rule, PFDs should be drawn from the left to the right in accordance with process flows.

6.3 Process and Utility Lines in General

The main process flow shall be accentuated by heavy lines.

Process utility lines shall be shown only where they enter or leave the main equipment.

Pipe lines shall not be identified by numbers.

Valves, vents, drains, by-passes, sample connections, automatic or manual control systems, instrumentation, electrical systems, etc. shall be omitted from the schemes.

The direction of the flow shall be indicated for each line.

6.4 Kind of Lines

As a rule, Process lines, utility lines, and loop lines for instrument should be drawn according to IPS-E-PR-230 as follows:

a) Main process lines
Thickness = 0.8 mm

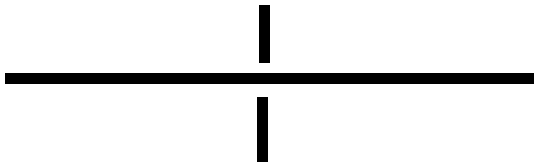
b) Secondary process lines and utility lines
Thickness = 0.5 mm

c) All electrical, computer and instrument signals
Thickness = 0.3 m

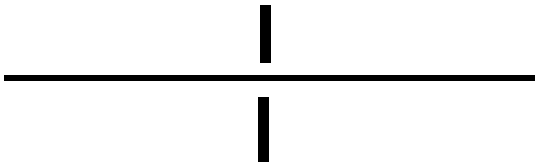
6.5 Line Crossover

Where two lines cross each other, the horizontal line should be drawn as a continuous line in all cases. This shall not apply to loop lines for instruments.

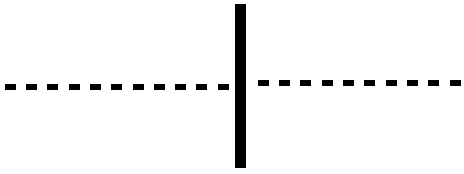
a) Where two main process lines cross



b) Where one main line crosses one secondary process and utility lines



c) Where one main line crosses one loop line for an instrument



6.6 Denotation of Lines at Battery Limit Tie-In Points

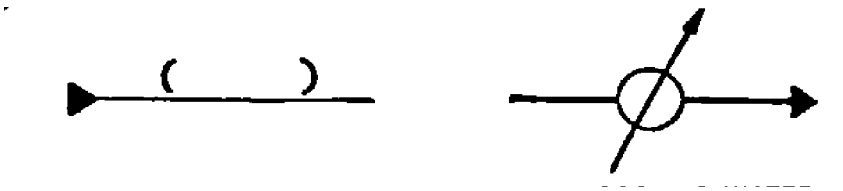
a) Process lines

From Item No. and/
or Dwg. No.

To Item No. and/
or Dwg. No.

Where a PFD consists of two or more divided sheets, drawing numbers should be indicated.

b) Utility lines



Names of fluids should be given in parentheses above the utility lines.

Names of these fluids should be as abbreviations defined according to IPS-E-PR-308.

6.7 Direction of Flow

The direction of flow should be indicated by arrows. In principle all flow lines should be denoted by arrows located at the inlet of equipment, at merging points, and at the corners of the lines. Where a process line is long, however, the process flow may be denoted by arrows located at intermediate points.

The number of arrows used to denote one process flow line is not restricted. However, care should be taken not to clutter the drawing with excessive arrows.

Arrows at corners may be suitably omitted.

6.8 Division of PFD

Where a PFD must be divided into two or more sheets, it should be divided at portions where division is easiest from the process standpoint and each divided section should be drawn on a separate sheet.

6.9 Other Trains

Where there are two or more identical trains of process flows, one representative train may be given in the PFD and the others omitted. However, anotations pointing out such omissions must be clearly indicated in the titles of all relevant PFDs to avoid confusion.

6.10 Base Line

As a rule, base lines should not be drawn. Similar items of equipment, however, should be aligned at the same level as far as possible.

6.11 Title

The title should be given in the title block at the lower right-hand corner of the PFD. A typical title block is shown in Appendix A.

6.12 Legend

The legend may be given, as a rule, at the upper right-hand corner of the PFD.

6.13 Size

The size of PFD should normally be A1 (594 mm × 841 mm).

7. IDENTIFICATION AND NUMBERING OF EQUIPMENT

7.1 Process Equipment

7.1.1 Letter of group

Each item of equipment shall be identified by an identifying or a tag number composed of letter as given in IPS-E-PR-308.

7.1.2 Equipment number and name

The equipment number and name should be given in the PFD, as a rule, at the upper or the lower part of the sheet, preferably in a space close to the center line of the equipment which is to be denoted. However, depending upon the space, either the number or the name can be omitted.

7.1.3 Installed spare equipment

Installed spare equipment, such as pumps, shall be indicated by a suffix letter like "A" or "B".

7.1.4 Equipment drivers

Equipment drivers shall carry the same designation as the driven equipment.

7.1.5 Instrumentation

It is not necessary to assign an identifying number in the PFD.

8. DESCRIPTION OF EQUIPMENT

8.1 Symbols of Equipment and Operating Conditions

a) As a rule, piping and equipment symbols which are common to individual processes should be unified. These are mentioned in Figs. 1.1-1.18.

Symbols to denote other equipment are optional, but such equipment should be drawn as simply as possible.

b) Decimal numbers should be used inside the symbols mentioned in Fig. 2 to denote operating conditions.

c) The position of the operating condition denotation should be as close as possible to the point requiring indication. Where it is difficult to find space for such denotation, however, an auxiliary line should be used to indicate it.

8.2 Minimum Information Requirements for Equipment

8.2.1 Designated streams

a) Stream numbers should be serially denoted by Decimal numbers.
b) Fluid name.
c) Total flow rate.
d) Density and/or molecular mass (weight) if required.
e) Operating pressure and temperature if required.

8.2.2 Heat exchangers

a) Identification number and service name.
b) Operating heat duty.
c) Inlet and outlet temperatures on both shell and tube sides.

8.2.3 Furnaces

a) Identification number and service name.
b) Operating absorbed heat duty.
c) Inlet and outlet operating temperatures on tube side.

8.2.4 Reactors

a) Identification number and service name.
b) Inlet and outlet operation temperature.
c) Inlet and/or outlet pressure.

8.2.5 Columns

a) Identification number and service name.

b) Tray numbers, operating temperature and pressure for top and bottom trays and also for special trays such as feed and draw-off, etc.

c) Trays shall be numbered from bottom to top.

8.2.6 Drums

a) Identification number and service name.
b) Operating temperature.
c) Operating pressure.

8.2.7 Pumps

a) Identification number and service name.
b) Normal operating capacity and differential pressure.

8.2.8 Compressors and blowers

a) Identification number and service name.
b) Normal operating capacity and differential pressure.

8.2.9 Ejectors

a) Identification number and service name.
b) Inlet and outlet operating pressure for ejector system.

8.2.10 Tanks

a) Identification number and service name.
b) Operating temperature.
c) Operating pressure.

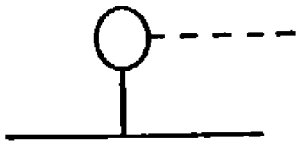
9. DESCRIPTION OF INSTRUMENTATION

Instrumentation to be denoted are instruments, measuring devices and control valves.

9.1 Instruments

9.1.1 Symbols for instrument

a) The symbol for an instrument is a circle which shall be connected to the line which is nearest the point of measurement.



b) Where the instrument is a controller, a dotted line representing the control impulse shall connect the instrument circle to the controller valve.

c) The denotation of such functional symbols as "R" for recorder, "I" for indicator, and "A" for alarm, etc. should be omitted except for the functional symbol "C" for control.

- There should be no distinction as to whether instruments should be locally installed or mounted on the main instrument panel.

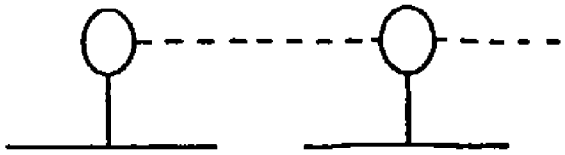
9.1.2 Functional symbols for control

The following symbols are shown inside the circle representing the instrument. For further details refer to IPS-E-PR-308.

Flow Controlling	FC
Flow Ratio Controlling	FRC
Level Controlling	LC
Pressure Controlling	PC
Pressure Differenial Controlling	PDC
TemperatureControlling	TC
Temperature Differencial Controlling	TDC
Speed Controlling	SC
Mass (Weight) Controlling	MC

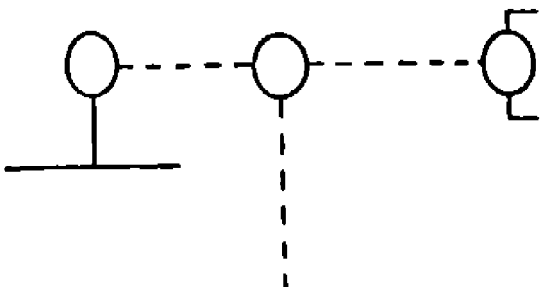
9.1.3 Cascade control

Where one controller alters the desired value of one or more other controllers, the instruments circles shall be connected by a dotted line.



9.1.4 Compound control

Where the control actions of two or more controllers combine to operate one or more control valves, the instrument circles representing the controllers shall be joined by dotted lines to the instrument circle representing the combining device.



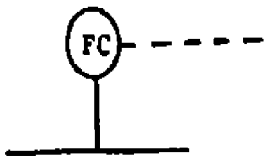
9.2 Measuring Devices

The connecting line between the circle representing the instrument and the stream line represents the measuring device such as for temperature measurement,pressure measurement,flow rate measurement, etc.

9.2.1 Flow rate measuring

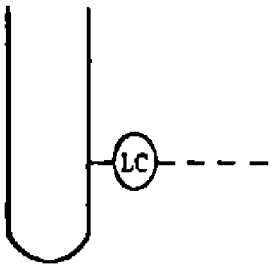
a) Regarding flow rate measurement, definitions of apparatus type such as rotameter, pitot tube, turbine meter,

c) Valves associated with the device need not be shown.



9.2.2 Level measuring

a) Definitions of apparatus type such as ball float, displacement, difference pressure, etc., need not be shown.
b) A distinction should not be made as to whether the apparatus is an internal or external type.
c) Valves associated with the device need not be shown.



9.2.3 Measurement of pressure, temperature, etc.

a) No distinction should be made regarding measuring type.
b) Valves associated with measuring devices need not be shown.

9.3 Control Valves

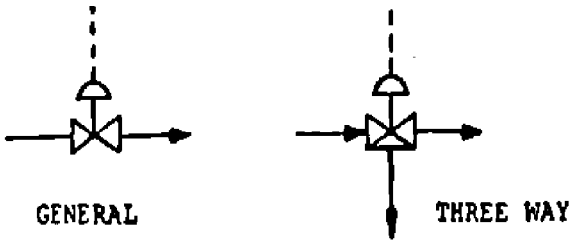
9.3.1 Actuator

a) The symbol for an actuator is a half circle which half circle shall be connected with a dotted line representing the control impulse.

b) There should be no distinction made as to whether the actuator is a diaphragm type, electric motor type or oil cylinder type, etc.

9.3.2 Control valves

Control valves operated by instruments are shown as following:



10. MATERIAL BALANCE TABLE

10.1 Contents of Material Balance Table

A material balance table literally describes the balance between materials and, in many cases, includes further information. A common material balance table will consist of the following information.

10.1.1 Stream information

Stream No., name of stream, flow rate, composition.

10.1.2 Operating conditions

Operating temperature and pressure.

10.1.3 Basic physical properties

Molecular mass (weight), API gravity, Relative Mass Density (Specific Gravity) or (Sp.Gr.), etc.

10.1.4 Data concerning hydraulic calculation

Density, viscosity, etc. if required.

10.2 Denotation of Material Balance Table

As a rule, no requirements will be made regarding the form of the material balance table. However, care should be given to the following points.

10.2.1 Position of denotation

As a rule, the material balance table should be inserted at the lower part of the PFD or at its right-hand side.

10.2.2 Number of digits of numerals and denotation of small quantities

As a rule, percentages should be expressed down to 0.01%. Where traces of components are concerned, special units, such as ppm, should be used.

10.3 Examples

A typical material balance table is shown in Table 1. The following comments should be noted prior to preparation of the sheet, however:

a) Operating pressure and temperature may be omitted because the operating conditions are indicated on the equipment as stated in "Minimum Information Requirements for Equipment".

b) The total flow rate is sometimes described as m^3/h or bbl/sd (stream day) for liquid flow and as Nm^3/h for gas flow.

c) The molecular mass (weight) and/or boiling point and/or melting point of each component are often inserted near each component mentioned in Table 1.

11. HEAT AND MATERIAL BALANCE SHEETS

When preparing the heat and material balance sheets in addition to material balance tables, necessary reference should be made to PFD stream numbers.

The heat and material balance sheets should be prepared as typically shown in IPS-E-PR-290.

TABLE 1 - TYPICAL MATERIAL BALANCE TABLE

STREAM No.			**101**	**102**
Fluid name				
Components	mol/h or mol% or mass/h or mass%	Spec. MW and/or BP and/or MP		
A B C D E				
Total flow rate (mol/h)				
Total flow rate (mass/h), in (kg/h)				
Total flow rate (volume/h), in (m^3/h) For liquids at operating conditions, and in (Nm^3/h) for gases				
Operating pressure, in kPa (ga) or bar (ga)				
Operating temperature, in (°C)				
Molecular mass (weight), in (kg)				
Relative mass density (specific gravity) at operating conditions, dimensionless				
Mass density at operating conditions, in (kg/m^3)				
Others				
Remarks				

12. PIPING AND EQUIPMENT SYMBOLS (SEE FIGS. 1.1 THROUGH 1.18)

12.1 Pipeline Symbols (See Fig. 1.1.a)

12.1.1 Piping-Pipelines symbols (see Fig. 1.1 b)

12.1.2 Piping-Trap functions symbols (see Fig. 1.2)

12.1.3 Piping-General equipment symbols (see Fig. 1.3)

12.2 Shell and Tube Type Heat Exchanger Symbols (See Fig. 1.4)

12.3 Double-Pipe Heat Exchanger Symbol (See Fig. 1.5)

12.4 Reboiler Symbols (See Fig. 1.6)

12.5 Air Fin Cooler Symbols (See Fig. 1.7)

12.6 Box Cooler Symbols (See Fig. 1.8)

12.7 Furnace Symbols (See Fig. 1.9)

12.8 Pump Symbols (See Fig. 1.10)

12.9 Compressor, Expander and Blower Symbols (See Fig. 1.11)

12.10 Column Symbols (See Fig. 1.12)

12.11 Drum Symbols (See Fig. 1.13)

12.12 Reactor Symbol (See Fig. 1.14)

12.13 Ejector Symbol (See Fig. 1.15)

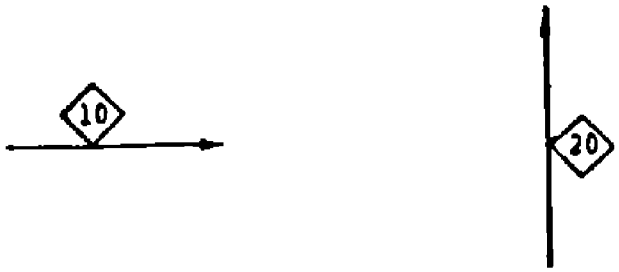
12.14 Tank Symbols (See Fig. 1.16)

12.15 Other Equipment Symbols (See Figs. 1.17 and 1.18)

12.15.1 Atmospheric storage tanks symbols (see Fig. 1.17)

12.15.2 Vessels, incl. pressure storage vessels (see Fig. 1.18)

12.1 Pipeline Symbols



PIPELINE SYMBOLS

Fig. 1.1 (a)

Note:

Stream numbers should be serially denoted by Decimal numbers which are given, as a rule, above a horizontal line or on the right-hand side of a vertical line.

12.1.1 Piping-Pipelines symbols

MAIN PROCESS LINE*	
Secondary process line and service line	
Existing line	
Future line	
Existing line to be removed	
Underground line	

PIPING - PIPELINES SYMBOLS

Fig. 1.1 (b)

Note 1:

*** Arrow or 30 indicates direction of fluid flow.**

Note 2:

The piping abbreviations shall be used to identify the graphical representation of piping components as mentioned in IPS-E-PR-230.

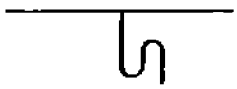
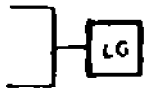
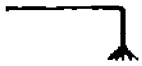
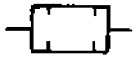
12.1.2 Piping-Trap functions symbols

TRAP DRAIN, e.g. CONDENSATE RELEASE, BASIC SYMBOLS	
TRAPPED VENT, e.g. AUTOMATIC AIR VALVE, BASIC SYMBOLS	
STEAM TRAP ASSEMBLY	STA

PIPING - TRAP FUNCTIONS SYMBOLS

Fig. 1.2

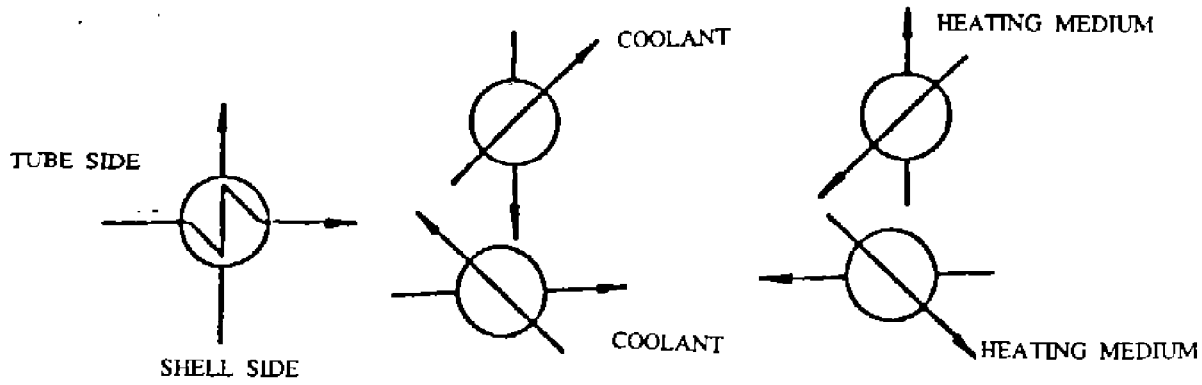
12.1.3 Piping-General equipment symbols

OPEN VENT	
TUNDISH	
SYPHON DRAIN (SEAL LEG)	
LIQUID SEAL, OPEN	
LIQUID SEAL, CLOSED	
LEVEL GAGE	
LEVEL GAGE ON STANDPIPE	
LEVEL GAGE MAGNETIC FLOAT TYPE	
LEVEL GAGE BULL EYE TYPE	
SPRAY DEVICE	
SILENCER	
STRAINER, FILTER	

PIPING- GENERAL EQUIPMENT SYMBOLS

Fig. 1.3

12.2 Shell and Tube Type Heat Exchanger Symbols



a) Heat Exchanger b) Cooler c) Heater

SHELL AND TUBE TYPE HEAT EXCHANGER SYMBOLS

Fig. 1.4

Note 1:

- Distinction to be made between shell and tube side.

- Flow direction of heating medium should be downward.

- Flow direction of cooling medium should be upward.

Note 2:

Heat exchanger could be shown as below (optional).

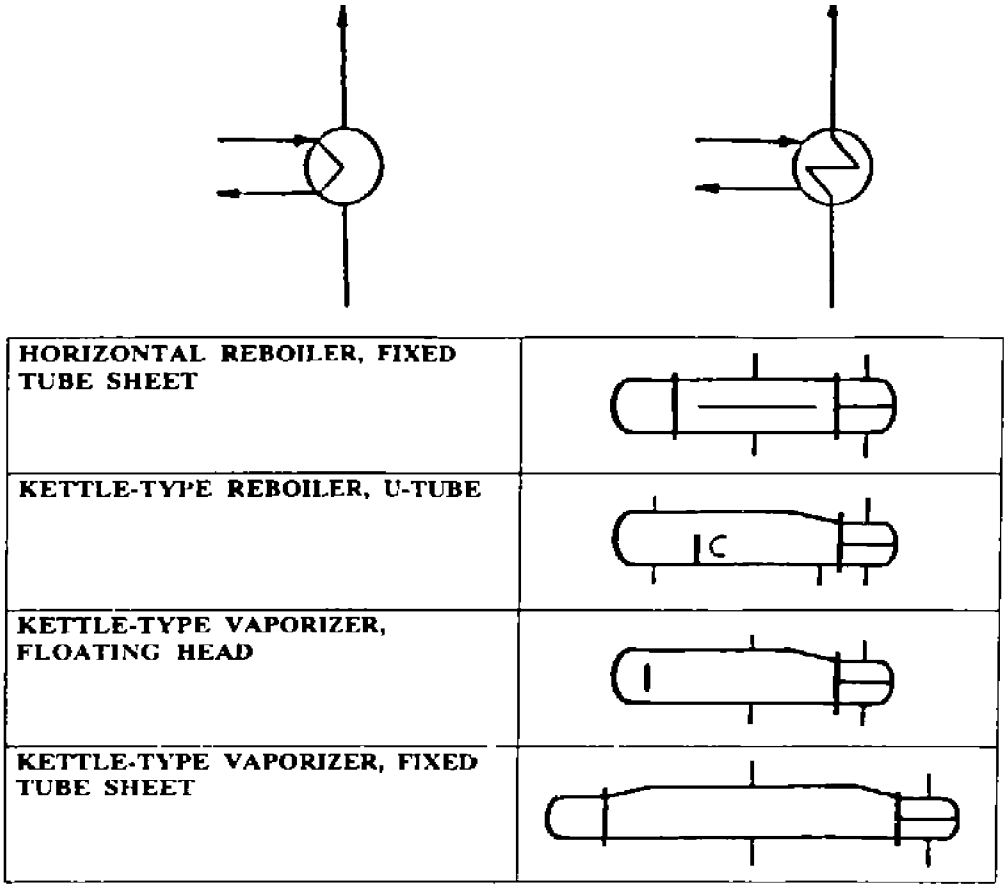
12.3 Double-Pipe Heat Exchanger Symbol

DOUBLE-PIPE HEAT EXCHANGER	

DOUBLE-PIPE HEAT EXCHANGER SYMBOL

Fig. 1.5

12.4 Reboiler Symbols



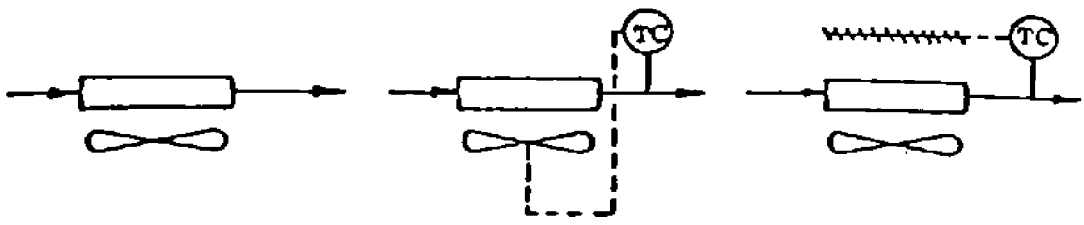
REBOILER SYMBOLS

Fig. 1.6

Note:

The direction of lines is optional, but the lines denoting the shell and tube side respectively, should cross each other at 90° or 45°.

12.5 Air Fin Cooler Symbols



a) No Automatic Control **b) Fan Pitch Control** **c) Louver Control**

AIR FIN COOLER SYMBOLS

Fig. 1.7

Note:

- Where temperature controls must be selected in consideration of various factors, the process engineer will show the control types on the PFD.

- There is no distinction between "Forced" and "Induced" AFC.

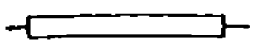
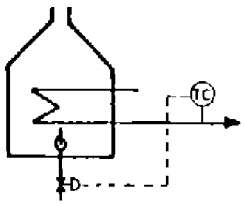
12.6 Box Cooler Symbol

BOX COOLER	

BOX COOLER SYMBOL

Fig. 1.8

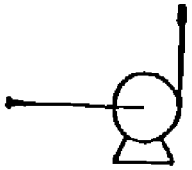
12.7 Furnace Symbols

FURNACE COIL, BASIC SYMBOL	
COIL BANK, BASIC SYMBOL	
FURNACE, HEATER, BASIC SYMBOL	

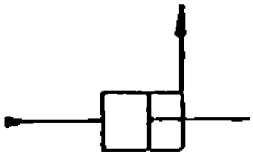
FURNACE SYMBOLS

Fig. 1.9

12.8 Pump Symbols



a) Centrifugal Pump



b) Reciprocating Pump

PUMP SYMBOLS

Fig. 1.10

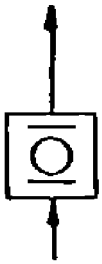
Note:

- There is no distinction between "Single" or "Multiple" stage.

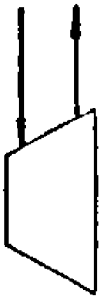
- Drivers need not be shown.

12.9 Compressor, Expander and Blower Symbols

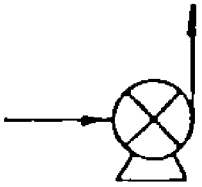
a) Centrifugal Compressor



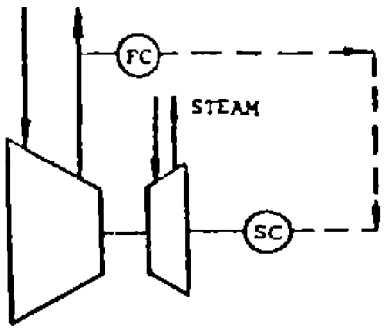
b) Reciprocating Compressor



c) Expander



d) Blower



Compressor Turbine

e) Driver Control

COMPRESSOR, EXPANDER AND BLOWER SYMBOLS

Fig. 1.11

Notes:

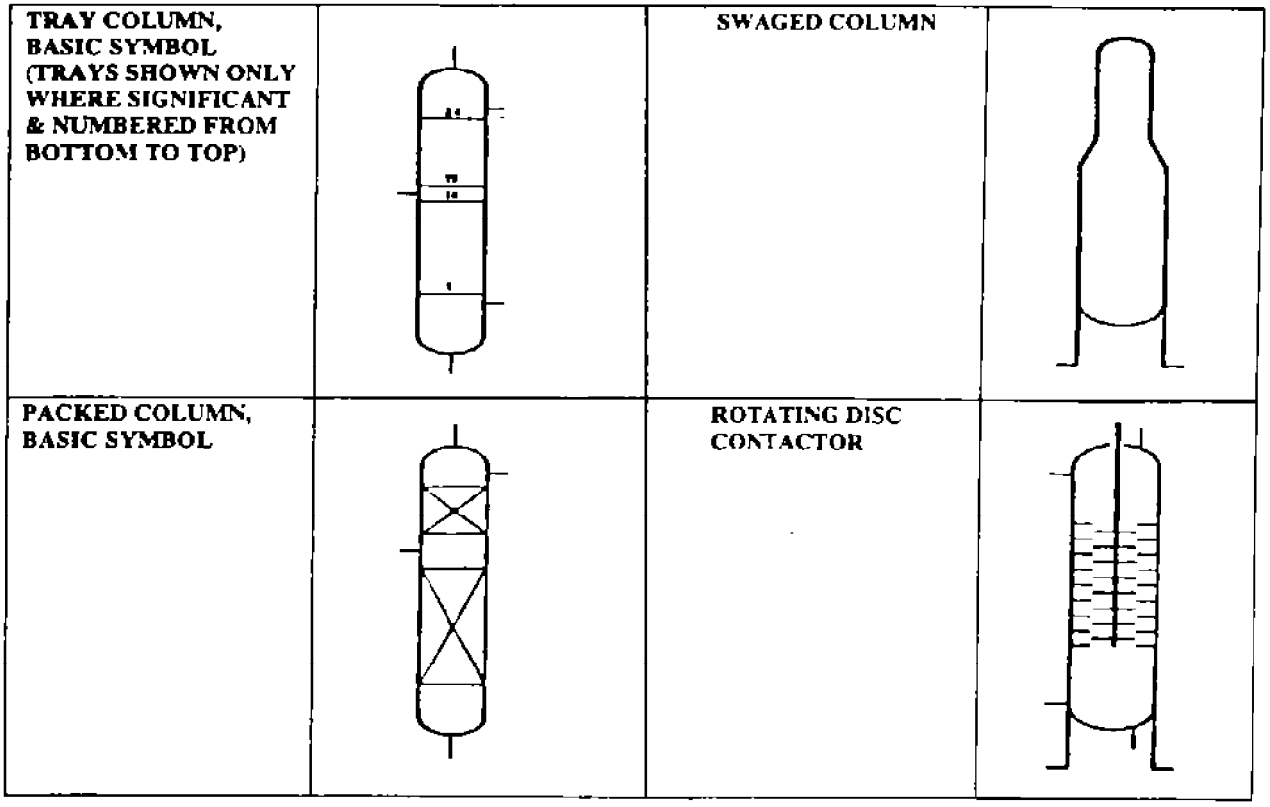
- There is no distinction between "Single" or "Multiple" stage.

- The intercooler need not be shown.

- The driver need not normally be shown.

- In the case where the process gas pressure or flow rate is controlled by a driver (speed), it is necessary to show the driver and control system as mentioned above.

12.10 Column Symbols



a) Tray Column **b) Swaged Column** **c) Packed Column** **d) Rotating Disc Contactor**

COLUMN SYMBOLS

Fig. 1.12

Notes:

- Skirts and supports need not be shown.

- The trays should be shown pictorially in such a way that their number can be readily determined. Actual numbers should be inserted only in parts which are important from the process point of view.

- Special trays such as draw offs, feed trays and those which locate process lines and/or instruments shall be shown.

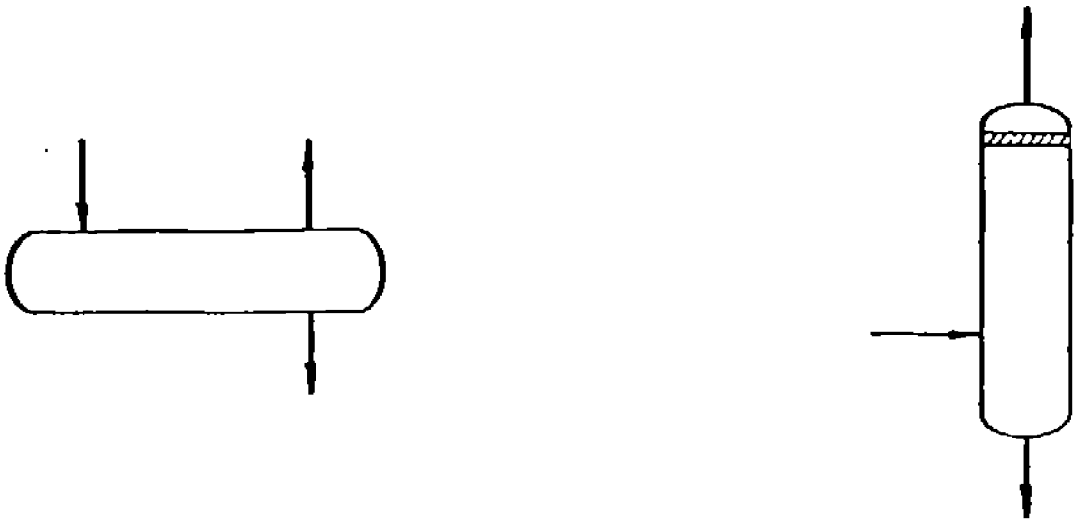
- Packed beds should be shown pictorially in such a way that their number can be readily determined.

- Demister pads should be shown pictorially.

- It is not necessary to show internals such as distributors, spray nozzles, chimneys, cyclones, partition plates, vortex breakers, etc., except in special cases.

- It is not necessary to show tray type such as valve, bubble cap, sieve, grid, etc.

12.11 Drum Symbols



a) Horizontal b) Vertical

DRUM SYMBOLS

Fig. 1.13

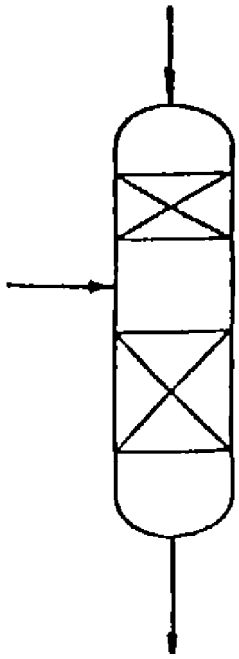
Notes:

- Skirts and supports need not be shown.

- Demister pad should be shown pictorially.

- It is not necessary to show internals such as distributors, vortex breakers, etc., except in special cases.

12.12 Reactor Symbol



REACTOR SYMBOL

Fig. 1.14

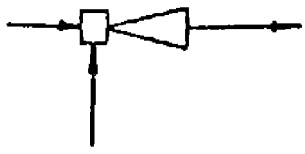
Notes:

- All process streams should be shown.

- The catalyst beds should be shown pictorially in such a way that their number can be readily determined.

- It is not necessary to show any internals such as fluid distributors.

12.13 Ejector Symbol



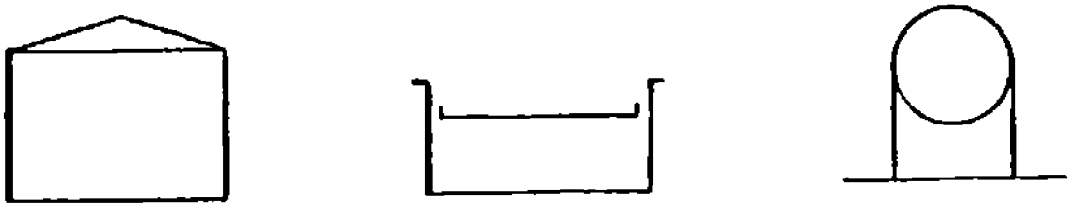
EJECTOR SYMBOL

Fig. 1.15

Note:

- There is no distinction between "Single" or "Multiple" stage.

12.14 Tank Symbols



a) Con Roof b) Floating Roof c) Spherical

TANK SYMBOLS

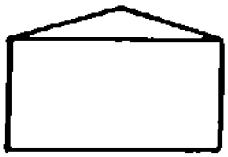
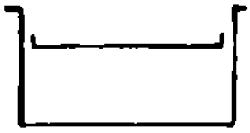
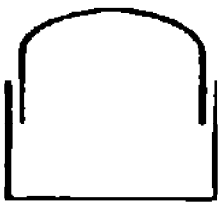
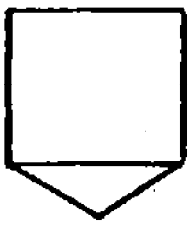
Fig. 1.16

Note:

The pressure relieving and vacuum breaking system need not be shown.

12.15 Other Equipment Symbols

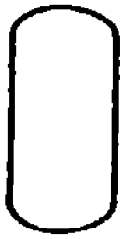
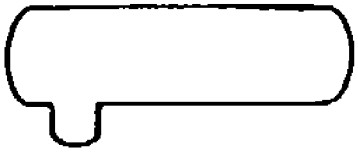
12.15.1 Atmospheric storage tanks symbols

CLOSED TANK, BASIC SYMBOL	
OPEN TANK	
CONICAL ROOF TANK	
FLOATING ROOF TANK	
GAS HOLDER	
CONICAL BOTTOM TANK	

ATMOSPHERIC STORAGE TANKS SYMBOLS

Fig. 1.17

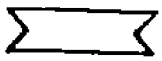
12.15.2 Vessels, incl. pressure storage vessels symbols

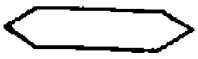
VESSELS BASIC SYMBOL	
VESSEL WITH SUMP	
SPHERE	

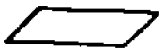
VESSELS, INCL. PRESSURE STORAGE VESSELS SYMBOLS

Fig. 1.18

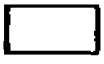
13. SYMBOLS OF OPERATING CONDITIONS

Liquid flow rate: 

Mass flow rate: 

Gas flow rate: 

Pressure: 

Temperature: 

Heat duty:

SYMBOLS OF OPERATING CONDITIONS

Fig. 2

Note:

Decimal numbers should be inserted inside the symbols.

APPENDICES

APPENDIX A
A TYPICAL TITLE BLOCK

REV.	DATE	DESCRIPTION	PREP.	CHECK	APPD.
5					
4					
3					
2	3/89	NIOC COMMENTS INCORPORATED			
1	12/88	GENERAL REVISIONS AS PER PFD REVIEW MEETING.			
0	9/88	ISSUE			

NATIONAL IRANIAN OIL COMPANY REFINERIES ENGINEERING AND CONSTRUCTION	N.I.O.C. DWG. No. SCALE NONE
SNAMPROGETTI - CHIYODA JOINT VENTURE	JOB No. 175600
BANDAR ABBAS REFINERY	REVISION 2
TWO STAGES DISTILLATION UNIT (UNIT 01) PROCESS FLOW DIAGRAM (CASE 4) PREHEATING TRAIN SECTION	DWG. No. 01-GE-B-04341