

دوره آموزشی PFD-P&ID

PFD-P&ID training course

سال 1393

تهیه کننده : محمد بهزادی Mohammad Behzadi

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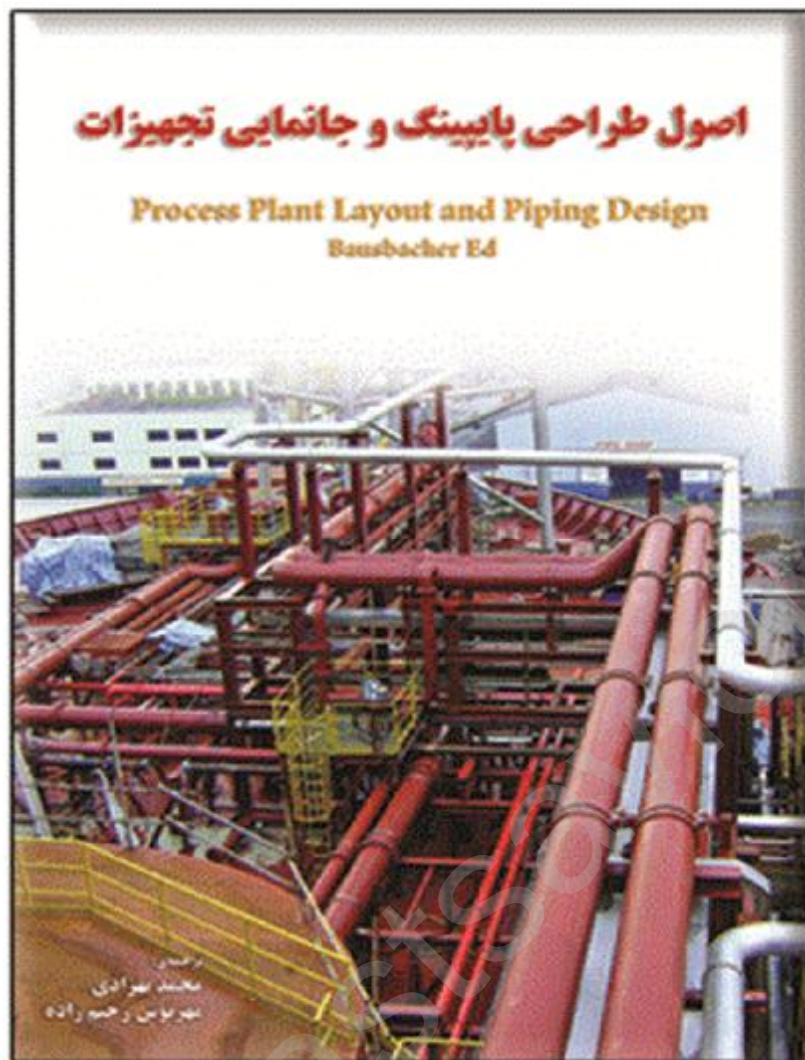
Lastsavior@gmail.com

خواهشمند است از نظرات خود جهت بهبود جزوات دریغ نفرمایید

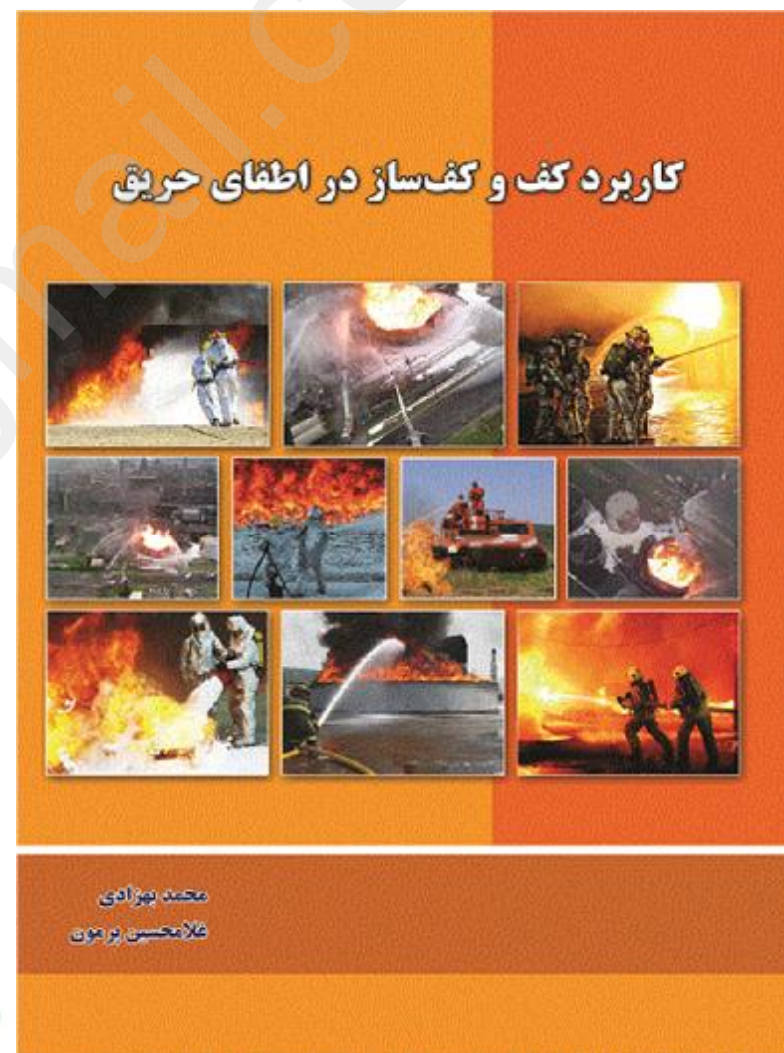
تهیه کننده: محمد بهزادی

تالیفات

پایپینگ و جانمایی تجهیزات



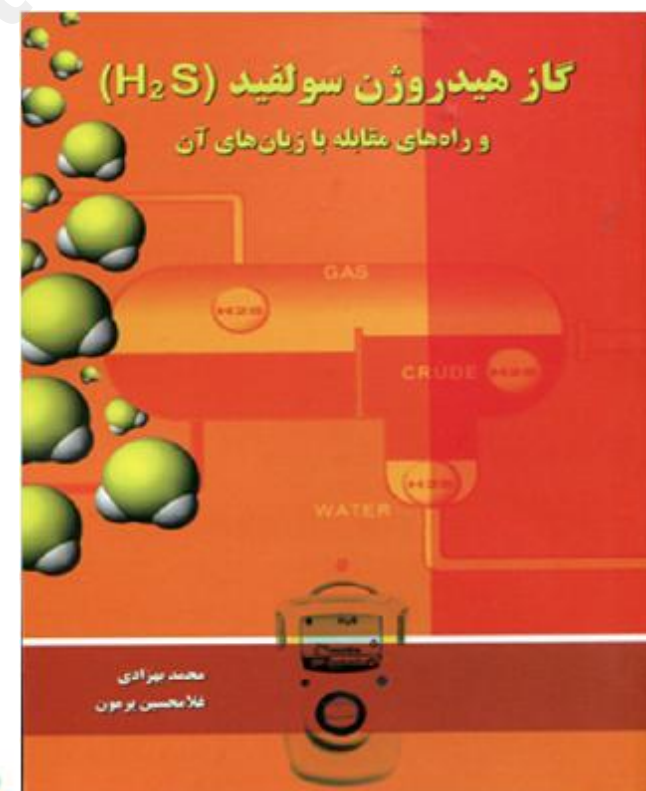
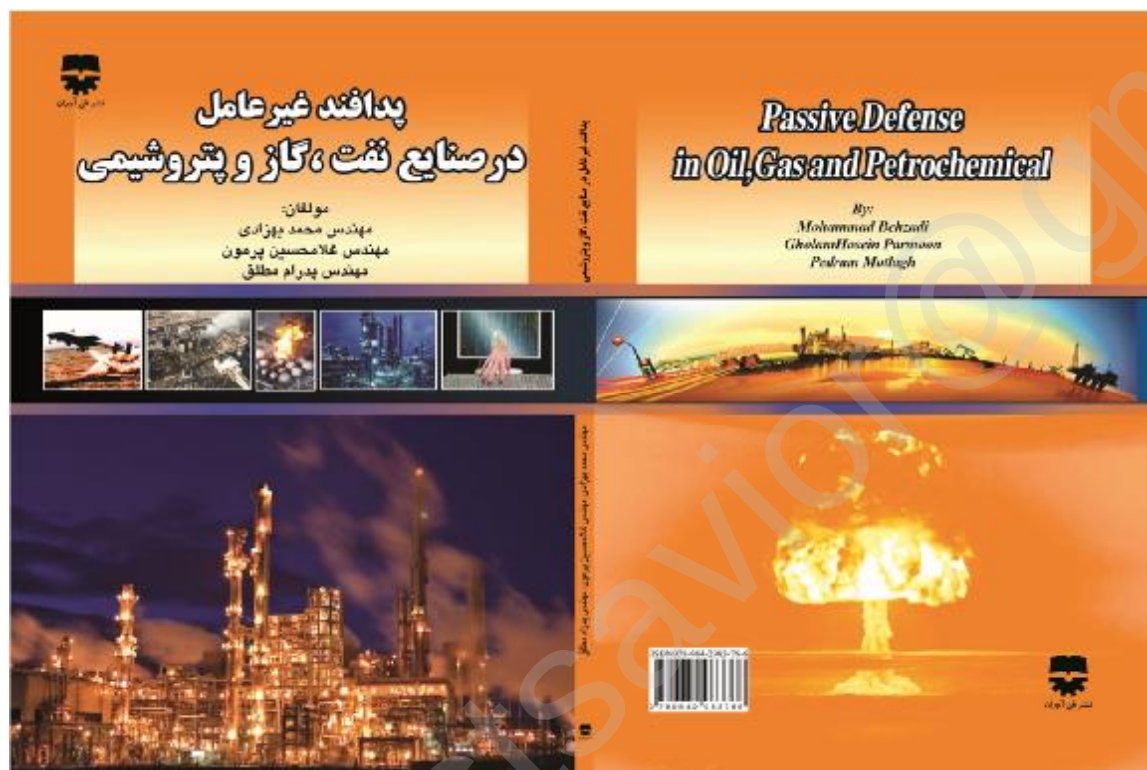
کاربرد کف در اطفای حریق



تالیفات

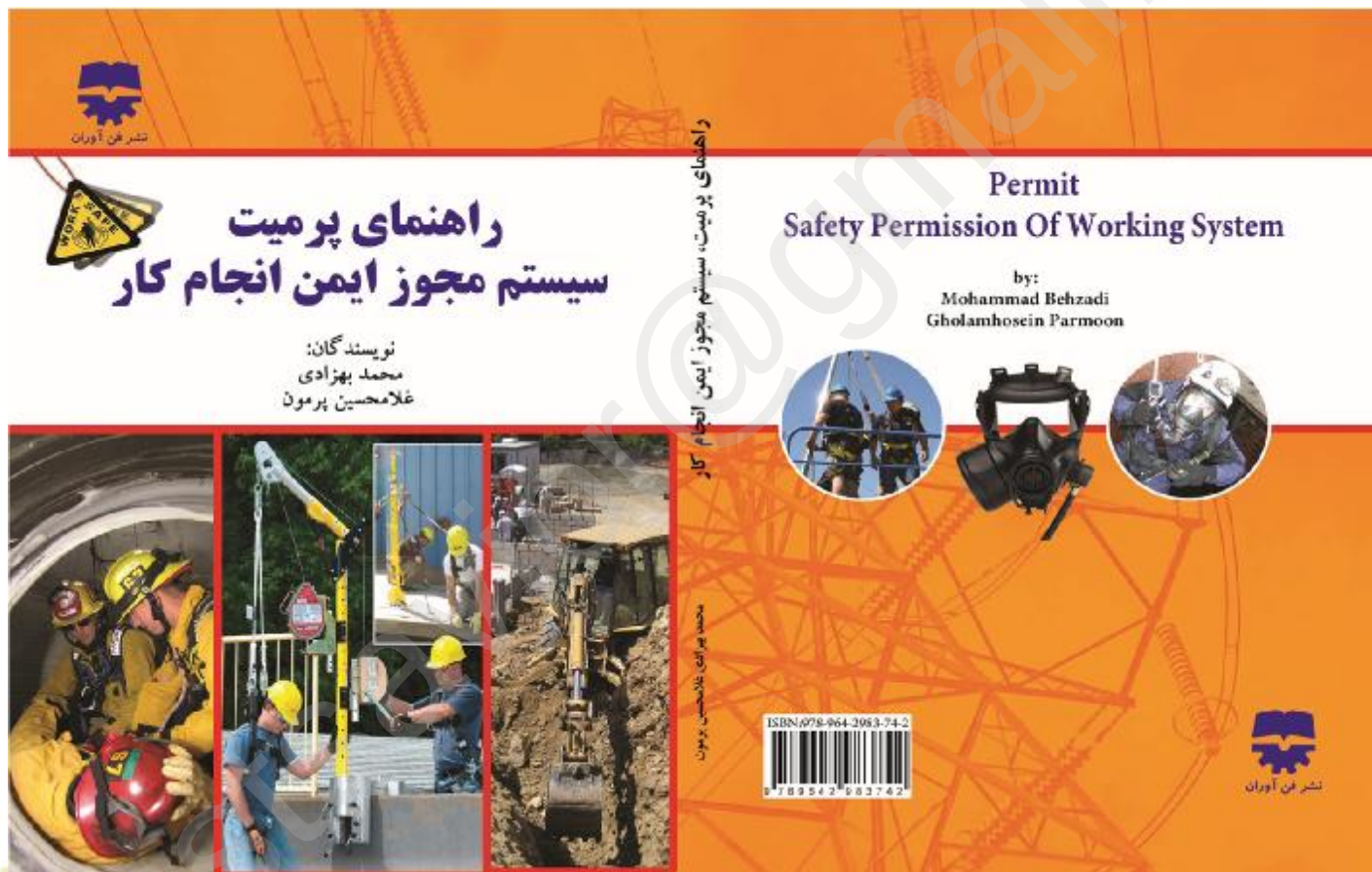
پدافند غیر عامل (حتما جلد دوم را تهیه نمایید زیرا دارای تغییرات کلی می باشد)

گاز هیدروژن سولفید H_2S و راه های مقابله با آن



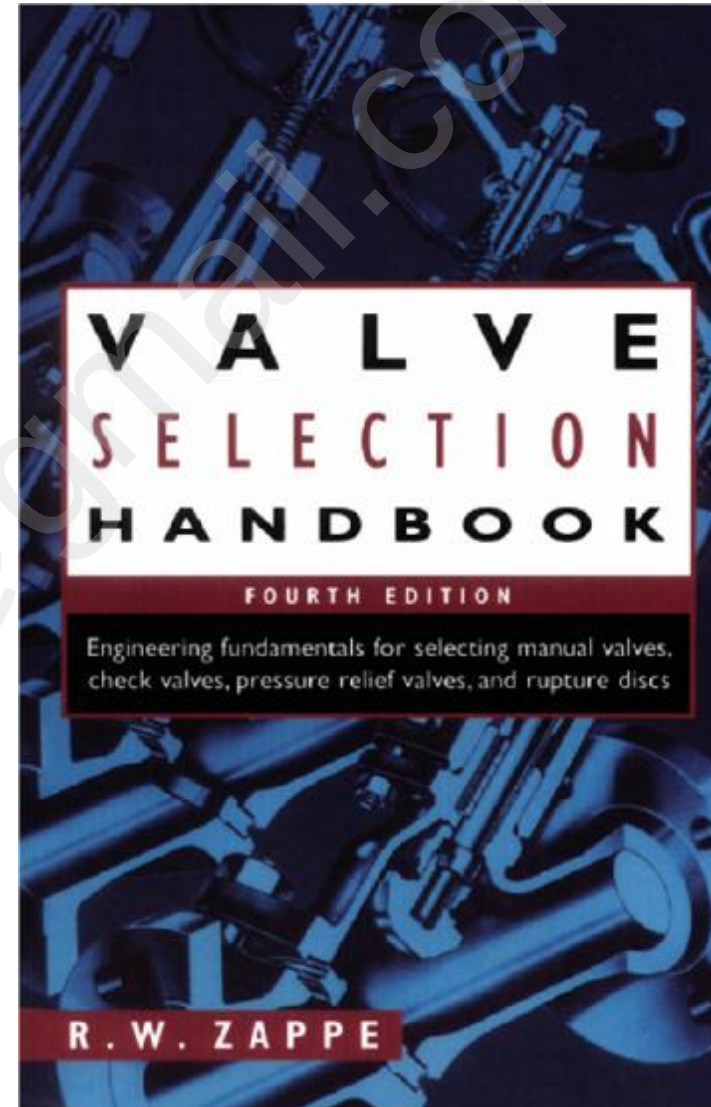
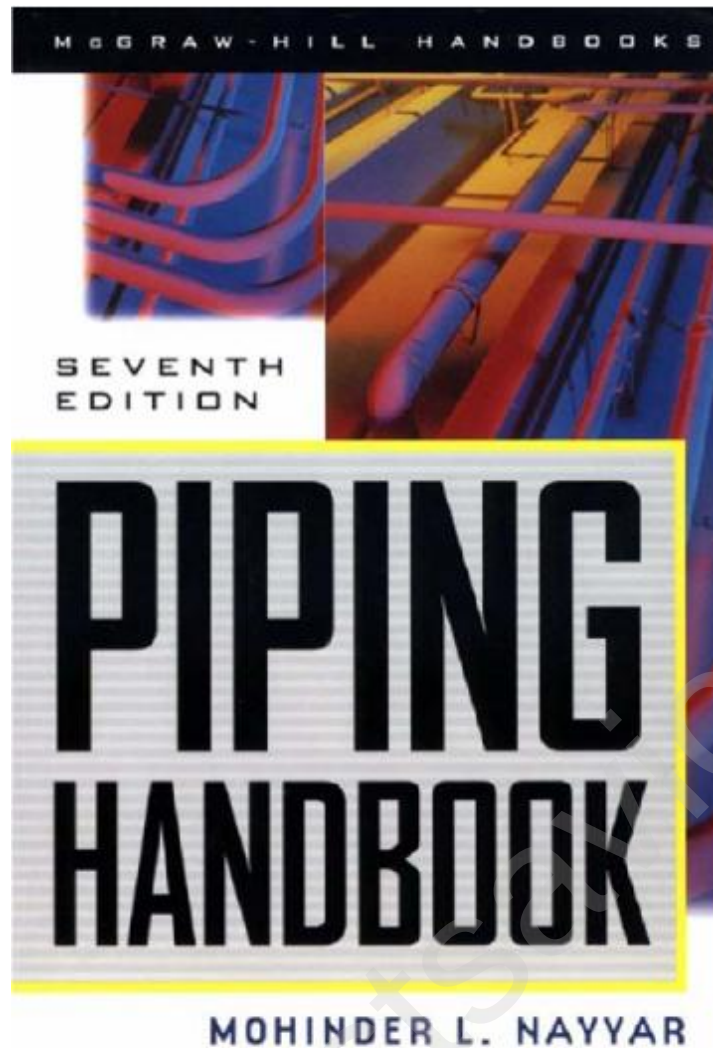
تالیفات

پرمیت، سیستم ایمن مجوز انجام کار



منابع مطالعاتی

منابع مطالعاتی بخش پاپینگ



منابع مطالعاتی بخش پاپینگ

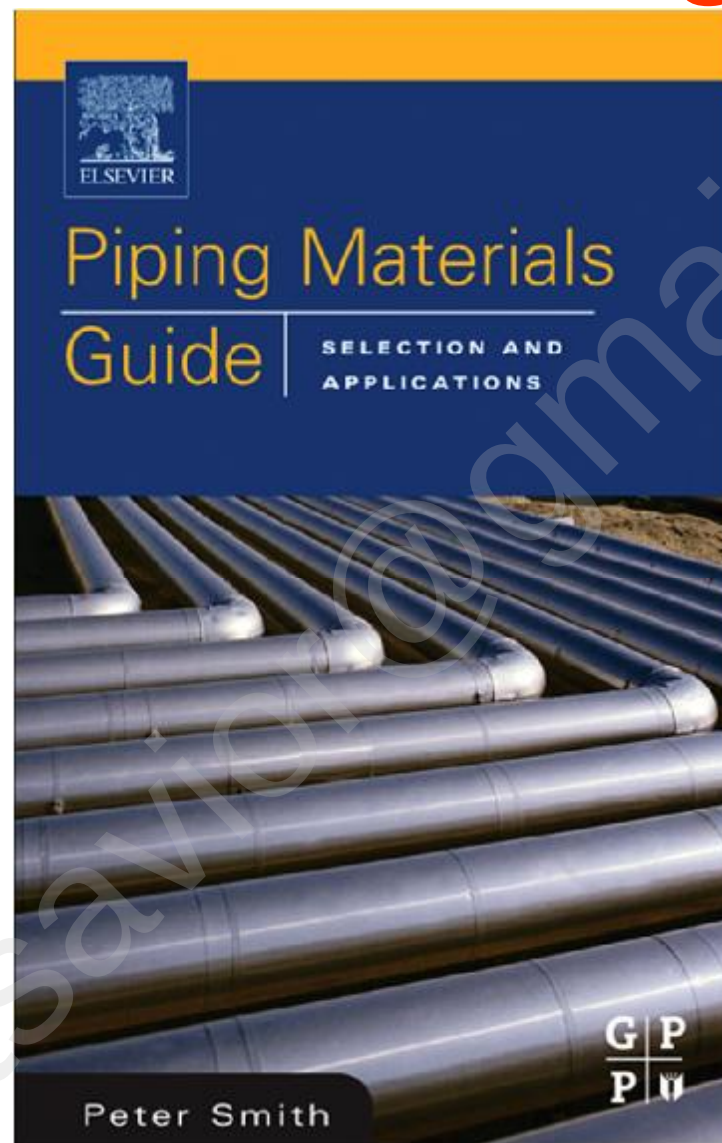
TROUVAY TE & CAUVIN		Company profile	Présentation du Groupe
PIPING EQUIPMENT/MATÉRIEL PÉTROLE			
<i>pipe</i>	1	<i>tubes</i>	
<i>welding fittings</i>	2	<i>raccords à souder</i>	
<i>flanges, sealing products</i>	3	<i>brides, étanchéité</i>	
<i>forged steel fittings</i>	4	<i>raccords en acier forgé</i>	
<i>forged steel valves</i>	5	<i>robinetterie en acier forgé</i>	
<i>cast steel valves</i>	6	<i>robinetterie en acier moulé</i>	
<i>ASTM standards</i>	7	<i>normes ASTM</i>	
<i>industrial valves</i>	8	<i>robinetterie industrielle</i>	
<i>conversion tables</i>	↔	<i>tables de conversion</i>	

CONTENTS

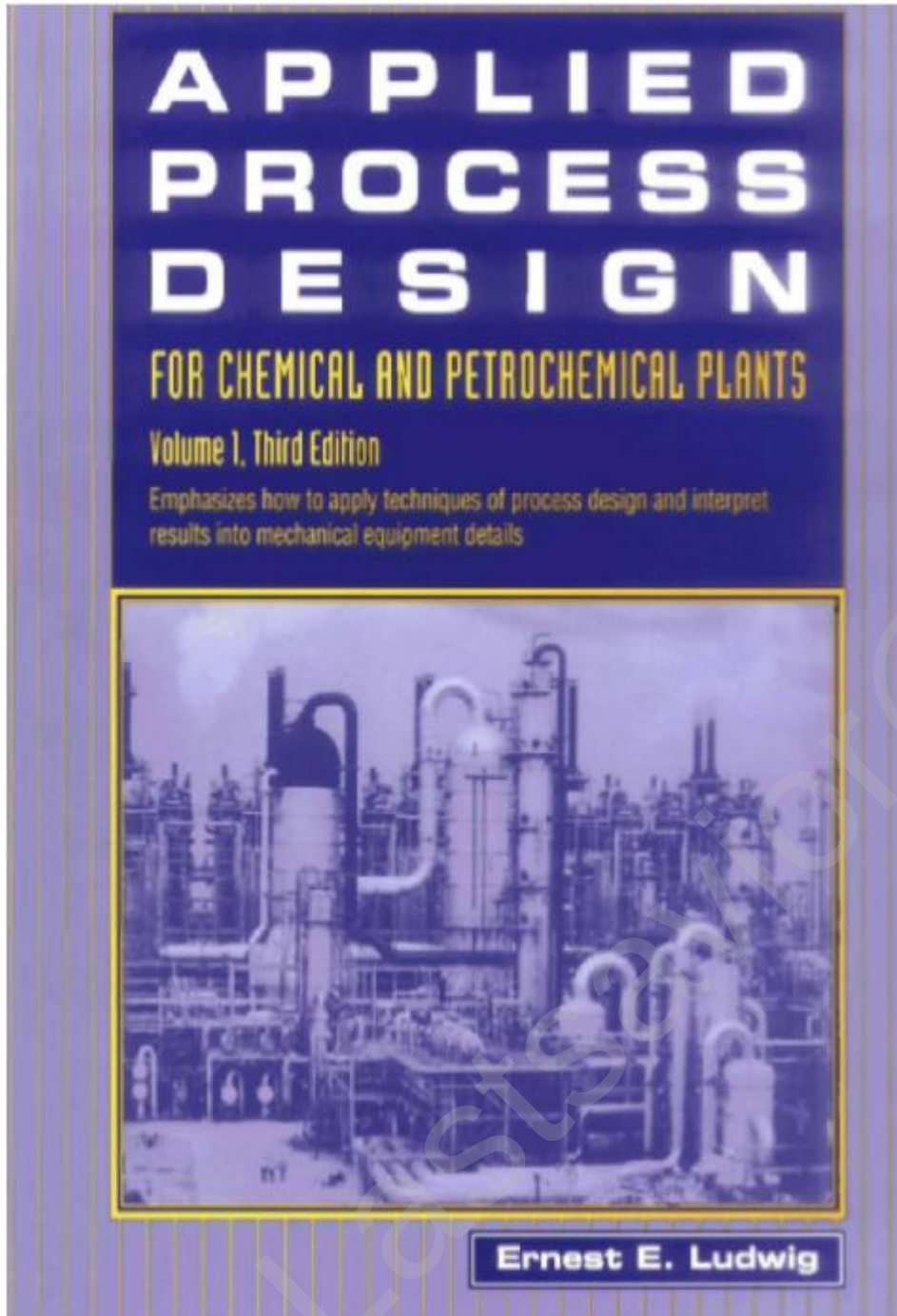
SOMMAIRE

**PIPING EQUIPMENT
MATÉRIEL PÉTROLE
TE
1998
TROUVAY & CAUVIN**

منابع مطالعاتی بخش پایپینگ



منابع مطالعاتی بخش فرآیند



Volume 1:

1. Process Planning, Scheduling, Flowsheet Design
2. Fluid Flow
3. Pumping of Liquids
4. Mechanical Separations
5. Mixing of Liquids
6. Ejectors
7. Process Safety and Pressure-Relieving Devices
Appendix of Conversion Factors

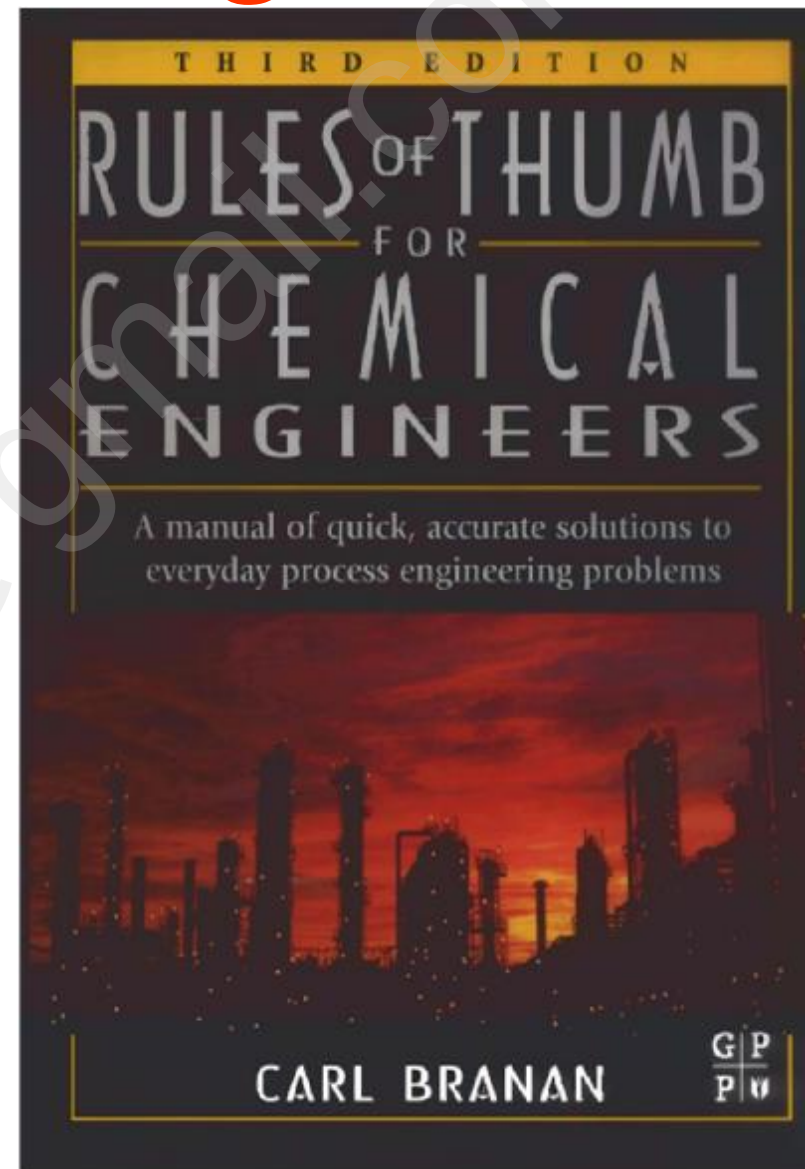
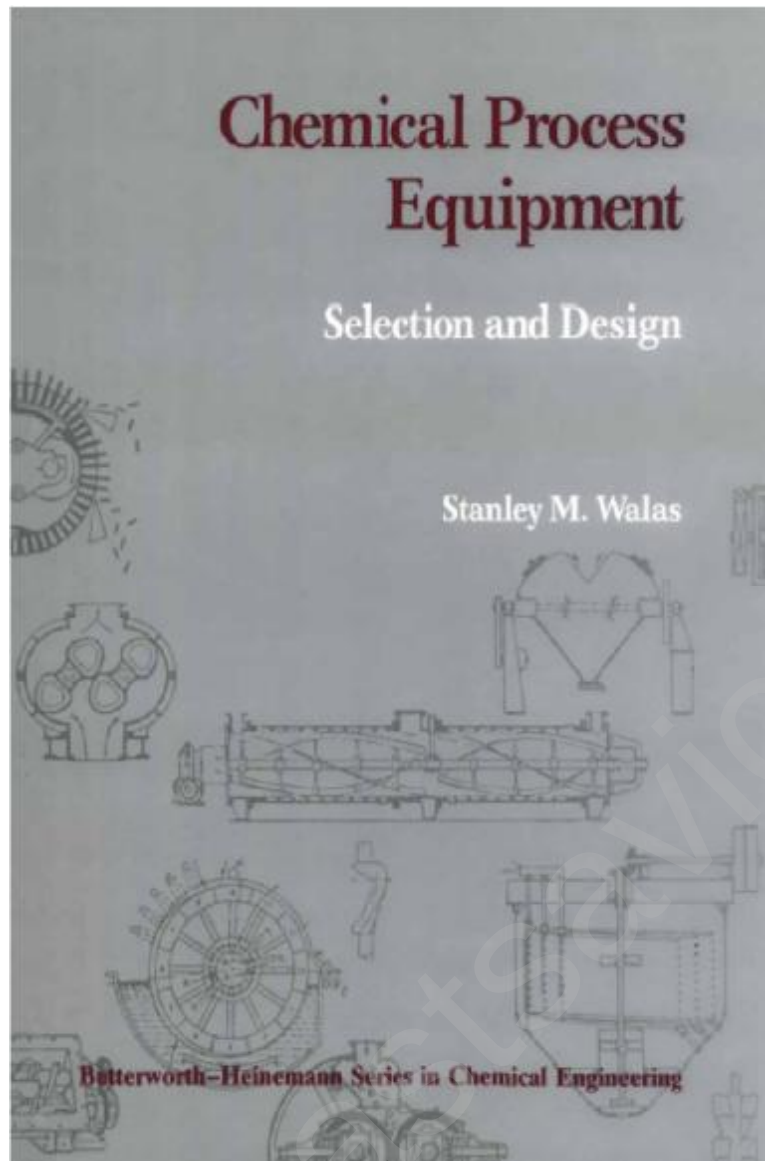
Volume 2:

8. Distillation
9. Packed Towers

Volume 3:

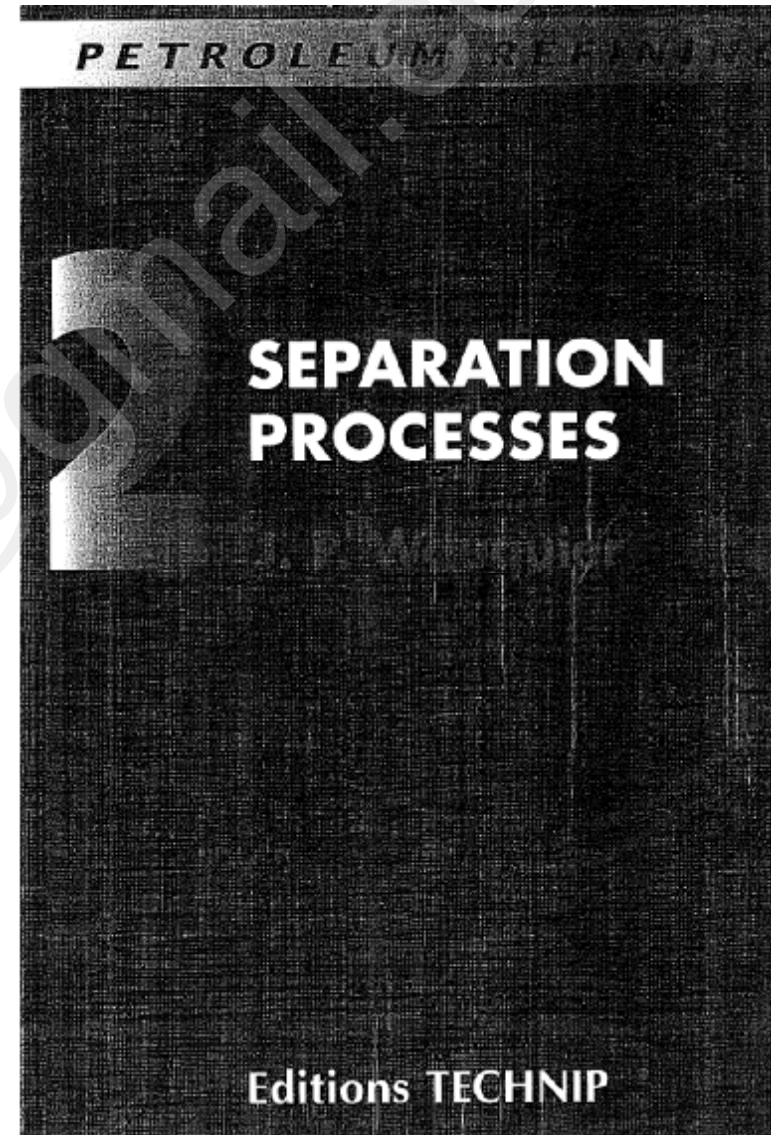
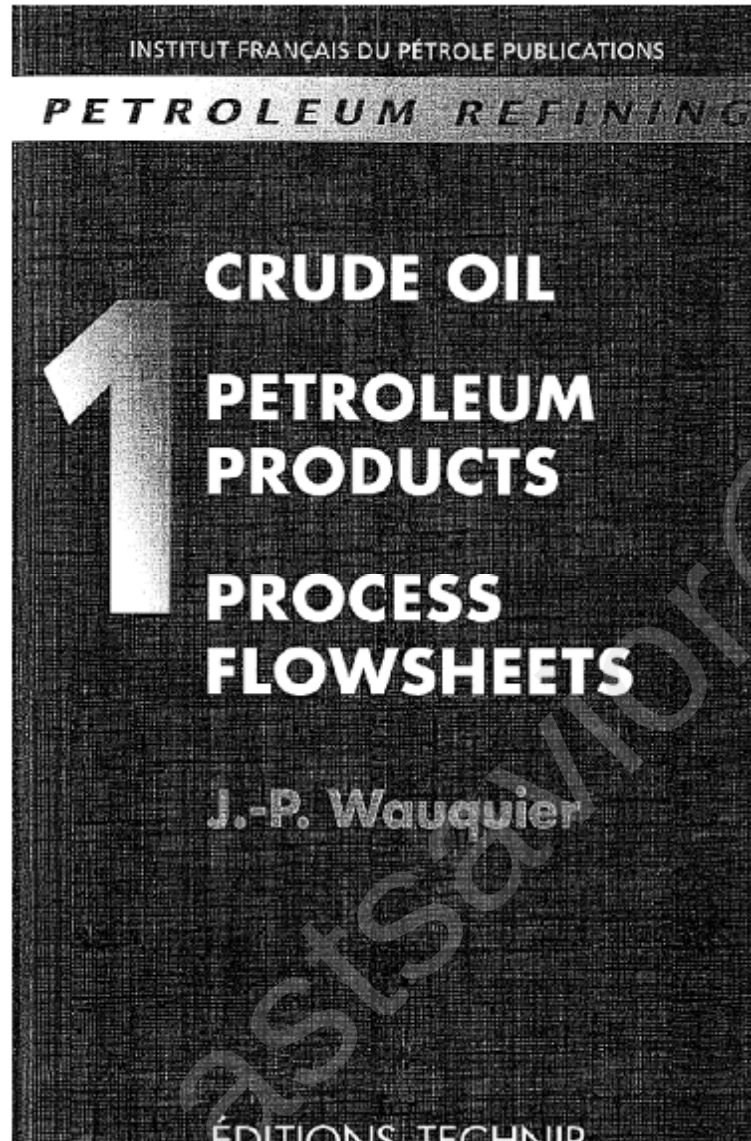
10. Heat Transfer
11. Refrigeration Systems
12. Compression Equipment (Including Fans)
13. Reciprocating Compression Surge Drums
14. Mechanical Drivers

منابع مطالعاتی بخش فرآیند



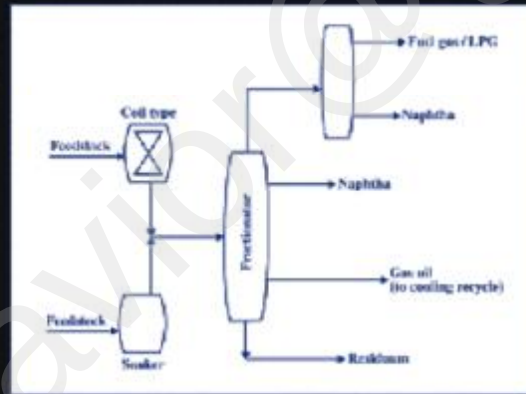
تهیه کننده: محمد بهزادی

منابع مطالعاتی بخش فرآیند



منابع مطالعاتی بخش فرآیند

PETROLEUM REFINING PROCESSES



James G. Speight
Baki Özüm

مقدمه

STANDARDS

Why do we apply standards?

Work Uniformity

Increase of safety

Improvement in qualification of design and operating condition

Decrease of design and selection of material

STANDARDS

API

American Petroleum Institute

ASME

American Society of Mechanical Engineers

ANSI

American National Standard Institute

ASTM

American Society for Testing and Material

ISA

Instrumentation System and Automation Society

NACE

National Association of Corrosion Engineers

STANDARDS

NFPA

National Fire Protection Association

TEMA

Tubular Exchanger Manufacturers Association

DIN

Deutsches Institut für Normung

BSI

British Standards Institution

ISO

International Organization for Standardization

AWWA

American Water Works Association

STANDARDS

IPS

Iranian Petroleum Standard

IGS

IRANIAN GAS STANDARDS

NPCS

National Petrochemical Company Standard

API

API-RP-520: Sizing, Selection, and Installation Of Pressure-Relieving Devices in Refinery

API-RP-521: Guide For Pressure-Relieving and Depressuring System

API-STD-2000: Venting Atmospheric and Low-Pressure Storage Tanks

IPS

IPS-E-PR-308: Engineering Standard For Process Design for Numbering System

IPS-E-PR-750: Engineering Standard For Process Design of Compressor

IPS-E-PR-330: Engineering Standard For Process Design of Compressor Air System

NFPA

NFPA 20: Standard for the Installation of **Centrifugal Fire Pump**

¢ برای دیدن لیست کامل استانداردهای برگزیده یک پروژه نمونه به انتهای جزوه
Appendix I مراجعه کنید

کارفرماها در ایران

CLIENTS (OWNERS)

- ☛ NIOC NATIONAL IRANIAN OIL COMPANY
- ☛ NISOC NATIONAL IRANIAN SOUTH OIL COMPANY
- ☛ NIGC NATIONAL IRANIAN GAS COMPANY
- ☛ NPC NATIONAL PETROCHEMICAL COMPANY
- ☛ POGC: PARS OIL GAS COMPANY

EPCC

- Engineering
- Procurement
- Construction

¢ Commissioning

ENGINEERING COMPANY

دیسپلینہای کلی یک شرکت

1. Management
2. Procurement
3. Projects
4. Estimating
5. Proposals
6. Budget-&-Control
7. Accounting
8. Construction – Supervision
9. Engineering
10. HR-Communication
11. Information – Technology
12. Support-Services

ENGINEERING DISCIPLINES

دیسپلینهای مهندسی

- Process
- SAFETY
- HSE(Health,Safety,Environment)
- Piping
- Instrument
- Mechanic

A .Fixed Equipments

- Vessel
- Tank
- Tower
- Exchanger
- ...

B. Rotary Machineries

- Pump
- Compressor
- Mixer
- Air Cooler

- Civil-Structure-Architecture
- Electrical

انواع مدارک PFD (یا هر مدرک دیگر مهندسی) از لحاظ ارزش

❖ First Issue (**FI**):

Release for proposal (Conclusion of estimate, study)

- Main equipment (Tagged)
- Main Process Lines
- Battery Limit
- Main control concept (control & switch)
- Package unit Limits

❖ Issued For Information (**IFI**) : it is not used in constuction

مانند مدارک MTO که پیمانکار یک پروژه EPC تولید می کند

❖ Issued For Comment (**IFC**): between client and contractor and after that will be issued to owner(some kind of internal issue!!)

انواع مدارک PFD (یا هر مدرک دیگر مهندسی) از لحاظ ارزش

❖ Issued For Design (**IFD**):

Release for Basic Engineering Development (Conclusion of verification Phase and Basic Eng.)

-Content as 1. & 2. however adjusted to the contract conditions

❖ Approved For Design (**AFD**):

Release for Detail Engineering (End of Basic Eng.)

-Crosscheck with P&ID, release detail engineering

انواع مدارک PFD (یا هر مدرک دیگر مهندسی) از لحاظ ارزش

❖ Issued For Approval (**IFA**):

Release for Basic Engineering In addition to contents 1.

- Important valve (isolation, manual control)
- Essential process shutdown circuits
- Important start up lines
- Definition of heat exchanger type

Approved For Construction (**AFC**):

Release for Construction phase (End of Detail Eng)

- Final issue of PFD in Detail phase

❖ As Built (**ASB**):

End of construction

- Includes all of the changes in commissioning and construction phase

❖ Issued For Construction (**IFC**):

Release for Detail Engineering Development

- Crosscheck with P&ID, release for purchase of bulk material

اعضای تیم پایپینگ یا پروسس

- ❖ PM(Project manager)مدیر پروژه
- ❖ PEM(Project Enginnering manager)مدیر واحد مهندسی
- ❖ Process team members
 - Process Dept.Manager
 - ❖ Process Senior Engineer کارشناس ارشد
 - ❖ Process Engineer کارشناس
 - نقشه کش
 - Process Senior Draftsman
 - ❖ Process Draftsman

PROCESS DEPARTMENT ACTIVITIES

Process Department's Activities in the following engineering stages:

1. Feasibility Study (FS)
2. Proposal Preparation (PP)
3. Basic Engineering (BE) (BDP:BASIC DESIGN PACKAGE)
4. Detail Engineering (DE)

**PFD, DEFINITION, PREPARATION SEQUENCE.
ACCORDING TO IPS-E-PR-170**

**Feasibility Study
Process Design Basis
Conceptual Design**

**Steady State
Process Simulation(HYSYS-ASPEN-CHEMCAD-PROII)**

**PFD
Heat & Material Balance(H&M)**

PROCESS DEPARTMENT ACTIVITIES

- ¢ BFD
- ¢ Simulation
- ¢ PFD
- ¢ UFD
- ¢ Process Description
- ¢ Heat & Material Balance(H&M)
- ¢ P&ID
- ¢ Process Design Criteria
- ¢ Utility Consumption
- ¢ Chemical Consumptions
- ¢ Line List (For Piping Discipline)
- ¢ Instrument PROCESS Data Sheet (For Instrument Discipline)
- ¢ Equipment PROCESS Data Sheet (For mechanic Discipline)
- ¢ Process Data Sheet For Piping Special Item (For Piping Discipline)

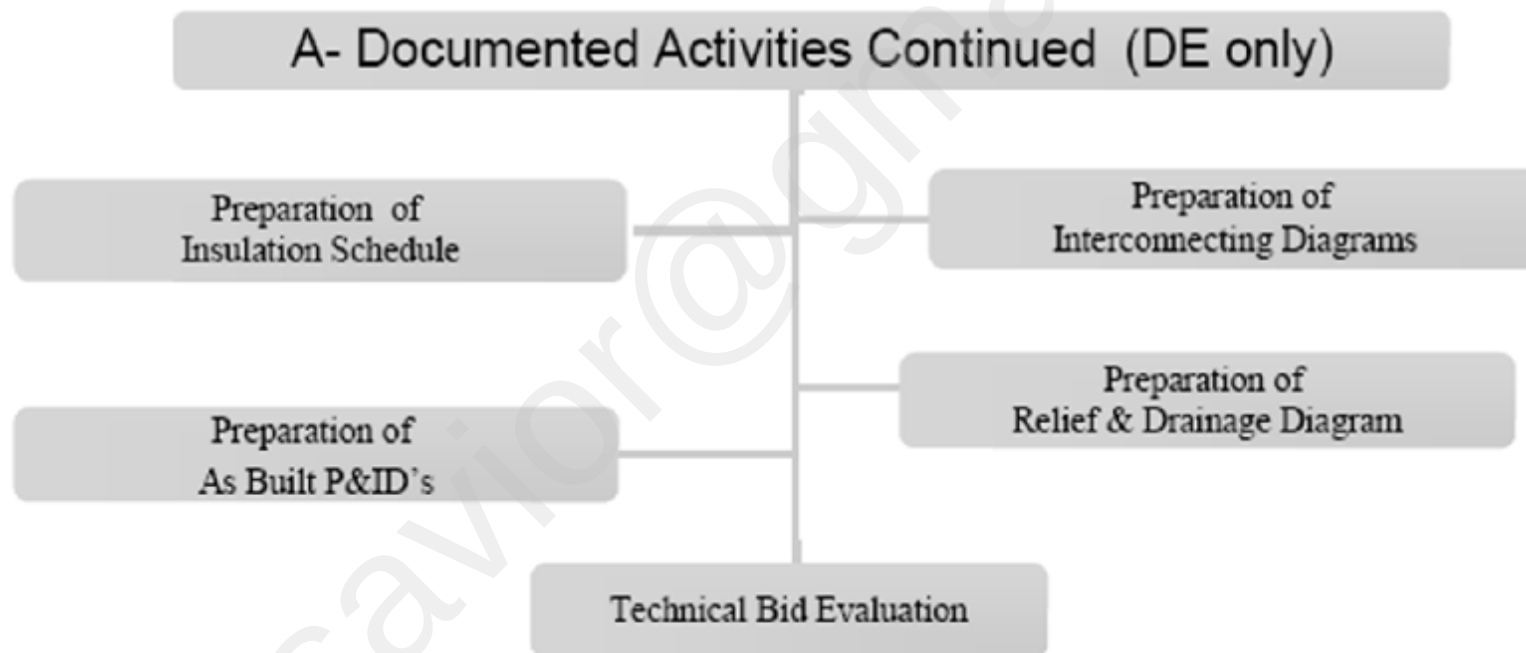
PROCESS DEPARTMENT ACTIVITIES

1. DOCUMENTED ACTIVITIES
2. NON-DOCUMENTED ACTIVITIES

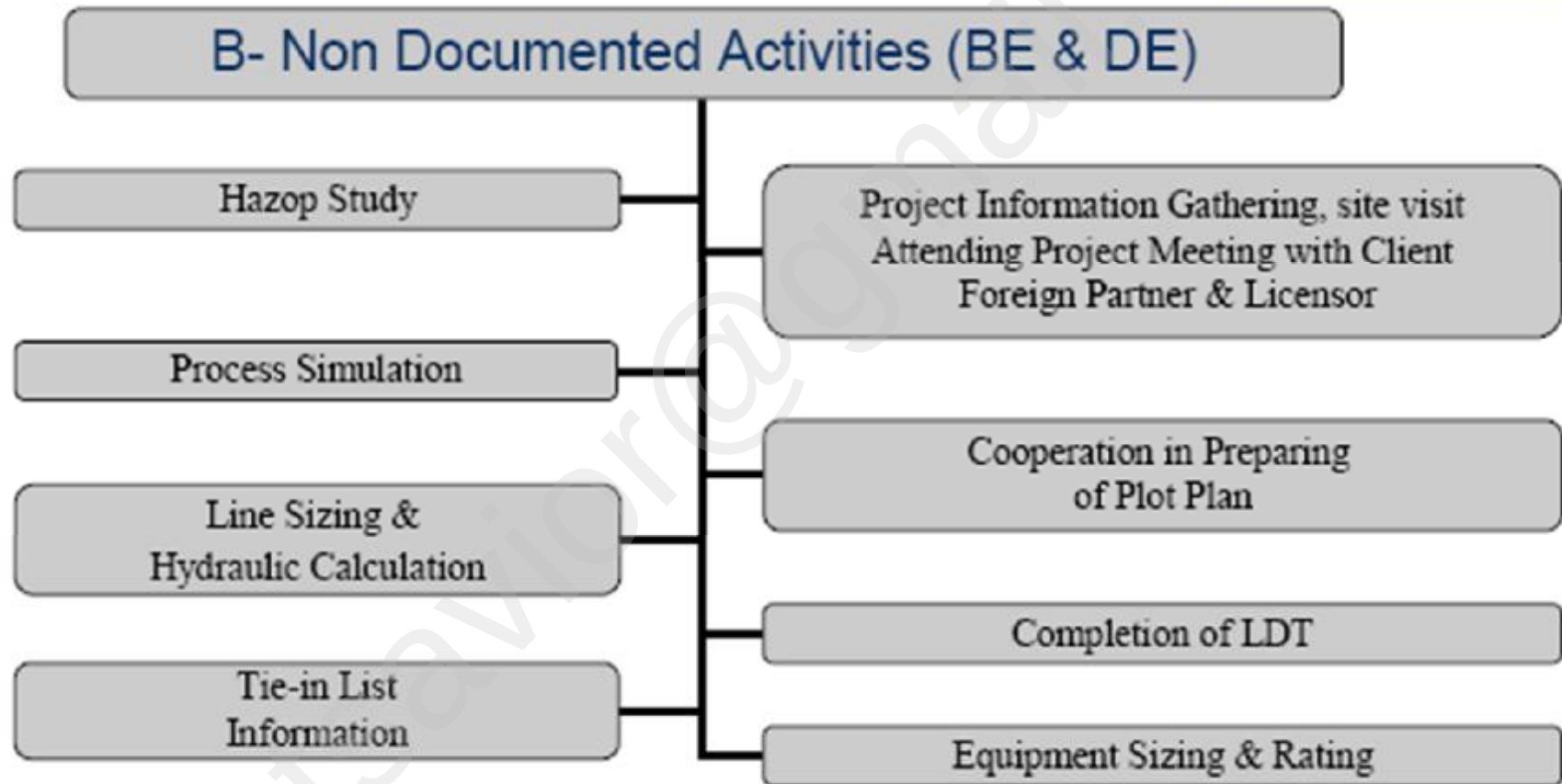
PROCESS DEPARTMENT ACTIVITIES BASIC & DETAILED ENGINEERING



PROCESS DEPARTMENT ACTIVITIES DETAILED ENGINEERING

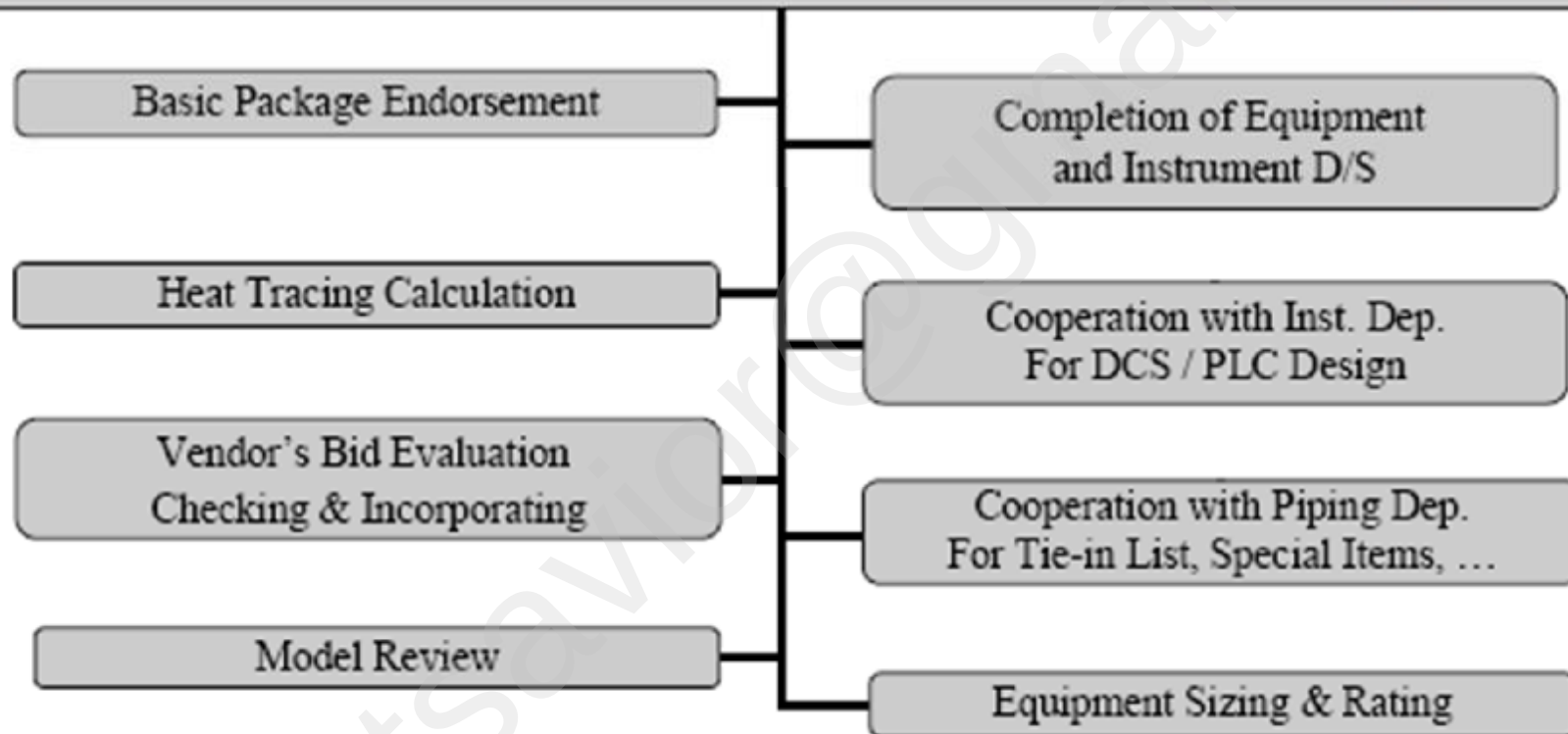


PROCESS DEPARTMENT ACTIVITIES DETAILED ENGINEERING



PROCESS DEPARTMENT ACTIVITIES DETAILED ENGINEERING

B- Non Documented Activities Continued (DE only)



FLOWSHEETS

- BFD (BLOCK FLOW DIAGRAM)
- PFD (PROCESS FLOW DIAGRAM)
- P&ID (Piping & INSTRUMENTATION DIAGRAM)
- UFD (UTILITY FLOW DIAGRAM)
- UHD (UTILITY HEADER DIAGRAM)
- ¢ UDFD (UTILITY DISTRIBUTION FLOW DIGRAM)

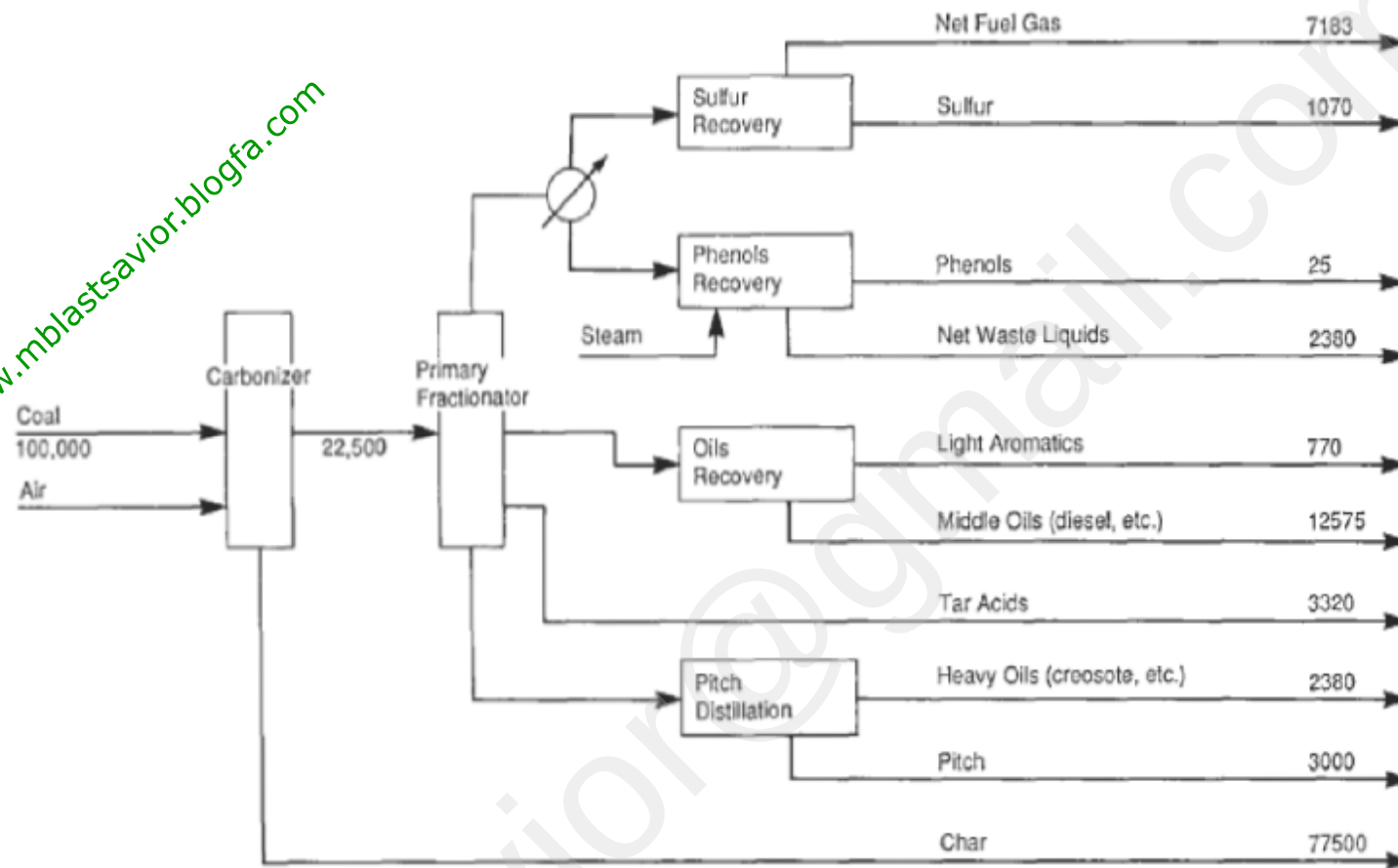
3 مورد آخر که با رنگ قرمز مشخص شده اند یک مدرک با نام های متفاوت می باشند

BFD

A BFD is a simple breakdown of a process into blocks or units of operations which represent major parts of the process being depicted.

: Block Flow Diagram یا BFD

- اولین نقشه یک پروژه که در طراحی مفهومی basic design تهیه می شود
- با مشاهده آن کل فرایند کارخانه بصورت نمودار جعبه ای فهمیده می شود.
- تجهیزات و جریانهای فرایندی در آن بصورت عینی وجود ندارد ولی مفهوم فرایندی یک یا چند تجهیز در یک جعبه نشان داده می شود.
- مراحل تولید، جداسازی، تخلیص و ... در یک کارخانه بصورت مرحله مرحله نشان داده می شود.
- یک بیان جرمی کلی که شامل جریانهای مهم کارخانه نظیر خوراکهای ورودی، محصولات نهائی و ... در آن وجود دارد. لذا با ملاحظه آن میزان تولید محصولات اصلی و جانبی و مصرف مواد اولیه در سال مشخص می شود.
- BFD یک کارخانه که شامل چند واحد و زیر واحد فرایندی است معمولاً در یک شیت تهیه می شود.



فرآیند خالص سازی زغال سنگ

Quantities(MASS BALANCE) are in lb/hr

BFD (BLOCK FLOW DIAGRAM)

C بلوکها معمولا از دایره و مربع

منابع تهیه BFD

☛ BFD

- Contract
- Technical Proposal
- Preliminary Eng. Study

PFD (process flow diagram)

نقشه شماتیکی است که تعریف کلی از فرایند سیستم را توسط نمایش تجهیزات و خطوط اصلی فرایند همراه با مشخصات پروسسی این خطوط ارائه میدهد. این مشخصات عموماً شامل درجه حرارت و فشار کاری (عملیاتی)، دبی جریان، دانسیته و ویسکوزیته، میزان و یا درصد عناصر مهم در خطوط مختلف میباشد.

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P&ID (piping and instrumentation diagram)

نقشه شماتیکی است که شامل کلیه تجهیزات مکانیکی، خطوط ارتباطی، تجهیزات ابزار دقیق، سیستمهای کنترلی و اینترلاکها است. به عبارت دیگر کلیه اقلام و تجهیزات مکانیکی، لوله کشی و ابزار دقیق در این نقشه به طور شماتیک نشان داده میشوند ولی اندسته از اقلام لوله کشی که در طراحی piping layout (چیدمان لوله کشی) مورد نیاز واقع میشوند در نقشه P&ID دیده نمیشوند از جمله زانویی ها که دقیقاً بستگی به طریقه چیدمان لوله کشی دارند.

UHD (utility header diagram)

نقشه های شماتیکی هستند که توزیع سیالات غیر پرورسی (جانبی) را از خروجی واحد تولید کننده این سیالات، تا مرز ورودی واحدهای مصرف کننده (پروسسی) نشان میدهد. همچنین در داخل واحدهای پروسسی نیز این دیاگرامها توزیع سیالات غیر پرورسی (utility) در واحد را نمایش میدهند.

PFD

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PFD یا Process Flow Diagram :

- برای هر واحد ممکن است یک یا چند شیت PFD تهیه شود. در پروژه جزء نقشه های طراحی مفهومی است.
- با مشاهده آن کل فرایند کارخانه بصورت نمودار جریانی فهمیده می شود.
- تجهیزات و جریانهای فرایندی اصلی در آن وجود دارند و مشخصات آنها آورده می شود.
- در جدول مواد، موازنه جرم جریانهای اصلی فرایند به همراه پارامترهای فرایندی هر جریان آورده می شود.
- سیستم ابزار دقیق در آن نشان داده نمی شود ولی لویپهای کنترلی در آن باید ارائه گردد.
- با مشاهده آن کل منطق فرایندی یک واحد صنعتی بطور کامل قابل ملاحظه است.

PFD

A PFD is a detailed breakdown of a process into symbols which represent all major equipment and pipelines which are part of a process as defined by the BFD.

A PFD consists of the following:

- Diagram Drawing
- Numbered Pipelines which indicate Flow Conditions
- Major Control Loops

PFD

Scale

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

Flow Direction

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

Size

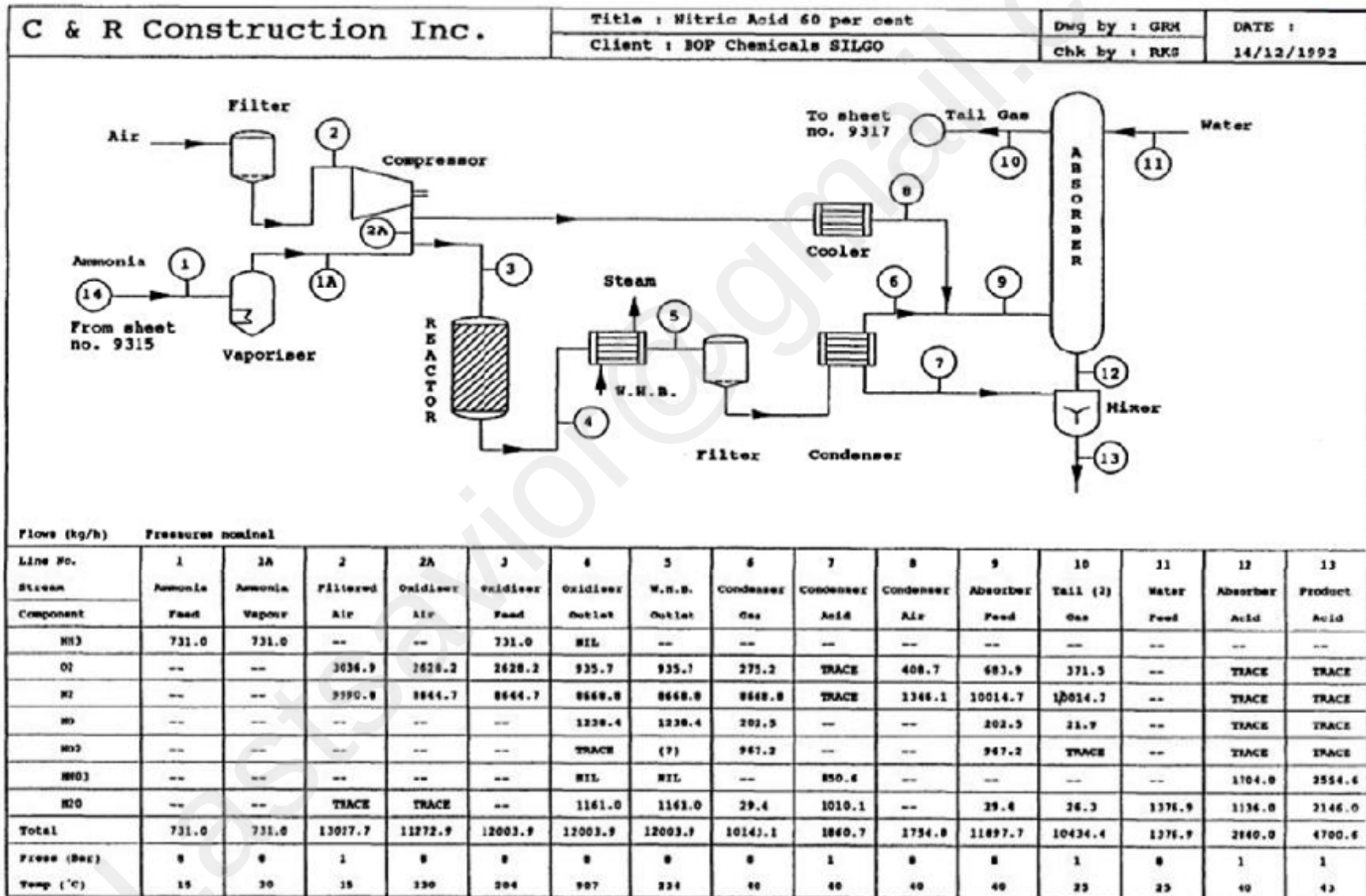
The size of PFD should normally be **A1** (594 mm × 841 mm).

نکات مهم در کنترل نحوه نقشه‌کشی نقشه PFD

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ITEM	DESCRIPTION
01	IS LAY OUT ACCEPTABLE? آیا شکل نقشه از نظر میزان پراکندگی تجهیزات و لوله‌کشی یکنواخت است
02	DIRECTION OF FLOWS? جهت جریان‌ها زده شده باشد
03	THICKNESS AND TYPE OF LINES FOR INDICATION OF MAIN PROCESS, SECONDARY PROCESS, UTILITIES, SIGNALS, ETC. ARE CORRECT? ضخامت خطوط متناسب با نوع جریان انتخاب شده باشد (خطوط اصلی پررنگتر از خطوط فرعی بوده و جهت نشان دادن سیگنال‌های ابزار دقیق از خط متفاوتی استفاده شود)
04	CROSSING ARE CORRECT? خطوطی که هاز روی هم رد میشوند با یکدیگر برخورد نداشته باشند
05	BATTERY LIMITS, AND ADDRESSES ARE SHOWN CORRECTLY? مرز نقشه مشخص شده باشد و آدرس خطوط در ورود و خروج به واحد داده شده باشد
06	LEGEND OF EQ. ARE CORRECT? شکل شماتیکی تجهیزات مطابق با LEGEND قراردادی انتخاب شده باشد
07	STRAM NOS ARE AS REQUIRED FOR MAKING BALANCE AROUND ALL EQ.? شماره جریان‌ها که با استفاده از آن در جدول MATERIAL BALANCE مشخصات بررسی داده میشود به تعداد کافی نشان داده شده باشد
08	TITLE BLOCK IS CORRECTLY COMPLETED? جدول عنوان نقشه به درستی تکمیل شده باشد

چند PFD نمونه:





◇	STREAM NUMBER
—	PROCESS LINE
—	WATER (SUPPLY, DM &
—	CONDENSATE STEAM)
—	WASTE WATER
—	NITRIC ACID
—	STEAM
—	AIR AND NITROGEN
—	(NH ₄) ₂ CO ₃ SOLUTION
—	VACUUM & EXHAUST
—	UNK. & AUC
—	METHANOL

1. ALL OF THE PROPERTIES OF THE STREAMS IN THE STREAM TABLE HAVE BEEN PROVIDED FROM FILED PACKAGE OF ASPEN PLUS SOFTWARE.
2. BECAUSE 100 UNF HAS BEEN IGNORED AND BY THIS UNIT 5% MOLE IS USED, THEN EQUIPMENT OF PRODUCTION OF 5% MOLE SOLUTION HAS BEEN TRANSFERRED FROM 100 UNIT TO 100 13.07.

[illegible]

^a CRITICAL INCIDENT OF PROGRESS FOR P DURING OF
ADAPTATION PERIODS (MAY-BE-TO-COMMIT TO THE NEW)

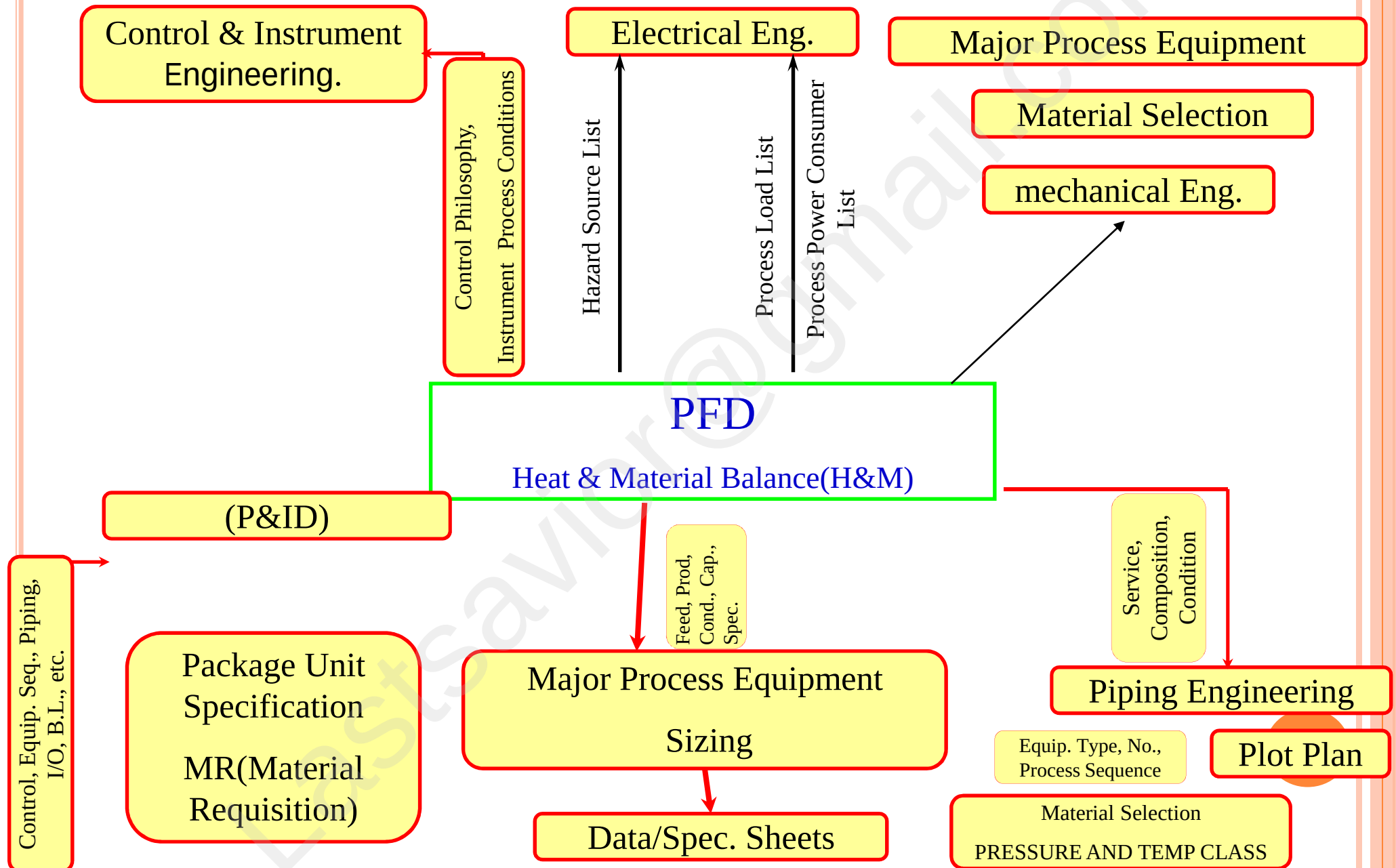
	G
	H

آنچه در یک PFD باید آورده شود:

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 loop pertaining to control valves and the likes to be involved in process flows.
5. Operating conditions around major equipment.
6. Heat duty for all heat transfer equipment.
7. Changing process conditions along individual process flow lines, such as flow rates, operating pressure & temperature, etc.
8. All alternate operating conditions.
9. Material balance table.

آنچه در یک PFD نباید آورده شود:

1. Minor process lines which are not usually used in normal operation (NNF) 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 (stand by) shall be shown as one unit.
5. Piping information such as size, orifice plates, strainers, and classification into hot or cold insulated or 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 (loop control).
8. Drivers of rotating machinery except where they are important for control line of the process conditions.
9. 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.



نکات طراحی PFD-P&ID

- ☛ توزیع و پراکندگی تجهیزات درون مدرک یکنواخت باشد
- ☛ شماتیک است
- ☛ هر جریان باید دارای شماره باشد
- ☛ تجهیزات موجود (existing Equipment) از تجهیزات پروژه مشخص و متمایز شوند
- ☛ خطوط فرآیندی از خطوط ابزار دقیق باید متمایز و مشخص باشند
- ☛ خطوط اصلی از خطوط فرعی متمایز و مشخص شوند (با فلش یا پررنگ و ضخیم کردن خطوط اصلی)
- ☛ از چپ به راست
- ☛ اندازه نسبی تجهیزات
- ☛ تجهیزات موجود

نکات طراحی PFD-P&ID

- ❖ پایپینگ (شیر) و ابزار دقیق های ضروری
- ❖ محدوده vendor package باید مشخص شود
- ❖ UTILITY SUMMARY
- ❖ جریانهای اصلی از جریانهای ثانویه و فرعی متمایز
- ❖ هر خط با یک فلش با زاویه 30 درجه (هر فلش در انتهای مسیر)
- ❖ BL (BATTERY(BOUNDARY) LIMIT: محدوده اختیارات قانونی پروژه معادل TIE-IN POINT در دیسیپلین پایپینگ (tie-in) گزینه های بیشتری مانند اتصالات یوتیلیتی را نیز در خود دارد
- ❖ VENDOR PACKAGE LIMIT (COOLING TOWER-FLARE-TURBINE-AIR COMPRESSOR)
- ❖ TAG هر تجهیز
- ❖ تجهیزات یدکی (پمپ، کمپرسور، کمپرسور هوا، میکسر، بلوور و فیلتر)
- ❖ تجهیزات موازی

طراحی PFD-P&ID

- ❖ مخازن اتمسفریک با GOOSENECK یا VENT مشخص شود
- ❖ در P&ID شیرهای NC (NORMALLY CLOSED) مشخص شوند
- ❖ نوع پمپ و نوع نیروی محرکه مشخص شود
- ❖ تجهیزات درونی مهم مانند همزن نیز به نمایش در آید
- ❖ بخش های خاص سیویل مانند حوضچه های اسیدی به نمایش در آیند
- ❖ NNF:NORMALLY NO FLOW به طور نرمال و معمول جریان در خط وجود ندارد
- ❖ EQUIPMENT DESCRIPTION (بهتر است برای تجهیزات ثابت در بالای صفحه و برای تجهیزات دوار در پایین صفحه زیر TAG تجهیز قرار گیرد)
- ❖ NOTES
- ❖ LEGEND
- ❖ REVISION TABLE
- ❖ TITLE BLOCK

الزامات موجود در PFD از کتاب WALAS

TABLE 2.1. Checklist of Data Normally Included on a Process Flowsheet

1. Process lines, but including only those bypasses essential to an understanding of the process
2. All process equipment. Spares are indicated by letter symbols or notes
3. Major instrumentation essential to process control and to understanding of the flowsheet
4. Valves essential to an understanding of the flowsheet
5. Design basis, including stream factor
6. Temperatures, pressures, flow quantities
7. Weight and/or mol balance, showing compositions, amounts, and other properties of the principal streams
8. Utilities requirements summary
9. Data included for particular equipment
 - a. Compressors: SCFM (60°F, 14.7 psia); ΔP psi; HHP; number of stages; details of stages if important (Standard cubic feet per minute)
 - b. Drives: type; connected HP; utilities such as kW, lb steam/hr, or Btu/hr
 - c. Drums and tanks: ID or OD, seam to seam length, important internals Internal or external diameter TL/TL: TANGENT LINE TO : TANGENT LINE
 - d. Exchangers: Sqft, kBtu/hr, temperatures, and flow quantities in and out; shell side and tube side indicated
 - e. Furnaces: kBtu/hr, temperatures in and out, fuel
 - f. Pumps: GPM (60°F), ΔP psi, HHP, type, drive GALLONS PER MINUTE
 - g. Towers: Number and type of plates or height and type of packing; identification of all plates at which streams enter or leave; ID or OD; seam to seam length; skirt height
 - h. Other equipment: Sufficient data for identification of duty and size

P&ID

A P&ID is a document which is developed and used by Engineers, Technicians, Technologists, Maintenance and Operations personnel to define a manufacturing system. Its intent is to communicate in detail the controls, instruments, piping, and equipment used to implement that system.

نکات طراحی PFD-P&ID

❖ دو مورد را نمی توان در P&ID مشخص MTO (MATERIAL Take Off نمود):

❖ طول لوله

❖ تعداد زانویی ها

P&ID

A P&ID consists of the following:

- Diagram Drawing
- Equipment List information
- Piping Equipment List information
- Pipeline List Information
- Instrument List information (both local and DCS I PLC)
- Notes and Details
- Line slope and Flow direction

"P&ID" INPUT DATA	
اطلاعات مورد نیاز جهت طراحی P&ID	
ITEM	DESCRIPTION
01	PROJECT DESIGN CRITERIA
02	PROCESS FLOW DIAGRAM (PFD)
03	PIPING MATERIAL SPEC.
04	PROCESS DATA SHEET
05	EQUIPMENT PROCESS DATA
06	INSTRUMENT DATA
07	ENG. PRACTICE CODE AND STANDARD
08	LEGEND AND SYMBOLS

Piping & Instrument Diagram

- تعریف: نقشه P&ID که بر پایه PFD تهیه می شود عبارتست از مجموعه ای از سمبلهای گرافیکی تجهیزات و لوله باهم همراه سمبلهای گرافیکی اندازه گیری پارامترهای فرایندی تابعهای کنترلی.
- UFD: یا utility flow diagram نوع خاصی از P&ID است که فرایندهای تأسیسات جانبی را نشان می دهد.
- جایگاه P&ID در پروژه: اولین و جامعترین نقشه یک پروژه که در طراحی گسترده detailed design تهیه می شود که پایه نقشه های بعدی طراحی گسترده نظیر piping layout, equipment layout, Isometric و نقشه های 3D است.
- با مشاهده آن اطلاعات فرایندی کارخانه، کل سیستم لوله ها و لوله کشی (piping) شامل اتصالات، سائزها، جنس و کلاس لوله، ولو و fitting مربوطه، اصلی به فرعی و بالعکس و ...، کل منطق ابزار دقیق شامل کنترلرها، آلامها، سیستمهای PLC و DCS، محلی یا کنترل روم و ...، اطلاعات موجود در دیتا شیت تجهیزات، ارتفاع واقعی و نسبی تجهیزات ازهم، اطلاعات مربوط به Hazop و ... فهمیده می شود.
- بر این اساس تهیه P&ID باید بصورت تیمی و بکمک همه گروههای مهندسی با رهبری فرآیند انجام می شود.

اطلاعات عمومی P&ID

• سایز هر شیت: معمولاً هر شیت نقشه های P&ID در کاغذهای A0 (841 mm × 1189 mm) و در صورت ساده بودن نقشه A1 (591 mm × 841 mm) تهیه می شود.

• ترسیم Title Block: در جعبه عنوان (Title Block) باید موارد زیر آورده شود:

- جدول بازنگریها
- نام شرکت مشاور
- نام کارفرمای اصلی (مثلاً شرکت ملی پتروشیمی) و شرکت وابسته (مثلاً شرکت پتروشیمی بندر امام)
- معمولاً سایز نهایی A1 و سایزهای قبل از نهایی معمولاً A3
- آرم شرکت
- نام شرکت پیمانکار
- عنوان نقشه
- شماره سند (شماره کارفرما و پیمانکار)

▪ سایز Title Block:

DRAWING DIMENSIONS (mm × mm)	TITLE BLOCK SIZE (INCLUDING REVISION TABLE) WIDTH (mm) × LENGTH (mm)
A0 = 841 × 1189	180 × 190
A1 = 594 × 841	130 × 175
A2 = 420 × 594	100 × 155
A3 = 297 × 420	75 × 120

اطلاعات عمومی P&ID

• **سایز خطوط:** خطوط در نقشه های P&ID شامل خطوط فرآیندی اصلی و غیر اصلی، تأسیساتی، زیر زمینی، سیگنالهای الکتریکی و منطقی و ... است که سایز هر یک طبق استاندارد عبارتست از:

- 0.8 mm for main process lines;
- 0.5 mm for other process lines; utility lines, and underground lines;
- 0.5 mm for graphical symbols for equipment and machinery, except valves and fittings and piping accessories;
- 0.5 mm for rectangular boxes for illustrating Unit operations, process equipment, etc.;
- 0.5 mm for subsidiary flow lines or subsidiary product lines and for energy carrier lines and auxiliary system lines;
- 0.4 mm for class changes designation;
- 0.3 mm for graphical symbols for valves and fittings and piping accessories and for symbols for process measurement and control functions, control and data transmission lines;
- 0.3 mm for all electrical, computer and instrument signals;
- 0.3 mm for reference lines;

خطوط زیر 0.3 mm نباید در P&ID استفاده شود.

فاصله خطوط: فاصله بین دو خط موازی (جریان) حدود 10 mm مناسب است.

اطلاعات عمومی P&ID

- تقاطع خطوط: خطوط متقاطع بین جریانهای فرآیندی اصلی و غیر اصلی عبارتست از:
- ضخامت متن: ضخامت (ارتفاع) متنهای داخل نقشه P&ID عبارتست از:
- برای شماره نقشه: 7 mm
- برای عنوان نقشه و شماره تجهیزات اصلی: 5 mm
- برای سایر عبارتهای متنی: 3mm

65

UFD

UFD (UTILITY FLOW DIAGRDAM)

U&ID (UTILITY AND INSTRUMENTATION DIAGRDAM)

هوا ¢

آب ¢

بخار ¢

روغن ¢

نیترژن ¢

مدارک لازم برای تهیه UFD-UHD

- Project design criteria
- PFD
- P&ID
- Plot Plan
- symbology

- **UTILITY FLOWSHEETS**

UFD (UTILITY FLOW DIAGRAM)
UHD (UTILITY HEADER DIAGRAM)
UDFD (UTILITY DISTRIBUTION FLOW DIGRAM)

These are **UFD** diagrams(LIKE P&ID) for individual utilities such as

- ¢ steam condensate (HPS,MPS,LPS)
- ¢ cooling water(CWS,CWR,RWA,DWA(demin water))
- ¢ **NIT(NITROGEN)** inert blanketing gases or purging or catalyst regeneration,

تفاوت سیال پروسسی و یوتیلیتی

آب

پروسسی : در راکتور

یوتیلیتی : آب خنک کننده در مبدل

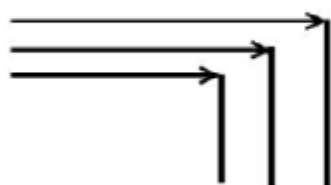
هوا

پروسسی : واحد (ASU (AIR SEPARATION UNIT

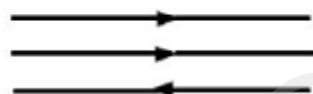
یوتیلیتی : هوای احتراق کوره، هوای ابزار دقیق

اطلاعات عمومی تهیه PFD:

۱. Scale: در نقشه های PFD مقیاس داده نمی شود با در مقیاس NONE نوشته می شود.



۲. جهت جریانها: بعنوان یک قانون جریانهای فرآیندی، از



چپ به راست کشیده می شود. همچنین جهت جریانهای

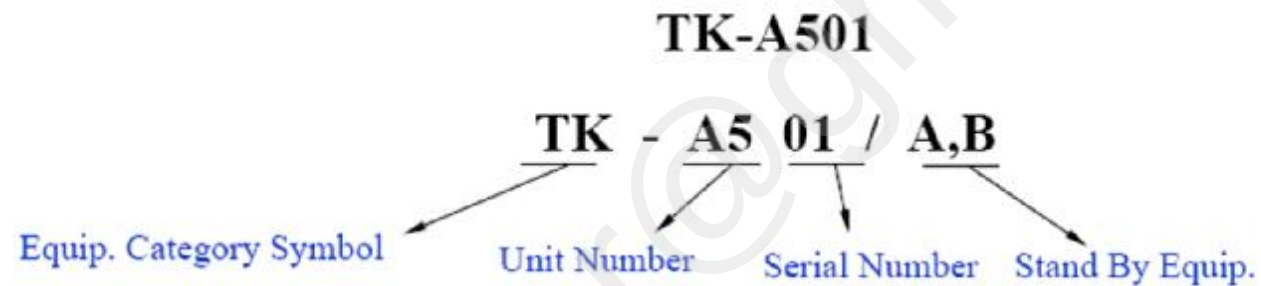
فرایندی و غیر فرایندی بصورت شکل روبرو گذاشته می شود.

۳. جریانهای فرایندی و یوتیلیتی: - جریانهای فرایندی اصلی باید با خطوط ضخیم ترسیم شود

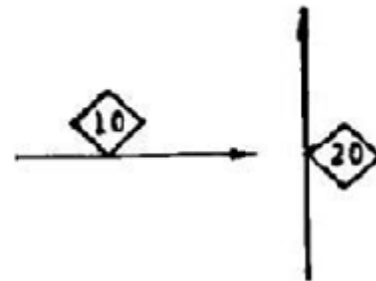
- فقط خطوط یوتیلیتی فرایندی رسم باید شود که به تجهیزات اصلی وارد یا خارج می شود
- ولوها، ونت و درین ها، بای پس، سیستمهای نمونه گیر، سیستمهای کنترلی منوال و اتوماتیک (بجز لوپهای کنترلی)، ابزار دقیق، الکتریکال و ... در PFD صرفنظر می شود

شماره گذاری تجهیزات (Tag number)

- زیر هر تجهیز فرآیندی باید شماره تجهیز (Tag Number) بصورت زیر نهاده شود:



جدول جریانها و موازنه جرم و انرژی



STREAM No.			101	102
Fluid name				
Components	mol/h or mol% or mass/h or mass%	Spec. and/or and/or MW BP 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				

اطلاعات عمومی P&ID

• مکان یابی در P&ID: نقشه P&ID باید از طول و عرض به اجزاء مساوی ۵۰ mm تقسیم بندی شود تا چینش تجهیزات در آن تسهیل گردد. برای این مبنا طول نقشه را از ۱ تا ۲۳ تقسیم و شماره دهی و عرض آن را با حروف از A تا P تقسیم می نمائیم. بکمک این تقسیم بندی می توان هریک از المنتهای ترسیم شده در P&ID اعم از تجهیزات، ولو و ... مکان یابی (آدرس دهی) گردد.

• روش چیدن تجهیزات در P&ID:

- پیشنهاد می شود برجها، وسله‌ها و فایر هیترها معمولاً در نیمه بالای نقشه باشد.
- پیشنهاد می شود مبدل‌های حرارتی در سه چهارم بالائی و تجهیزات ماشینی (پمپها) در ربع پایین نقشه باشد.
- فضای بالای Title Block برای قرار دادن Reference و Note باید خالی باشد.
- جعبه مربوط به خطوط فرآیندی ورودی و خروجی از نقشه باید حاوی مفاد زیر باشد:
 - نوع سیال
 - دستگاهی که از یا به آن وارد می شود
 - شماره نقشه مربوطه
- تجهیزات، لوله ها و یا ابزار دقیقی که دارای عایق‌بندی یا heat tracing هستند باید در P&ID نشان داده شود.
- جدول شرح تجهیزات باید در P&ID آورده شود و حداقل اطلاعات مربوط به تجهیزات در آن ارائه گردد.

نحوه شماره گذاری

۱. شماره سند (نقشه): AK - 01 - 0001 - 1/3 - A1

محل کارخانه (اراک)

شماره واحد

شماره سریال (جدول پایین)

Sheet No. / No. of sheets

سایز کاغذ (A1)

۲. شماره تجهیز:

TK - 05 01 / A, B - M

سمبل تجهیز (تانک)

شماره واحد

شماره سریال

Stand by (A, B, C, ...)

Driver type (Motor)

TYPE OF DRAWING	SERIAL NUMBER
PROCESS FLOW DIAGRAM	0001 - 0099
MECHANICAL FLOW DIAGRAMS (P & IDs)	0100 - 0199
UTILITY FLOW DIAGRAM	0200 - 0399
AUXILIARY DIAGRAM	0400 - 0499
PLOT PLAN	0500 - 0599
SITE PREPARATION AND ROUGH GRADING DIAGRAMS	0600 - 0700
CONCRETE	1000 - 1999
STRUCTURAL STEEL	2000 - 2999
ARCHITECTURAL	3000 - 3999

آموزش PFD و ID

نحوه شماره گذاری

INSULATION OR HEAT

TRACING TYPE

SERVICE

ET (1)	Electrical Traced and Insulated
ETT (1)	Electrical Traced With Heat Transfer Cement and insulated
IC	Insulation Cold
IH	Insulation Hot
IS	Insulation for Personnel Protection
SJ (1)	Steam Jacketed and Insulated
ST (1)	Steam Traced and Insulated
STS (1)	Steam Traced With Spacers and Insulated
STT (1)	Steam Traced with Heat Transfer Cement and Insulated
TB	Trace Body and Insulate
TBB	Trace Body and Bonnet and Insulate
PT	Painting
NP	NO Painting, No Insulation
UW	Underground Wrapping

(I) Use (W) for Winterization and (H) for Heat Conservation as a suffix after the above symbols.

۳. شماره خطوط لوله:

CRD - 01 - 0001 A - 100 - ST(W) - DN25-DN10(1-3/8")

حرف اختصاری سیال (Crude)

شماره واحد

شماره سریال خط لوله

کد کلاس پایشنگ با توجه به سند PMS

سایز نامی لوله یا NPS (in یا mm)

سمبل عایق یا Heat Tracing (جدول پایین)

سایز و کمیت Tracer ها

مهندس افتین نیلی

آموزش PFD و P&ID

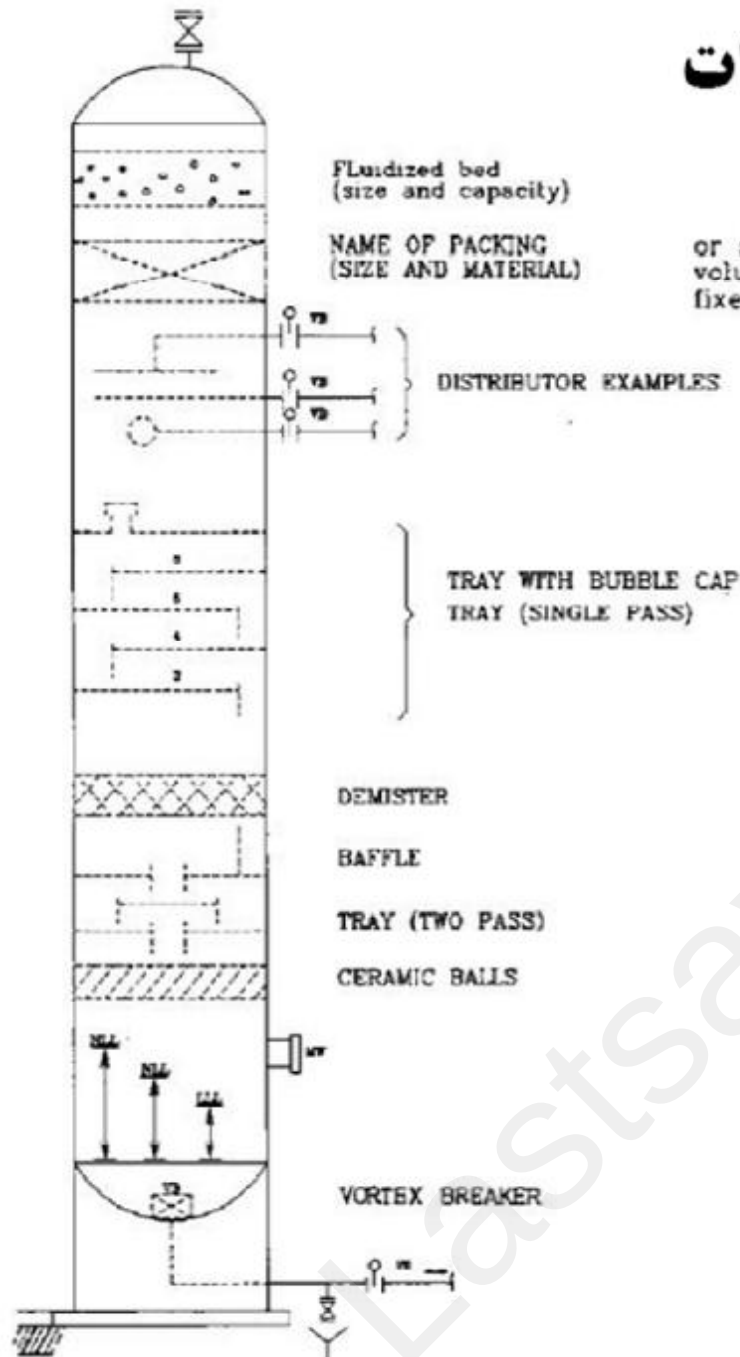
حداقل اطلاعات لازم برای تجهیزات

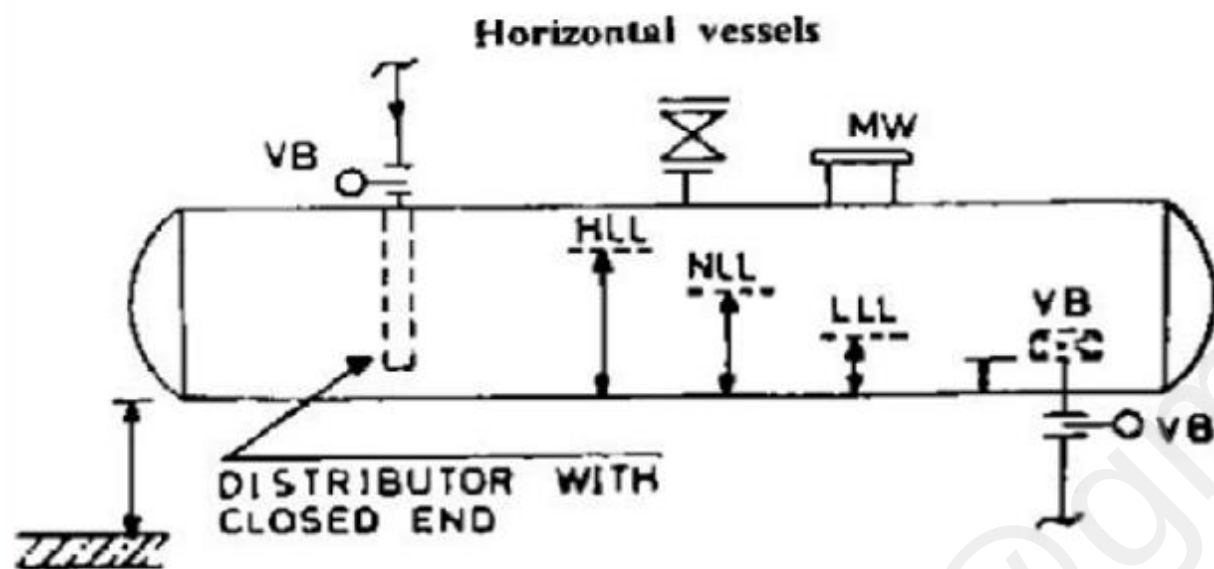
روی سمبل تجهیز و در جدول شرح تجهیزات برای هر دستگاه فرآیندی باید حداقل اطلاعاتی آورده شود که عبارتست از:

برج، درام و وسل

الف) اطلاعاتی که باید روی سمبل آورده شود:

- changes of shell diameter (if any);
- top and bottom trays, and those trays which are necessary to locate feed, reflux and product lines;
- downcomer position (e.g., side or center);
- all nozzles, manholes, instrument connections, drains, vents, pump-out and steam-out connections, blank-off ventilations, vortex breakers, safety/relief valve connections, sample connections and handholes;
- skirt or legs, top and bottom tangent lines;
- elevations above base line to bottom tangent line of column or to bottom of horizontal drum;
- the position of HHLL, HLL, NLL, LLL and LLLL;
- all flanged connections;





i) catalyst beds, packing, demisters, chimney trays, distributors, grids, baffles, rotating discs, mixers, cyclones, tangential inlet and all other internals;

j) Numbering of the trays shall be from bottom to top.

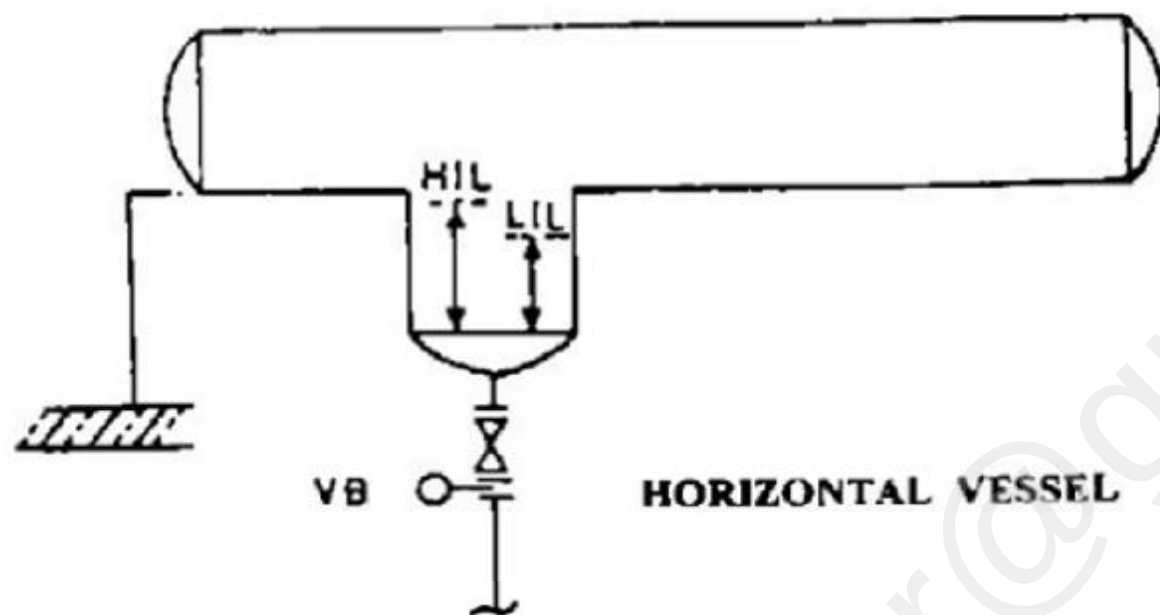
k) A valved drain for all columns and vessels shall be indicated. Generally, this valve is to be located on the bottom line outside the skirt and between the vessel and the first pipe line shut-off location. The drain valve shall be located on the bottom of the vessel when:

- 1) No bottom line is present, or
- 2) The bottom line is not flushed with the lowest point of the vessel.

l) The valved vent with blind flange for all columns and vessels provided on the top of the vessel should be indicated.

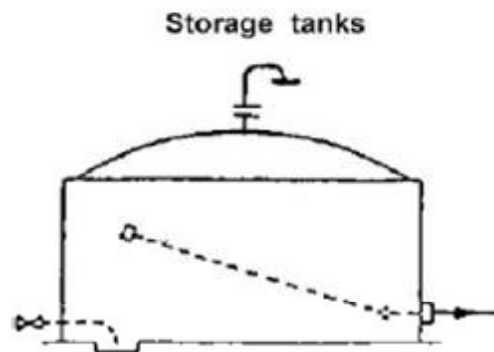
m) Relief valves generally located on the top outlet line downstream of the vessel blinding location or directly connected to the vessel should be indicated.

n) One PI shall be indicated on top of vessel/column.

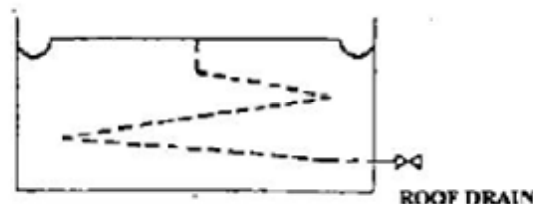


ب) اطلاعاتی که باید در جدول شرح تجهیز آورده شود:

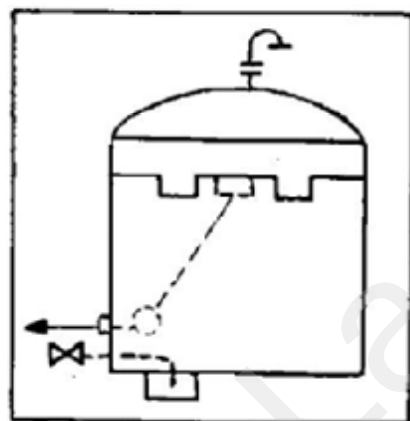
- a) vessel item number (this number will also appear adjacent to the vessel);
- b) service;
- c) size [inside diameter(s) and tangent to tangent length];
- d) design pressure (internal/external) and design temperature;
- e) indication of insulation;
- f) line number of vessel trim (this applies to LG & LC connections, vents, sample connections, etc.);
- g) indication of cladding and lining (if any).



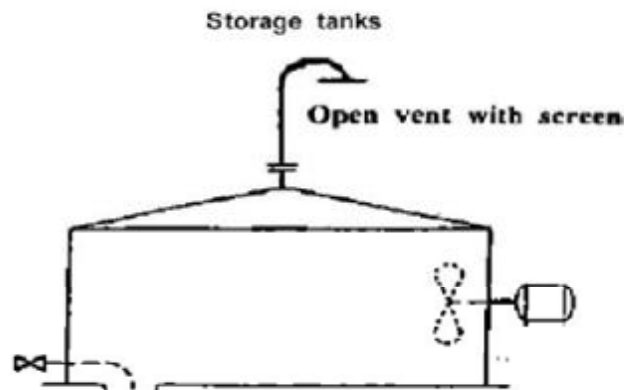
Storage tanks
DOME ROOF
WITH SWING PIPE FLOAT TYPE



FLOATING ROOF



INTERNAL (COVERED) FLOATING ROOF TANK



Storage tanks

Open vent with screen

تانک

الف) اطلاعاتی که باید روی سمبل آورده شود:

- a) all nozzles, manways, instrument connections, drains, vents, vortex breakers, and safety/relief valve connections;
- b) all internals such as steam coils, air spargers, tank heaters and etc.

ب) اطلاعاتی که باید در جدول شرح تجهیز آورده شود:

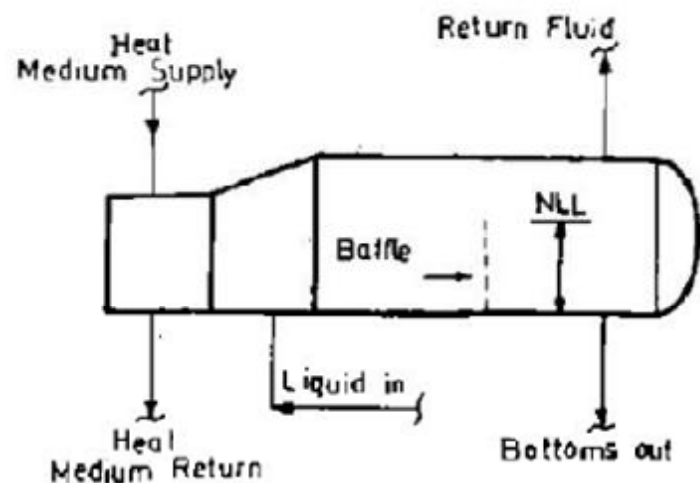
- a) equipment item number (this number also appears adjacent to the tank);
- b) service;
- c) inside diameter and height;
- d) nominal capacity, in (m^3);
- e) design pressure and temperature;
- f) indication of insulation.

آموزش PFD و P&ID

مبدل‌های حرارتی، کولر و ریبویلر

الف) اطلاعاتی که باید روی سمبل آورده شود:

- a) all nozzles, instrument connections, drains and vents, chemical cleaning connections and safety/relief valves as indicated on the equipment data sheet;
- b) elevations required;
- c) the position of HLL, NLL and LLL for kettle type reboilers;
- d) direction of flow in each side of exchanger.
- e) Shell and channel piping shall be provided with a valved vent connection and a drain connection unless venting and draining can be done via other equipment.
- f) An inlet and outlet, temperature indicator shall be provided on each exchanger (on either shell or tube side) so that to facilitate checking of heat balance around exchanger.
- g) Type of temperature indicator shall be as follows:
 - A board mounted TI shall be provided at the inlet and outlet of all shell and tube.
 - For water coolers, the water side outlet shall be provided with a local TI only. The shell side in and out shall be provided with board mounted TI.
 - Thermowells (TWs) shall be provided between each shell side and tube side of the same services when the exchangers are in series.
 - Local indicator type shall be provided for the requirement of local temperature control, such as manual bypass control.



ب) اطلاعاتی که باید در جدول شرح تجهیز آورده شود:

- a) equipment item number (this number also appears adjacent to the equipment);
- b) service;
- c) duty (kJ/s);
- d) shell side design pressure and temperature;
- e) tube side design pressure and temperature;
- f) indication of insulation.

۴,۴,۳ کولرهای هوایی فین دار

الف) اطلاعاتی که باید روی سمبل آورده شود:

- a) all nozzles and instrument connections;
- b) any automatic control (fan pitch control or louver control) and any alarm;
- c) configuration of inlet and outlet headers and the branches. Only one bundle and fan shall be shown; total number of fans and bundles shall be indicated. When multiple bundles are required, header's arrangement as separate detailed sketch shall be indicated;
- d) steam coil and condensate recovery system (if required);
- e) valved vent and valved drain connection for each header, vent header should be connected to closed system for volatile services;
- f) a board mounted TI at inlet and outlet, (the TI will monitor the process side of each air fin service). If multiple bundles to be used for fouled services, provide TW's on the outlet of each bundle.

ب) اطلاعاتی که باید در جدول شرح تجهیز آورده شود:

- a) equipment item number (this number will also appear adjacent to the equipment);
- b) service;
- c) duty (kJ/s);

پمپ

الف) اطلاعاتی که باید روی سمبل آورده شود:

- a) all nozzles including instrument connections;
- b) pump suction valve and strainer, and discharge valve and check valve. Provision of wafer type check valve should be avoided unless otherwise specified;
- c) pump drains and vents piping and destination.
- d) the type of pump;
- e) pump auxiliary system connections such as, cooling water, seal oil and lube oil steam ...
- f) detail of lube and seal oil systems, cooling water piping arrangement, and minimum flow bypass line requirement for pumps;
- g) pressure gage located on the discharge of each pump; the gage shall be installed between the pump discharge nozzle and the check valve;
- h) pressure relief safety valves (if any);
- i) automatic start-up of standby unit (if required);
- j) balanced or equalized line for vacuum service.

ب) اطلاعاتی که باید در جدول شرح تجهیز آورده شود:

- a) pump item number (this number also appears below the pump);
- b) service;
- c) capacity, (m^3/h , dm^3/h for injection pumps);
- d) differential pressure, (kPa);
- e) relative density (specific gravity) of pumped fluid at pumping temperature;
- f) indication of insulation and tracing;
- g) miscellaneous auxiliary piping (CW, flushing oil, seal oil, etc.).

۶,۴,۳ کمپرسور، بلور

الف) اطلاعاتی که باید روی سمبل آورده شود:

- a) type of compressor or blower;
- b) start-up facilities (i.e., inert gas purge system);
- c) safety/relief valves;
- d) suction and discharge valves;
- e) suction strainer (filter) and discharge check valve;
- f) suction and discharge pulsation dampener where required;
- g) valved vents and casing drains;
- i) lube and seal oil and cooling water systems detail arrangement;
- j) interstage coolers where required;
- k) surge protection (where required);
- l) inlet and outlet nozzles;
- m) all instrument connections.

ب) اطلاعاتی که باید در جدول شرح تجهیز آورده شود:

- a) equipment item number and stage (this number also appears below the compressor);
- b) service;
- c) capacity, (Nm³/h);
- d) suction pressure, and temperature, [kPa (ga)], (°C);
- e) discharge pressure, and temperature, [kPa (ga)], (°C);
- f) miscellaneous auxiliary piping (CW, lube oil, seal oil, etc.);

الزامات موجود در PFD

MINIMUM INFORMATION REQUIREMENTS FOR EQUIPMENTS

حداقل اطلاعات لازم برای تجهیزات

❖ 1. Designated streams

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

الزامات موجود در PFD

Minimum Information Requirements For Equipments

حداقل اطلاعات لازم برای تجهیزات

❖ 2. Heat exchangers

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

❖ 3. Furnaces

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

الزامات موجود در PFD

MINIMUM INFORMATION REQUIREMENTS FOR EQUIPMENTS

حداقل اطلاعات لازم برای تجهیزات

4. Reactors

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

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.

الزامات موجود در PFD

Minimum Information Requirements For Equipments

حداقل اطلاعات لازم برای تجهیزات

❖ 6. Drums

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

❖ 7. Pumps

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

الزامات موجود در PFD

Minimum Information Requirements For Equipments

حداقل اطلاعات لازم برای تجهیزات

TYPE OF EQUIPMENT	REPRESENTATION OF INFORMATION ON PFD	REPRESENTATION OF INFORMATION ON P & ID
Pressure vessel / Tower	Item No.: Service: ID × TT: mm Operating Temp.: °C Operating Press.: Barg	Item No.: Service: ID × TT: mm Design Press.: Barg Design Temp.: °C
Package Unit	Item No.: Service: Capacity:	Item No.: Service: Capacity: Dimension or other related information
Pig Launcher /Receiver	Item No.: Service: Operating Press.: Barg Operating Temp.: °C	Item No.: Service: Dimension: Design Press.: Barg Design Temp.: °C

الزامات موجود در PFD

انواع خطوط و ضخامتهای استاندارد آنها KIND OF LINES

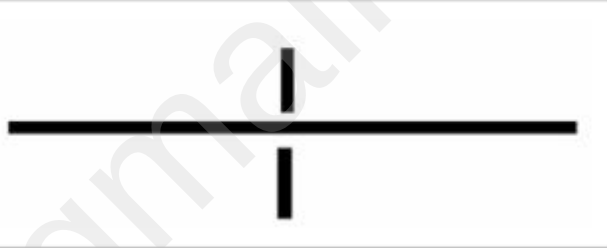
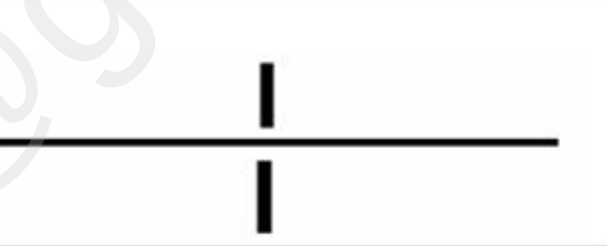
As a rule, Process lines, utility lines, and loop lines for instrument should be drawn according to [IPS-E-PR-230](#) as follows:

a) Main process lines Thickness = 0.8 mm	
b) Secondary process lines and utility line Thickness = 0.5 mm	
c) All electrical, computer and instrument signals Thickness = 0.3 mm	

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الزامات موجود در PFD

گذر خطوط و نقاط تقاطع LINE CROSSOVER

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	

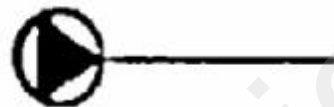
الزامات موجود در PFD

نقاط تعیین کننده مرز پروژه (TP(TIE IN POINT))

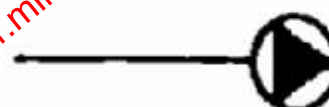
Denotation of Lines at Battery Limit Tie-In Points

a) Process lines

From Item No. and/
or Dwg. No.



To Item No. and/
or Dwg. No.



هدر (header, manifold)

لوله‌هایی که جهت جمع‌آوری سیال از چند خط، چند پمپ، و یا چند شیر اطمینان (safety valve) و، و ارسال این سیال به یک یا چند خط بکار می‌روند.

شیر اطمینان (safety valve)

شیرهایی که روی خطوط لوله و یا مخازن تحت فشار نصب میشوند و در صورت بروز پدیده افزایش فشار بیش از میزان تعیین شده (set point) باز شده و بخشی از سیال را از خط و یا مخزن تحت فشار تخلیه کرده و فشار آن را به زیر میزان تعیین شده کاهش میدهد.

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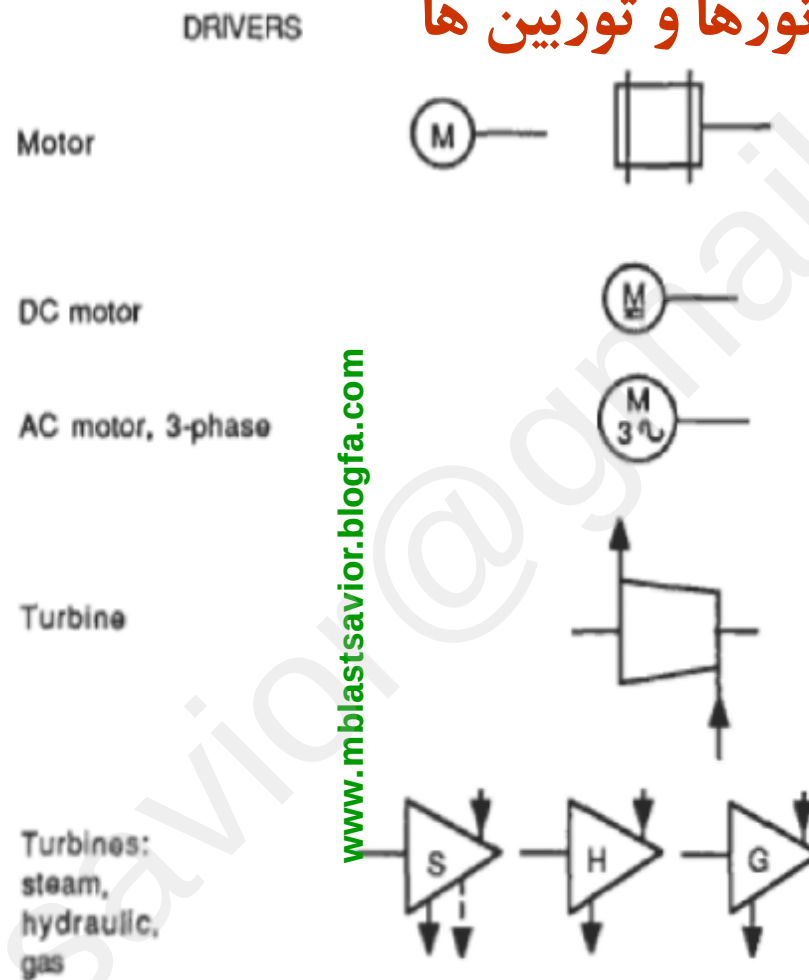
شیر کنترل (control valve)

شیرهای اتوماتی هستند که به منظور کنترل پارامترهایی مانند فشار، دبی، درجه حرارت و ... در خط تعبیه شده و بنا به نوع کنترلی که دارند از pressure transmitter، temperature transmitter و یا سایر تجهیزات اندازه‌گیری با برنامه‌ای که در DCS با عنوان logic diagram برای آنها تعریف میشود پارامتر مورد نظر را کنترل مینمایند. عملگر این شیرها عموماً هوای ابزار دقیق میباشد (pneumatic actuator)

Vent و drain

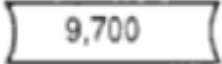
به ترتیب شیر تخلیه هوا که در بالاترین نقطه خط نصب میشود و جهت تخلیه هوا از خط مورد استفاده قرار میگیرد و شیر تخلیه مایع که در پایین‌ترین نقطه خط نصب شده و جهت تخلیه مایع استفاده میشود.

الگوهای مختلف مورد استفاده در رسم نمودار جریان موتورها و توربین ها



الگوهای قدیمی مختلف مورد استفاده در رسم نمودار جریان

TABLE 2.3. Flowsheet Flags of Operating Conditions in Typical Units

Mass flow rate, lbs/hr		13,028
Molal flow rate, lbmols/hr		217
Temperature, °F		510
Pressure, psig (or indicate if psia or Torr or bar)		155 psia
Volumetric liquid flow rate, gal/min.		65.3
Volumetric liquid flow rate, bbls/day		8,500
Kilo Btu/hr, at heat transfer equipment		9,700
Enthalpy, Btu/lb		953
Others		

معمول

تهیه کننده: محمد بهزادی

**Typical Thickness Chart—Insulation for Services 70°F
through 1200°F Piping, Vessels & Equipment 36"
Diameter & Smaller**

Pipe size	Insulation Thickness				
	1"	1½"	2"	2½"	3"
2½" & Smaller	700°F	1000°F	1200°F		
3"	700	900	1100	1200°F	
4"	700	900	1100	1200	
6"	600	800	1000	1200	
8"	—	800	1000	1200	
10"	—	800	1000	1200	
12"	—	800	1000	1200	
14"	—	800	1000	1100	1200°F
16"	—	800	900	1100	1200
18"	—	800	900	1100	1200
20"	—	800	900	1100	1200
24"	—	800	900	1100	1200
30"	—	800	900	1100	1200
36"	—	800	900	1000	1200

Temperatures in chart are maximum operating temperatures in degrees Fahrenheit for given thickness.

Note: All hot insulated piping shall be coded, including piping insulated for personnel protection. Thickness is a function of insulation composition.

P&ID Symbols:

P&ID Equipment Symbols

P&ID General Symbols

P&ID Instrument Symbols (Typical Hook-Up)

P&ID Instrument Symbols (Valve Symbol)



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طرق مختلف نمایش خطوط فرآیندی

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PIPING LINE TYPES

	MAIN PROCESS LINE
	AUXILIARY PROCESS/UTILITY LINE
	UNDERGROUND LINE - PRIMARY
	UNDERGROUND LINE - SECONDARY
	EXISTING LINE
	FUTURE LINE
	BATTERY OR PACKAGE LIMIT

مدارک Legend و Symbolism یک پروژه

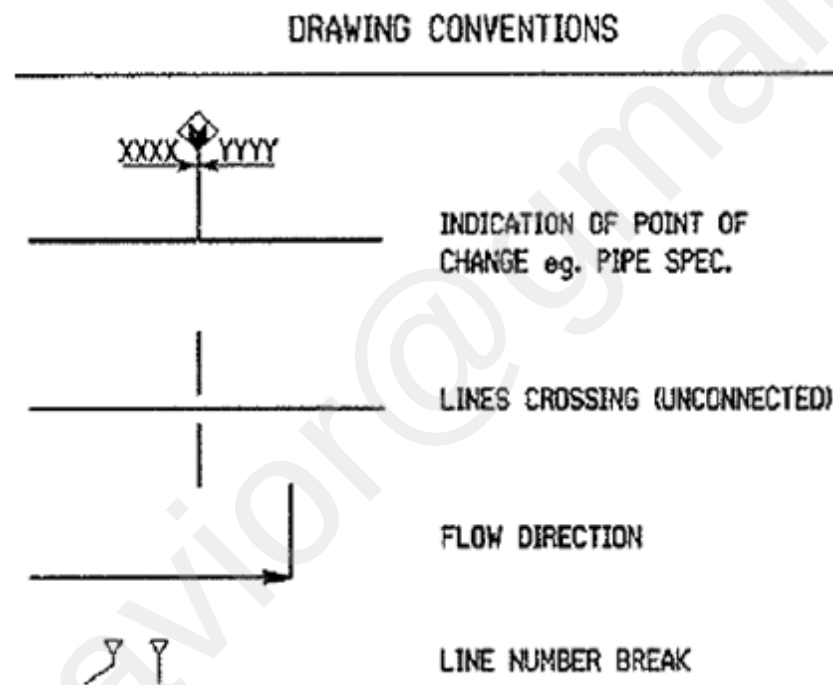
NW	NON CONTAMINATED SEWER
OW	OILY WATER
OWS	OILY WATER SEWER
P	OIL AND OIL PRODUCTS
PO	PUMP OUT
POS	POTENTIALLY OIL CONTAMINATED SEWER
PW	PROCESS WATER
RL	RELIEF LINE
RP	REFRIGERANT PROPANE
SA	SULPHURIC ACID
SH	HIGH PRESSURE STEAM
SL	LOW PRESSURE STEAM
SO	SEAL OIL
SOW	SOUR WATER
SR	SEWER (STORM) - NON CONTAMINATED RUN OFF
SW	SEA WATER
SWR	SEA WATER RETURN
SWS	SEA WATER SUPPLY
UW	UTILITY WATER

UTILITIES/OFFSITES

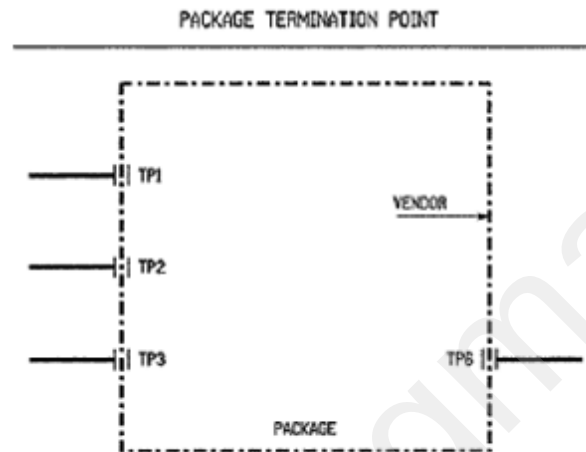
A	PLANT AIR
AF	FOAM SOLUTION
BBD	BOILER BLOWDOWN
BD	BLOWDOWN (HYDROCARBON)/CLOSED DRAIN
BFW	BOILER FEEDWATER
C	CHEMICAL
CA	CAUSTIC
CD	CLOSED DRAIN
CHW	CHILLED WATER
CS	CHEMICAL SEWER
CWR	COOLING WATER RETURN
CWS	COOLING WATER SUPPLY
DEA	DIETHANOL AMINE
DFW	DEAERATOR FEEDWATER
DMW	DEMINEALISED WATER
DO	DIESEL OIL
DSW	DESALINATED WATER
DW	DRINKING WATER
DWW	DOMESTIC WASTE WATER
E	EXHAUST STEAM
FB	BUTANE STORAGE FLARE
FHD	HIGH PRESSURE FLARE DRY
FHW	HIGH PRESSURE FLARE WET
FLD	LOW PRESSURE FLARE DRY
FLW	LOW PRESSURE FLARE WET
FM	MARINE FLARE
FP	PROPANE STORAGE FLARE
FFW	FIRE WATER
G	HYDROCARBON GAS
GM	GLYCOL (MEG)
HC	HYDROCARBON (LIQUID/GAS)
HFG	HP FUEL GAS
HSC	HP STEAM CONDENSATE
HSG	HYDROGEN SULPHIDE GAS
IA	INSTRUMENT AIR
L	HYDROCARBON LIQUID
LFG	LP FUEL GAS
LO	LUBE OIL
LSC	LP STEAM CONDENSATE
MDEA	METHYL DIETHANOL AMINE
ME	METHANOL
N	NITROGEN

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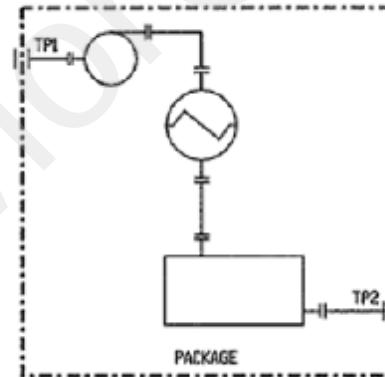


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طرق مختلف نمایش پکیج



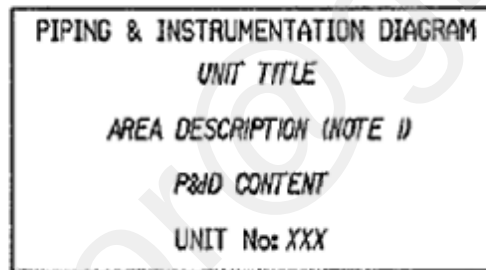
TP - TERMINATION POINTS TO BE ADDED DURING DETAILED ENGINEERING

تهیه کننده: محمد بهزادی

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STANDARD TITLE BLOCK ARRANGEMENT

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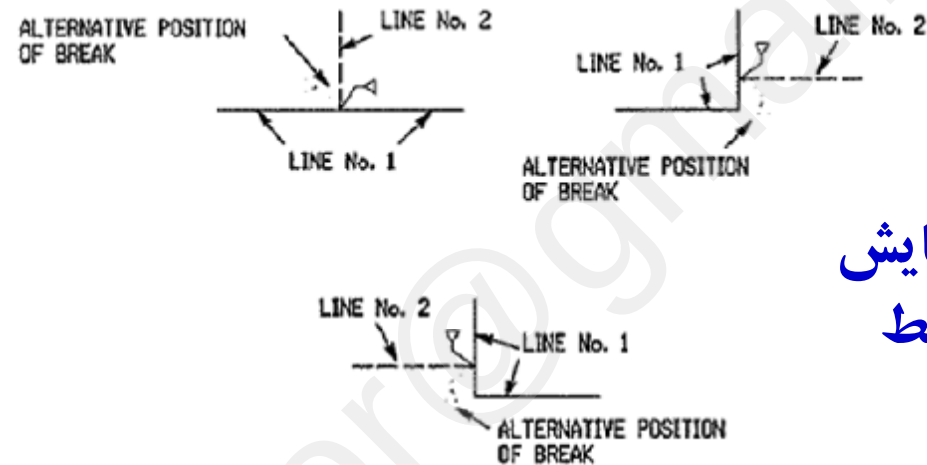


NOTE 1 - ONLY TO BE USED FOR OFFSHORE,
BGCS AND PIPELINES TO FACILITATE AREA IDENTIFICATION

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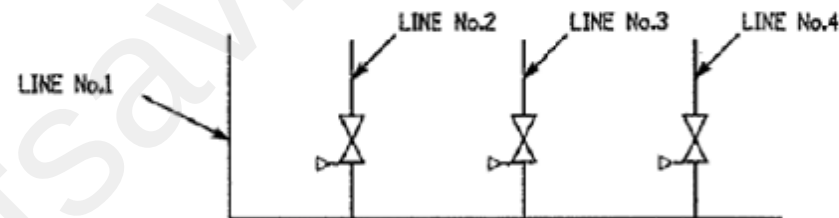
LINE NUMBER BREAK

THE LINE NUMBER BREAK IS USED TO IDENTIFY THE TERMINATION AND CHANGE OF LINE NUMBER. IT CAN BE PLACED IN VARIOUS CONFIGURATIONS AS SHOWN IN THE EXAMPLES BELOW.



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تغییر شماره خط

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FOR A HEADER FABRICATED WITH FLANGED BRANCHES, THE LINE NUMBER STARTS / ENDS AT VALVE SUBJECT TO PIPE SPECIFICATION

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شماره گذاری نواحی

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LINE LIST / EQUIPMENT LIST DOCUMENT NUMBERING

TO PROVIDE A CONSISTENT BASIS FOR DOCUMENT NUMBERING FOR EACH AREA, THE FOLLOWING AREA NUMBERING SYSTEM SHALL BE USED.

AREA NUMBER	AREA DEFINITION
1	OFF-SHORE
2	ON-SHORE
3	BGCS & 56' PIPELINES

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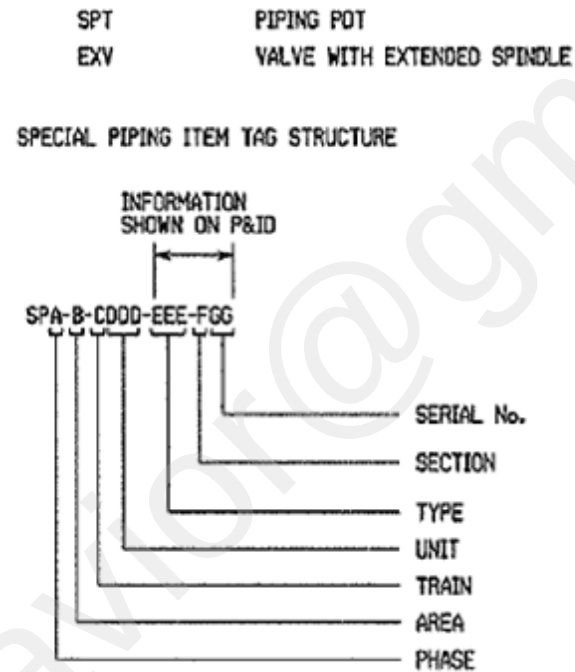
SPECIAL PIPING ITEM

SOT	AIR TRAP DRAINER
SES	EYE WASHER & SHOWER
SFD	FILTER
SFS	SPACER & BLANKS
SHC	HOSE CONNECTION
SIL	SILENCER
SJT	EJECTOR
SMA	FLAME ARRESTER
SMX	LINE STATIC MIXER
SPN	SPRAY NOZZLE
SQC	QUICK COUPLING
SQF	QUENCH FITTING
SRD	RUPTURE DISC
SSC	SAMPLE COOLER
SSG	SIGHT GLASS
SST	STEAM TRAP
STM	TEMPORARY STRAINER
STR	STRAINER
SVB	VACUUM BREAKER
SVR	BREATHING VALVE
SVT	VACUUM TRAP
SXB	EXPANSION BELLOWS, METALLIC
SXH	FLEXIBLE TUBE, METALLIC
SXB/SXH	EXPANSION JOINTS, NON-METALLIC
SSP	SPECIAL SPOOL PIPE
SFL/SFJ	SPECIAL FLANGE
SFT/SEA/STA	SPECIAL FITTINGS
SBN	SPECIAL BOLT AND NUTS
SGT	SPECIAL GASKET
SHS	HOSE
SPV	SPECIAL VALVE
SCD	CONTINUOUS DRAINER

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اختصارات عایقها

INSULATION CODES CONT.

FOR DETAILED ENGINEERING THE 'NI' INSULATION CODE CAN BE REPLACED WITH ONE OF THE FOLLOWING IF THE EPC CONTRACTOR REQUIRES.

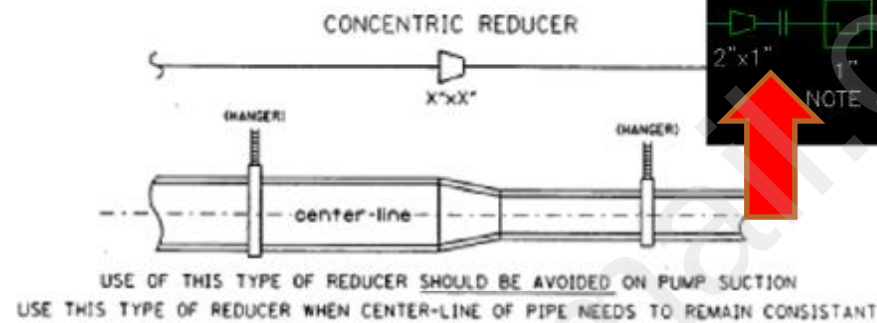
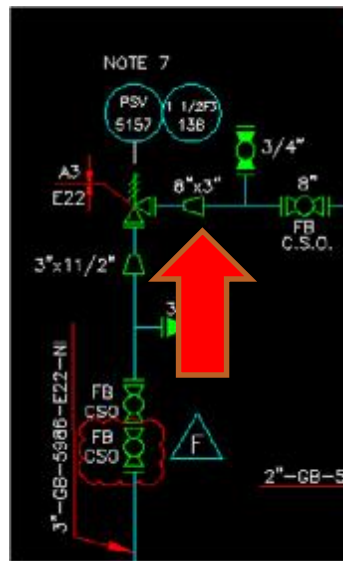
N	LINE NOT PAINTED AND NOT INSULATED
P	LINE EXTERNALLY PAINTED ONLY
X	LINE EXTERNALLY COATED AND WRAPPED ONLY
Y	LINE INTERNALLY TREATED AND EXTERNALLY COATED AND WRAPPED
Z	LINE INTERNALLY TREATED AND EXTERNALLY PAINTED

INSULATION CODES

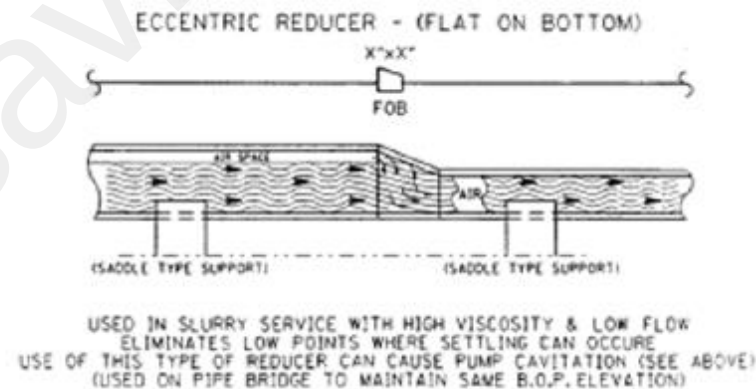
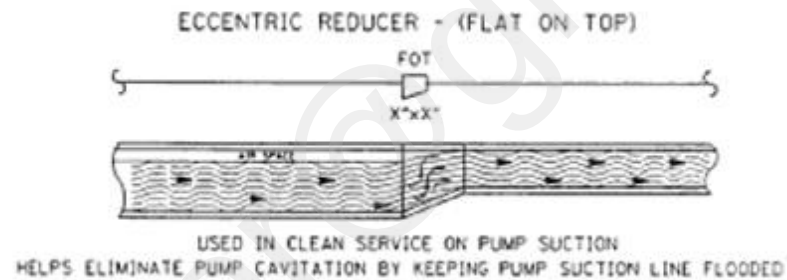
NI	NOT INSULATED
C1	CC + ACOUSTIC INSULATION (CLASS-A)
C2	CC + ACOUSTIC INSULATION (CLASS-B)
C3	CC + ACOUSTIC INSULATION (CLASS-C)
P1	PH + ACOUSTIC INSULATION (CLASS-A)
P2	PH + ACOUSTIC INSULATION (CLASS-B)
P3	PH + ACOUSTIC INSULATION (CLASS-C)
H1	HC + ACOUSTIC INSULATION (CLASS-A)
H2	HC + ACOUSTIC INSULATION (CLASS-B)
H3	HC + ACOUSTIC INSULATION (CLASS-C)
F1	HCF + ACOUSTIC INSULATION (CLASS-A)
F2	HCF + ACOUSTIC INSULATION (CLASS-B)
F3	HCF + ACOUSTIC INSULATION (CLASS-C)
NA	NI + ACOUSTIC INSULATION (CLASS-A)
NB	NI + ACOUSTIC INSULATION (CLASS-B)
NC	NI + ACOUSTIC INSULATION (CLASS-C)
CC	COLD CONSERVATION INSULATION
ET	ELECTRIC TRACE AND INSULATE
HC	HEAT CONSERVATION INSULATION
HCF	HEAT CONSERVATION(FULL) INSULATION (NOTE 1)
PH	PERSONEL PROTECTION (HOT)
PC	PERSONEL PROTECTION (COLD)
SJ	STEAM JACKET AND INSULATE
ST	STEAM TRACED

NOTES

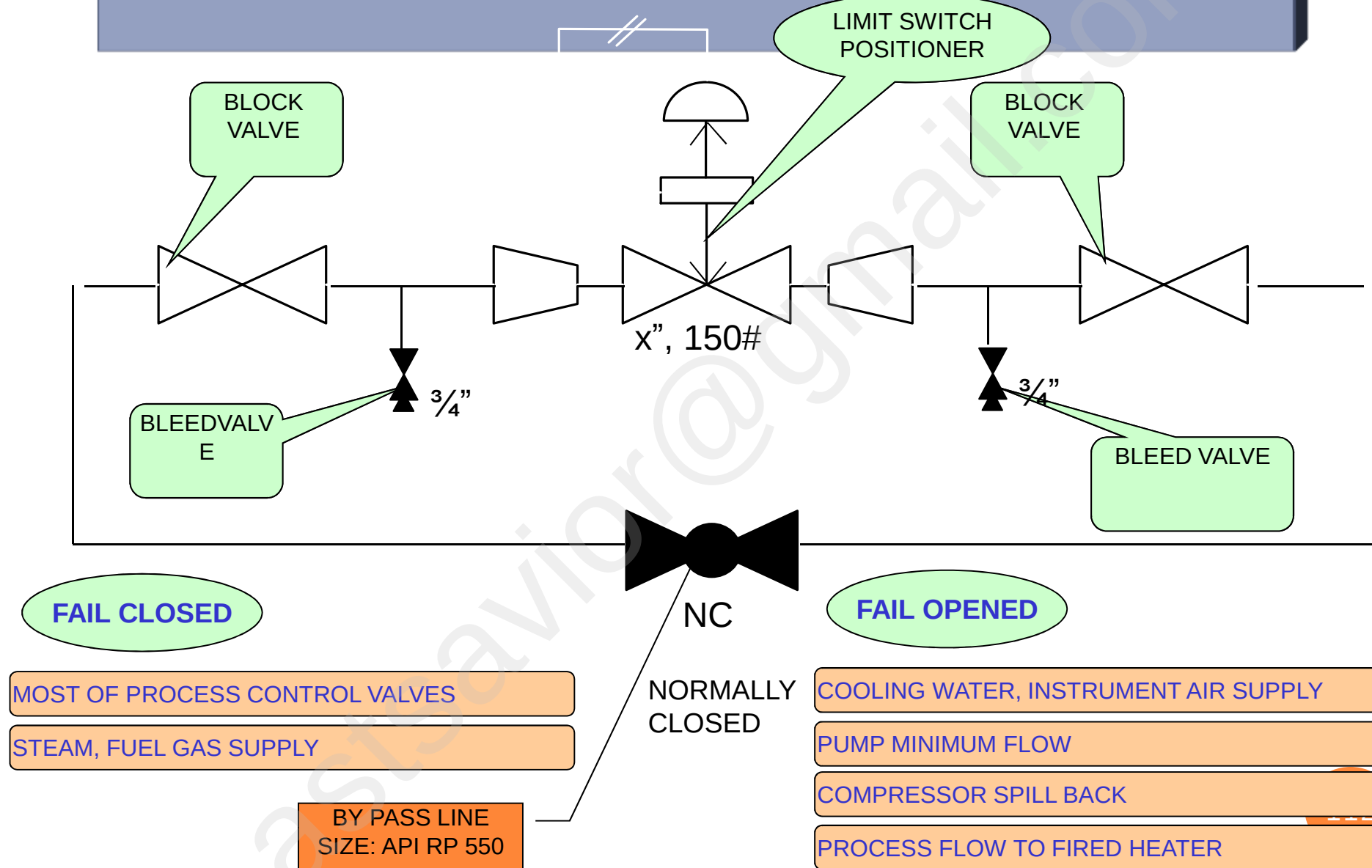
1. ALL VALVES AND FLANGED JOINTS SHALL BE INSULATED.



ECCENTRIC AND CONCENTRIC REDUCER



CONTROL VALVE MANIFOLD. IPS-E-PR-230, IPS-E-PR-830



Fail Open / Closed (Control Valve): The safe position of a valve which will shift to upon loss of the power medium.

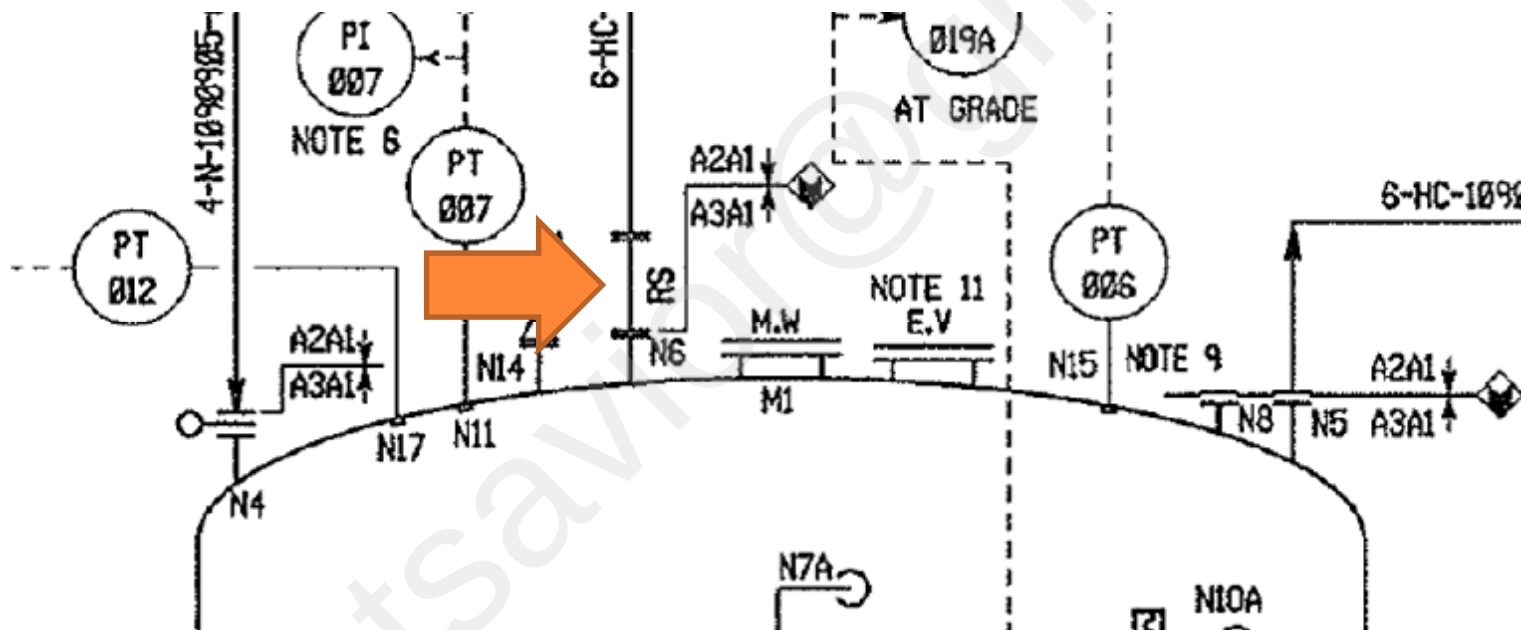
Normal Position (Valve): The position of a valve in Normal Condition of the process (N.O. , N.C.)

- PSV
- BLOW DOWN(BDV)
- MANUAL (GLOBE GOR PRESSURE REDUCTION)

تہیہ کنندہ: محسن بھڑادی



REMOVABLE SPOOL



ESD: EMERGENCY SHUT DOWN

- ⌚ ESD 4: EQUIPMENT SHUT DOWN
- ⌚ ESD 3: TRAIN SHUT DOWN
- ⌚ ESD 2: AREA SHUT DOWN
- ⌚ ESD 1: UNIT SHUT DOWN
- ⌚ ESD 0: SHUT DOWN AND ESCAPE

- ⌚ PSD: PLANT SHUT DOWN

MAN WAYS (IPS-E-PR-491)

Size of man ways

- Horizontal vessels

900 to 1300 mm ID

Man way, on the head, 460 mm (18") ID.

Larger than 1300 mm ID

Man way, on the side or on the top 510 mm (20") ID.*

- Vertical vessels

Under 900 mm ID

Top head flanged.

900 to 1300 mm ID

Man way, in shell, 460 mm (18") ID.

Larger than 1300 mm ID

Man way, in shell, 510 mm (20") ID.*

* Note:

Higher size man way shall be provided if required to accommodate internals.

- Location of manholes
at the opposite side of the utility connection for horizontal vessel
- Number of manholes

NUMBER OF MANHOLES

- Vessel

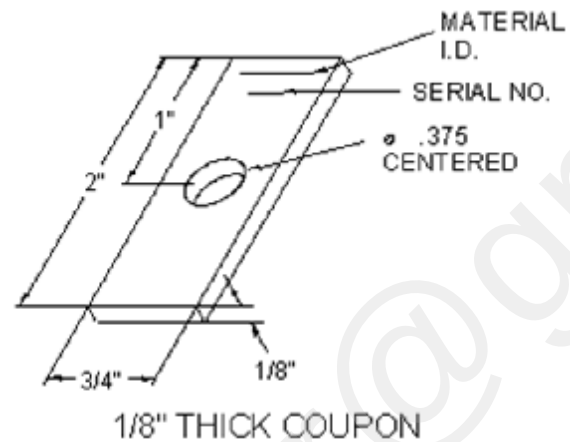
For vessels with length or height less than 6 m a single manhole will be provided. For other vessels (length or height $> 6\text{m}$), two manholes have to be provided at least one manhole each 6 m for longer or higher vessel. If vessel is equipped with internals (baffle, etc.), one manhole has to be provided on each compartment.

Except when provided with full bolted full diameter end closure all vessels 900 mm O.D. and larger shall have at least one man way for inspection maintenance requirements.

HAND HOLE

Hand hole size = 8". Hand hole to be installed on vessel with diameter lower than 800 mm or on vessel where severe fouling of internals is expected.

CORROSION COUPONS



تهیه کننده: مهندس مازیار

Shape

Rectangular

Finish

120 grit, glass bead, or mill

Identification

Stenciled - alloy, heat no., sequence

Surface Area

3.47 in²

FLAT CORROSION COUPONS



P/N	Size	Hole	Hole Location	Area Sq. In.
CO100	1/2" X 3" X 1/16"	3/16"	1/4" fr. end	3.38
CO101	1" X 2" X 1/16"	3/16"	1/4" fr. end	4.32
CO102	1/2" X 3" X 1/16"	9/64"	1/8" fr. end	3.41
CO103	1/2" X 3" X 1/16"	1/4"	1/4" fr. end	3.34
CO104	1/2" X 3" X 1/16"	(2) 1/4"	1/2" fr. ea. end	3.24
CO105	1/2" X 3" X 1/16"	3/16"	1/2" fr. end	3.38
CO106	1/2" X 3" X 1/16"	1/4"	1/2" fr. end	3.34
CO115	1/2" X 3" X 1/16"	1/4"	1/4" fr. end	7777
CO117	3/8" X 3" X 1/16"	9/64"	1/8" fr. end	2.64
CO118	1/2" X 3" X 1/16"	(2) 1/4"	1/4" & 3/4" end	3.24
CO120	3/8" X 3" X 1/16"	(2) 1/4"	1/4" & 3/4" end	2.48

CYLINDRICAL CORROSION COUPONS



P/N	Size	Thread	Slot
ES200	1/4" X 2 1/2"	1/4"-20 X 3/8"	1/16"
ES201	1/4" X 2"	1/4"-20 X 3/8"	1/16"
ES202	1/4" X 3"	1/4"-20 X 3/8"	1/16"
ES204	1/4" X 1 1/2"	1/4"-20 X 3/8"	1/16"
ES209	1/4" x 3"	1/4"-20 X 3/8"	
*			

تهیه کننده: محمد بهزادی

SCALE CORROSION COUPONS

SCALE COUPONS (OR DEPOSITION COUPONS) PROVIDE A QUALITATIVE MEASURE OF RELATIVE DEPOSITION RATES IN INDUSTRIAL WATER AND MANUFACTURING PROCESS SYSTEMS



P/N CO115 -
flat coupon

P/N ES209 -
cylindrical
coupon

CAR SEAL VALVE



- ❖ Car seals are manufactured from stainless steel
- ❖ and come complete with 95cm stainless steel
- ❖ cable attached. Ideal for long term uses, each car
- ❖ seal is self locking so once the cable passes through the
- ❖ body the only way to remove it is by cutting. All seals
- ❖ are individually numbered to prevent tampering and
- ❖ allow easy identification. Supplied in packs of 10.

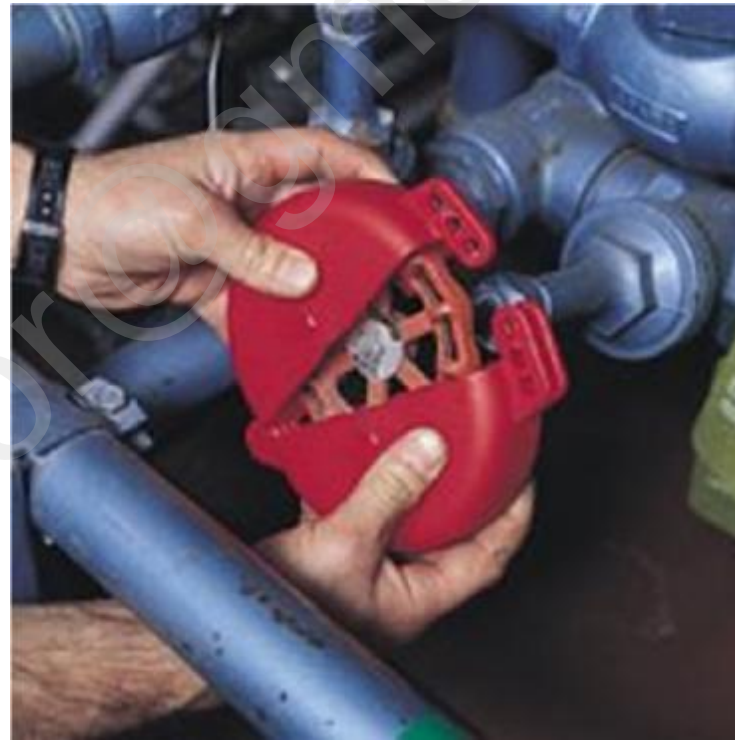
<http://www.reecesafety.co.uk>

ROTATING GATE VALVE LOCKOUTS

- ❖ Manufactured from tough lightweight dielectric Xenoy thermoplastic these
- ❖ rotational valve covers can withstand extreme conditions, temperature
- ❖ range -46 C to 177 C



ROTATING GATE VALVE LOCKOUTS



ROTATING GATE VALVE LOCKOUTS



1) Feed through the valve and secure around a suitable anchor point



2) Pull tight to remove any slack



3) Tighten the tamper proof screw with the special tool provided



4) Place padlock through the centre hole

BALL VALVE LOCKOUTS

- ❖ Manufactured from ultra-tough polypropylene, the two halves of the device encompass the
- ❖ ball valve lever to secure it from inadvertent activation of the valve



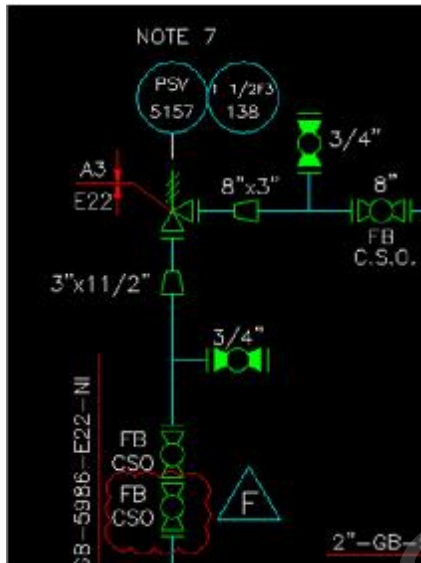
ADJUSTABLE GATE VALVE LOCKOUT

- ❖ This versatile valve handwheel lockout adjusts to fit valve handwheels from
- ❖ 25.4mm to 165mm (1" to 6.1/2") diameter.
- ❖ Manufactured from durable polypropylene and can withstand temperature changes from -45 C to 182 C .



TYPES OF BALL VALVE

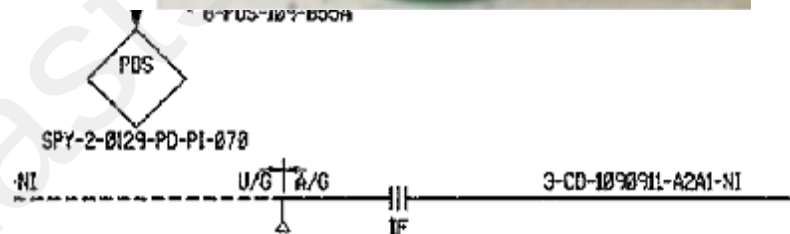
- ❖ A *full port* or more commonly known *full bore* ball valve has an over-sized ball so that the hole in the ball is the same size as the pipeline resulting in lower friction loss. Flow is unrestricted but the valve is larger and more expensive so this is only used where free flow is required, for example in pipelines which require pigging.



- ❖ در توپک رانی و دو طرف شیر اطمینان
- ❖ In *reduced port* or more commonly known *reduced bore* ball valves, flow through the valve is one pipe size smaller than the valve's pipe size resulting in flow area being smaller than pipe. As the flow discharge remains constant and is equal to area of flow (A) times velocity (V), the velocity increases with reduced area of flow

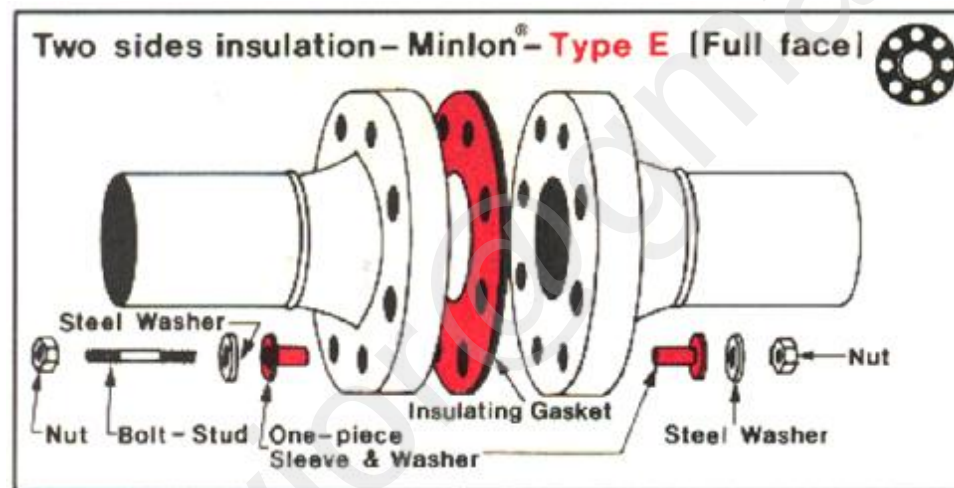
INSULATION FLANGE

در مرز پایپینگ روزمینی / زیرزمینی و یا روزمینی / دریا



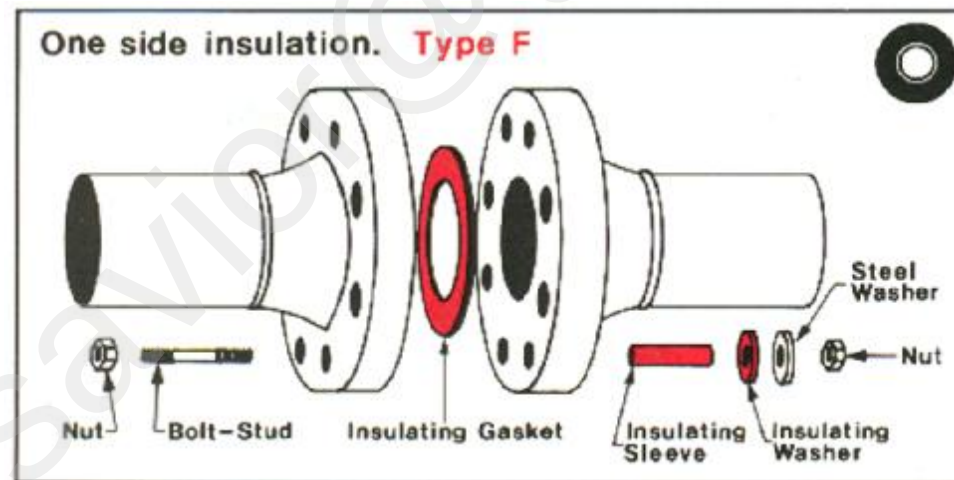
Type "E" (Full Face) Gaskets

Type "E" gaskets perfectly center on precisely located bolt holes. Since their outside diameters are the same, foreign material is prevented from "shorting" the flange insulation.



Type "F" Gaskets

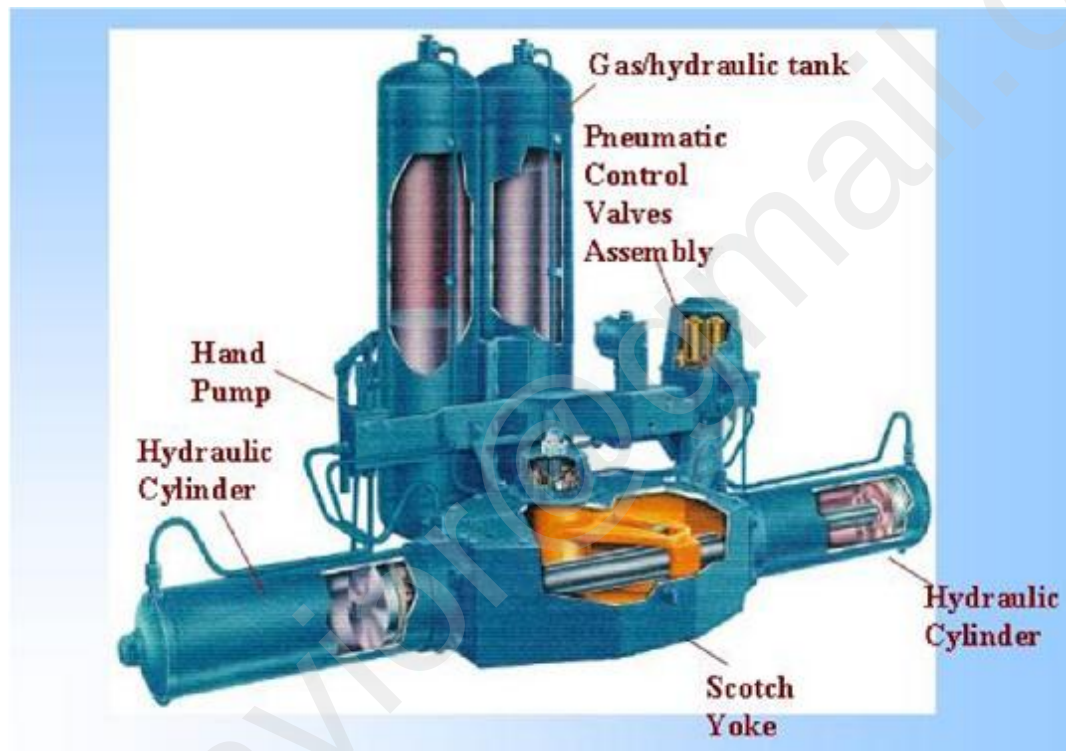
Type "F" gaskets are made without bolt holes, to fit tightly inside the overall bolt hold circle of the flange faces. The outside diameter of the gasket fits tightly in place, assuring a well centered position.



JOULE-THOMSON VALVE

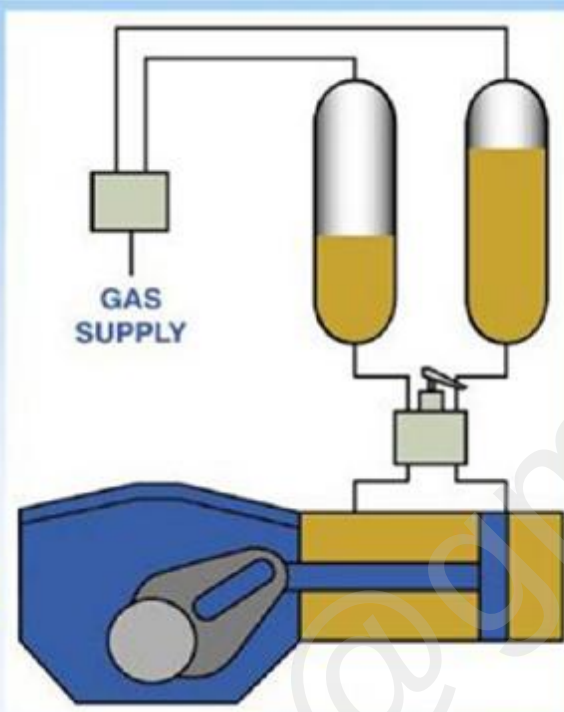
- ❖ A valve through which a gas is allowed to expand adiabatically, resulting in lowering of its temperature; used in production of liquid hydrogen and helium

Gas over oil valve (GOV)
Actuator Main Mechanical Parts

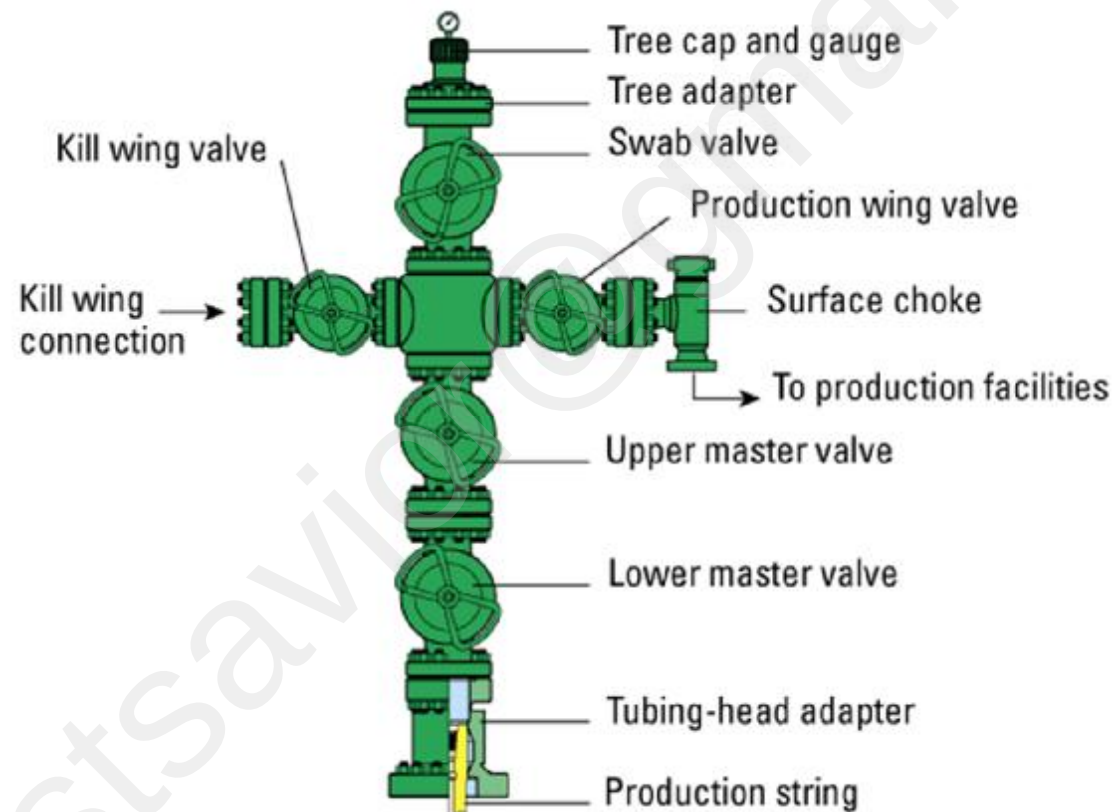


Gas over oil actuator working principal

Demonstration



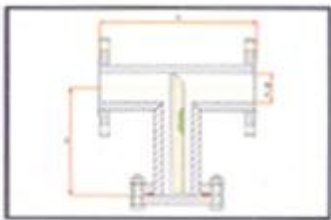
X-MASS TREE



FLEXIBLE HOSE



STRAINER



تهیه کننده: محمد بهزادی

STRAINER:

- ¢ PUMP
- ¢ COMPRESSOR
- ¢ STEAM TRAP (INTEGRAL STRAINER)
- ¢
- ¢ T TYPE >2"
- ¢ Y TYPE <2" ,SPACE CONFINEMENT

CONNECTION TYPE

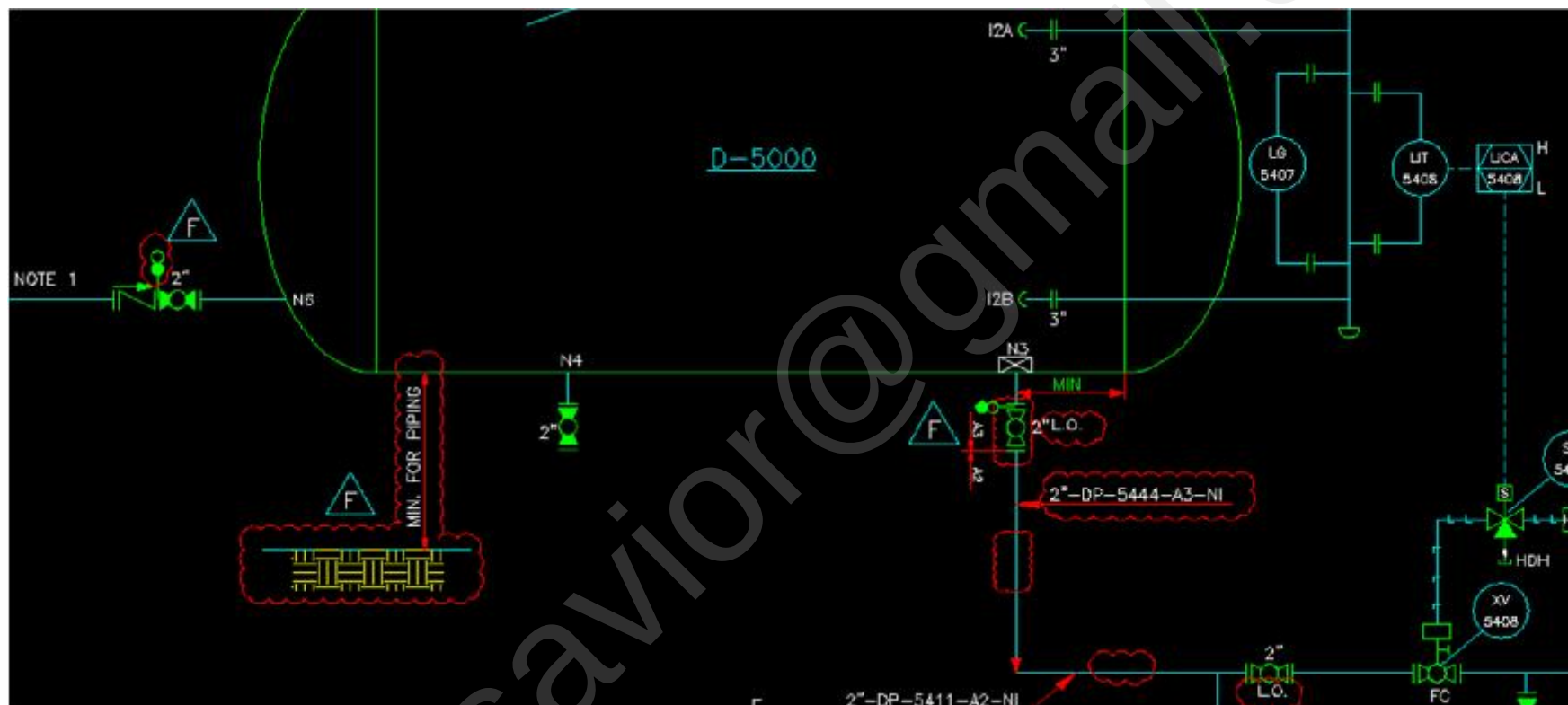
- ¢ Welding
- ¢ BW (butt welding) economic ($>2''$)
- ¢ Sw(socket welding)
toxic,flammable,valuable,steam, $<2''$
- ¢ Flange
- ¢ Treaded water,low pressure

ISOLATION:

- ❖ Valve (wrong)
- ❖ Valve+spacer (spade)
- ❖ Valve+spectacle blind (8 figure shape)
- ❖ RS(removable spool)

AG ABOVE GROUND	رو زمینی
AS AIR SUPPLY	هوای ابزار دقیق (شیرها) سایر نیروی محرکه شیرها: هیدرولیک (روغن و آب (به ندرت)، برقی (MOV)، (GOV)
ATM ATMOSPHERE	فشار اتمسفریک
BD	خروجی از درام تولید کننده بخار (زیر آب زدن) (CBD (CONTINUOUS BLOW DOWN)-IBD (INTERMITTENT BLOW DOWN) تخلیه مخزن در شرایط اضطراری
BDV BLOW DOWN VALVE	شیر بلودان تعداد مراحل ESD به ابعاد پروژه بستگی دارد به طور مثال برای یک پروژه بزرگ ESD 4 EQUIPMNT SHUT DOWN (SHUTDOWN) ESD 3 UNIT SHUT DOWN(EMERGENCY SHUTDOWN ESD 2 AREA SHUT DOWNEMERGENCY SHUTDOWN ESD1 PLANT SHUT DOWNEMERGENCY SHUTDOWN USS" ULTIMATE SAFETY SYSTM
BGCS BOOSTER GAS COMPRESSOR STATION	ایستگاه تقویت فشار گاز
BL BATTERY LIMIT	محدوده اختیارات قانونی پروژه (گارانتی)
CC CORROSION COUPON	کوپن نمایشگر خوردگی
CCR CENTRAL CONTROL ROOM	اطاق کنترل (BUILDING) CCB

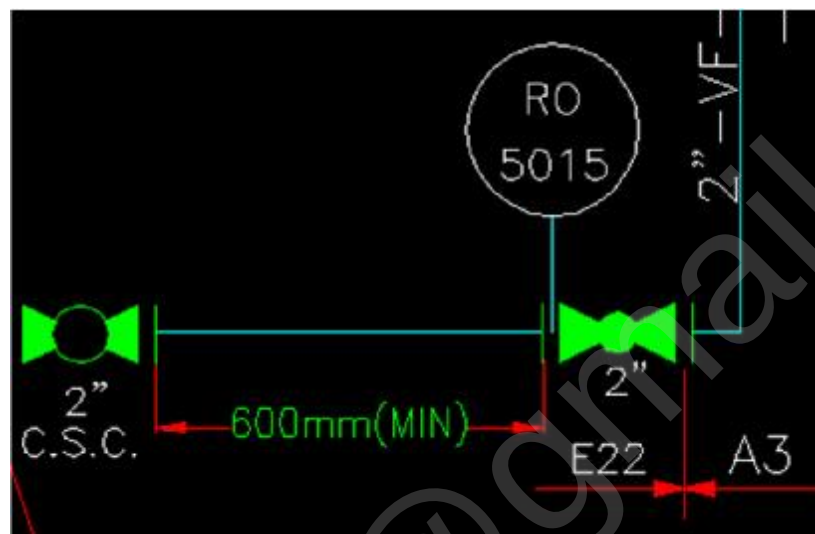
CCS COMPRESSOR CONTROL SYSTEM	سیستم کنترل کمپرسور (برای مقابله با ANTI SURGE کمپرسور سانتریفوژ) شیر ANTI SURGE باید در محدوده کاری کمپرسور قرار گیرد
CP CORROSION PROBE	پراب نمایشگر خوردگی (به صورت لحظه ای در اطاق کنترل نمایش می دهد)
CSC CAR SEAL CLOSED	شیر در حالت بسته که توسط تسمه ای قفل شده است (مسیر PSV BY PASS و DRAIN)
CSO CAR SEAL OPEN	شیر در حالت باز که توسط تسمه ای قفل شده است (ورودی و خروجی psv, BDV)
D DRAIN	مسیر خروج مایعات بی ارزش و زائد (ضایعات) (به دو صورت BLIND FLANG و یا CSC باید بسته بماند) برای ایمنی بیشتر باید به صورت HARD PIPE باشد.
DCS DISTRIBUTION CONTROL SYSTEM	سیستم توزیع شده کنترل مرکزی
EC EROSION COUPON	کوپن نمایشگر سایش (چاههای نفت و گاز حاوی شن)
EDPS EMERGENCY DEPRESSURISATION SYSTEM	سیستم کاهش دهنده فشار در شرایط اضطراری (BDV)
EL ELEVATION	ارتفاع ELEVATION (برای جلوگیری از کلویتاسیون پمپ)
ER ELECTRICAL RESISTANCE PROBE	
ESD	خاموش کردن اضطراری



ESDV EMERGENCY SHUT DOWN VALVE	شیر خاموش کردن اضطراری (معمولا FC)
FB FULL BORE	فول بور (مسیر PSV ها، توپک رانی (PIGING)) و گرانتر از شیر RB (Reduced Bore (port))
FC CLOSED	بسته شدن در حالت فیل (از دست رفتن نیروی محرک) شیر مانند همه SDV,ESDV ها یا بعضی از شیرهای ورودی به راکتور
FL LOCKED IN POSITION	*** ماندن در وضعیت قبلی شیر در حالت فیل (از دست رفتن نیروی محرک) شیر
FO FAIL OPEN	باز شدن در حالت فیل (از دست رفتن نیروی محرک) شیر مانند همه BDV ها
FW FIELD WELD	جوش درون سایت (جوش دو سمت مجموعه ای از المانها که قبلا در کارگاه یا در روی زمین جوش داده شده و تشکیل یک SPOOL را داده اند و سپس برای اتصال نهایی دو سمت به درون واحد منتقل می شوند (پر کاربرد برای جوش های سربالا)
GO GEAR OPERATED	شیرهای گیربکسی
CHAIN OPERATED	شیرهایی که دور از دسترس هستند و توسط زنجیر باز و یا بسته می شوند
GOV GAS OVER OIL VALVE	شیرهایی که از خود گاز فرآیندی به عنوان نیروی محرکه استفاده می کنند (مناسب برای شیرهای خطوط لوله در ایستگاههای بین راهی) (گاز نباید سمی بوده و باید از هوا سبکتر باشد تا در صورت خروج از شیر با هوا مخلوط شده و بالا رود)
HC HAND CONTROL	شیرهایی که توسط اپراتور کنترل می شوند.
HH HAND HOLE	سوراخ ورود دست (8 اینچ)
HIPS	HIGH INTEGRITY PRESSURE PROTECTION SYSTEM VOTING 2 OF 3 سیستمهای جلوگیری از افزایش فشار در پایین دست آن در شرایط ناخواسته (کمک به DE RATE کردن کلاس تجهیزات و اتصالات پائینگی)

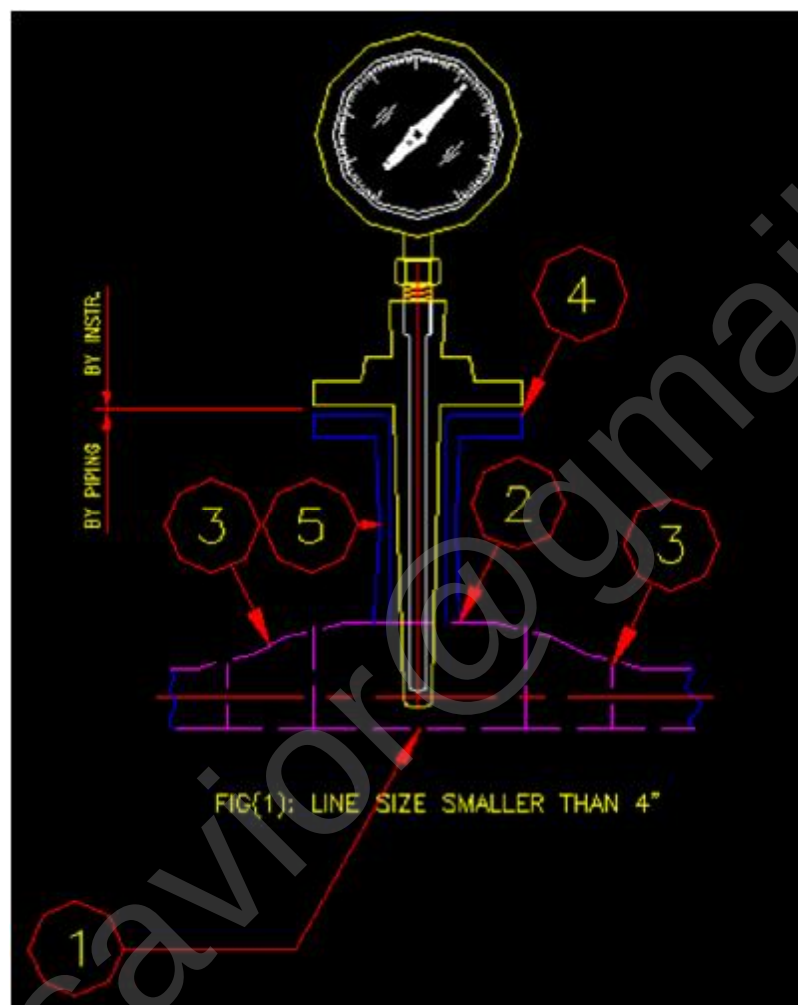
HPT HIGH POINT	محل جانمایی شیر هواگیری مسیر پایپینگ و مخازن
HR HANDLE REMOVED	شیری که دسته آن باز شده و برده شده است برای جلوگیری از باز شدن احتمالی
HV HAND VALVE	شیر دستی
ID INTERNAL DIAMETER	قطر داخلی مخازن، برجها، مبدل و ...
IF INSULATING FLANGE	فلنج عایق کننده در مرز خطوط رو زمینی و زیر زمینی و نیز خطوط درون آب و روی سکو
INST INSTRUMENT SECTION SUPPLY	مشخص کننده مرز بین دیسیپلینهای پایپینگ و ابزار دقیق (برای خرید اقلام ابزار دقیق و پایپینگ MTO (MATERIAL TAKE (OFF)
IJ INSULATING JOINT	
JTV JOULE-THOMPSON VALVE	با کاهش فشار گاز به صورت آدیاباتیک سبب تبدیل شدن گاز به مایع می شود (مانند فرآیند تولید هیدروژن ، هلیوم یا هوای مایع)
LC LOCKED CLOSED	شیر قفل شده در حالت بسته
LO LOCKED OPEN	شیر قفل شده در حالت باز
LPT	محل گرفتن انشعاب برای خارج کردن مایع (DRAIN)
LPR	

LS LIQUID SEAL	مابع درز بند برای پمپها یا (کمپرسورها)
MAX MAXIMUM	بیشینه (معمولا فاصله بین تجهیزات پایپینگ)
MCC MOTOR CONTROL CENTER	اطاق کنترل کننده موتور (پمپ، کمپرسور، میکسر و مبدل هوا خنک)
MIN MINIMUM	کمینه (معمولا فاصله بین تجهیزات پایپینگ (مثلا بین دو شیر) یا ارتفاع مخازن قبل از پمپ
MOV MOTOR OPERATED VALVE	شیرهای با نیروی محرکه الکتریکی (معمولا برای شیرهای 20 اینچ به بالا)
MV MASTER VALVE	شیر سر چاهی
MW MANWAY MANHOLE	دریچه ورود انسان به داخل مخازن، مبدل و ... (معمولا 20 و 24 اینچ) برای بازرسی یا تعمیرات
NC NORMALLY CLOSED	شیرهای معمولا بسته (drain و مسیر بای پس شیر کنترل، شیر ورودی شیر اطمینان یدکی
NO NORMALLY OPEN	شیرهای معمولا باز
NNF NORMALLY NO FLOW	خطوطی که عموما جریانی ندارند (افزودنی ها، افزودن متانول سر شیرهای اطمینان برای جلوگیری از تشکیل هیدرات)
OD OUTER DIAMETER	قطر خارجی
PCS PROCESS CONTROL SYSTEM	سیستم کنترل واحد
PLC PROGRAMMABLE LOGIC CONTROLLER	سیستم کنترل مرکزی

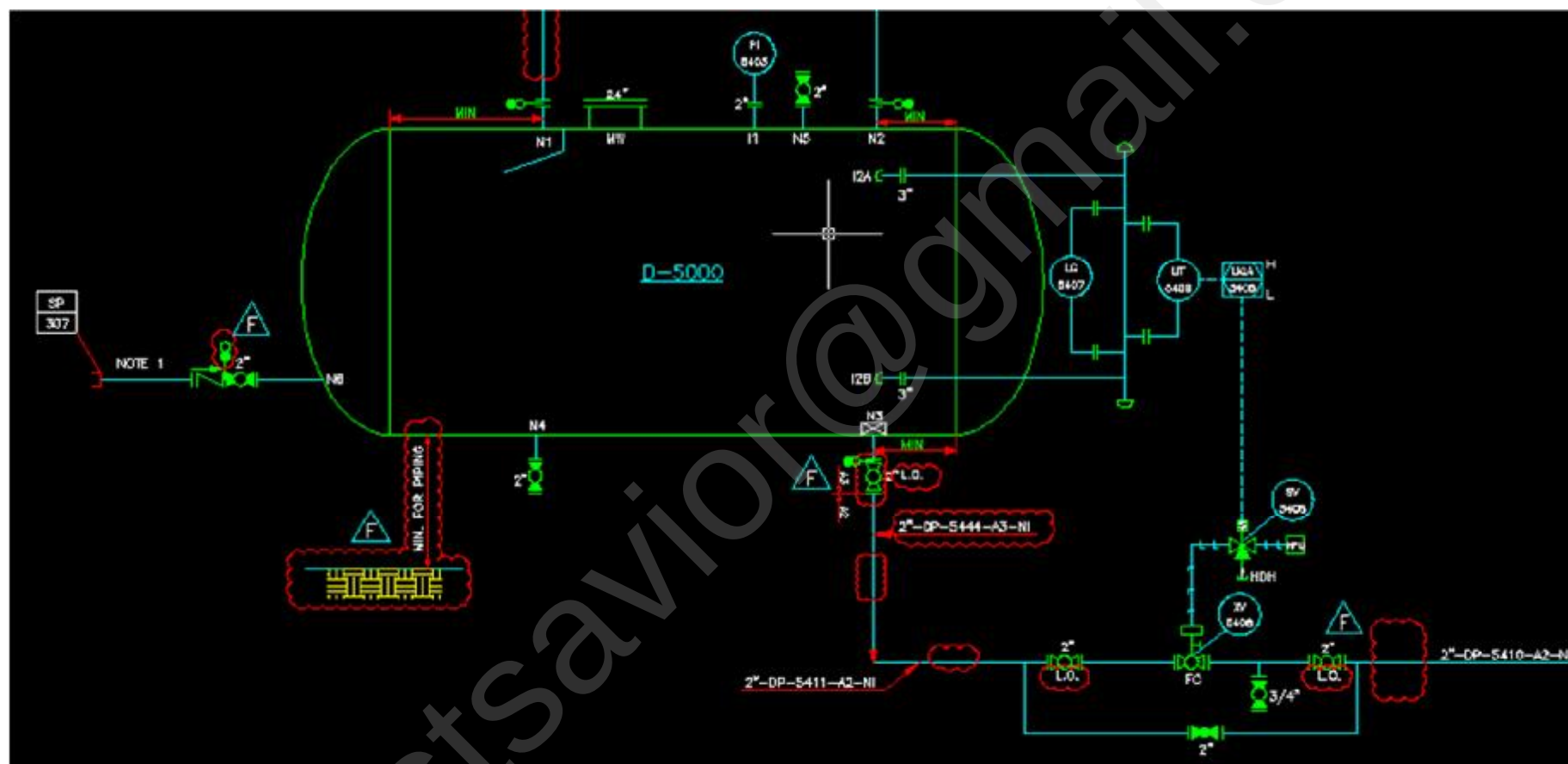


RAS RESERVE AIR SUPPLY	سیستم ذخیره تامین هوای ابزار دقیق (معمولا کمپرسور ثانویه برقی یا کمپرسور دیزلی)، مخزن ذخیره هوا (AIR BUFFER-AIR SURGE DRUM) برای 15 دقیقه) و برای BDV ها که به یکباره همگی باز نشده و وارد شبکه فلر (که حجم مشخص و محدودی دارد) نشوند.
RDF REDUCING FLANGE	فلنج جهت کاهش قطر (متداول نیست)
RO RESTRICTION ORIFICE	صفحه محدود کننده جریان (جهت اندازه گیری جریان در (ORIFICE FLANGE) (بخصوص در مسیر بای پس شیرهای اطمینان و مسیر BDV ها در صورتی که سبب شود دما افت بسیار زیادی پیدا نموده و متریال تجهیز و خط فلر عوض شود)
RS REMOVABLE SPOOL	تکه لوله جدا شونده (برای خط متصل به شیر اطمینان این الزام وجود دارد) جهت ایزولاسیون تجهیز هنگام تعمیرات
SC SAMPLE CONNECTION	اتصال گرفتن نمونه (محصولات، مواد اولیه، ونت و درین و بلودان درام بویلر)
SD SHUT DOWN VALVE	شیر بستن هنگام SHUT DOWN یک تجهیز که از طریق سیستم DCS فرمان می گیرد.
SK	
SO STEAM OUT	نازل خروجی بخار جهت شستشو و پرچ مخزن و احیاء کاتالیست
TL TANGENT LINE	خط مماسی عدسی
TP TERMINATION POINT	محل ورود و خروج جریانات به یک پکیج

T/T TANGENT LINE TO TANGENT LINE	ارتفاع یک تجهیز (بین دو خط مماس جوشی بالا و پایین مخزن)
TSO TIGHT SHUT OFF	شیر برای جلوگیری از هر نوع نشتی (شیرهای SDV,ESDV حتما TSO هستند)(مثال دیگر شیر ورودی خوراک ها به یک راکتور)
TW THERMOWELL	نازل اندازه گیر دما
UC UTILITY CONNECTION	نازل سیال یوتیلیتی (معمولا به صورت FEMALE) (مادگی) (بخار، آب، هوا، نیتروژن)
UG UNDERGROUND	خطوط زیر زمینی (Sewer,drain),fire water
US UTILITY STATION	ایستگاه سیالات یوتیلیتی درون واحد (بخار، آب، هوا، نیتروژن)
VENT	نازل هواگیری (یا خروجی گاز بی ارزش به هنگام تعمیرات)
VDU VISUAL DISPLAY UNIT	مانیتور درون اطاق کنترل
VF VENDOR FURNISHED	آن چه که باید توسط وندور تهیه شود
VT VESSEL TRIM	شماره خطی که به تجهیز نسبت داده می شود و اتصالات روی تجهیز تحت آن شماره خط شناخته شده و مدل می شود
VTS VALVE TEST SYSTEM	مجموعه شیرهایی که برای تست و آزمایش یک تجهیز و یا یک مخزن به کار می روند



WO WASHING OUT	نازل شستشو (بخار، نیتروژن، آب و...)
WV WING VALVE	شیر سر چاهی
XV PROCESS ACTUATED ON/OFF VALVE	شیرهایی که فقط حالت باز یا بسته دارند (حالت کنترل فرآیندی)



تجهیزات و مدارهای کنترلی

مدارک Legend و Symboly یک پروژه

GOV	GAS OVER OIL VALVE
HC	HAND CONTROL
HH	HAND HOLE
HIPS	HIGH INTEGRITY PROTECTION SYSTEM
HPT	HIGH POINT
HR	HANDLE REMOVED
HV	HAND VALVE
ID	INTERNAL DIAMETER
IF	INSULATING FLANGE
INST.	INSTRUMENT SECTION SUPPLY
IJ	INSULATING JOINT
JTV	JOULE-THOMPSON VALVE
LC	LOCKED CLOSED
LO	LOCKED OPEN
LPT	LOW POINT
LPR	LINEAR POLARIZATION PROBE
LS	LIQUID SEAL
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTRE
MIN	MINIMUM
MOV	MOTOR OPERATED VALVE
MV	MASTER VALVE
MW	MANWAY
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NNF	NORMALLY NO FLOW
OD	OUTSIDE DIAMETER
PCS	PROCESS CONTROL SYSTEM
PLC	PROGRAMMABLE LOGIC CONTROLLER
RAS	RESERVE AIR SUPPLY

اختصارات مختلف

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ABBREVIATIONS

A/G	ABOVE GROUND
AS	AIR SUPPLY
ATM	ATMOSPHERE
BD	BLOWDOWN
BDV	BLOWDOWN VALVE
BGCS	BOOSTER GAS COMPRESSOR STATION
BL	BATTERY LIMIT
CC	CORROSION COUPON
CCR	CENTRAL CONTROL ROOM
CCS	COMPRESSOR CONTROL SYSTEM
CP	CORROSION PROBE
CSC	CAR SEAL CLOSED
CSD	CAR SEAL OPEN
D	DRAIN
DCS	DISTRIBUTION CONTROL SYSTEM
DHSV	DOWN HOLE SAFETY VALVE
EC	EROSION COUPON
EDPS	EMERGENCY DEPRESSURISATION SYSTEM
EL.	ELEVATION
ER	ELECTRICAL RESISTANCE PROBE
ESD	EMERGENCY SHUTDOWN
ESDV	EMERGENCY SHUTDOWN VALVE
F & G	FIRE AND GAS
FB	FULL BORE
FC	FAIL CLOSED
FL	FAIL LOCKED IN POSITION
FO	FAIL OPEN
FW	FIELD WELD
GO	GEAR OPERATED

مدارک Legend و Symbolology یک پروژه

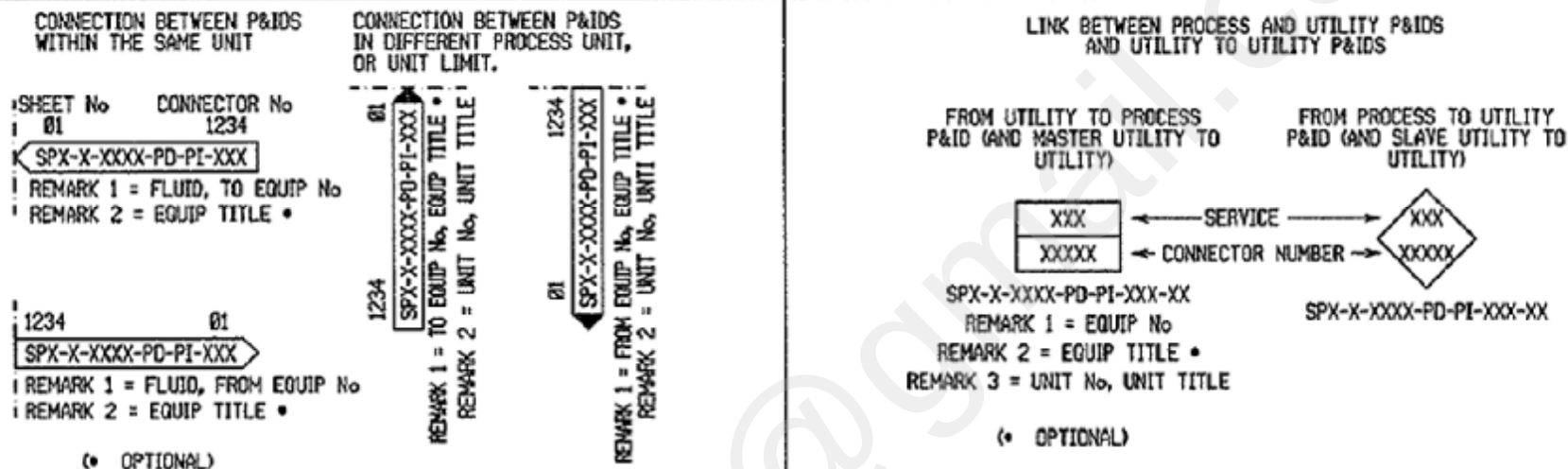
اختصارات مختلف

RDF	REDUCING FLANGE
RO	RESTRICTION ORIFICE
RS	REMOVABLE SPOOL
SC	SAMPLE CONNECTION
SDV	PROCESS SHUTDOWN VALVE
SK	SURFACE MOUNTED (SKIN)
SO	STEAM OUT
TL	TANGENT LINE
TP	TERMINATION POINT
T/T	TANGENT LINE TO TANGENT LINE
TSO	TIGHT SHUT OFF VALVE
TW	THERMOWELL
UC	UTILITY CONNECTION
U/G	UNDERGROUND
US	UTILITY STATION
V	VENT
VDU	VISUAL DISPLAY UNIT
VF	VENDOR FURNISHED
VT	VESSEL TRIM
VTS	VALVE TEST SYSTEM
WO	WASHING OUT
WV	WING VALVE
XV	PROCESS ACTUATED ON/OFF VALVE

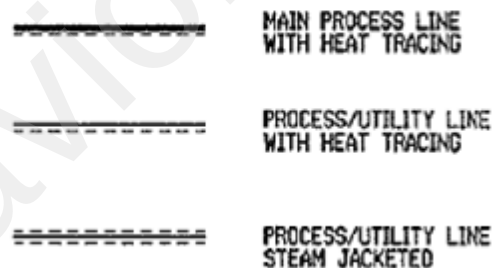
مدارک Legend و Symbolism یک پروژه

طرق مختلف اتصال خطوط بین مدارک

DRAWING CONNECTORS



TRACING REQUIREMENTS



طرق مختلف نمایش خطوط تریس

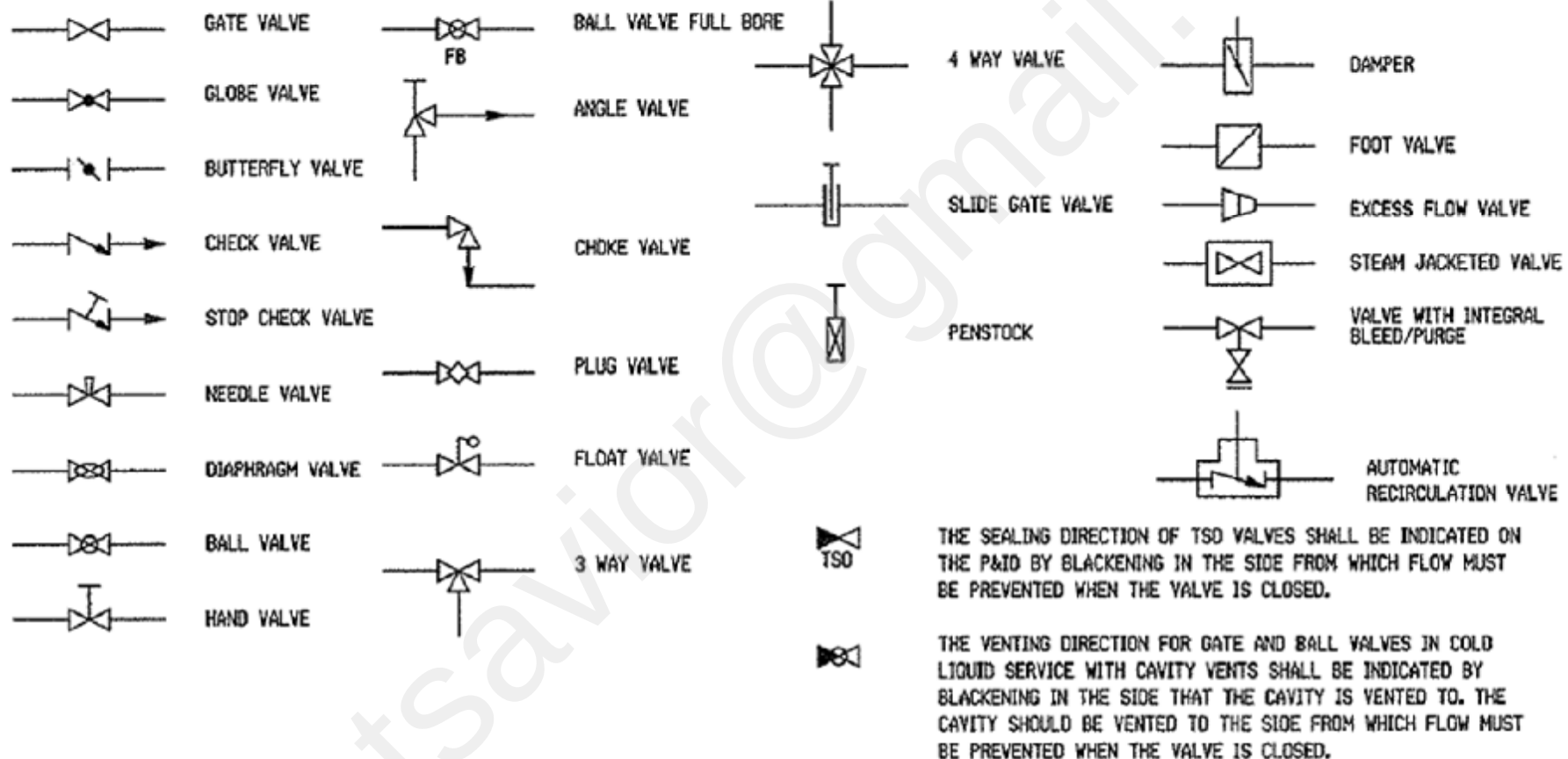
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مدارک Legend و Symbolism یک پروژه

شکلهای شیرهای مختلف

PIPING VALVES



صفحه دوم

مدارک Legend و Symbolism یک پروژه

شرایط انتخاب شیرهای مختلف

DOUBLE BLOCK AND BLEED (DBB) VALVES SHALL BE PROVIDED WITH SPACERS FOR SYSTEMS OF ASME CLASS 900 RATING AND ABOVE. THIS INCLUDES CONTROL VALVE SETS AND INSTRUMENTS.

DOUBLE BLOCK AND BLEED ISOLATION SHALL BE APPLIED IN ACCORDANCE WITH THE ISOLATION PHILOSOPHY SPY-2-0000-PR-PH-009.

AREAS WHERE DOUBLE BLOCK VALVES MAY ALSO BE SPECIFIED BELOW 900* RATING, INCLUDE:-

- SYSTEMS ISOLATING HIGH TEMPERATURE FLUIDS AT OR ABOVE AUTO IGNITION.
- SOME SPECIAL CASES I.E. FOR HIGH VAPOUR PRESSURE FLUIDS SUCH AS LPG, WHERE SYSTEMS ARE AT PRESSURES ABOVE 600* RATING.
- HP STEAM AND BOILER FEED WATER
- TOXIC SERVICE (INCLUDING HIGH H₂S RISK AREAS-SEE BLOW).
- SYSTEMS WHICH ARE REGULARLY ISOLATED FOR ROUTINE OPERATIONS/MAINTENANCE.
- ISOLATION BETWEEN METERING SYSTEM AND PROVING SYSTEM
- DBB VALVES SHALL BE USED FOR ISOLATION OF PARALLEL EQUIPMENT ON PARALLEL TRAINS, WHEN MAINTENANCE IS DONE DURING NORMAL OPERATION ON THE ADJACENT EQUIPMENT OR TRAIN.

VALVE/SERVICE

ESD
PSV ISOLATION
BDV
HYDROCARBON GAS
HYDROCARBON MULTI PHASE
LPG
MEG
AMINE
CAUSTIC
COOLING WATER

FIREWATER
SEAWATER

AIR

NITROGEN

ACID/CHEMICAL

FLARE PHASE/TRAIN ISOLATION

FOR THE REMAINING VALVE SELECTION GATE VALVES SHOULD BE USED.

TYPE

BALL
FB BALL (VENT & DRAIN BALL)
FB BALL (VENT & DRAIN BALL)
BALL (VENT & DRAIN BALL)
BALL (VENT & DRAIN BALL)
BALL (VENT & DRAIN BALL)
GATE
GATE
BALL
GATE FOR ISOLATION
BUTTERFLY FOR ISOLATION (≥ 4")
BUTTERFLY FOR THROTTLING
BUTTERFLY
GATE FOR ISOLATION
BUTTERFLY FOR THROTTLING
BALL < 2"
GATE > 2"
BALL < 2"
GATE > 2"
BALL FOR ISOLATION
GLOBE FOR THROTTLING
GATE OR BALL

END CLOSURES

 BLIND FLANGE

 CAP

 PLUG

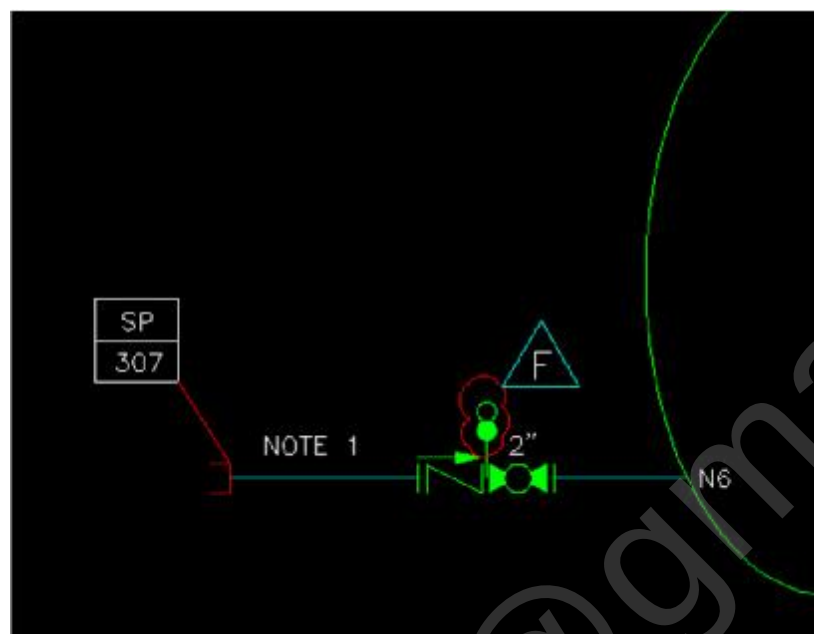
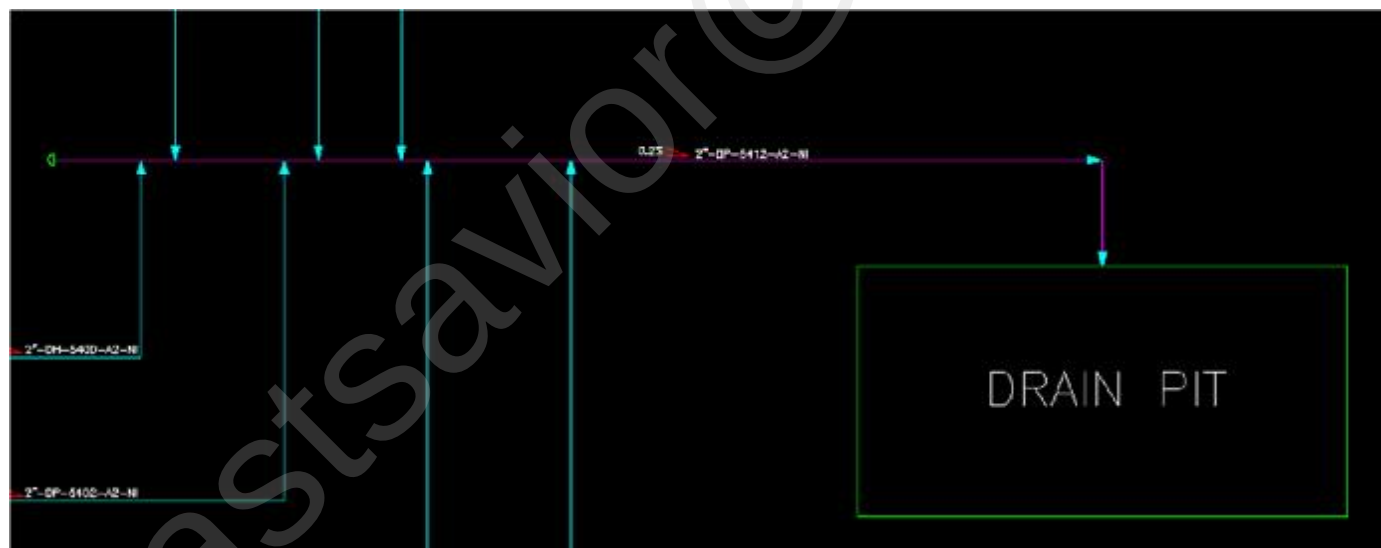
 THREADED CAP

EXPANSION FACILITIES

 FLEXIBLE HOSE

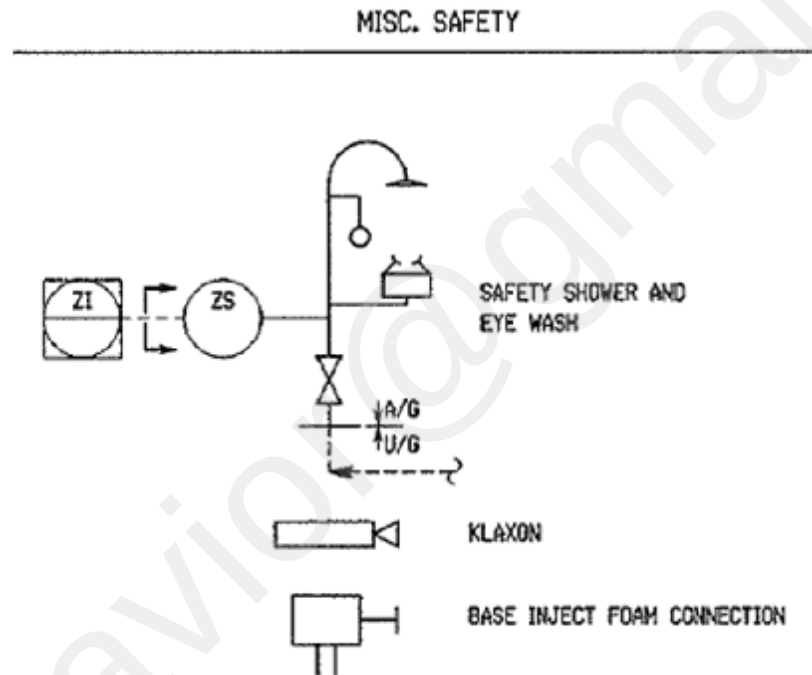
 EXPANSION JOINT

صفحه دوم



مدارک Legend و Symbolism یک پروژه

طریقه نمایش حوضچه شستشو



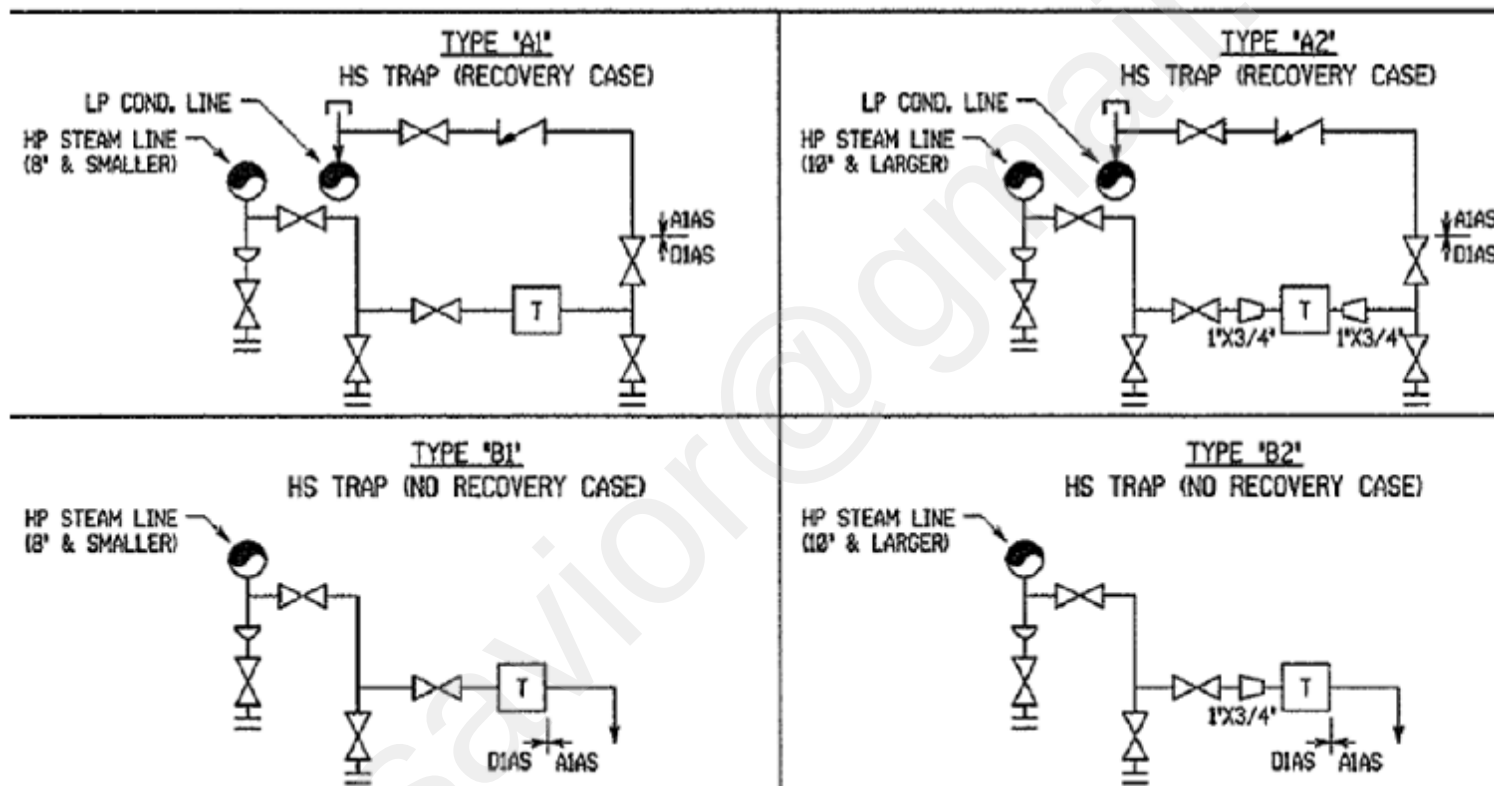
مدارک Legend و Symbolism یک پروژه

شکلهای مختلف سیستمهای تله بخار

فشار بالا

با ریکاوری

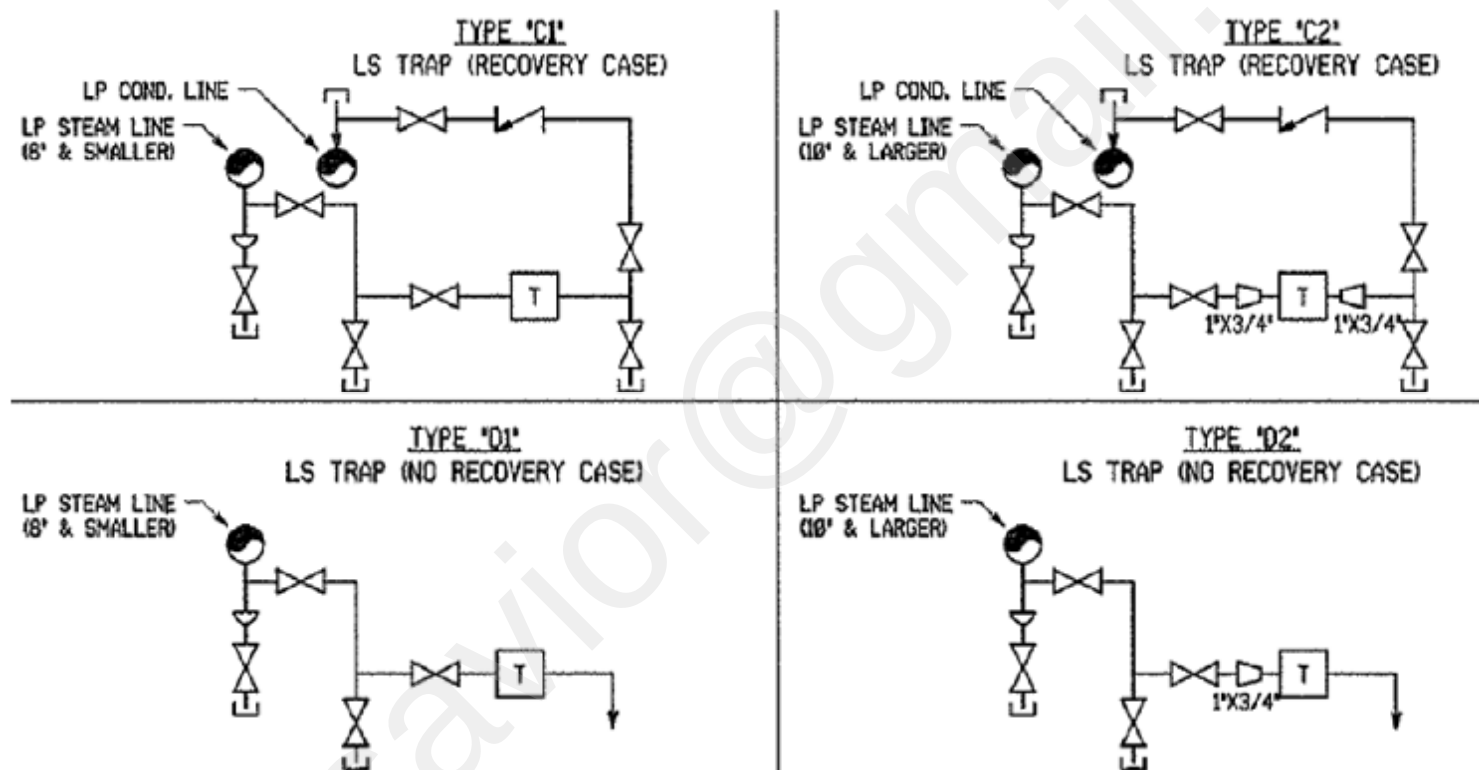
TRAP ARRANGEMENT (NOTE 1)



بدون ریکاوری

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شکلهای مختلف سیستمهای تله بخار
فشار پایین

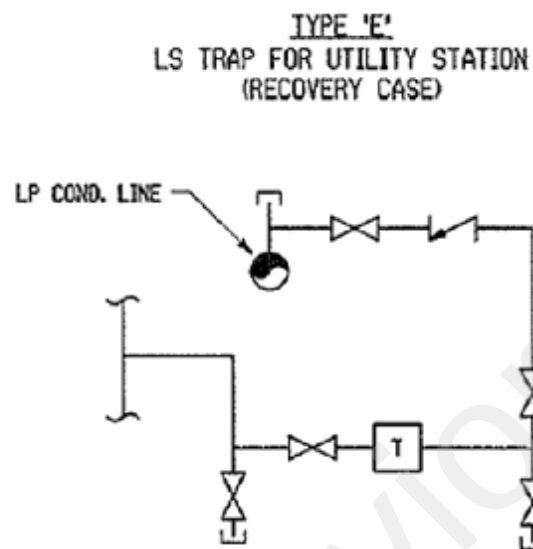


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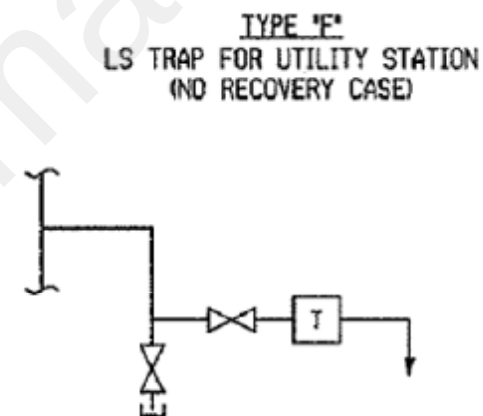
تهیه کننده: محمد بهزادی

مدارک Legend و Symbolیک پروژه

شکلهای مختلف سیستمهای تله بخار



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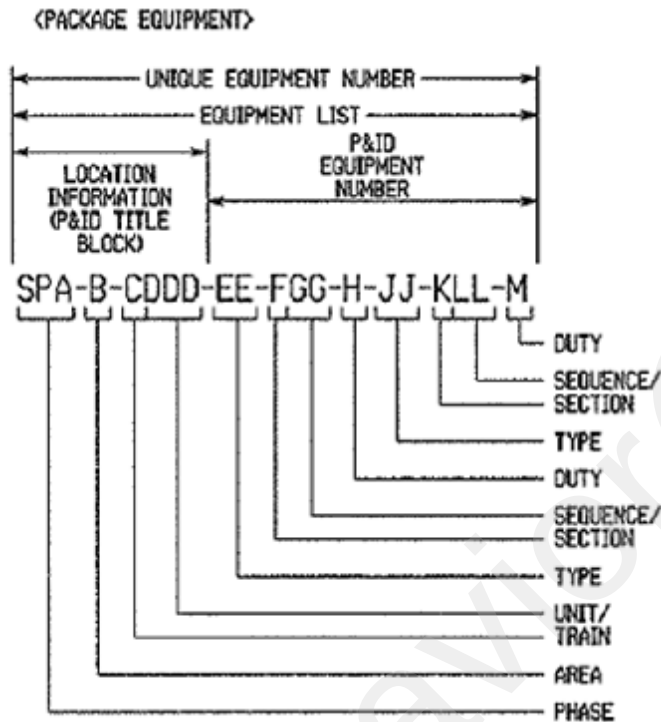
تهیه کننده: محمد بهزادی

مفتاح سوم

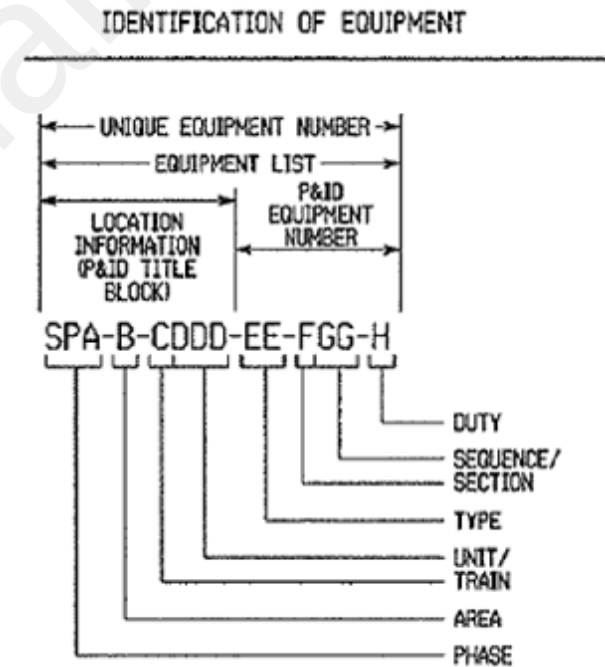
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شماره گذاری پکیج



شماره گذاری تجهیزات



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صفحه سوم

مداد ک Legend و Symboly یک پروژه

EQUIPMENT & PACKAGE CODES TABLE

اختصارات تجهیزات

PACKAGE	
U	MISCELLANEOUS PACKAGE
UM	METERING PACKAGE
UG	MEG PACKAGE
UR	REFRIGERATION PACKAGE
US	MOLECULAR SIEVE PACKAGE

EQUIPMENT

A	MISCELLANEOUS EQUIPMENT
AC	AIR CONDITIONING
AG	AGITATOR AND MIXER
BA	BASIN, PIT SUMP
BL	BLOWERS, FANS AND EXHAUSTERS
C	COLUMN
CA	CAISSON
CE	CENTRIFUGE
CR	CLARIFIERS AND THICKENERS
CT	COOLING TOWERS
CV	MATERIAL CONVEYING EQUIPMENT
CY	CYCLONE
D	DRUMS, REACTORS AND SEPARATORS
DA	DEAERATOR
DE	DIESEL ENGINE
DL	DRILLING EQUIPMENT
DS	DESUPERHEATERS (PIPING ITEM)
E	HEAT EXCHANGERS
EA	AIR COOLERS
EH	ELECTRICAL HEATER
F	FILTERS
FL	FLARES
G	ELECTRICAL GENERATOR
GT	GAS TURBINE
GX	GAS TURBO EXPANDER
H	FIRED HEATERS
K	COMPRESSOR (ALL TYPES)
LA	LOADING ARMS/VAPOUR RETURN ARMS
LE	LABORATORY EQUIPMENT
LF	LABORATORY FURNITURE
LZ	FIRE FIGHTING AND SAFETY EQUIPMENT
M	MOTORS
MB	MOBILE EQUIPMENT
MX	MIXER
P	PUMPS (ALL TYPES)
PL	PIG LAUNCHER
PR	PIG RECEIVER
SB	SINGLE POINT MOORING
SG	STEAM GENERATORS AND BOILERS
SI	SILENCERS
SK	STACKS
SP	SPECIAL PIPING ITEM
T	TOWER
TE	TURBO EXPANDER
TH	TANK HEATERS
TK	TANKS
TL	TELECOMMUNICATION EQUIPMENT
W	WELLHEAD AND EQUIPMENT
WE	WORKSHOP EQUIPMENT
X	SLUG CATCHER

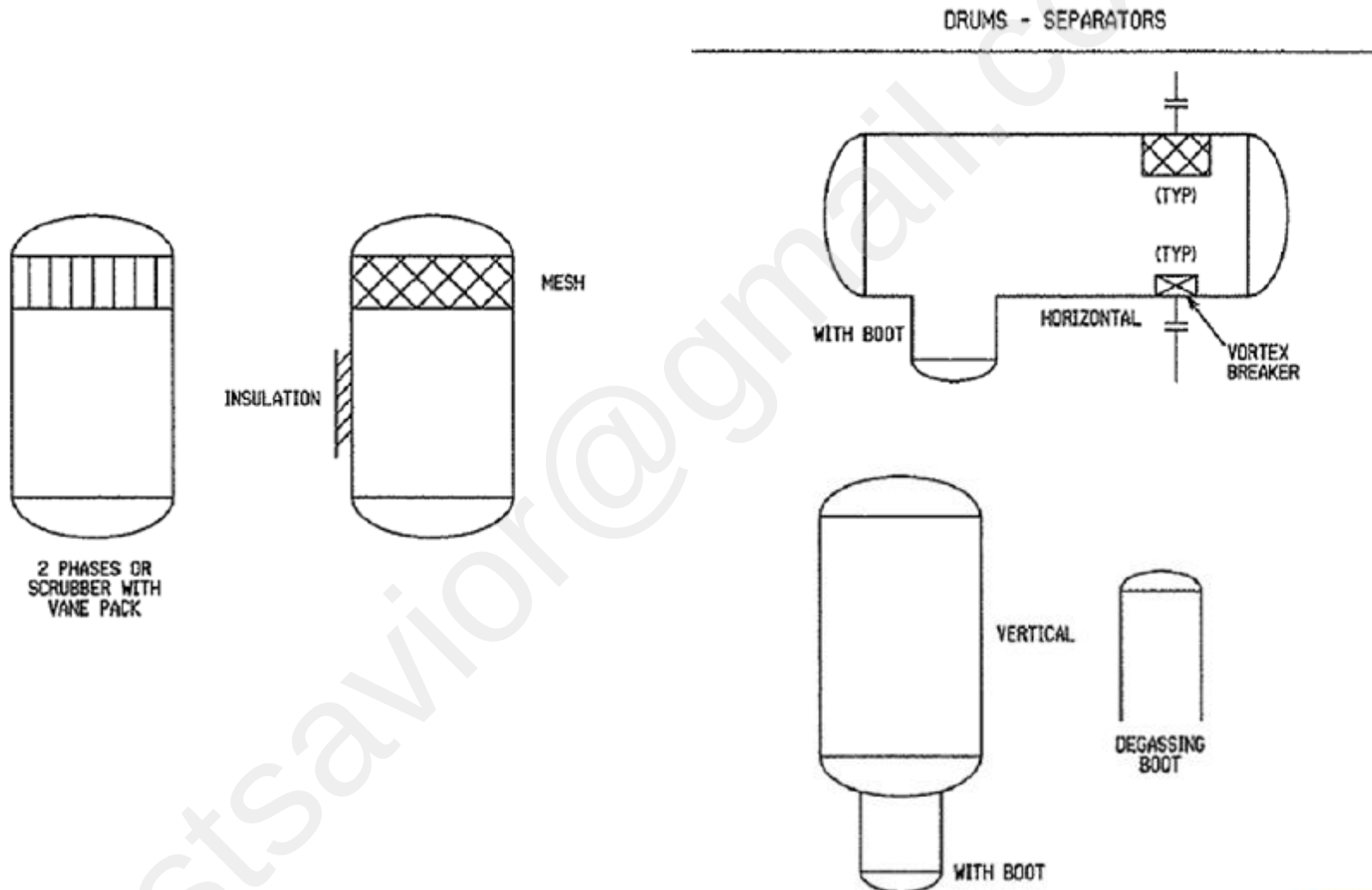
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تهیه کننده: محمد بهزادی

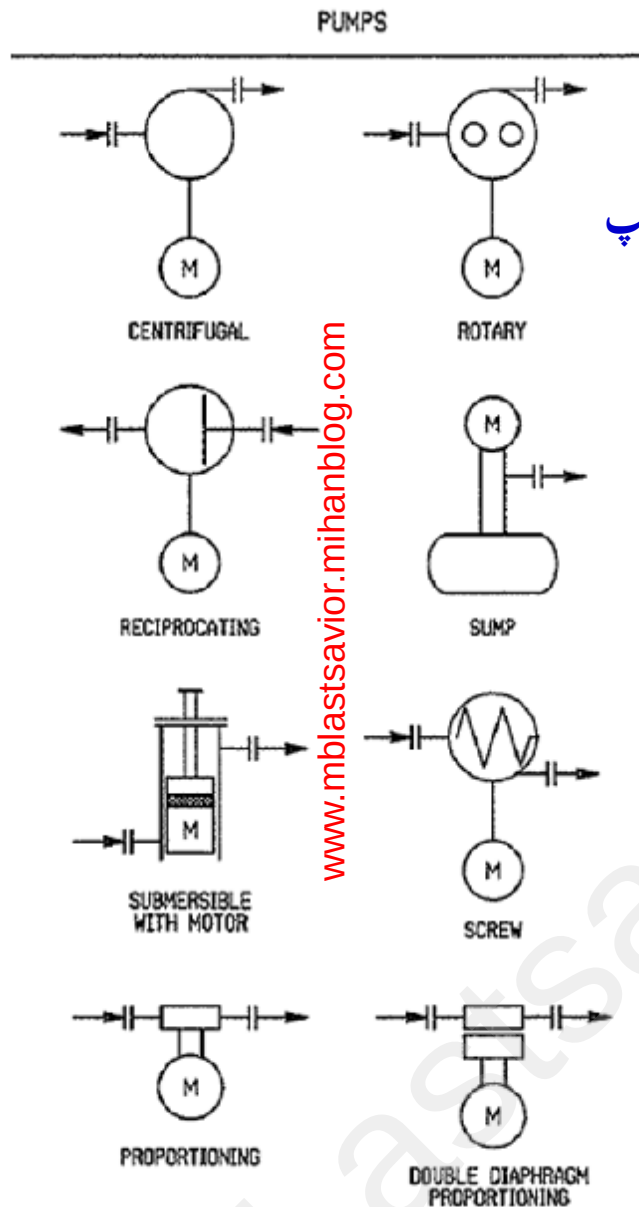
صفحه سوم

مدارک Legend و Symbolism یک پروژه

شکلهای مختلف درام

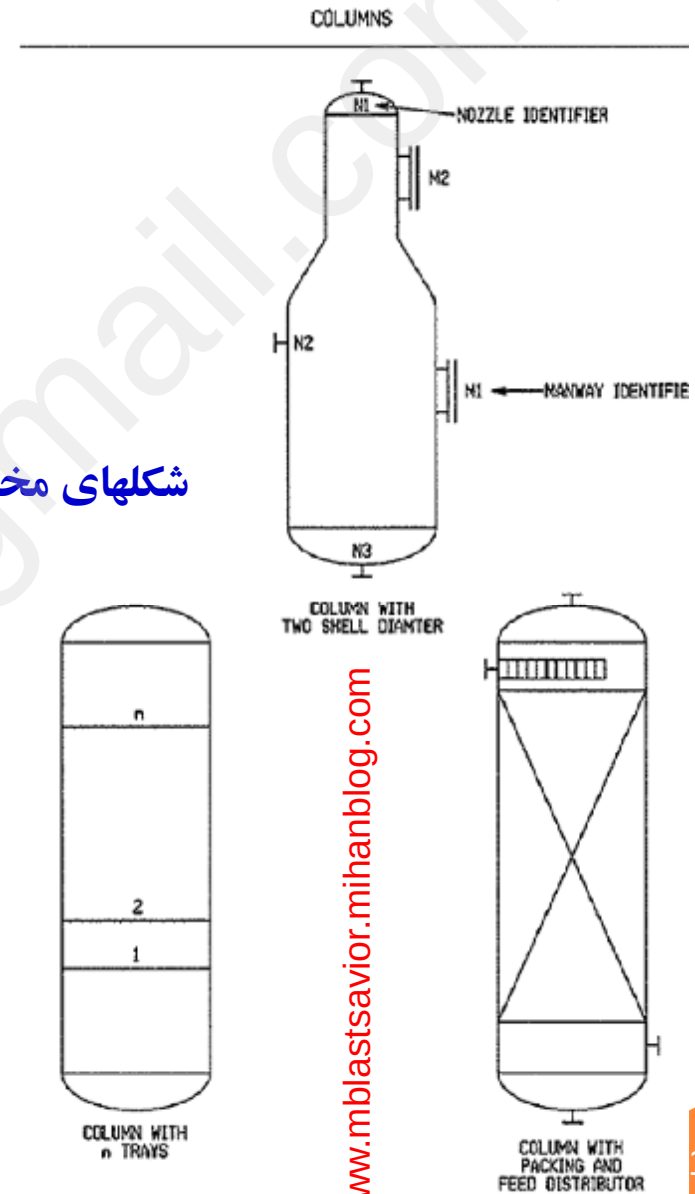


مدارک Legend و Symbolism یک پروژه



شکلهای مختلف پمپ

شکلهای مختلف برج

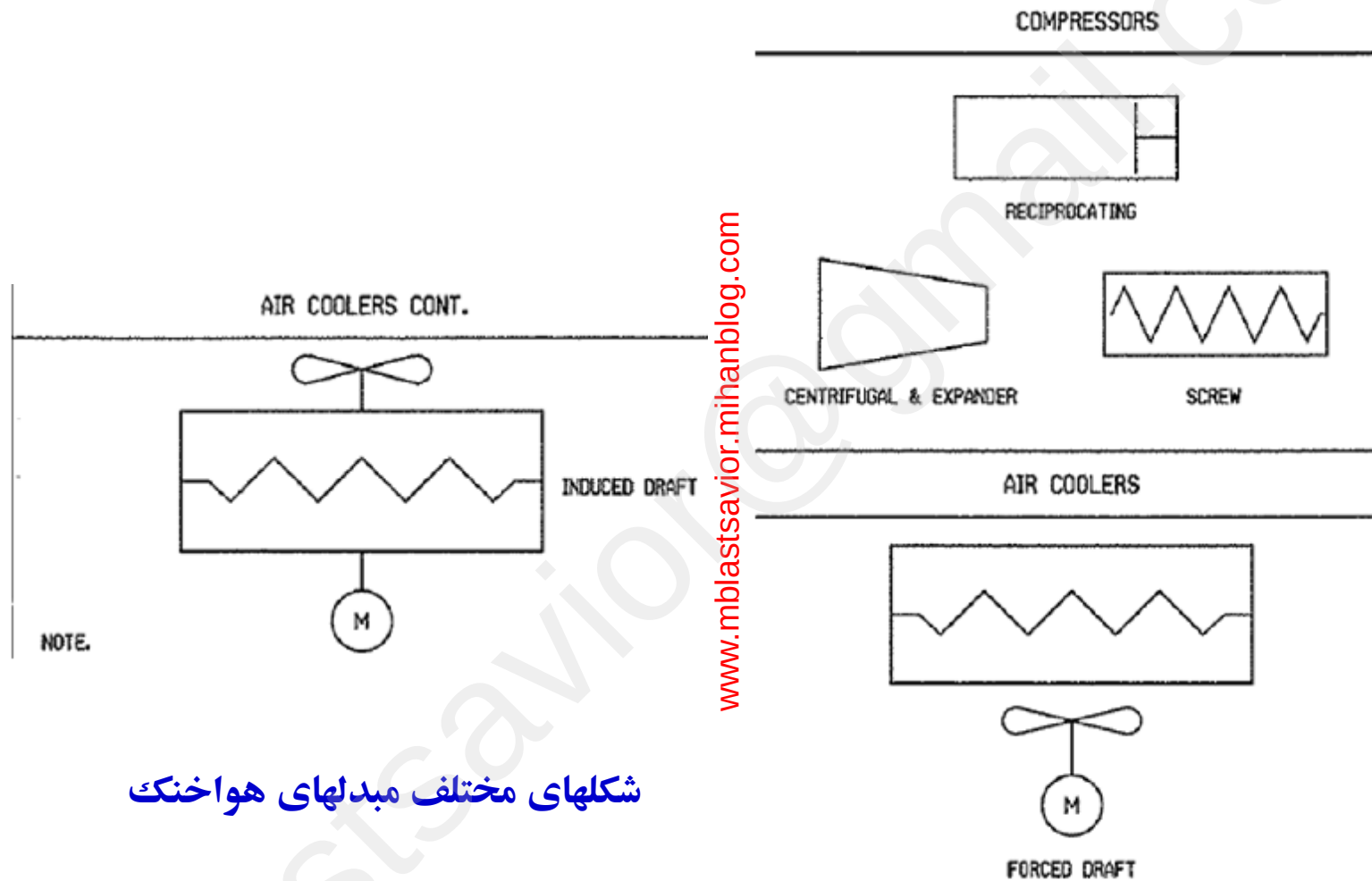


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مدارک Legend و Symbolism یک پروژه

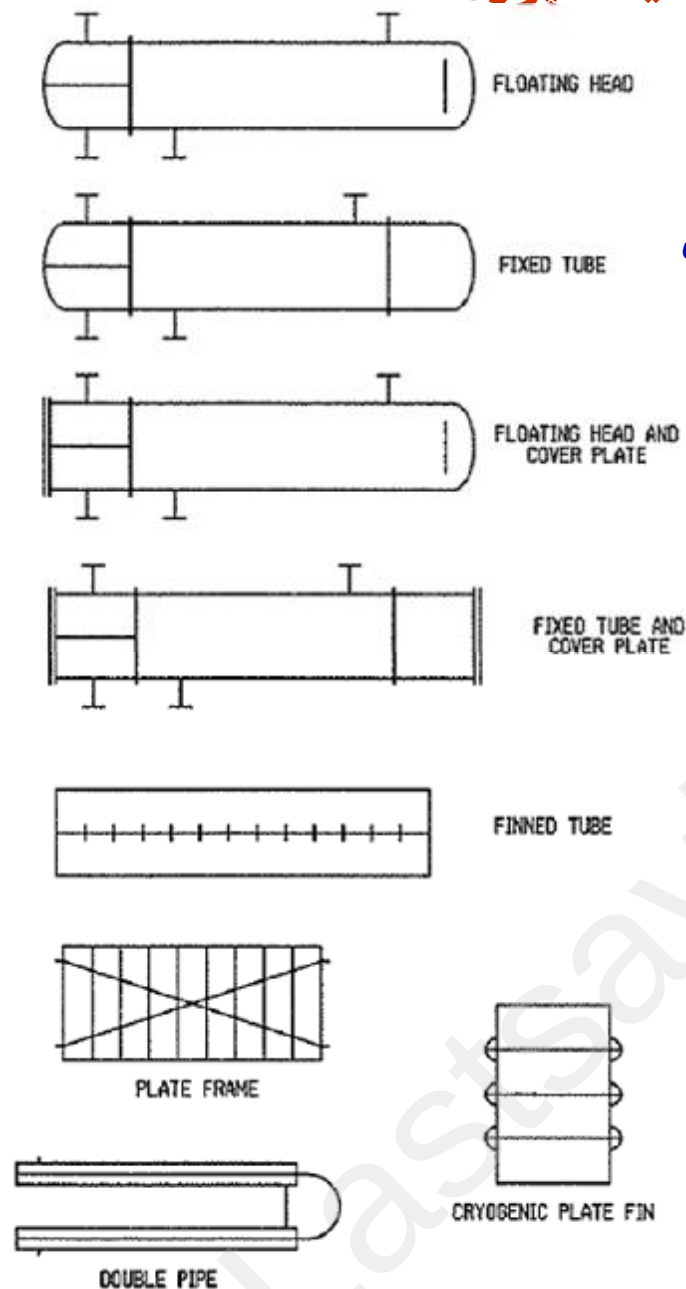
شکلهای مختلف کمپرسور



شکلهای مختلف مبدلهای هواخنک

تهیه کننده: محمد بهزادی

مدارک Legend و Symboly یک پروژه

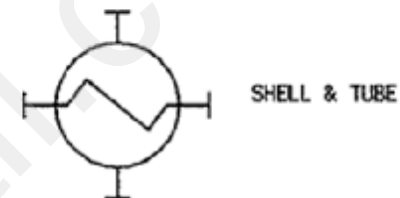


شکلهای مختلف مبدلهای حرارتی

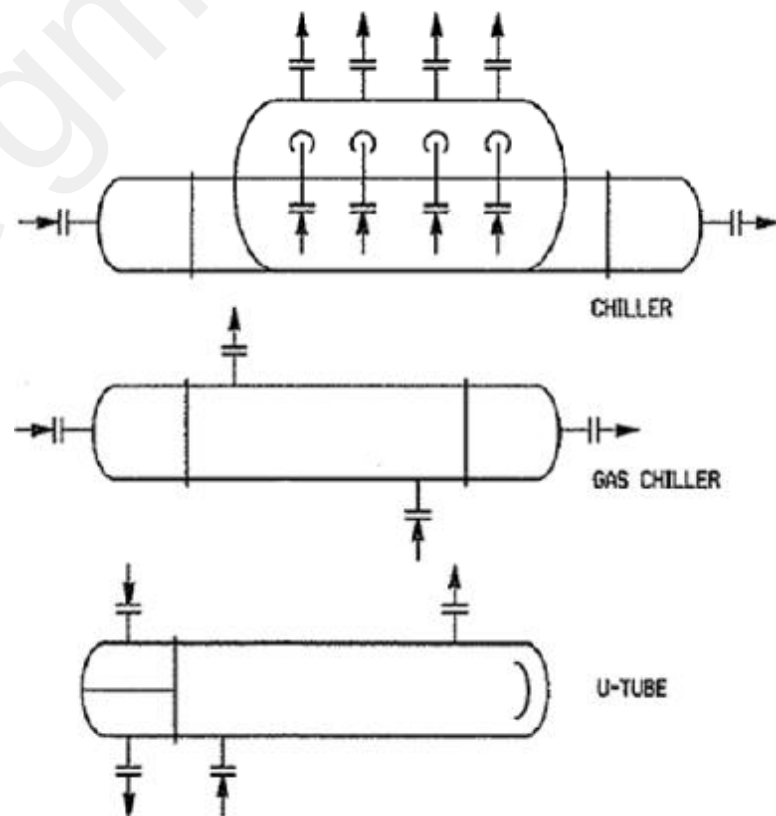
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HEAT EXCHANGERS - OTHER

SHELL & TUBE SYMBOL TO BE USED FOR BASIC ENGINEERING



SHELL AND TUBE SYMBOLS FOR DETAIL ENGINEERING

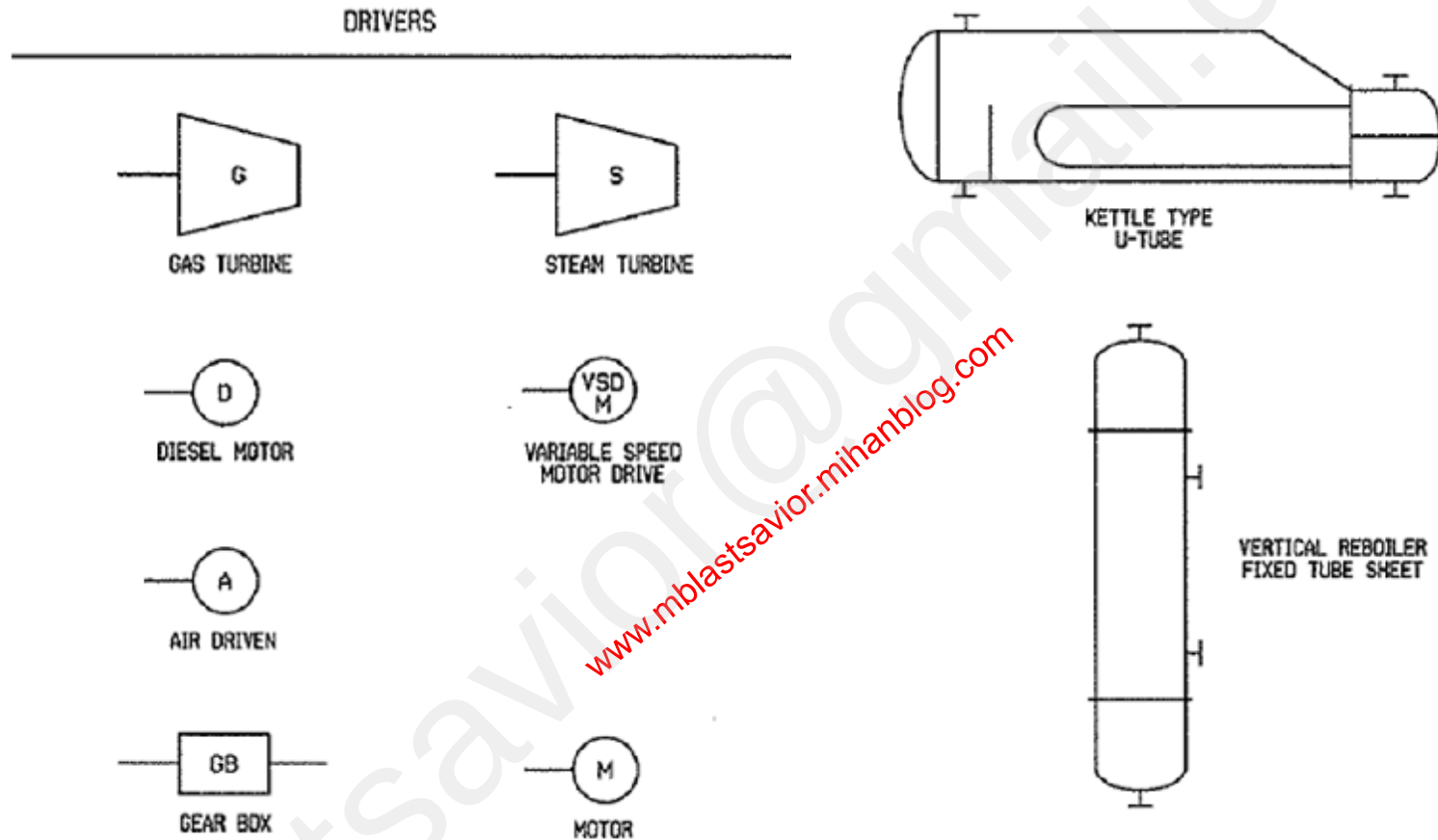


تهیه کننده: محمد بهزادی

صفحه سوم

مدارک Legend و Symbolism یک پروژه

شکلهای مختلف منابع انرژی



مدارک Legend و Symbolism یک پروژه

شکلهای مختلف مخازن ذخیره

STORAGE TANKS

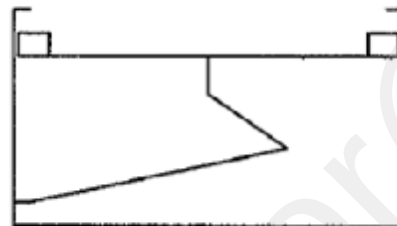
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CONED FIXED ROOF TANK



FLAT HEAD TANK



FLOATING ROOF TANK



OPEN TANK



SPHERICAL TANK

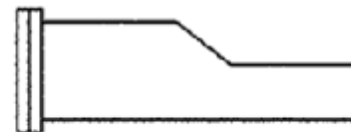


DOMED ROOF TANK

تهیه کننده: محمد بهزادی

مدارک Legend و Symbolism یک پروژه

MISCELLANEOUS EQUIPMENT ITEMS



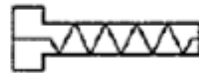
PIG LAUNCHER / RECEIVER



SILENCER



COOLING / HEATING
COIL



ELECTRICAL HEATER



CYCLONE



(SURFACE)

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PIPE FLARE TIP



SONIC FLARE TIP



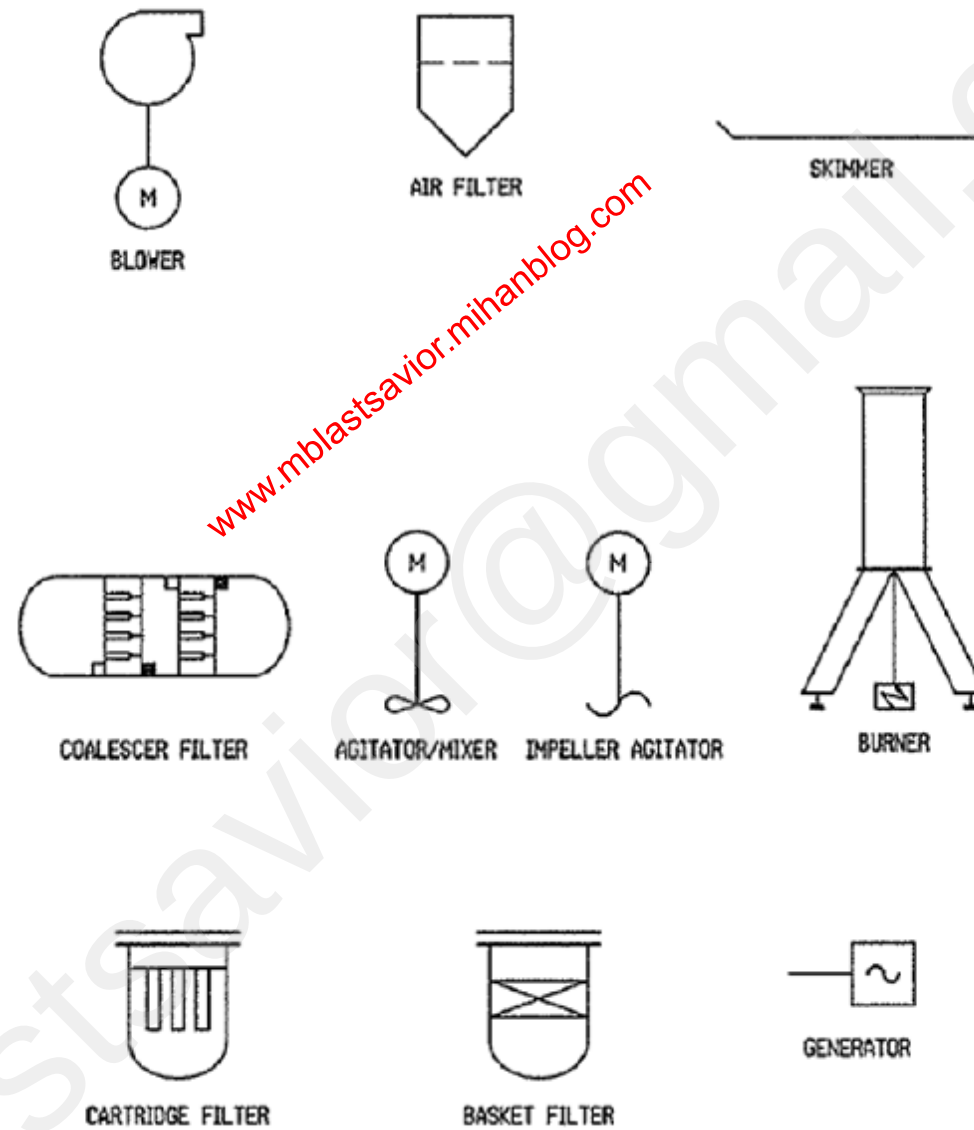
SONIC FLARE TIP
WITH INTERNAL SEALS



SONIC FLARE TIP

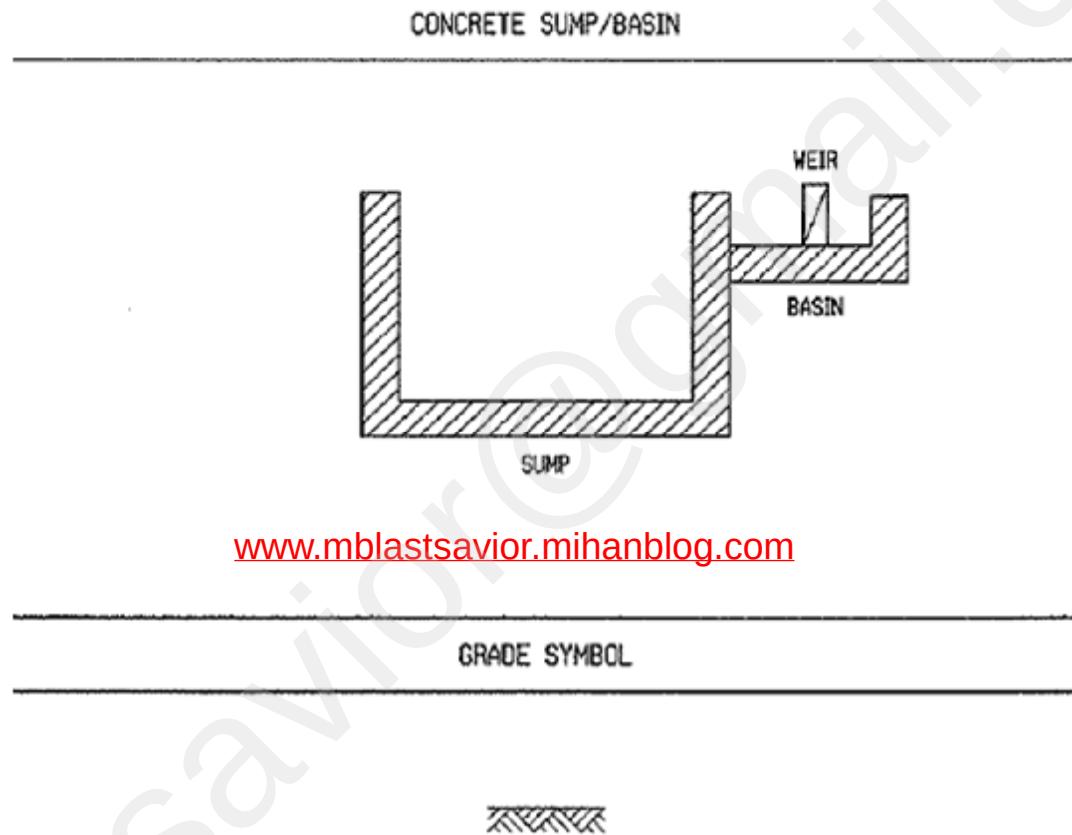
تهیه کننده: محمد بهزادی

مدارک Legend و Symboly یک پروژه



تهیه کننده: محمد بهزادی

مدارک Legend و Symboly یک پروژه



مدارک Legend و Symboly یک پروژه



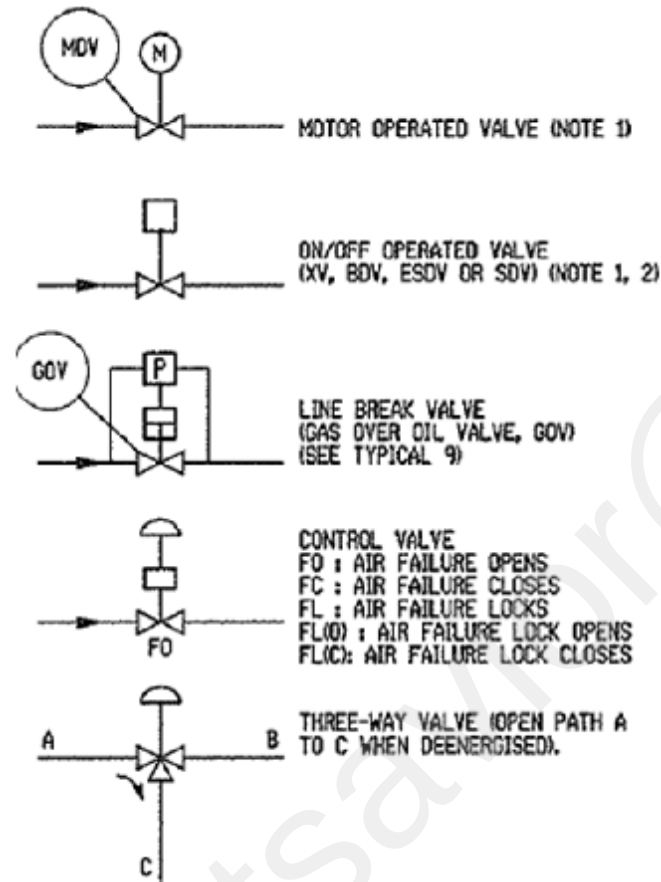
صفحة ٣٠٤



FUNCTION SYMBOLS

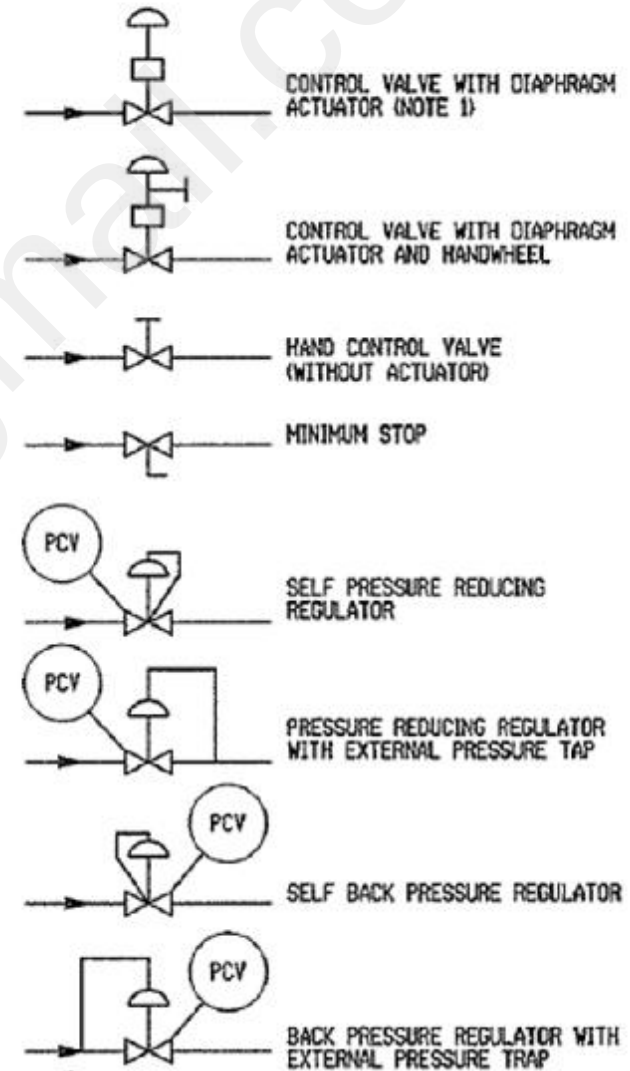
	CONTROL ROOM MOUNTED		INSTRUMENT ROOM MOUNTED
	LOCAL ANNUNCIATOR		LOCAL PANEL MOUNTED
	LOCALLY MOUNTED		LOCAL RESET (MECHANICAL)
	AVAILABLE ON VDU, PCS FUNCTION (CONTROL ROOM) NOTE 5		RESERVE AIR SUPPLY VALVE TEST SYSTEM
	PCS FUNCTION, NOT AVAILABLE TO OPERATE ON VDU		
	ESD. XX: ESD LEVEL (ALL APPLICABLE NO. EXCEPT 0) YY: LOGIC SEQUENCE NO. (TWO DIGITS)		
	HIGH INTEGRITY PROTECTION SYSTEM		
	UCP = UNIT (PACKAGE) CONTROL PANEL.		
	PCS PROCESS INTERLOCK OR LOGIC XX: SEQUENCE NO. (TWO DIGITS)		INSTRUMENT MOUNTED BEHIND LOCAL CONTROL PANEL
	FIRE & GAS SYSTEM		INSTRUMENT MOUNTED BEHIND CONTROL PANEL IN CONTROL ROOM
	MCC		
	SIGNAL HARDWIRED TO UCP TRANSMITTED BY SERIAL LINK TO PCS (FOR PACKAGE UNIT)		
	SIGNAL HARDWIRED TO UCP (FOR PACKAGE UNIT)		
	(VF) VENDOR FURNISHED PACKAGE INSTRUMENT		

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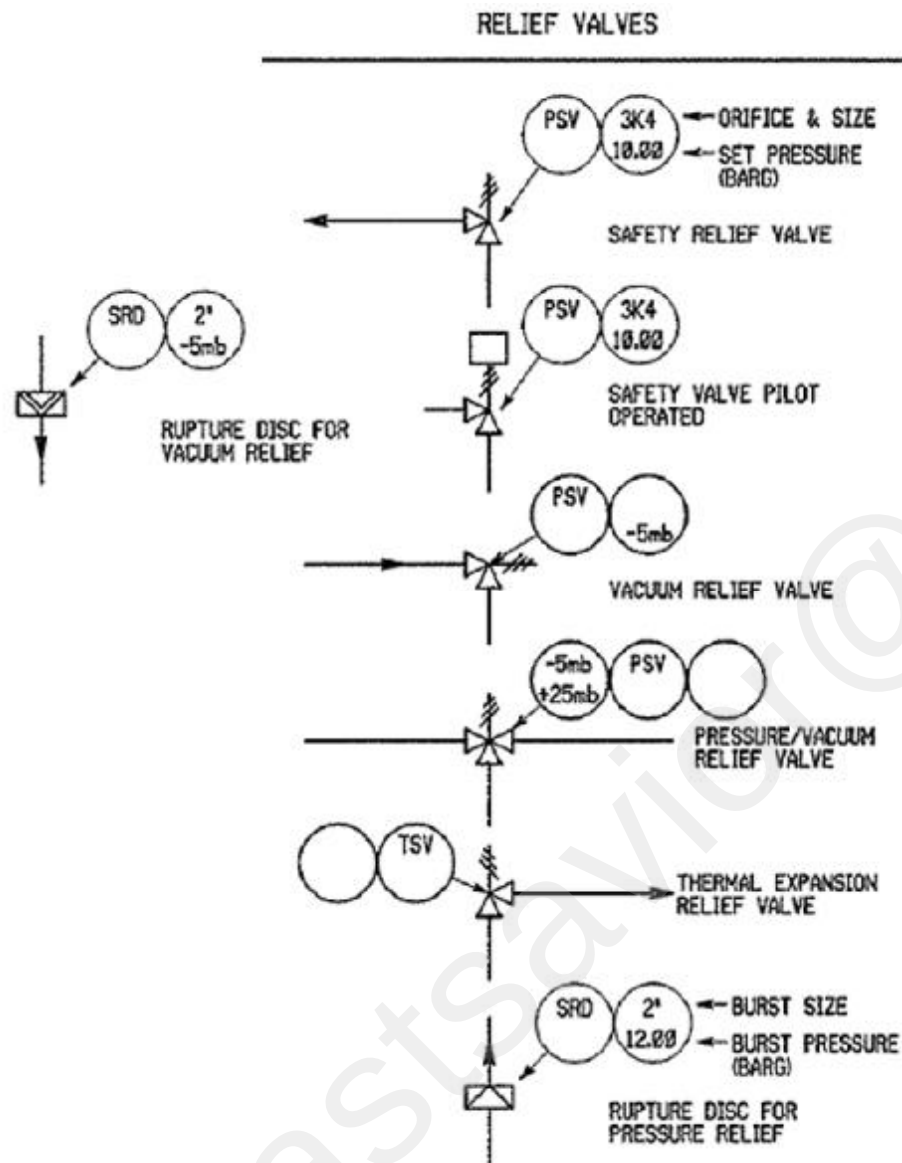


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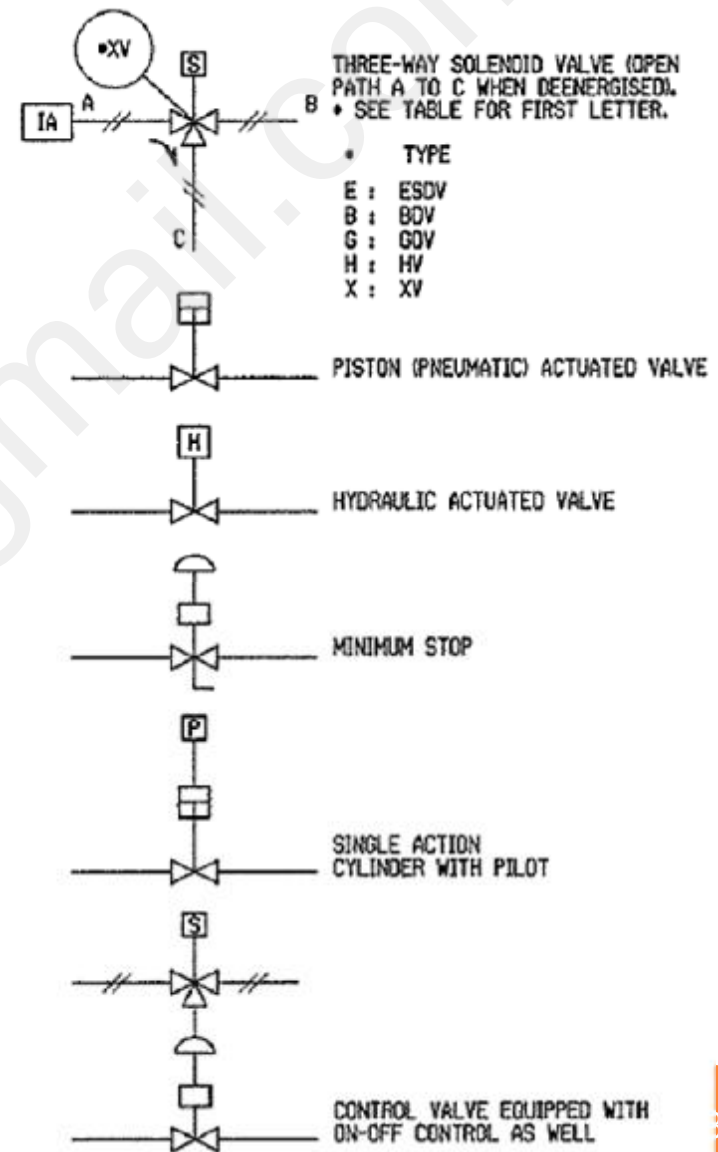
CONTROL VALVES & ACTUATORS



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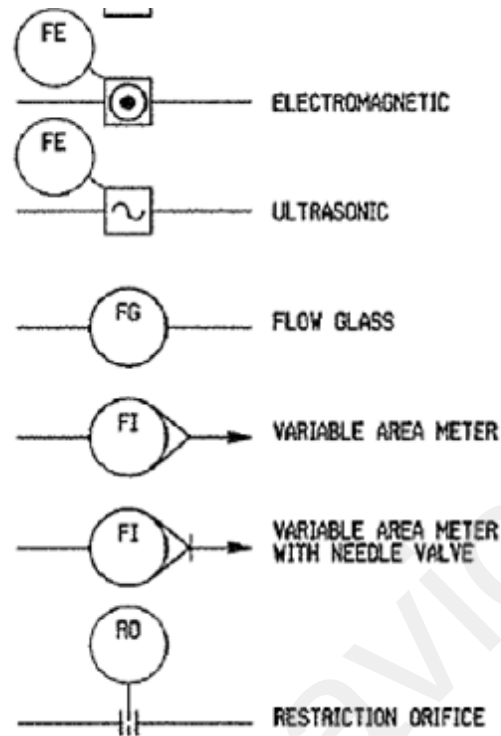
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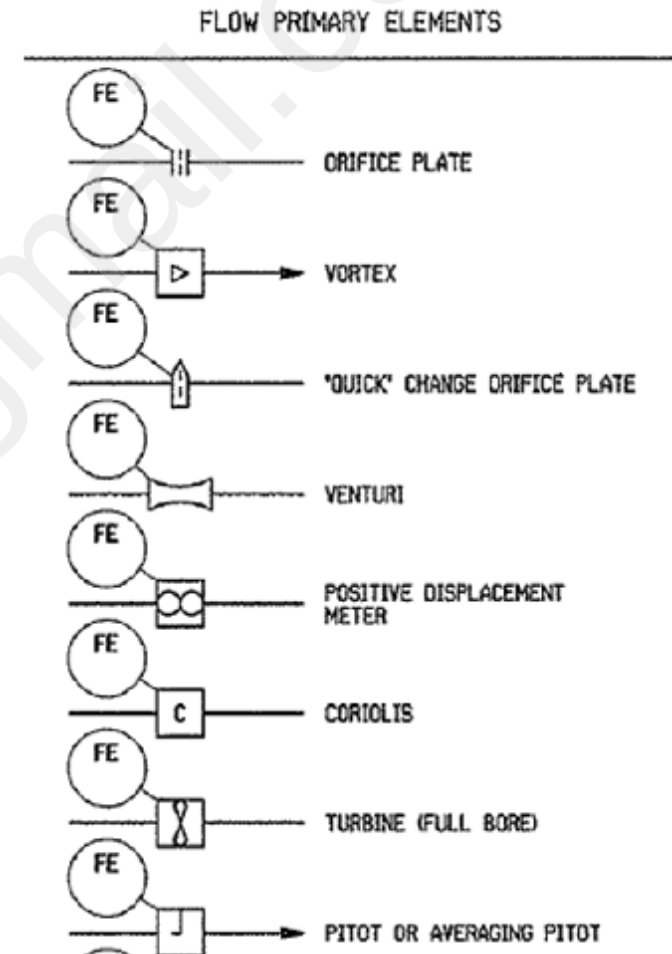
تهیه کننده: محمد بهزادی

مدارک Legend و Symbolism یک پروژه

طرق مختلف اندازه گیری دبی

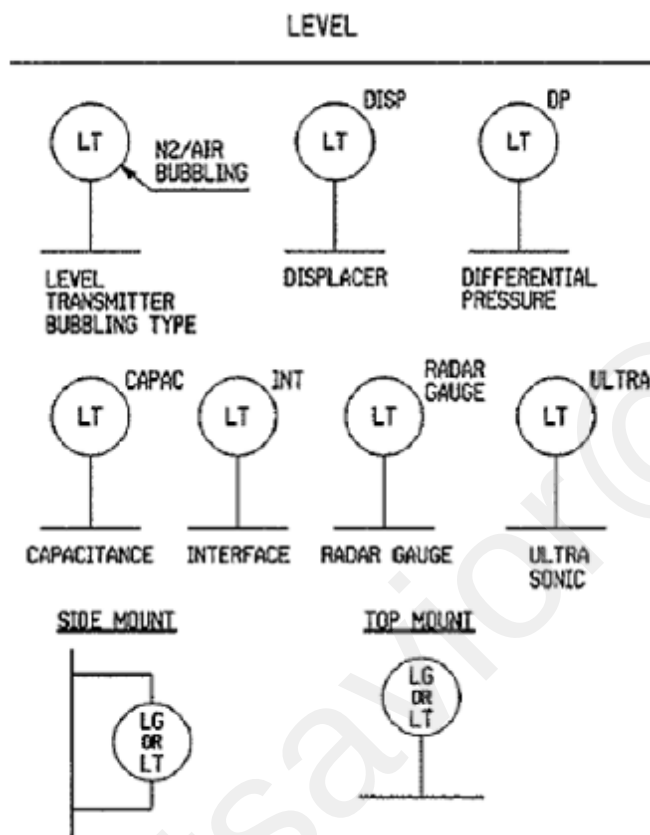


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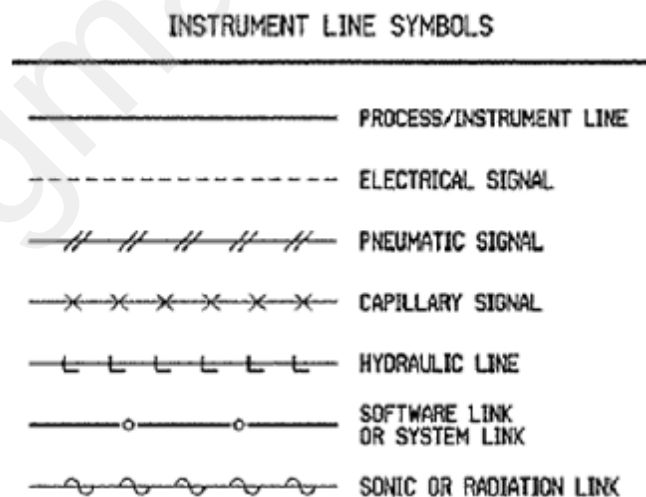


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طرق مختلف اندازه گیری سطح مایع



خطوط ابزار دقیق



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مدارک Legend و Symbolism یک پروژه

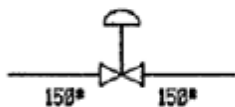
طرق مختلف اندازه گیری دما

کلاس فشاری ابزار دقیق

GENERAL NOTES FOR INSTRUMENT CONNECTIONS

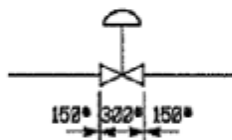
1. ALL INSTRUMENTS ON VESSELS SHALL BE 300 lbs MINIMUM RATING.
2. ALL FLANGE CONNECTION OF CONTROL VALVE SIZE UP TO 8" WHICH LOCATES IN 150 lbs PIPE HAVE 300 lbs RATING FLANGE.

VALVE SIZE $\leq 8"$

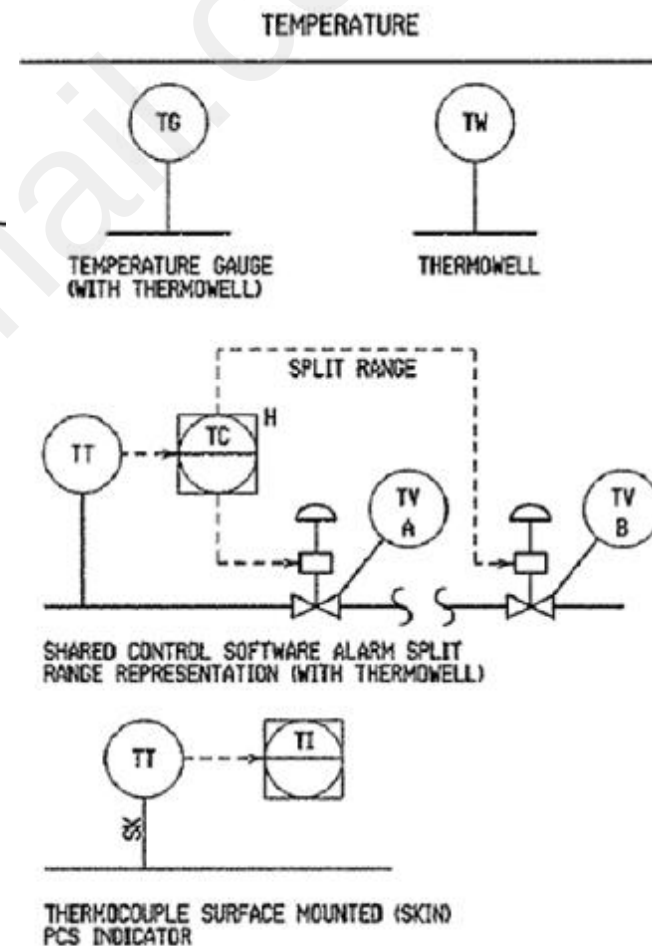


=>

VALVE SIZE $\leq 8"$



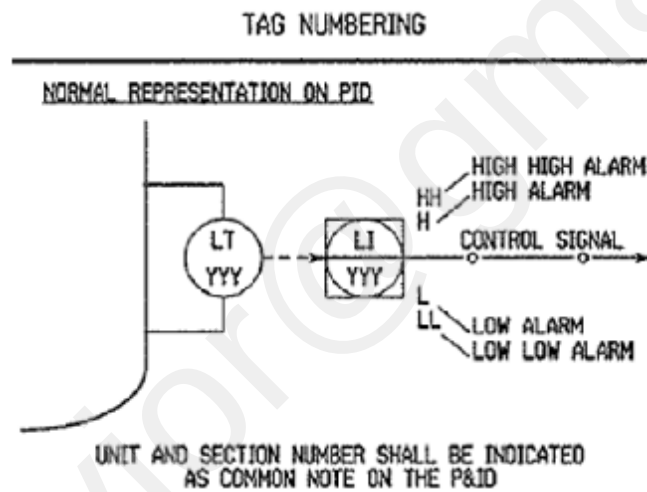
3. ORIFICE FLANGE SHALL BE MINIMUM 300# RATING.



صفحه پنجم

مدارک Legend و Symbolism یک پروژه

شماره گذاری ابزار دقیق



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ALL CONNECTIONS LISTED BELOW ARE FLANGED UNLESS OTHERWISE STATED.

اندازه نازل ابزار دقیق

LEVEL GAUGE	2"	-	-	FLANGE: 2" INST: 3/4"	3/4" NPT
LEVEL SWITCH	2"	-	2"	FLANGE: 2" INST: 1"	3/4" NPT
LEVEL SWITCH (TOP)	4"	-	4"	4"	-
DIRECT MOUNTED TRANSMITTER	3"	-	3"	-	DRIP RING
FLOW D/P CELL	-	1/2"	-	1/2" NPT	1/4"

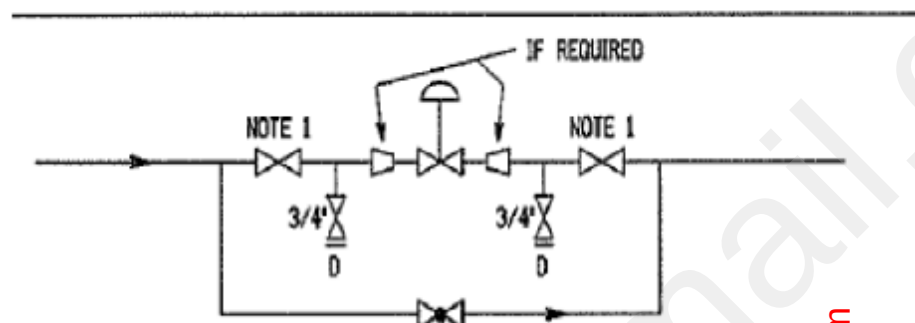
	CONNECTION TO EQUIPMENT			INSTRUMENT CONNECTION	VENT & DRAIN
	VESSELS	PIPE	TANK		
THERMOWELLS	2"	2"	2"	-	-
PRESSURE GAUGES	2"	1"	2"	1/2" NPT	1/4" NPT
PRESSURE TRANS.	2"	1"	2"	1/2" NPT	1/4" NPT
D/P CELL (PRESSURE)	2"	1"	2"	1/2" NPT	1/4" NPT
DIAPHRAGM TYPE PRESSURE GAUGES	2"	1"	2"	1"	-
DIAPHRAGM TYPE PRESSURE TRANS.	2"	2"	2"	2"	-
DIAPHRAGM TYPE PRESSURE DIFF. TRANS.	3"	3"	3"	3"	-
DIAPHRAGM TYPE LEVEL TRANS.	3"	-	3"	3"	-
LEVEL DISPLACERS	2"	-	-	2"	3/4" NPT
LEVEL DISPLACERS (TOP)	4"	-	-	4"	-
D/P CELL (LEVEL)	2"	-	2"	1/2" NPT	1/4" NPT

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TYPICAL 2 - CONTROL VALVE MANIFOLD



- 1 - FOR CONTROL VALVE DIAMETER $\leq 6"$ IN CONTINUOUS SERVICE, COMPLETE MANIFOLD (BLOCK+BY PASS) SHALL BE PROVIDED.
- 2 - FOR CONTROL VALVE DIAMETER $> 6"$, THE NEED FOR INSTALLATION OF BLOCK AND BYPASS VALVES AROUND THE CONTROL VALVE SHALL BE DEFINED BY PROCESS CASE BY CASE (HAND WHEEL SHALL BE PROVIDED IF NO BY PASS, ACCORDING TO PROCESS REQUIREMENTS.)
- 3 - $3/4"$ BLEED 'D' SHALL BE PROVIDED AS FOLLOWS:
 - UPSTREAM CONTROL VALVE SIZE $> 6"$:
 - CONTROL VALVE OPEN BY FLUID FAILURE (FO), ONE MAINTENANCE BLEED ($3/4"$ BLOCK VALVE WITH BLIND FLANGE) WILL BE INSTALLED DOWNSTREAM THE CONTROL VALVE.
 - CONTROL VALVE CLOSED BY FLUID FAILURE (FC), TWO MAINTENANCE BLEEDS WILL BE INSTALLED, ONE UPSTREAM AND ONE DOWNSTREAM THE CONTROL VALVE.
 - UPSTREAM CONTROL VALVE SIZE $\leq 6"$:
 - ONE MAINTENANCE BLEED WILL BE INSTALLED DOWNSTREAM OF THE CONTROL VALVE WHATEVER THE CONTROL VALVE POSITION (FO OR FC) BY FLUID FAILURE.
- 4 - BY PASS VALVES SHALL BE SIZED ACCORDING TO FOLLOWING TABLE:
- 5 - THE FLANGE ANSI RATING CLASS SHALL BE IN ACCORDANCE WITH THE PIPING CLASS UNLESS OTHERWISE SPECIFIED. THE MINIMUM FLANGE RATING SHALL BE 300# 1b_s FOR VALVE SIZES UP TO 8".

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مدارک Legend و Symbolism یک پروژه

VARIABLE	PRIMARY ELEMENT	INDICATION	LOCAL	CONTROLLER	TRANSM.	CONTROL VALVE	SOLENOID VALVE	SWITCH	ALARM	STATUS	TOTALISING	FUNCTION BLOCK
ANALYSIS (*)	AE	AI	-	AC	AT		AX	AS	AA		AD	AY
BURNER FLAME	BE	BI	-	-	-			BS	BA	BL		
CURRENT	IE	II	-	IC	IT			IS	IA			
FLOW (***)	FE	FI	FG	FC	FT	FV	FX	FS	FA		FQ	FY
LEVEL (**)	-	LI	LG	LC	LT	LV	LX	LS	LA			LY
HANDILY OPERATED				HC		HV	HX	HS				HY
MOTOR OPERATED VALVE						MOV						
MULTI VARIABLE				UC	UV	UX		UA			UQ	UY
OTHER	XE	XI	-	XC	XT	XV		XS XS	XA XA	XL		XY
POSITION (***)		ZI			ZT			ZSD ZSC	ZA	ZLO ZLC		
POWER	JE	J1			JT						JQ	
PRESSURE	-	PI	PG	PC	PT	PV	PX	PS	PA			PY
PRESSURE DIFFERENTIAL	-	POI	POG	POC	POT	POV	POK	PDS	POA			
SPEED	SE	SI	-	SC	ST			SS	SA		SG	
TEMPERATURE	TE	TI	TG	TC	TT	TV	TX	TS	TA			TY
VIBRATION	VE	VI			VT			VS	VA			
VOLTAGE	EE	EI	-	EC	ET			ES	EA			
WEIGHT	WE	WI							WA			

جدول معادل سازی اندازه

TABLE G.1- PIPE COMPONENT-NOMINAL SIZE (METRIC- IMPERIAL)

NOMINAL SIZE		NOMINAL SIZE		NOMINAL SIZE		NOMINAL SIZE	
DN(1)	NPS(2)	DN	NPS	DN	NPS	DN	NPS
6	¼	100	4	600	24	1100	44
15	½	125	5	650	26	1150	46
20	¾	150	6	700	28	1200	48
25	1	200	8	750	30	1300	52
32	1¼	250	10	800	32	1400	56
40	1½	300	12	850	34	1500	60
50	2	350	14	900	36	1800	72
65	2½	400	16	950	38		
80	3	450	18	1000	40		
90	3½	500	20	1050	42		

- 1) Diameter Nominal, mm.
- 2) Nominal pipe Size. Inch.

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DN (mm)	NPS (inches)	DN (mm)	NPS (inches)
15	1/2	350	14
20	3/4	400	16
25	1	450	18
40	1 1/2	500	20
50	2	600	24
80	3	650	26
100	4	700	28
150	6	750	30
200	8	800	32
250	10	900	36
300	12	1000	40

جدول معادل سازی فشار

ATM

IMPERIAL-METRIC		IMPERIAL		METRIC	
PRESSURE CLASSES			PRESSURE CLASSES		PN DESIGNATION
150	20		25		2.5
300	50		125		6
400	68		250		10
600	100		800(1)		16
900	150		800(2)		25
1500	250				
2500	420				
4500	760				

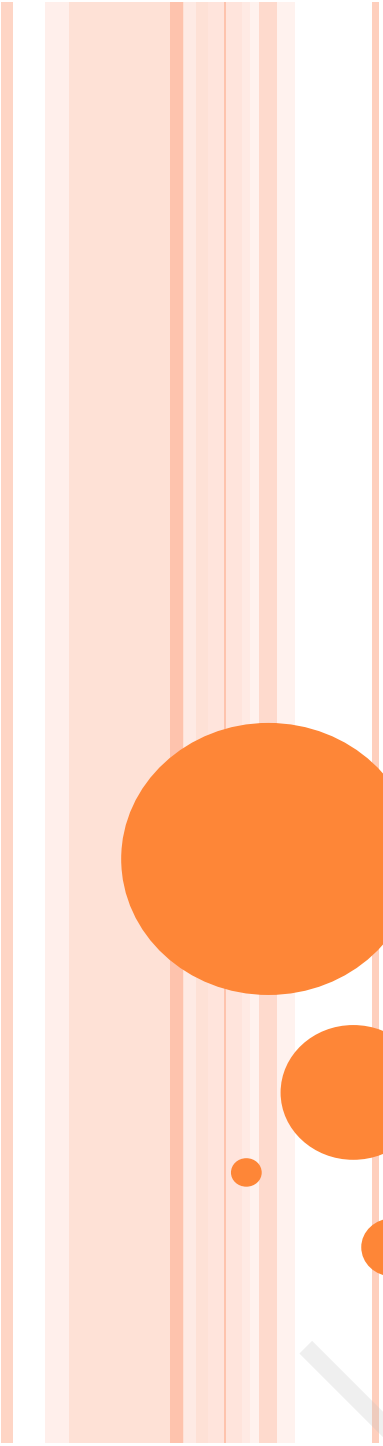
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Equivalent pressure ratings designations.

Rating designations which have not exact equivalents

مدارک SYMBOL

یک پروژه دیگر



ISOLATION PHILOSOPHY

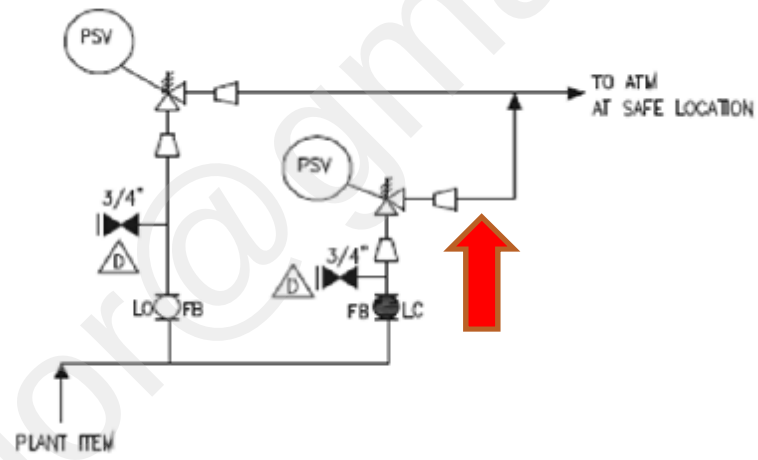
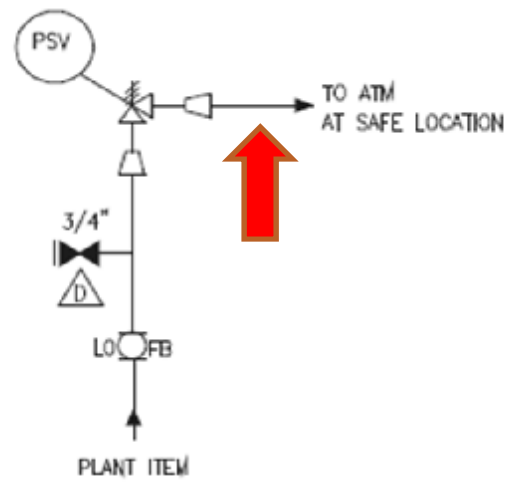
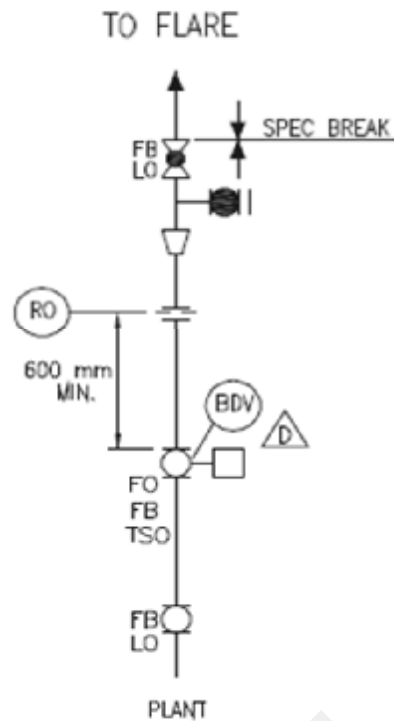


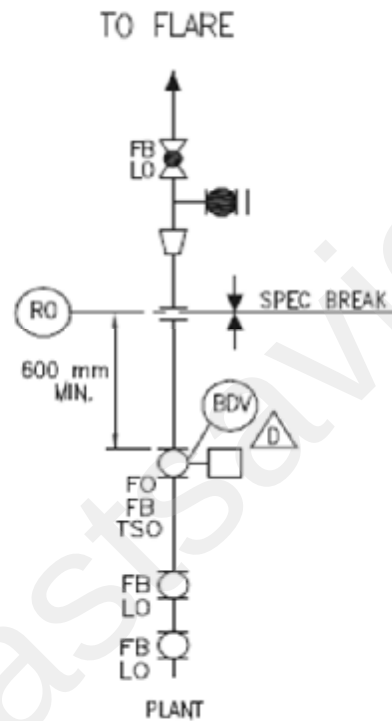
Table 3 – Valve arrangement requirement for PSVs

Service	Sweet Service 600#	Sweet Service less than 600#	Sour & Steam Service	
	600# and more	less than 600#		
PSV's inlet block valves	single	single	doubled	single
PSV's outlet block valves	single	single	single	single
PSV's bypass valves	doubled (2) (3)	doubled (2) (3)	doubled (2) (3)	doubled (2) (3)

AUTOMATIC BLOW DOWN



GENERAL SERVICE



HIGH PRESSURE SERVICE

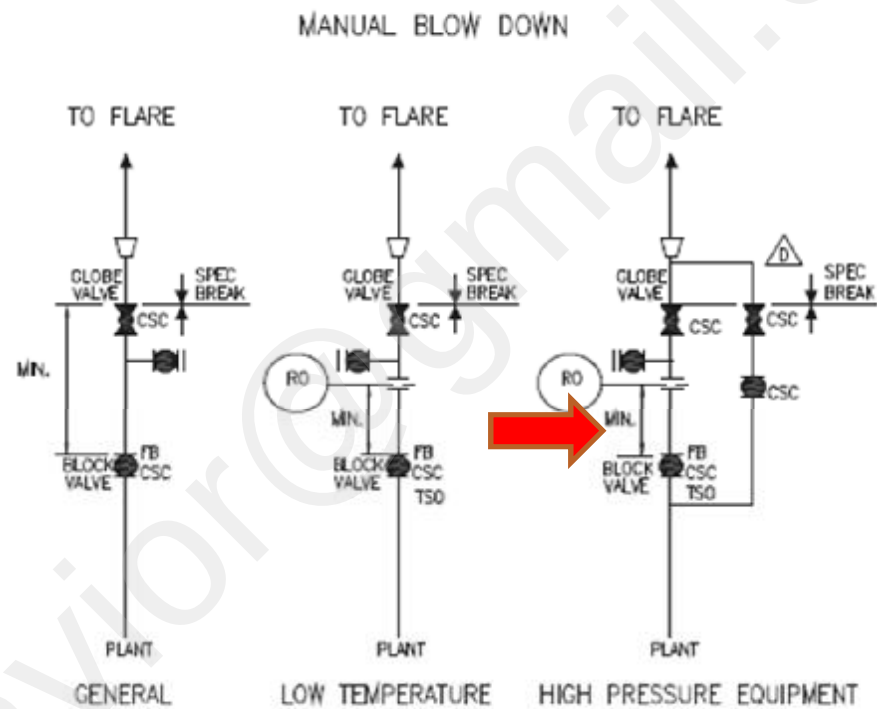


Fig.5- Vent to blowdown arrangement – Manual blowdown

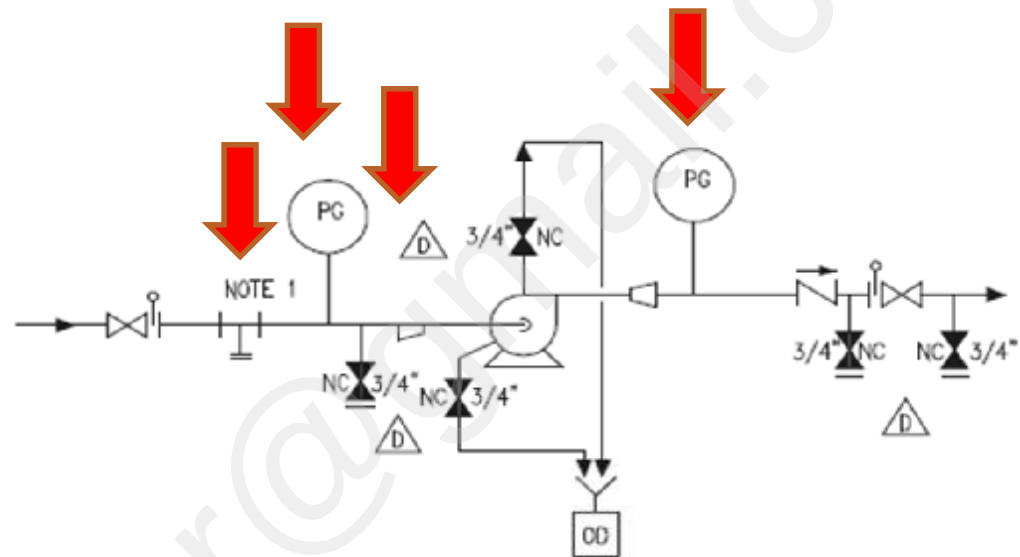


Fig.6- Pump Isolation - General Service



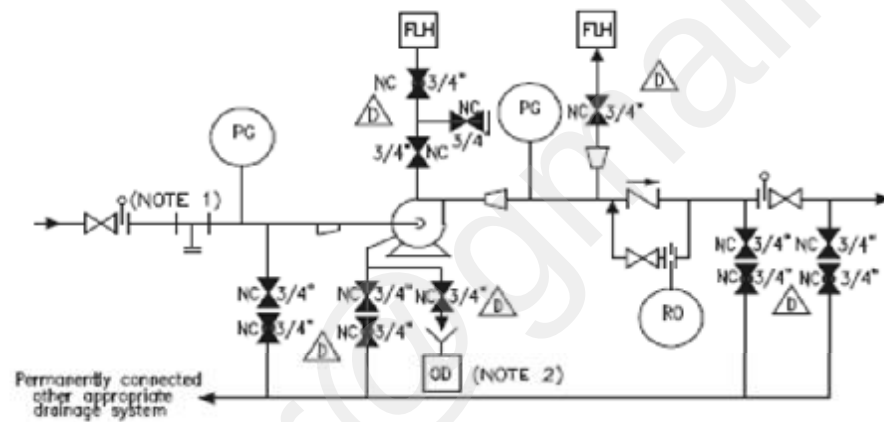


Fig.7- Pump Isolation - Hydrocarbon Service/High Vapour Pressure/Bubble Point Service/Hot Oil Service



Table 4 – Valve arrangement requirement for Pumps suction/discharge

Service	Sweet Service 600#	Sweet Service less than 600#	Sour & Steam Service	
			600# and more	less than 600#
Pumps suction/discharge block valves	single	single	doubled (1)	single

Note 1: ESD valve may be used as second block valve.

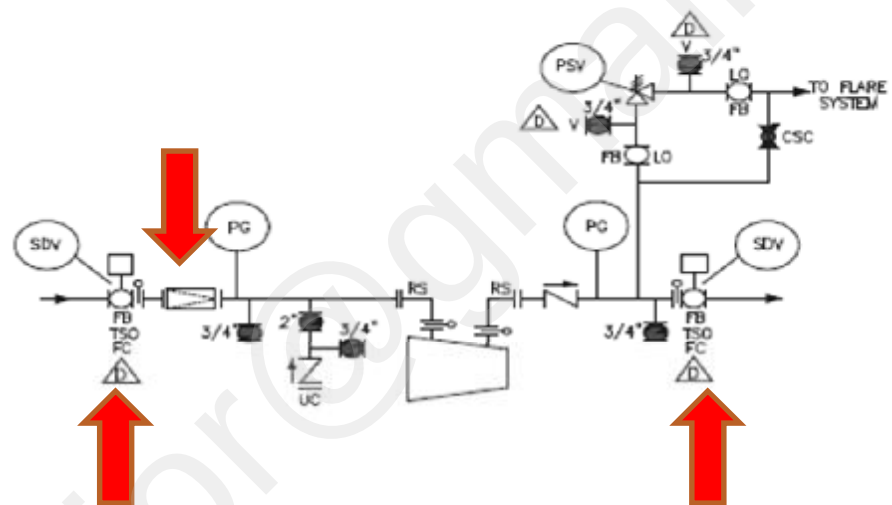


Fig.11- Compressor Isolation - typical arrangement



Table 5 – Valve arrangement requirement for control valves

Service	Sweet Service 600#	Sweet Service less than 600#	Sour & Steam Service	
			600# and more	less than 600#
Control valves block valves	single	single	doubled	single
Control valves by-pass valves	single	single	doubled (1)	single

Note 1: One valve is used for throttling purposes (usually a globe valve), and other for isolation as per piping specification.

Table 6 – Number drain valve around control valves

Service	Valve type	Upstream vent	Upstream drain	Downstream vent	Downstream drain
Pure Gas	FO	Yes	No	No	No
	FC	Yes	No	Yes	No
Saturated Gas	FO	Yes	Yes	No	No
	FC	Yes	Yes	Yes	Yes
Pure Liquids	FO	No	Yes	No	No
	FC	No	Yes	No	Yes



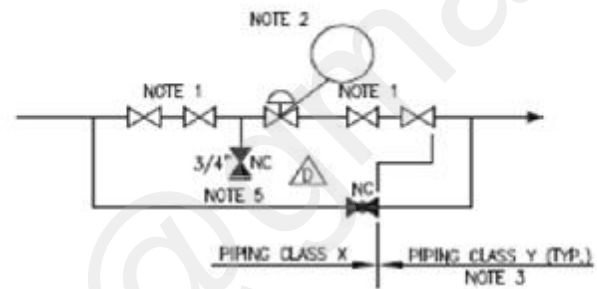


Fig.10- Control valve – arrangement for high pressure service



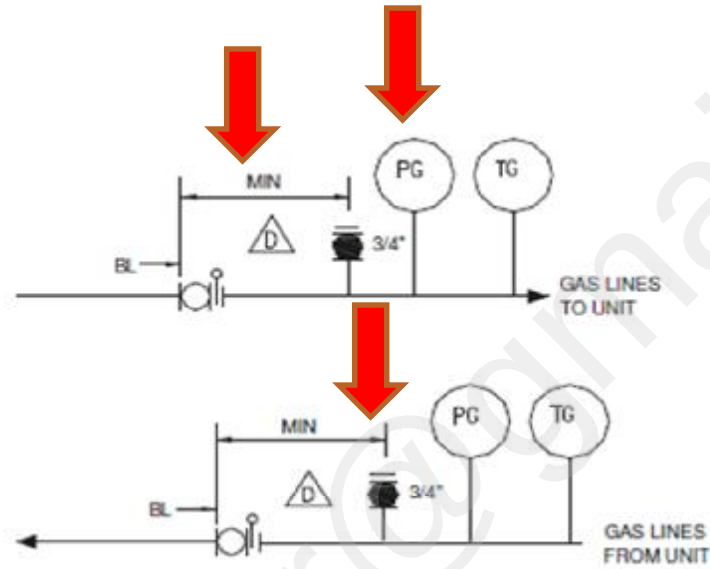


Fig.1. B.L. arrangement for gas lines – General (inlet or outlet)

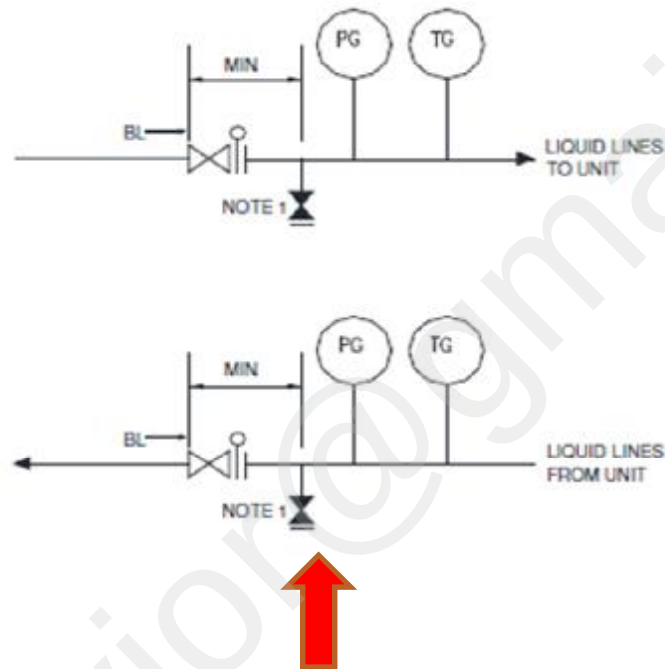


Fig.2. B.L. arrangement for liquid lines – General (inlet or outlet)

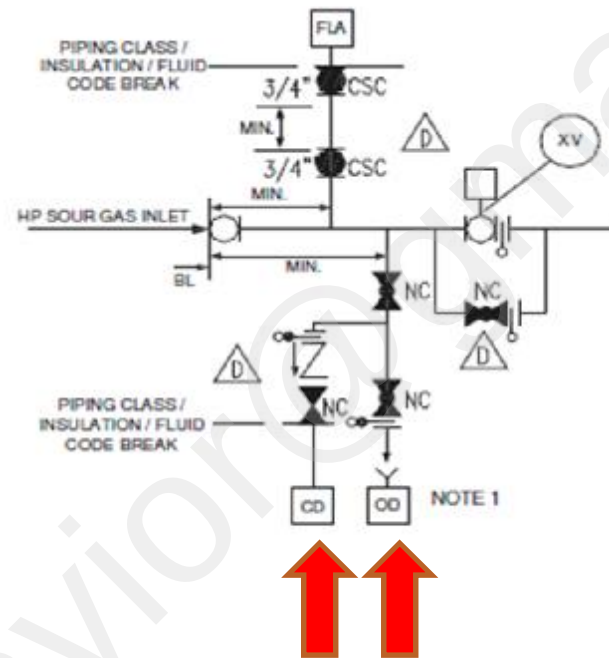


Fig.3. B.L. arrangement for HP Sour Gas - inlet

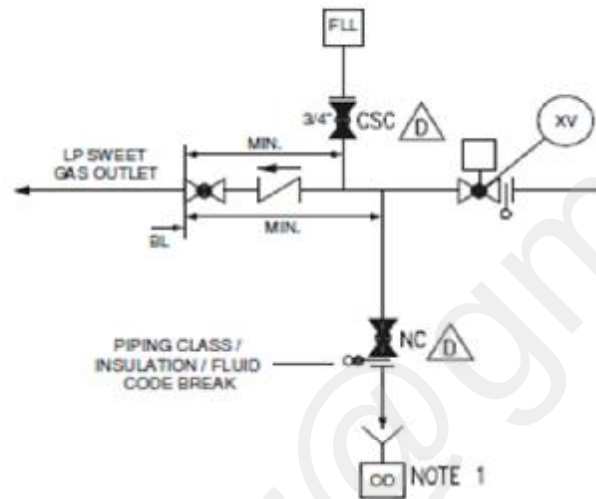


Fig.5. B.L. arrangement for LP Sweet Gas - outlet

Note 2: For sweet gas, block valves will be represented as following:

- For rating 150#: - $\text{Ø} \leq 8"$ → "gate valve";
- $\text{Ø} \geq 10"$ → "ball valve"
- For rating 300#: "ball valve";
- For rating 600#: "ball";

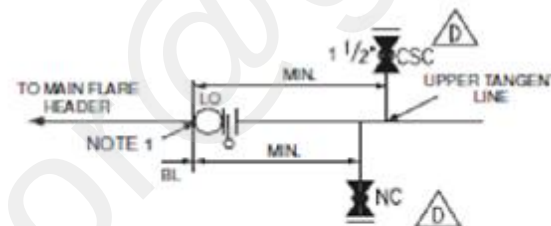


Fig.6. B.L. arrangement for Flare



Utilities Battery Limits

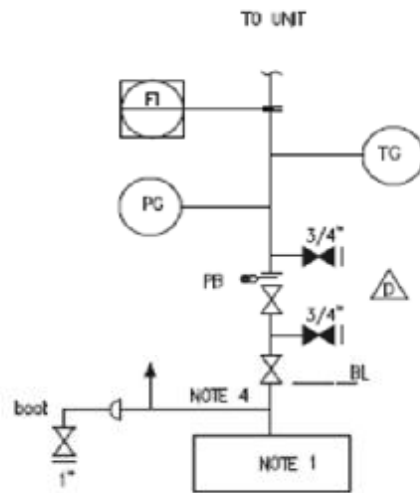


Fig.7. B.L. arrangement (Note 1)

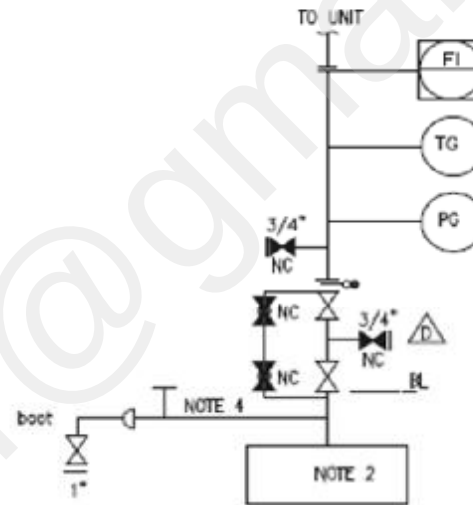


Fig.8. B.L. arrangement (Note 2)

TABLE 1: UTILITY BATTERY LIMITS

	Double block & Bleed valve	Vent	Drain	B/L Valve by-pass
Steam condensate (Low pressure) (CL)	No	Yes	Yes	No
Steam condensate (High pressure) (CH)	Yes	Yes	Yes	Yes
HP Steam (SH)	Yes	Yes	Yes	Yes
LP Steam (SL)	No	Yes	Yes	Yes



MP / LP Fuel gas (LFG)	No	Yes	Yes	No
Nitrogen (N)	No	Yes	No	No
Instrument air (IA)	No	Yes	No	No
Plant air (PA)	No	Yes	Yes	No
Boiler Feed Water (BW)	Yes	No	Yes	Yes
Utility water (UW)	No	No	Yes	No
Demin. Water (TW)	No	No	Yes	No

Note: 1. All battery limit valves are to be provided with an appropriate blind for positive isolation.



TABLE 2: STEAM SERVICES NOMINAL SIZES OF BY PASS VALVES

NOMINAL SIZE OF MAIN VALVE		NOMINAL SIZE OF BY PASS VALVE FOR WARMING-UP OF PIPE AND PRESSURE-BALANCING OF LINES WITH LIMITED VOLUMES		NOMINAL SIZE OF BY PASS VALVE FOR PRESSURE-BALANCING	
IN		IN		IN	
DN	NPS	DN	NPS	DN	NPS
150	6	20	$\frac{3}{4}$	25	1
200	8	20	$\frac{3}{4}$	40	1½
250	10	25	1	40	1½
300	12	25	1	50	2
350	14	25	1	50	2
400	16	25	1	80	3
450	18	25	1	80	3
500	20	25	1	80	3
600	24	25	1	100	4

Table 3.1. Vent and drain for piping

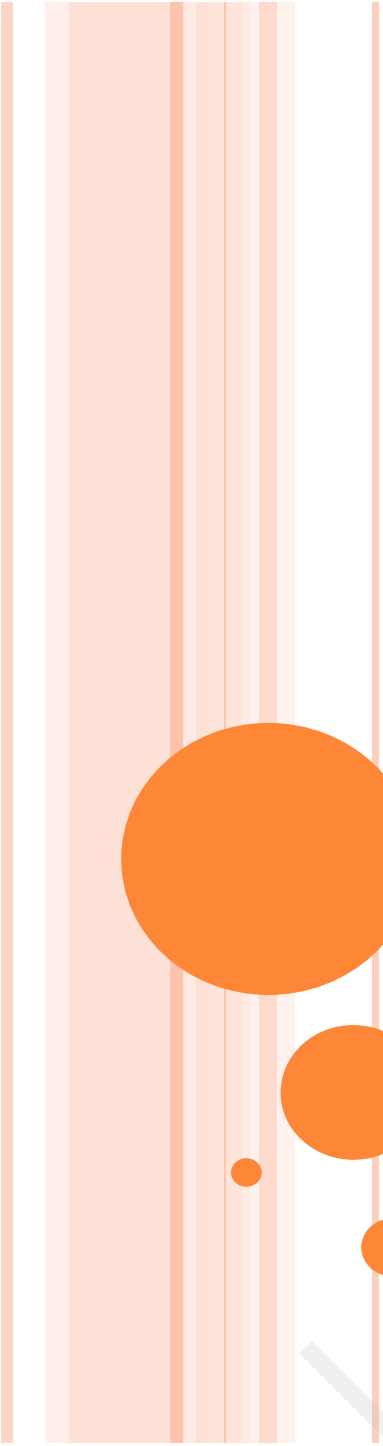
Pipe Size (in)	Vent Size (in)	Drain size (in)
4 & below	3/4"	3/4"
6 to 10	3/4"	1"
12 & above	1"	2"



VENTS AND DRAINS FOR VESSELS

Volume or diameter of vessel (m ³ or mm)	Vent size	Drain size
$V \leq 75$ or $D \leq 4\,500$	2"	2"
$75 < V \leq 220$ or $4500 < D \leq 6\,000$	3"	3"
$220 < V \leq 420$ or $D > 6\,000$	4"	4"
$V > 420$	6"	4"





SYMBOL & LEGEND

[illegible]

EQUIPMENT IDENTIFICATION

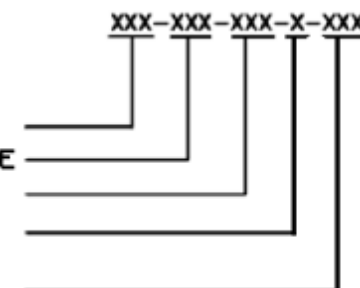
FIRST DIGIT — PROCES FUNCTION

A	AIR COOLER
B	BOILER
C	COLUMN
D	DRUM
E	HEAT EXCHANGERS
F	FILTER
FL	FLARE
G	ELECTRIC GENERATOR
H	HEATERS
IN	INCINERATOR
J	EJECTOR
K	COMPRESSOR, BLOWER, FAN
L	SCRAPER LAUNCHERS/RECEIVERS
ME	METERING SYSTEM
MX	MIXERS, AGITATORS
P	PUMP
R	REACTOR
S	STACK
T	STORAGE TANK
U	PACKAGE UNIT
X	MISCELLANEOUS EQUIPMENT
W	MOBILE EQUIPMENT
Z	SAFETY EQUIPMENT

SECOND DIGIT — SUPPORTING FUNCTION

DE	DIESEL ENGINE
GE	GAS MOTOR
M	ELECTRIC MOTOR
ST	STEAM TURBINE
GT	GAS TURBINE

UNIT No.
EQUIPMENT IDENTIFICATION CODE
SERIAL NUMBER
DUPLICATION SUFFIX FOR
IDENTICAL EQUIPMENT
ASSOCIATED EQUIPMENT
SUFFIX



FLUID IDENTIFICATION CODES

AIR		WATER	
EA	EXHAUST AIR	BW	BOILER FEED WATER
IA	INSTRUMENT AIR	DW	DRINKING WATER
PA	PROCESS AIR	FW	FIRE WATER
UA	UTILITY AIR	POD	PROCESS OILY WATER (CLOSED DRAIN)
CLOSED DRAIN		PW	PROCESS WATER
DA	AMINE DRAIN	TW	DEMINERALIZED WATER
DC	CAUSTIC DRAIN	UW	UTILITY WATER
DG	GLYCOL DRAIN	WA	FOAM SOLUTION WATER (FIRE FIGHTING)
DP	PROPANE DRAIN	WS	SOUR WATER
DR	HIDROCARBON DRAIN	WW	WATER (SPENT OR WASTE WATER)
DS	SOUR WATER DRAIN		
CHEMICALS			
AF	ANTI FOAM		
AV	VOLATILE AMINE		
BI	BIOCIDE		
CC	COLD CONDENSATE		
CD	CLEANING AGENT (DISTILLATION)		
CD	CLEANING AGENT (ELECTROCHLORINATION)		
CG	COAGULANT		
CK	CORROSION INHIBITOR		
CP	POLLUTED CONDENSATE		
DE	DEMULSIFIER		
OX	OXYGEN SCAVENGER		
SY	SODIUM HYDROXIDE		
STEAM			
SH	HIGH PRESSURE STEAM		
SL	LOW PRESSURE STEAM		
SM	MEDIUM PRESSURE STEAM		

CONDENSATES

CL	LOW PRESSURE STEAM CONDENSATE
CH	HIGH PRESSURE STEAM CONDENSATE
CM	MEDIUM PRESSURE STEAM CONDENSATE

FLARE

FLA	ACID GAS FLARE
FLH	HIGH PRESSURE FLARE
FLL	LOW PRESSURE FLARE

FUEL

DO	DIESEL OIL
FG	FUEL GAS

INERT GAS

IG	INERT GAS
N	NITROGEN

MISCELLANEOUS

ATM	ATMOSPHERIC VENT
CA	CATALYST
LO	LUBE OIL
SG	SEAL GAS
SO	SEAL OIL



PROCESS

AM	AMINE
CF	FRESH CAUSTIC
FL	FLUE GAS
G	HYDROCARBON GAS
GA	ACID GAS
GN	PROCESS/ NON-CORROSIVE/SWEET GAS
GM	SWEET GAS FROM DEHYDRATION UNIT (PRODUCT)
GS	SOUR GAS
GT	GLYCOL (TEG)
HC	HYDROCARBON GAS
L	HYDROCARBON LIQUID
LC	LEAN CAUSTIC
LS	SULFUR (LIQUID)
PR	PROPANE
SS	SULFUR (SOLID)

SEWER

CS	CHEMICAL SEWER
NW	NON - CONTAMINATED SEWER
OD	OILY WATER SEWER (OPEN DRAIN)
WD	SANITARY SEWER



Pipe Class	Description					
	Material	Material group	Temp. min/max °C	Corr. Allow. mm	Service / Fluid	Flange Rating/Face
A2 1F	Carbon Steel	Gr.1.1	-29 / 350	1.5	N,HC,DR,OD,GN,GT,WS,DS, PA,CL,SL,UW	150# / RF
A3 1F	Carbon Steel	Gr.1.1	-29 / 350	3	GN,GT,GS,DS,WS,DG ;	150# / RF
A3S1F	Killed Carbon Steel (KCS) Wet H ₂ S resistant	Gr.1.1	-29 / 350	3	GS,GA,AM,DA	150# / RF
A2 3F	Carbon Steel	Gr.1.1	-29 / 350	1.5	GN,HC,GT,WS,GM	300# / RF
A3 3F	Carbon Steel	Gr.1.1	-29 / 350	3	GN,GT,WS	300# / RF
A3S3F	Killed Carbon Steel (KCS) Wet H ₂ S resistant	Gr.1.1	-29 / 350	3	GS,AM	300# / RF
B2 1F	LTCS	Gr.1.1	-45 / 200	1.5	PR,DP	150# / RF
B3 1F	LTCS	Gr.1.1	-45 / 200	3	GN	150# / RF
B2 3F	LTCS	Gr.1.1	-45 / 200	1.5	PR	300# / RF
M1 1F	SS-TP 304L	Gr.2.3	-29 / 350	1	GA,AM,WS,TW,AF,CK	150# / RF
M1 3F	SS-TP 304L	Gr.2.3	-29 / 350	1	AF	300# / RF
N1 3F	SS-TP 321	Gr.2.4	-29 / 350	1	CH	300# / RF
W7 1P	HDPE Pipe		0 / 60	0	FW	150# / FF
A2G1F	Carbon steel Galvanized	Gr.1.1	-29 / 100	1.5	FW , IA	150# / RF

ABBREVIATIONS

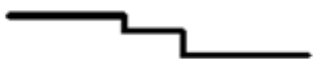
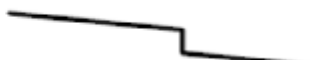
A/D	ANALOG TO DIGITAL
AG	ABOVE GROUND
AS	AIR SUPPLY
ATM	ATMOSPHERE
BL	BATTERY LIMIT
BD	BLOWDOWN
BDV	BLOW DOWN VALVE
CC	CORROSION COUPON
CP	CORROSION PROBE
CSC	CAR SEAL CLOSED
CSO	CAR SEAL OPEN
D	DRAIN
DBB	DOUBLED BLOCK AND BLEED VALVE
DCS	DISTRIBUTED CONTROL SYSTEM
DHSV	DOWN HOLE SAFETY VALVE
DISP	DISPLACEMENT
DP	DIFFERENTIAL PRESSURE
EC	EROSION COUPON
ELEV	ELEVATION
ER	ELECTRICAL RESISTANCE
ESD	EMERGENCY SHUTDOWN
ESDV	EMERGENCY SHUT DOWN VALVE
FB	FULL BORE
FC	FAIL CLOSED
FGS	FIRE AND GAS SYSTEM
FL	FAIL LOCKED IN POSITION
FO	FAIL OPEN
FTHP	FLOWING TUBING HEAD PRESSURE
GOV	GAS OPERATED VALVE
GWR	GUIDED WAVE RADAR
HHLL	HIGH HIGH LIQUID LEVEL
HLL	HIGH LIQUID LEVEL
HR	HANDLE REMOVED
HS	HAND SWITCH
IA	INSTRUMENT AIR
ID	INTERNAL DIAMETER
KILC	KEY INTERLOK CLOSED
KILO	KEY INTERLOK OPEN
LC	LOCKED CLOSED
LCP	LOCAL CTRL PANEL
LLL	LOW LIQUID LEVEL
LLLL	LOW LOW LIQUID LEVEL

LNL	LINE NUMBER LIMIT
LO	LOCKED OPEN
LS	LIQUID SEAL
MAG	MAGNETIC
MAGS	MAGNETOSTRICTIVE
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTER/SWITCHGEAR
MIN	MINIMUM
MOV	MOTOR OPERATED VALVE
MV	MASTER VALVE
MW	MANWAY
NC	NORMALLY CLOSED
NLL	NORMAL LIQUID LEVEL
NNF	NORMALLY NO FLOW
NO	NORMALLY OPEN
PB	PUSH BUTTON
PCV	PRESSURE CONTROL VALVE
PD	DESIGN PRESSURE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PS	PIPING SPECIAL
PSV	PRESSURE SAFETY VALVE
PVR	PRESSURE AND VACUUM RELIEF VALVE
RB	REDUCED BORE
RH	HYDRAULIC RETURN
RO	RESTRICTION ORIFICE
RVD	DELUGE VALVE
OWS	OPERATOR WORK STATION
SB	SPECTACLE BLIND
SC	SAMPLE CONNECTION
SD	PROCESS SHUTDOWN
SDV	SHUTDOWN VALVE
SG	SIGHT GLASS
SH	HYDRAULIC SUPPLY
SO	STEAM OUT
SP	REMOVABLE SPOOL
S/S	STOP/START
T	TRAP
TC	TEST CONNECTION
TCV	TEMPERATURE CONTROL VALVE
TD	DESIGN TEMPERATURE
TI	TEMPERATURE INDICATOR
TL/TL	TARGET LINE TO TANGENT LINE
TSO	TIGHT SHUT OFF
TSV	TEMPERATURE SAFETY VALVE
TW	THERMOWELL
UC	UTILITY CONNECTION
UCP	UNIT CONTROL PANEL
UG	UNDER GROUND
US	UTILITY STATION
USS	ULTIMATE SAFETY SYSTEM

V	VENT
VB	VORTEX BREAKER
VF	VENDOR FURNISHED
VFD	VARIABLE SPEED DRIVE
XV	ON/OFF VALVE
SITHP	SHUT-IN TUBING HEAD PRESSURE



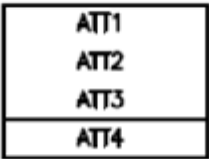
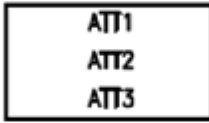
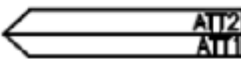
LINE IDENTIFICATION

	MAIN PROCESS PIPING
	SECONDARY PIPING
	BATTERY & PACKAGE LIMIT
	ELECTRICAL TRACING
	EXISTING LINE
	UNDERGROUND LINE
	JACKETED LINE
	FREE DRAINING
	SLOPED LINE
	NO LIQUID POCKET
	NO VAPOR POCKET
	GRAVITY FLOW

INSTRUMENT LINES IDENTIFICATION

	INSTRUMENT SUPPLY OR CONNECTION TO PROCESS
	ELECTRICAL SIGNAL
	PNEUMATIC SIGNAL
	CAPILLARY TUBING
	HIDRAULIC LINE
	INTERNAL SOFTWARE LINK OR SYSTEM LINK

PIPING — CONTINUATIONS & CONNECTIONS

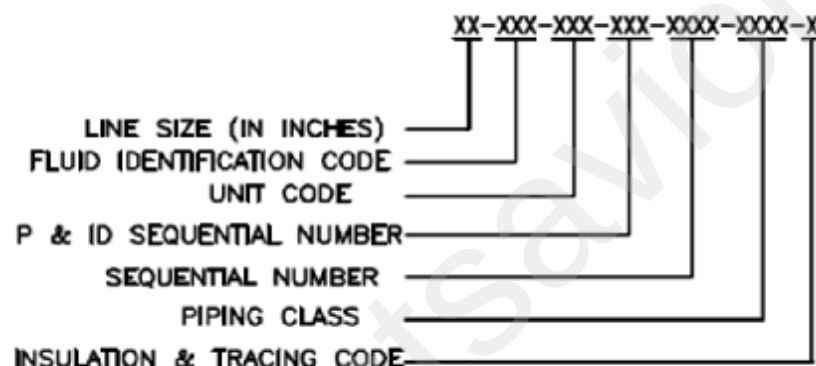
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	INSTRUMENTATION ARROW
	ARROW FOR CONTINUATION
	INTERRUPTION LINE
	CONTINUATION BETWEEN PID'S DWG NR ATT4: SPECIFIC DRAWING NUMBER AND TO READ: FIELD ZONE SEQUENTIAL NO. 101
	TEXT BOX
	FLAG

PAINTING, INSULATION AND TRACING CODE

A	ACOUSTIC INSULATION
B	SOLAR INSULATION PROTECTION
C	COLD INSULATION
D	DUAL INSULATION (HOT AND COLD)
E	ELECTRICAL TRACING
H	HOT INSULATION
J	STEAM JACKETED LINE
N	NO INSULATION
P	PERSONAL PROTECTION
PT	PAINTING
S	STEAM TRACING
U	UNDERGROUND EXTERNAL COATING

IF NO INSULATION CODE IS GIVEN IN THE LINE NO. IT HAS THE SAME MEANING AS 'N' (NO INSULATION).

LINES IDENTIFICATION



EXAMPLE:

14"-GS-ICU-100-013-A21F-P



NOZZLES IDENTIFICATION ON VESSELS, REACTORS AND TOWERS

NOZZLE	IDENTIFICATION SYMBOL
A, A2	INLETS
B	OUTLET
C	CONDENSATE
D	DRAIN OR DRAW-OFF
E*	
F	FEED
G	LEVEL GAUGE OR GAUGE GLASS
H	HANDHOLE
J	PUMPOUT
K*	
L	LEVEL INSTRUMENT (ALSO LT, LG)
M	MANHOLE
N	REBOILER CONNECTION
P	PRESSURE CONNECTION (ALSO PT, PG)
R	REFLUX
S	STEAM OR SAMPLE CONNECTION
T	TEMPERATURE CONNECTION (ALSO TG, TT, TW)
V	VAPOR OR VENT
W	RELIEF VALVE CONNECTION (OVERSIZE UNLESS ACTUAL SIZE KNOWN)

* USE E OR K WHEN NON OF THE OTHER SYMBOLS APPLY.
DO NOT USE I, O, Q, U, X, Y, OR Z.

(1) FREE DRAINING : LINE TO BE ROUTED TO A POINT DESIGNATED WITH NO LIQUID POCKET AND NO VAPOR POCKET IN THE LINE.

LAYOUT :



(2) SLOPED LINE : ELEVATION CHANGES ARE CONTINUOUSLY DOWNWARD ONLY, NO POCKETS ARE PERMITTED. SPECIFIC SLOPES REQUIRED ARE SHOWN BY SYMBOL.

LAYOUT :



(3) NO LIQUID POCKET : NO LIQUID POCKET IN THE LINE.

LAYOUT :



(4) NO VAPOR POCKET : NO VAPOR POCKET IN THE LINE.

LAYOUT :



(5) GRAVITY FLOW : ELEVATIONS DOWNSTREAM NEVER EXCEED INLET ELEVATIONS. LINE MAY CONTAIN LIQUID POCKETS AND VAPOR POCKETS.

LAYOUT :



01. IDENTIFICATION OF SYMBOLS USED IN THE PRESENTATION OF INSTRUMENTATIONS ON P&ID GIVEN IN DOCUMENT. IN ACCORDANCE WITH FOLLOWING STANDARDS NIOEC - SP - 00 - 55(O), IPS - E - PR - 230.
04. ALL HYDROCARBON VENTS TO ATMOSPHERE SHOULD BE VENTED AT MINIMUM 3 METERS ABOVE THE NEAREST OPERATING PLATFORM EXISTING WITHIN A RADIUS OF 15 METERS (IPS - E - PI - 240).
05. ALL STEAM VENTS TO ATMOSPHERE SHOULD BE VENTED AT MINIMUM 3 METERS ABOVE THE NEAREST OPERATING PLATFORM EXISTING WITHIN A RADIUS OF 7.5 METERS (IPS - E - PI - 240).
06. THE INSTRUMENTATION SHOWN FOR VENDOR PACKAGE UNITS IS MINIMUM PROCESS REQUIREMENT. VENDOR TO PROVIDE ADEQUATE INSTRUMENTATION FOR SAFE OPERATION AND MACHINE SAFETY.
13. PSV ISOLATION VALVES (UPSTREAM / DOWNSTREAM) SHALL BE OF FULL PORT SIZE, THE VALVES HAVE TO BE MOUNTED WITH STEM HORIZONTAL OR DOWN SLOPED.
14. ALL FT, PT (WITH DIAPHRAGM) AND DP TYPE LEVEL INSTRUMENTS IMPULSE LINE MANIFOLD INCLUDING ISOLATION AND DRAIN VALVES ARE TO BE STEAM TRACED ON STEAM TRACED LINE.
15. ALL CLOSED PRESSURE RELIEF VALVE DISCHARGE LEADS SHALL BE FREE DRAINING FROM PRESSURE RELIEF VALVE TO THE TOP OR SIDE OF THE DISCHARGE HEADER. PSV INLETS AND OUTLETS TO BE FREE DRAINING INTO SOURCE VESSEL AND INTO FLARE HEADER RESPECTIVELY.
16. WEEP HOLES ARE PROVIDED AT LOW POINTS OF PRESSURE RELIEF VALVE AND RUPTURE DISC OUTLET DISCHARGING TO ATMOSPHERE.

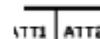
10. HIGH POINT VENTS AND LOW POINT DRAINS (USED FOR HYDRAULIC TEST PURPOSES ONLY) SHALL BE PROVIDED BUT ARE NOT SHOWN ON THE P&ID. VENT FOR HYDRAULIC TEST PURPOSE SHALL BE PROVIDED ONLY FOR 2" AND LARGER LINE.

11. ALL VENTS, DRAINS AND BLEEDER VALVES ARE PLUGGED OR BLIND-FLANGED AS PER PIPING SPECIFICATION. ALL VENTS AND DRAINS OF VESSELS ARE GATE VALVES WITH BLIND FLANGES.



PIPING — VALVES	PIPING — FITTINGS	PIPING — CONTINUATIONS & CONNECTIONS	INSTRUMENTATION CONTROL VALVES AND ACTUATORS	INSTRUMENTATION RELIEF VALVE																																				
GATE VALVE GATE VALVE NORMALLY CLOSED BALL VALVE FULL BORE BALL VALVE REDUCED BORE BALL VALVE NORMALLY CLOSED GLOBE VALVE GLOBE VALVE NORMALLY CLOSED ANGLE VALVE NEEDLE VALVE BUTTERFLY VALVE DIAPHRAGM VALVE CONICAL TAPER PLUG VALVE MINIMUM FLOW VALVE SLIDE GATE VALVE VALVE WITH NOZZLE REDUCTION CARTRIDGE VACUUM AIR RELEASE VALVE BREATHING VALVE 4 WAY VALVE 3 WAY VALVE CHECK VALVE HINGED VALVE DRAPER HINGED VALVE CAP PIPING CLASS SPECIFICATION BREAK/INSULATION CHANGE	CLAMPS ASSEMBLY (DRAWLOCK) CORROSION SLEEVE EXPANSION BELLOW FLANGE BLIND FLANGE INSULATING JOINT MAN HOLE SPACER PAN TAIL SPOTCOCK BLIND CLOSED SPOTCOCK BLIND OPEN FLANGES AND ORIFICE PLATE FEMALE PLUG MALE PLUG THREADED PLUG ISOLATING REDUCER (TOP FLAP) CONCENTRIC REDUCER SPECIAL PIPING ITEM FLEXIBLE HOSE FLEXIBLE HOSE WITH QUICK COUPLING REMOVABLE SPOOL WELDED SPOOL TEMPORARY TYPE STRAINER DUPLEX STRAINER CONICAL TYPE STRAINER COMPRESSOR SUCTION IN-LINE STRAINER CHEMICAL INJECTION POINT	Y STRAINER T STRAINER BAREED TEE 45° PIPE CONNECTION IN MAIN PIPE DIRECTION STEAM TRAP WITH BUILT-IN STRAINER (THERMOSTATIC OR THERMODYNAMIC TYPE) STEAM TRAP WITHOUT BUILT-IN STRAINER (THERMOSTATIC OR THERMODYNAMIC TYPE) VORTEX BREAKER CORROSION COUPON WITH ACCESS FITTING CORROSION PROBE ELECTRICAL RESISTANCE PROBE SAMPLING CONNECTION (TYPE SEE PDS SHEET) UTILITY STATION GROUP TE-IN HOOK UP CONNECTION CONNECTION TO A PARTICULAR NETWORK CONTRIBUTION BOX SUPPLIED BY VENDOR DOWN FITTED (CO-OPEN DRAIN SYSTEM) ORDNANCE SEAL FOR PIPING AND FLANGES	CONTROL VALVE WITH DIAPHRAGM ACTUATOR AND TRAVEL STOP SELF OPERATED GATE VALVE SELF OPERATED GLOBE VALVE MOTORISED ANGLE VALVE 3 WAY CONTROL VALVE BALL VALVE WITH CYLINDER ACTUATOR SINGLE ACTING BALL VALVE WITH CYLINDER ACTUATOR DOUBLE ACTING MOTORISED BALL VALVE MOTORISED BALL VALVE/HANDWHEEL MOTORISED VALVE SOLENOID VALVE SOLENOID VALVE WITH MANUAL RESET SOLENOID VALVE WITH REMOTE RESET 3 WAY SOLENOID VALVE 3 WAY SOLENOID VALVE WITH MANUAL RESET 3 WAY SOLENOID VALVE WITH REMOTE RESET 3 WAY SOLENOID VALVE (OPEN FROM A TO C WHEN DEENERGISED) HINGED CONTROL VALVE SELF BACK PRESSURE PRESSURE REDUCING REGULATOR WITH EXTERNAL PRESSURE TAP BACK PRESSURE REGULATOR WITH EXTERNAL PRESSURE TAP ON/OFF OPERATED VALVE (ON, ON, ON, ON) ANGLE CONTROL VALVE	PRESSURE OR VACUUM RELIEF VALVE FULLY OPERATED RELIEF VALVE PRESSURE AND VACUUM RELIEF VALVE VACUUM RELIEF VALVE QUICK EXHAUST VALVE PRESSURE AND VACUUM RELIEF VALVE MANHOLE COVER PRESSURE SAFETY VALVE																																				
				MISCELLANEOUS																																				
				BEND SYMBOL INSULATED LINE & INSULATION CODE INSULATED EQUIPMENT & INSULATION CODE PHYSICAL BARRIER SERVICE CONNECTION FLAME ARRESTOR VENTHOOK TYPE VENTDOWN HOOK																																				
				NOTES 2.4.5 TYPE 1-REMOVABLE INJECTION GULL RIGHT ANGLE SPRAY NOZZLE TYPE (COSASCO TYPE OR EQUIVALENT) FOR CORROSION INJECTION INJECTION ONLY NOTES 2.4.5 TYPE 2-REMOVABLE INJECTION GULL (COSASCO TYPE OR EQUIVALENT)																																				
				REVISIONS DOCUMENT REVISIONS <table><tr><th>REV</th><th>DATE</th><th>BY</th><th>CHKD</th><th>APPD</th><th>REVISION</th></tr><tr><td>1</td><td>01/01/2020</td><td>001</td><td>001</td><td>001</td><td>ISSUED FOR REVIEW</td></tr><tr><td>2</td><td>01/01/2020</td><td>001</td><td>001</td><td>001</td><td>ISSUED FOR REVIEW</td></tr><tr><td>3</td><td>01/01/2020</td><td>001</td><td>001</td><td>001</td><td>ISSUED FOR REVIEW</td></tr><tr><td>4</td><td>01/01/2020</td><td>001</td><td>001</td><td>001</td><td>ISSUED FOR REVIEW</td></tr><tr><td>5</td><td>01/01/2020</td><td>001</td><td>001</td><td>001</td><td>ISSUED FOR REVIEW</td></tr></table>	REV	DATE	BY	CHKD	APPD	REVISION	1	01/01/2020	001	001	001	ISSUED FOR REVIEW	2	01/01/2020	001	001	001	ISSUED FOR REVIEW	3	01/01/2020	001	001	001	ISSUED FOR REVIEW	4	01/01/2020	001	001	001	ISSUED FOR REVIEW	5	01/01/2020	001	001	001	ISSUED FOR REVIEW
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4	01/01/2020	001	001	001	ISSUED FOR REVIEW																																			
5	01/01/2020	001	001	001	ISSUED FOR REVIEW																																			

PIPING – VALVES	PIPING – FITTINGS	PIPING – CONTINUATIONS & CONNECTIONS
 GATE VALVE	 CLAMPS ASSEMBLY (GRAYLOCK)	 Y STRAINER
 GATE VALVE NORMALLY CLOSED	 CORROSION SLEEVE	 T STRAINER
 BALL VALVE FULL BORE	 EXPANSION BELOW	 BARRED TEE
 BALL VALVE REDUCED BORE	 FLANGE	 45° PIPE CONNECTION IN MAIN PIPE DIRECTION
 BALL VALVE NORMALLY CLOSED	 BLIND FLANGE	 STEAM TRAP WITH BUILT-IN STRAINER (THERMOSTATIC OR THERMODYNAMIC TYPE)
 GLOBE VALVE	 INSULATING JOINT	 STEAM TRAP WITHOUT BUILT-IN STRAINER (THERMOSTATIC OR THERMODYNAMIC TYPE)
 GLOBE VALVE NORMALLY CLOSED	 MAN HOLE	 VORTEX BREAKER
 ANGLE VALVE	 SPACER	 CORROSION COUPON WITH ACCES FITTING
 NEEDLE VALVE	 PAN TAIL	 CORROSION PROBE
 BUTTERFLY VALVE	 SPECTACLE BLIND CLOSED	 ELECTRICAL RESISTANCE PROBE
 DIAPHRAGM VALVE	 SPECTACLE BLIND OPENED	 SAMPLING CONNECTION (TYPE SEE PID SHEET)
 CONICAL TAPER PLUG VALVE	 FLANGES AND ORIFICE PLATE	 UTILITY STATION GROUP
 MINIMUM FLOW VALVE	 FEMALE PLUG	 TIE-IN
	 MALE PLUG	 HOOK UP CONTINUATION

	MINIMUM FLOW VALVE
	SLIDE GATE VALVE
	VALVE WITH NOISE REDUCTION CARTRIDGE
	VACUUM AIR RELEASE VALVE
	BREATHER VALVE
	4 WAY VALVE
	3 WAY VALVE
	CHECK VALVE
	HAND ANGLE VALVE
	DAMPER
	HAND VALVE
	CAP
	PIPING CLASS SPECIFICATION BREAK/INSULATION CHANGE

	MALE PLUG
	THREADED PLUG
	ECCENTRIC REDUCER (TOP FLAT)
	CONCENTRIC REDUCER
	SPECIAL PIPING ITEM
	FLEXIBLE HOSE
	FLEXIBLE HOSE WITH QUICK COUPLING
	REMOVABLE SPOOL
	WELDED SPOOL
	TEMPORARY TYPE STRAINER
	DUPLEX STRAINER
	CONICAL TYPE STRAINER
	COMPRESSOR SUCTION INLINE STRAINER
	CHEMICAL INJECTION POINT

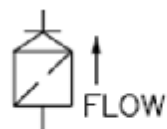
	HOO K UP CONTINUATION
	CONNECTION TO A PARTICULAR NETWORK
	CONTINUATION BOX
	SUPPLIED BY VENDOR
	DRAIN FUNNEL (OD-OPEN DRAIN SYSTEM)
	CHEMICAL SEAL FOR PIPING AND FLANGE

INSTRUMENTATION CONTROL VALVES AND ACTUATORS

	MANUALY OPERATED ANGLE CHOKE
	REMOTELY OPERATED ANGLE CHOKE
	CONTROL GATE VALVE (WITH DIAPHRAGM ACTUATOR)
	CONTROL GLOBE VALVE (WITH DIAPHRAGM ACTUATOR)
	CONTROL VALVE WITH DIAPHRAGM ACTUATOR + MANUAL OPERATOR
	CONTROL VALVE WITH DIAPHRAGM ACTUATOR AND POSITIONER
	VALVE WITH CYLINDER ACTUATOR SINGLE ACTING
	VALVE WITH CYLINDER ACTUATOR DOUBLE ACTING



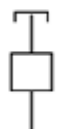
FLUSH BOTTOM VALVE



FOOT VALVE WITH STRAINER



FOOT VALVE



SELF DRAINING VALVE



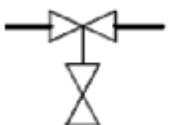
STOP CHECK



METERING COCK



AUTO RECYCLE VALVE



VALVE FOR BODY BLEED



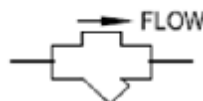
GATE VALVE BLINDED OFF



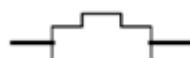
SLEEVE EXTENSION



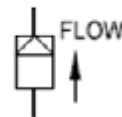
EXPANSION LOOP



STEAM TRAP WITH BUILT-IN STRAINER (THERMOSTATIC OR THERMODYNAMIC TYPE)



STEAM TRAP WITHOUT BUILT-IN STRAINER (THERMOSTATIC OR THERMODYNAMIC TYPE)



STEAM TRAP WITH INTEGRAL CHECK VALVE (BUCKET TYPE)



INSTRUMENTATION CONTROL VALVES AND ACTUATORS

 CONTROL VALVE WITH DIAPHRAGM ACTUATOR AND TRAVEL STOP

 SELF OPERATED GATE VALVE

 SELF OPERATED GLOBE VALVE

 MOTORISED ANGLE VALVE

 3 WAY CONTROL VALVE

 BALL VALVE WITH CYLINDER ACTUATOR SINGLE ACTING

 BALL VALVE WITH CYLINDER ACTUATOR DOUBLE ACTING

 MOTORISED BALL VALVE

 MOTORISED BALL VALVE/HANDWHEEL

 MOTORISED VALVE

 SOLENOID VALVE

 SOLENOID VALVE WITH MANUAL RESET

 SOLENOID VALVE WITH REMOTE RESET

 3 WAY SOLENOID VALVE

 3 WAY SOLENOID VALVE WITH MANUAL RESET

 3 WAY SOLENOID VALVE WITH REMOTE RESET

 3 WAY SOLENOID VALVE
(OPEN PATH A TO C WHEN DEENERG)

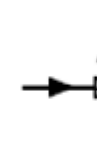
 HAND CONTROL VALVE

 SELF BACK PRESSURE

 PRESSURE REDUCING REGULATOR
WITH EXTERNAL PRESSURE TAP

 BACK PRESSURE REGULATOR
WITH EXTERNAL PRESSURE TAP

 ON/OFF OPERATED VALVE
(XV, SDV, BDV, ESDV)

 ANGLE CONTROL VALVE

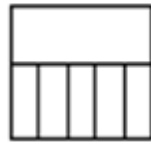


SYMBOL	DESCRIPTION		
	OPEN VENT		OPEN VENT WITH BIRD SCREEN
	SYPHONE DRAIN (SEAL LEG)		CALIBRATED LEVEL GLASS
	LIQUID SEAL, OPEN		
	LIQUID SEAL, CLOSED		
	BURSTING DISC		JET AERATOR
	SIGHT GLASS		SPECIAL ITEM
	DESUPERHEATER		
	EJECTOR		
	JET MIXER		
	RING HEADER		





FLAME ARRESTOR (GENERAL)



EXPLOSION-PROOF FLAME ARRESTOR (EXPLOSION COMES FROM THE SIDE OF THE RECTANGULAR)



DETONATION-PROOF FLAME ARRESTOR



FIRE-RESISTANT DETONATION-PROOF FLAME ARRESTOR WITH OUTLET TO THE ATMOSPHERE



FIRE-RESISTANT FLAME ARRESTOR

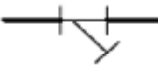
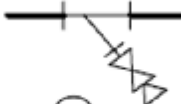
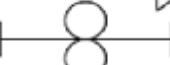


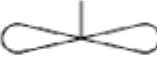
SILENCER



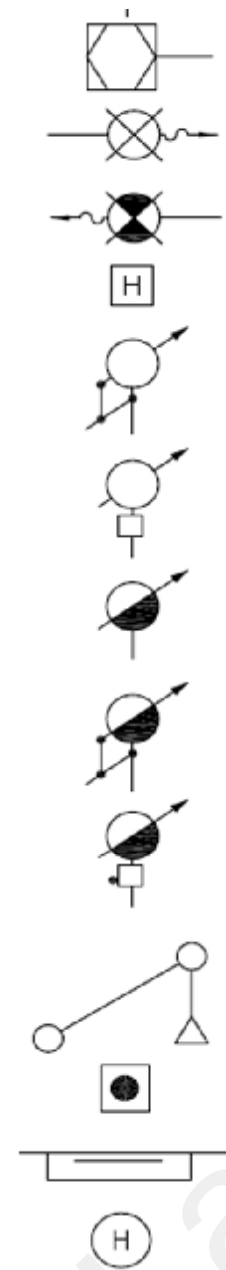
FILTER FOR COMPRESSOR



<u>SYMBOL</u>	<u>DESCRIPTION</u>
	BUCKET (BASKET) TYPE STRAINER
	TEMPORARY STRAINER (CONE TYPE)
	T-TYPE STRAINER
	Y-TYPE STRAINER
	Y-TYPE STRAINER (WITH VALVED DRAIN)
	DUPLEX STRAINER
	PULSATION DAMPENER
	FLEXIBLE HOSE WITH QUICK COUPLING
	FIRE HYDRANT
	FIRE HYDRANT WITH MINITOR
	DELUGE VALVE
	HYDRANT WITH WATER MONITOR
	HYDRANT WITH FOAM MONITOR

<u>SYMBOL</u>	<u>DESCRIPTION</u>
	FILTER (GENERAL)
	CARTRIDGE TYPE FILTER
	PROPELLER MIXER
	IN-LINE MIXER (STATIC)
	TURBINE MIXER
	NOZZLE (BLINDED OFF)
	FLEXIBLE HOSE
	EXPANSION JOINT
	"DRIP RING" ON CATALYST LINES. SEE DETAIL ON SECTION 3
	SWING ELBOW





YARD HYDRANT

HOSE REEL

FOAM HOSE REEL

HOSE BOX

ELEVATED FIRE MONITOR

REMOTE FIRE MONITOR

FOAM MONITOR

ELEVATED FOAM MONITOR

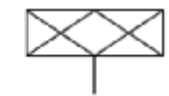
REMOTE FOAM MONITOR

LOADING ARM (BASIC SYMBOL)

PULL BOX FIRE ALARM (ALARM BUTTON)

HYDROCARBON DETECTOR

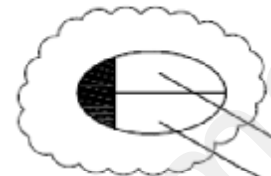
HALON PROTECTED AREA



BREATHER



SPRAY NOZZLE DEVICE



TIE-IN
UNIT

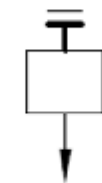
PROGRESSIVE NUMBER



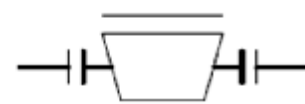
KERBED AREA



STRAHAMAN-RHAM PISTON VALVE

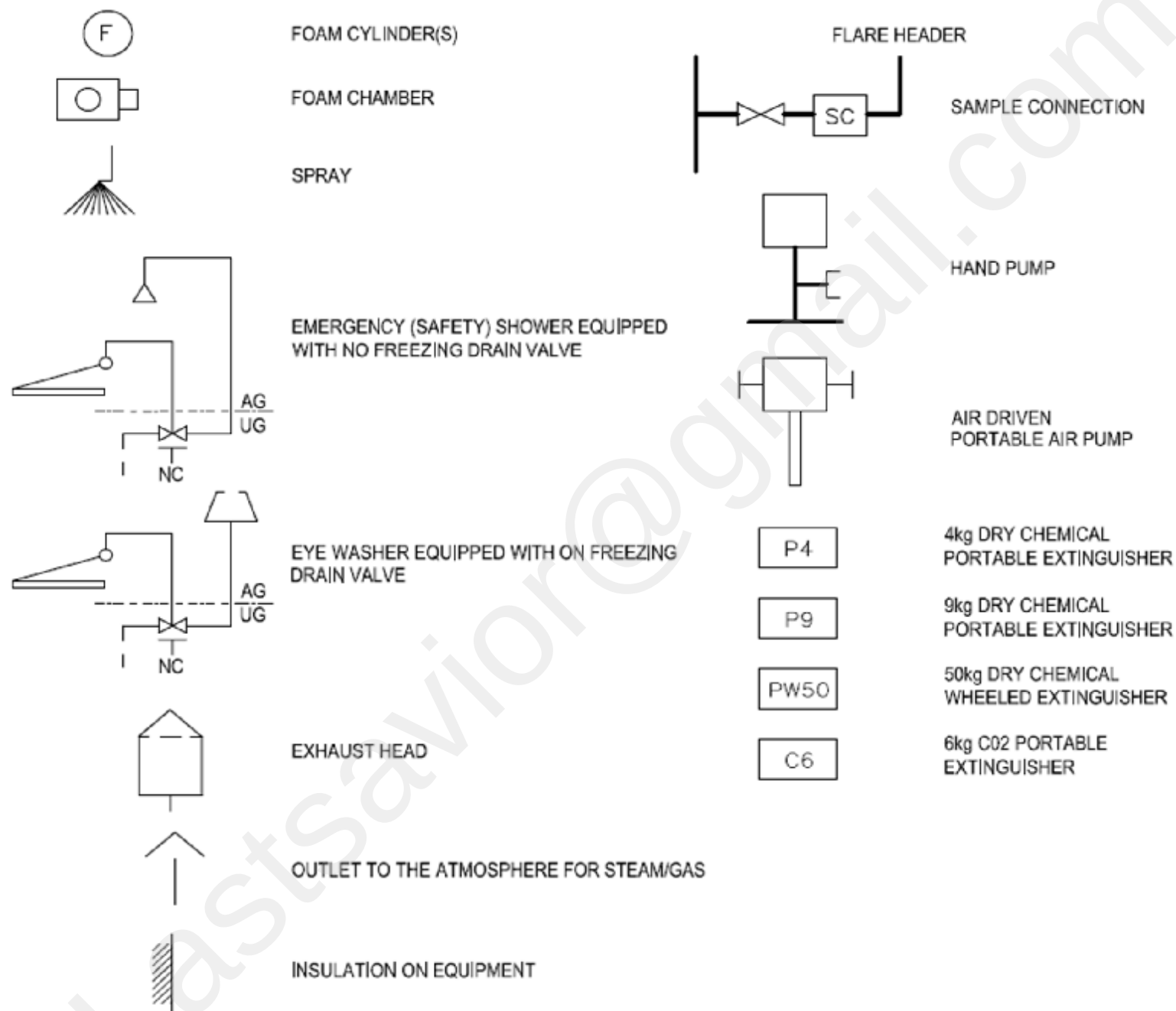


AIR TRAP

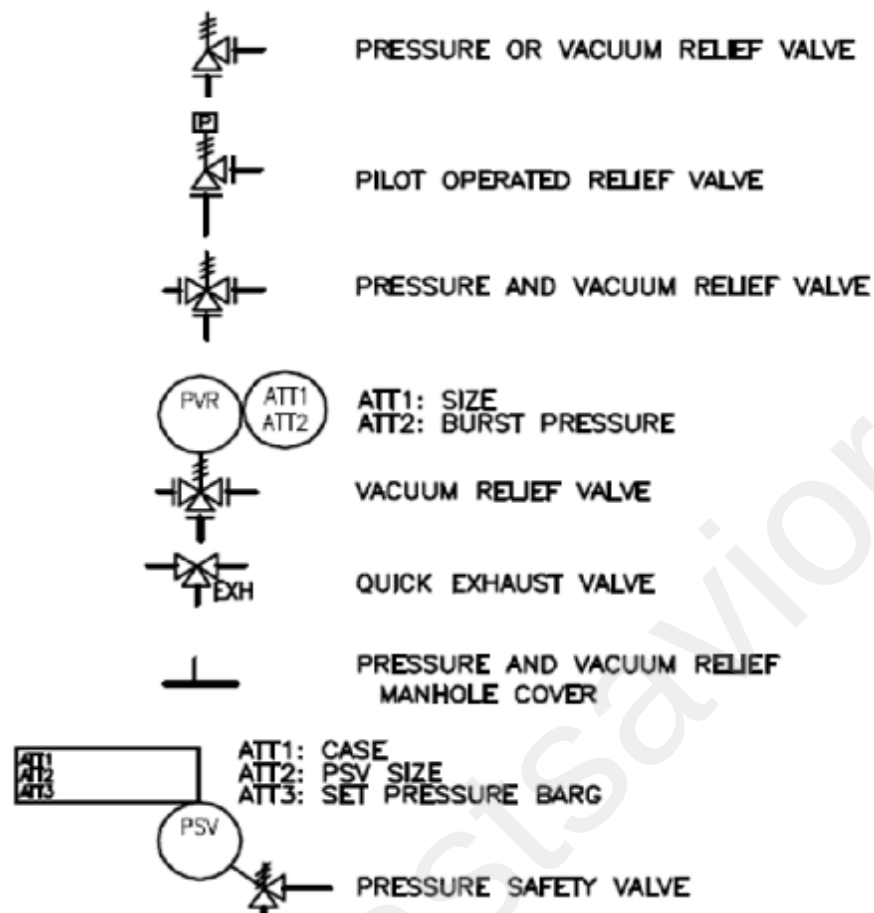


WATER TRAP

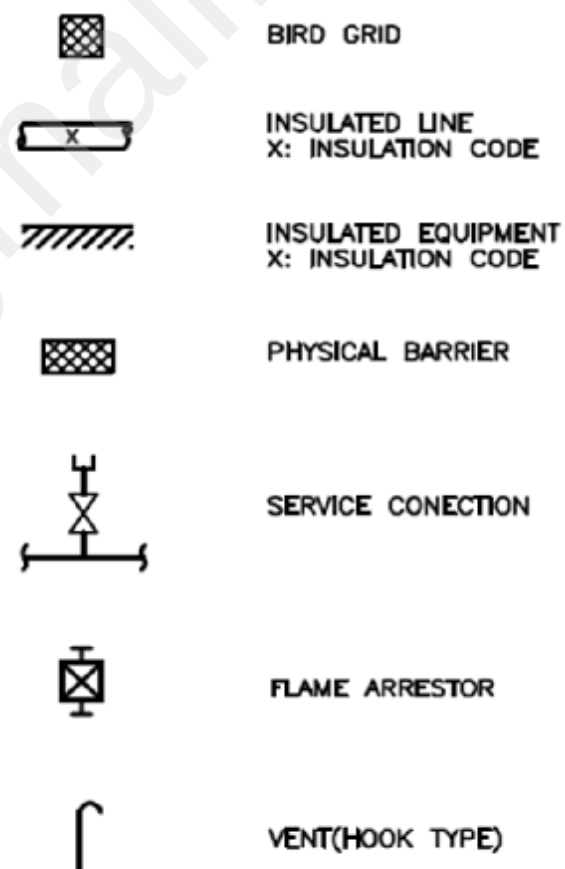


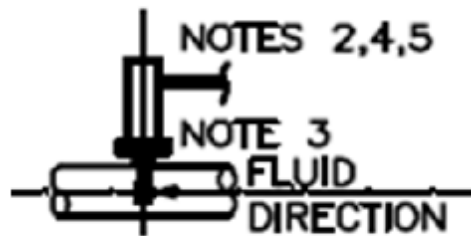


INSTRUMENTATION RELIEF VALVE



MISCELLANEOUS





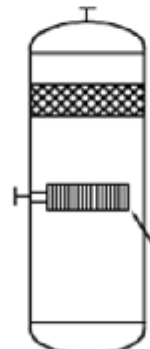
TYPE 1—RETRIEVABLE INJECTION QUILL
RIGHT ANGLE SPRAY NOZZLE TYPE
(COSASCO TYPE OR EQUIVALENT)
FOR CORROSION INHIBITOR INJECTION ONLY



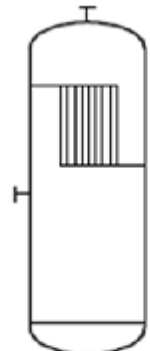
TYPE 2—RETRIEVABLE INJECTION QUILL
(COSASCO TYPE OR EQUIVALENT)



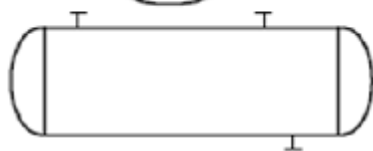
DRUMS; SEPARATORS



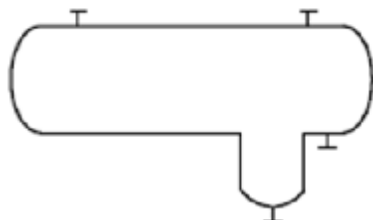
VERTICAL TWO PHASES DRUM
WITH MESH



VERTICAL TWO PHASES DRUM
WITH VANE PACK



HORIZONTAL DRUM OR SEPARATOR
TWO OR THREE PHASES



HORIZONTAL DRUM OR SEPARATOR
TWO OR THREE PHASES WITH BOOT



FLAT TOP VESSEL

COLUMNS

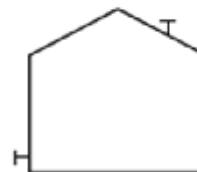


COLUMN WITH n TRAYS



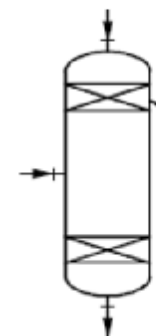
COLUMN WITH PACKING

TANK



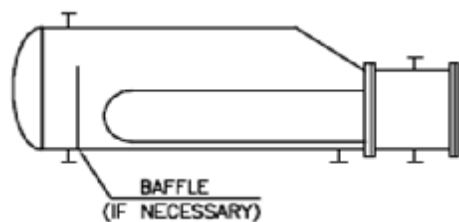
FIXED ROOF TANK

REACTOR

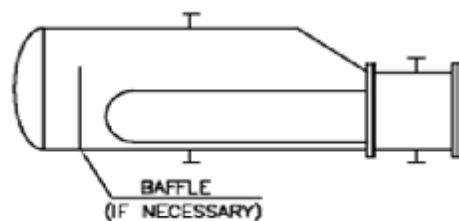


CATALYST BED

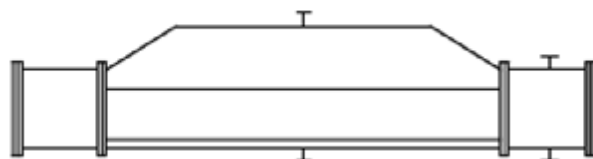
SHELL & TUBE HEAT EXCHANGERS; AIR COOLERS; HEATERS



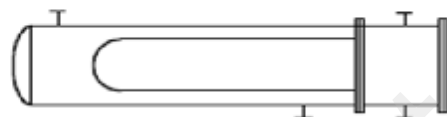
"KETTLE" TYPE
U-TUBE



"KETTLE" TYPE
FLOATING TYPE



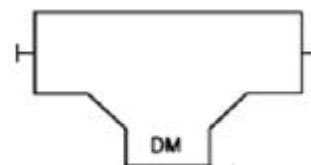
"KETTLE" TYPE
FIXED TUBE SHEET



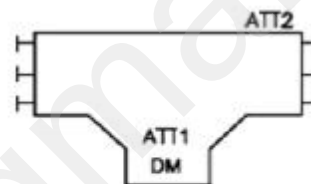
HEAT EXCHANGER (TYPE AEU)



PLATE TYPE HEAT EXCHANGER



FORCED DRAFT



AIR COOLER WITH SEVERAL BUNDLES
(ATT2) NUMBER OF FLANGES —
NUMBER OF BUNDLES
(ATT1) NUMBER OF MOTORS



FURNACE



ELECTRICAL HEATER



DESUPERHEATER

PUMPS; COMPRESSORS; DRIVERS & TURBINES



CENTRIFUGAL PUMP



BLOWER



VERTICAL PUMP



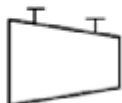
GEAR BOX



RECIPROCATING POSITIVE
DISPLACEMENT PUMP



VARIABLE
SPEED DRIVE



CENTRIFUGAL
COMPRESSOR



ELECTRIC MOTOR



MISCELLANEOUS



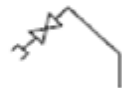
PIPE FLARE TIP



STACK



INCINERATOR



LOADING/UNLOADING ARM



CALIBRATION POT



PULSATION DAMPENER



AIR FILTER



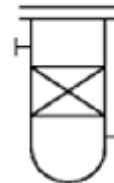
GAS FILTER



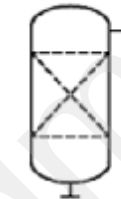
OR



CARTRIDGE FILTER



OR



CHARCOAL FILTER



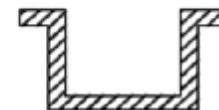
EJECTOR
INJECTOR
EDUCTOR



SILENCER



PROPANE OR
NITROGEN BOTTLE



CONCRETE SUMP



EARTH DIKE



SAND TRAP

INSTRUMENT SYMBOL IDENTIFICATION

PROCESS VARIABLE		PRIMARY ELEMENT	TRANSMITTER	SCAN	INDICATOR	RECORDER	CONTROLLER	INITIATING CONTROLLER	RECKING CONTROLLER	SWITCH				ALARM				CLASS. MEASNG DEVICE	WELL (W) CONNECTION (P)	SELF-ACTUATED REGULATOR VALVE	SOUNDING RELAY, CONVERTER, COMPUTE	FINAL ELEMENT
										ABNORMAL PROCESS FIRST STATE		ABNORMAL PROCESS SECOND STATE		ABNORMAL PROCESS FIRST STATE		ABNORMAL PROCESS SECOND STATE						
										HIGH	LOW	VERY HIGH	VERY LOW	HIGH NOTE 9	LOW NOTE 9	VERY HIGH	VERY LOW					
ANALYSIS NOTE 4	A	AE	AT	AJ	AI	AR	AC	AIC	ARC	ASH	ASL	ASHH	ASLL	AAH	AAL	AAHH	AALL	—	—	—	AY	AV
BURNER	B	BE	BT	BJ	BI	BR	BC	BIC	BRC	BSH	BSL	BSHH	BSLL	BAH	BAL	BAHH	BALL	BD	—	—	BY	BZ
	C																					
DENSITY	D		DT		DI	DR	DC	DIC	DRC	DS				DAH								
VOLTAGE	E	EE	ET		EI	ER	EC	EIC	ERC	ES				EAH								
FLOW	F	FE	FT	FJ	FI	FR	FC	FIC	FRC	FSH	FSL	FSHH	FSLL	FAH	FAL	FAHH	FALL	FG NOTE 3	—	—	FX	FV
FLOW RATE	FF	—	—	—	FFI	FFR	FFC	FFIC	FFRC	FFSH	FFSL	FFSHH	FFSLL	FFAH	FFAL	FFAHH	FFALL	—	—	—	FFY	FFV
FLOW QUANTITY	FQ	FQE	FQT	FQJ	FQI	FQR	FQC	FQIC	FQRC	FQSH	FQSL	FQSHH	FQSLL	FQAH	FQAL	FQAHH	FQALL	—	—	—	FQY	FQV
	G																					
HAND	H	—	—	—	—	—	HC	HIC	—	HS NOTE 2	—	—	NOTE 5	—	—	—	—	—	—	—	HY	HV
CURRENT	I	IE	IT	—	II	IR	IC	IRC	IRC	ISH	ISL	ISHH	ISLL	IAH	IAL	IAHH	IALL	—	—	—	IY	IZ
POWER	J	JE	JT	—	JJ	JR	JC	JIC	JRC	JSH	JSL	JSHH	JSLL	JAH	JAL	JAAH	JALL	—	—	—	JY	JV
TIME	K	KE	KT	KJ	KI	KR	KC	KIC	KRC	KSH	KSL	KSHH	KSLL	KAH	KAL	KAHH	KALL	—	—	—	KY	KV
LEVEL	L	LE	LT	LJ	LI	LR	LC	LIC	LRC	LSH	LSL	LSHH	LSLL	LAH	LAL	LAHH	LALL	LG	—	LCV	LX	LV
MOISTURE/HUMIDITY	M		MT		MI	MR				MS				MA								
	N																					
	O																					
PRESSURE/VACUUM	P	PE	PT	PJ	PI	PR	PC	PIC	PRC	PSH	PSL	PSHH	PSLL	PAH	PAL	PAHH	PALL	—	—	PCV NOTE 10	PX	PV
PRESSURE DIFFERENTIAL	PD	PDE	PDT	PDJ	PDJ	PDR	POC	POIC	PORC	POSH	POSL	POSHH	POSLL	POAH	POAL	POAHH	POALL	—	—	—	POX	POV
QUANTITY	Q	QE	QT	QJ	QI	QR	QC	QIC	QRC	QSH	QSL	QSHH	QSLL	QAH	QAL	QAAH	QALL	—	—	—	QY	QZ
RADIATION	R	RE	RT	RJ	RI	RR	RC	RIC	RRC	RSH	RSL	RSHH	RSLL	RAH	RAL	RAHH	RALL	—	—	—	RY	RZ
SPEED/FREQUENCY	S	SE	ST	—	SI	SR	SC	SIC	SRC	SSH	SSL	SSHH	SSLL	SAH	SAL	SAHH	SALL	—	—	—	SY	SV
TEMPERATURE	T	TE NOTE 8	TT	TJ	TI NOTE 8	TR	TC	TIC	TRC	TSH	TSL	TSHH	TSLL	TAH	TAL	TAHH	TALL	—	—	TCV	TX	TV
TEMPERATURE DIFFERENTIAL	TD	TDE	TDT	TDJ	TDJ	TDR	TDC	TDIC	TDRC	TDSH	TDSL	TDSHH	TDSSL	TDAH	TDAL	TDAAH	TDALL	—	—	—	TDX	TDV
MULTIVARIABLE	U	—	—	UJ	UI	UR															UY	UV
VIBRATION	V	VE	VT	VJ	VI	VR	VC	—	—	VSH	VSL	VSHH	VSLL	VAH	VAL	VAAH	VALL	—	—	—	VY	VZ
WEIGHT	W	WE	WT	—	WI	WR	WC	WIC	WRC	WSH	WSL	WSHH	WSLL	WAH	WAL	WAAH	WALL	—	—	—	WY	WZ
UNCLASSIFIED	X																					
STATE	Y	YE	YT	YJ	YI	YR	YC	YIC	YRC	YSH	YSL	YSHH	YSLL	YAH	YAL	YAAH	YALL	—	—	—	YY	YZ
POSITION NOTE 1	Z	ZE	ZT	ZJ	ZI	ZR	ZC	ZIC	ZRC	ZSH	ZSL			ZAH	ZAL			—	—	—	ZY	ZV

INSTRUMENT TAGGING

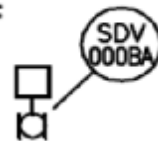
INSTRUMENT NUMBERING SHALL CONSIST OF A BALLON TYPE SYMBOL WITH A TOP LINE OF TEXT FOR AN IDENTIFIER AND A BOTTOM LINE OF TEXT FOR A NUMBER.

—UNLESS OTHERWISE SHOWN ALL INSTRUMENTS ARE PREFIXED "UNIT"



FFF: FUNCTION CODE
NNNN: SERIAL No. STARTING WITH 0001
S: SUFFIX

EX.:

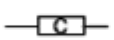


DESIGNATION	SIGNAL
E	VOLTAGE
I	CURRENT
H	HYDRAULIC
O	ELECTROMAGNETIC
P	PNEUMATIC
R	RESISTANCE
mV	MILLIVOLTS
A	ANALOG
D	DIGITAL

INSTRUMENT FUNCTION SYMBOLS

	LOCALLY MOUNTED		SUMMING
	CONTROL ROOM, PANEL MOUNTED INSTRUMENT (NORMALLY ACCESSIBLE TO OPERATOR)		AVERAGING
	CONTROL ROOM, MOUNTED (NORMALLY NOT ACCESSIBLE TO OPERATOR)		DIFFERENCE
	LOCAL PANEL MOUNTED INSTRUMENT (NORMALLY ACCESSIBLE TO OPERATOR)		PROPORTIONAL
	LOCAL ALARM LAMP		INTEGRAL
	LOCAL ANNOUNCIATOR		DERIVATIVE
	BEHIND LOCAL PANEL MOUNTED INSTRUMENT (NORMALLY NOT ACCESSIBLE TO OPERATOR)		MULTIPLYING
	LOCAL GAUGE BOARD MOUNTED		DIVIDING
	TECHNICAL ROOM MOUNTED		ROOT EXTRACTION
	AVAILABLE ON VDU. DCS FUNCTION, NORMALLY ACCESSIBLE TO OPERATOR (H/L-HIGH/LOW ALARM, IF APPLICABLE)		EXPONENTIAL
	DCS FUNCTION NOT AVAILABLE TO OPERATOR		NON LINEAR OR UNSPECIFIED FUNCTION
	DCS FUNCTION, NORMALLY NOT ACCESSIBLE TO OPERATOR (XX - RELAY FUNCTION, IF APPLICABLE)		TIME FUNCTION
			HIGH SELECTING
			LOW SELECTING
			HIGH LIMITING
			LOW LIMITING

	STATUS INDICATION WITHIN DCS (OPEN/CLOSE, RUN/STOP)		REVERSE PROPORT.
	PLC SYSTEM FUNCTION (NORMALLY NOT ACCESSIBLE TO OPERATOR)		VELOCITY LIMITER
	F&G SYSTEM FUNCTION (NORMALLY NOT ACCESSIBLE TO OPERATOR)		BIAS (M=X+B)
	PLC SYSTEM FUNCTION (NORMALLY ACCESSIBLE TO OPERATOR)		BIAS (M=X-B)
	F&G SYSTEM FUNCTION (NORMALLY ACCESSIBLE TO OPERATOR)		BIAS (M=X B)
	LOCAL PLC SYSTEM FUNCTION (NORMALLY ACCESSIBLE TO OPERATOR)		CONVERT (OUTPUT=f (INPUT))
	LOCAL PLC SYSTEM FUNCTION (NORMALLY NOT ACCESSIBLE TO OPERATOR)		3 WAY SWITCH
	COMPUTER FUNCTION MONITORING SYSTEM (FIELD LOCATED, NORMALLY NOT ACCESSIBLE TO OPERATOR)		4 WAY SWITCH
	COMPUTER FUNCTION MONITORING SYSTEM (CONTROL ROOM LOCATED, NORMALLY NOT ACCESSIBLE TO OPERATOR)		AUDIBLE ALARM
	MMS MACHINE MONITORING SYSTEM (CONTROL ROOM LOCATED, NORMALLY NOT ACCESSIBLE TO OPERATOR)		DCS PROCESS INTERLOCK
	INTELLIGENT MOTOR CONTROL CENTER (MCC/SWITCHGEAR)		FIRE & GAS SYSTEM
	INSTRUMENT WITH HEAT TRACING & INSULATION		PLC INTERLOCK (FOR PACKAGE UNIT)
	ESD LEVEL 1 (ESD1) (NOTE 11)		THYRISTORS PANEL
	ESD LEVEL 2 (ESD2) (NOTE 11)		
	ESD LEVEL 3 (ESD3) (NOTE 11)		
	USS (NOTE 11)		

	ELECTROMAGNETIC FLOWMETER		SINGLE PORT PITOT TUBE (OR ANNUBAR)
	ULTRASONIC FLOWMETER		TURBINE TYPE PRIMARY ELEMENT
	ROTAMETER		POSITIVE DISPLACEMENT FLOW TOTALIZING INDICATOR
	CORIOLIS FLOWMETER		FLOW (INDICATOR) SIGHT GLASS
	PRIMARY PRESSURE ELEMENT WITH DIAPHRAGM TYPE SEPARATOR		FLOW STRAIGHT VANE
	LEVEL INDICATOR FLOAT TYPE WITH GAUGE BOARD		VENTURI TUBE
	ORIFICE PLATE		VORTEX SENSOR
	FLANGES AND ORIFICE PLATE		
	ORIFICE PLATE IN QUICKCHANGE FITTING (SENIOR ORIFICE)		
	RESTRICTION ORIFICE		



2 - ALL FIELD TRANSMITTERS EXCEPT TEMPERATURE TRANSMITTER SHALL HAVE INTEGRAL INDICATORS, EXCEPT HEAD MOUNTED TEMPERATURE TRANSMITTER,

3 - LOCAL ELECTRONIC TYPE INDICATORS TO BE CONSIDERED ADJACENT TO CONTROL VALVE BY-PASS LOCATION.

5 - CONTROL VALVE FAILURE POSITION SHALL BE INDICATED ON P&ID'S.

6 - CONTROL VALVES SHALL BE SHOWN WITH APPROPRIATE SIZE ON ALL P&ID'S.

7 - SAFETY VALVES SHALL BE SHOWN WITH SIZE, SET PRESSURE AND ORIFICE DESIGNATION.

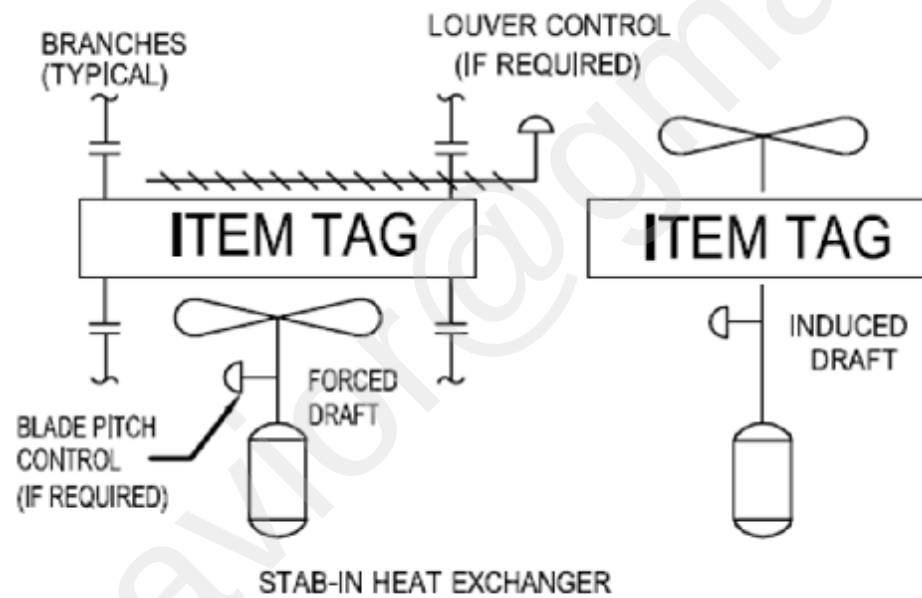
8 - DELETED.

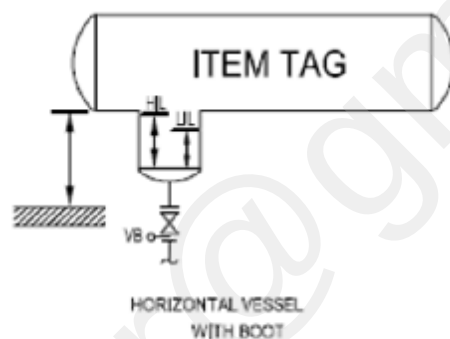
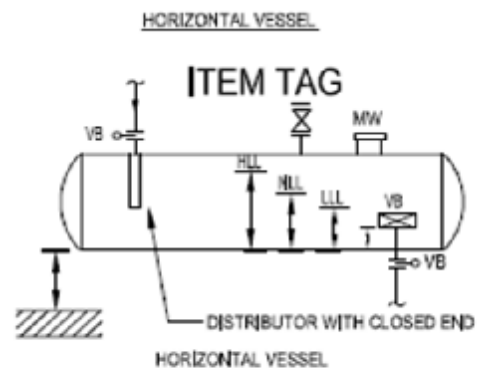
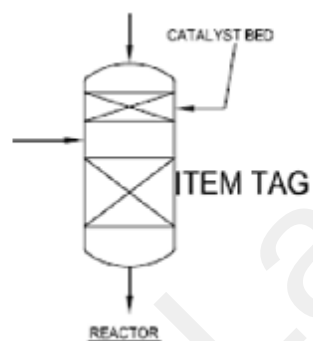
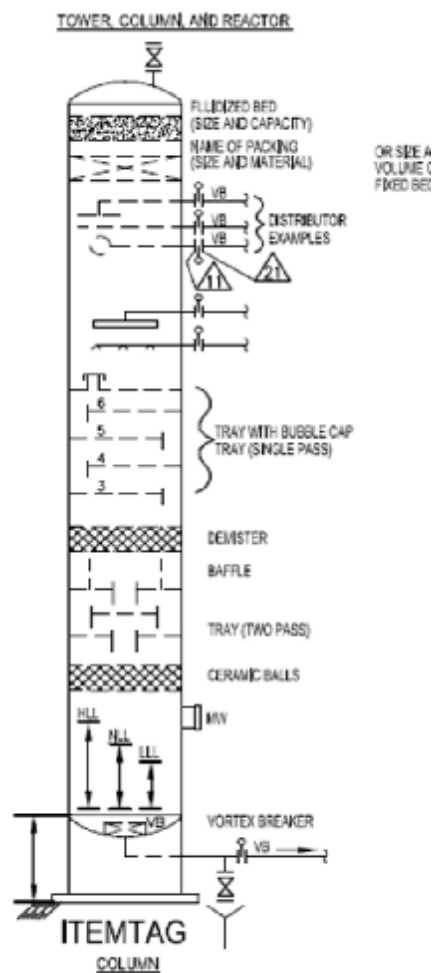
9 - ALL THERMOCOUPLE, RESISTANCE TEMPERATURE DETECTORS, AND THERMOMETER INSTALLED IN A PIPE HAVE AN ASSOCIATED THERMOWELL WHICH IS NOT SHOWN'S ON P&ID'S EXCEPT SKIN POINT TEMPERATURE.

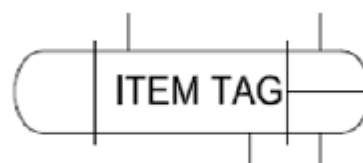
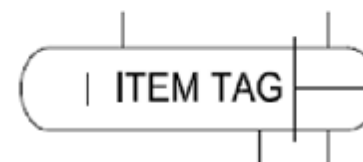
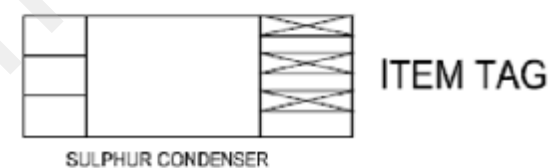
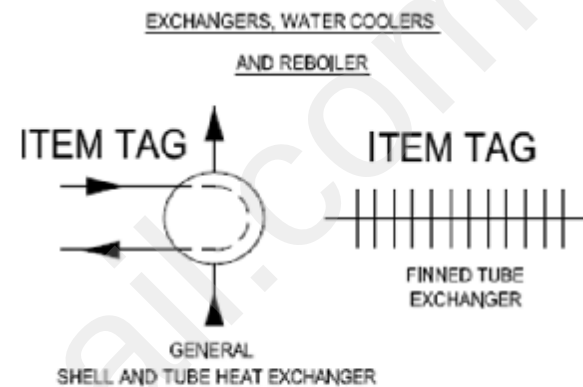
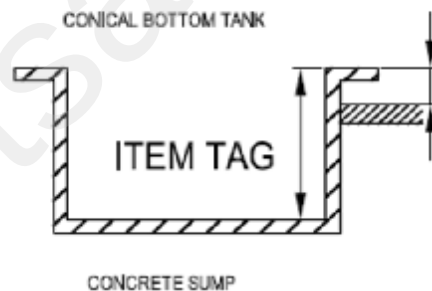
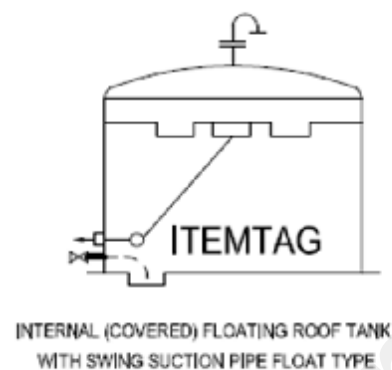
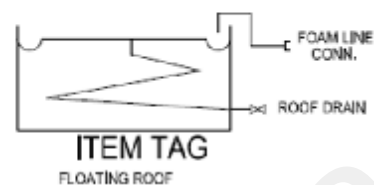
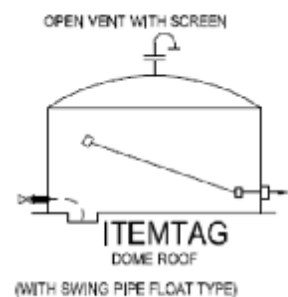
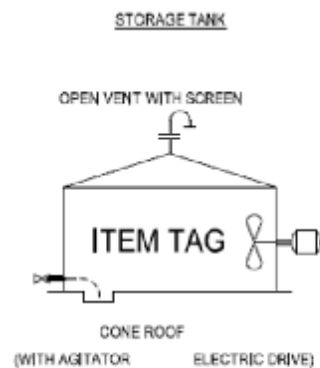
10 - SHUTDOWN VALVES SHALL BE LATCHED BY LOGIC AND RESET BY LOCALLY MOUNTED PUSH BUTTON.

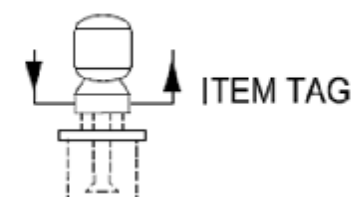
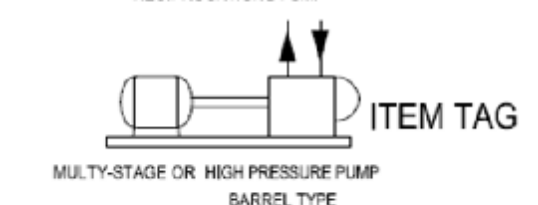
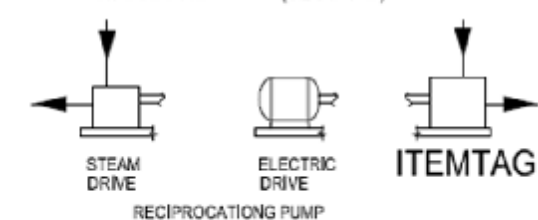
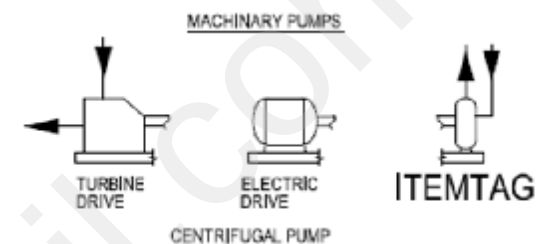
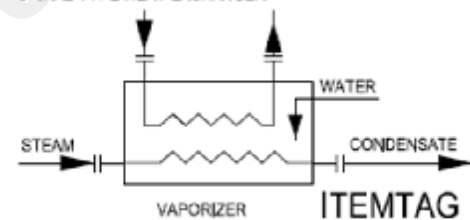
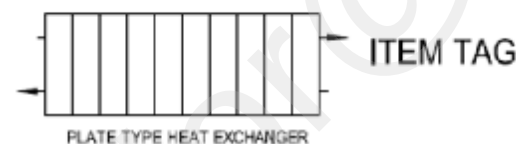
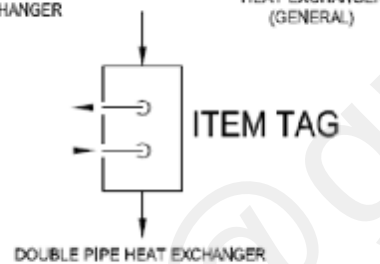
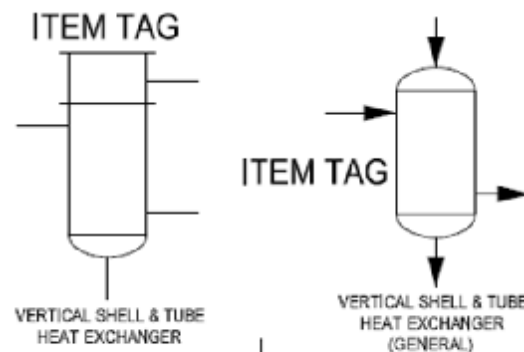
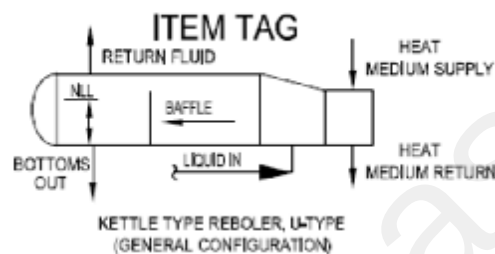
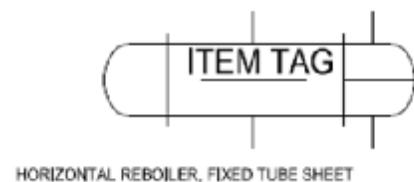


AIR COOLERS

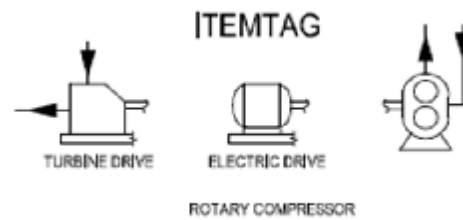
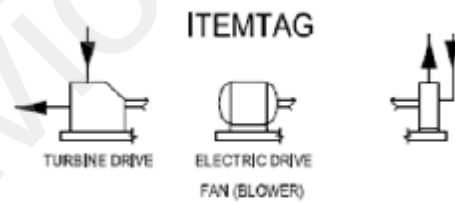
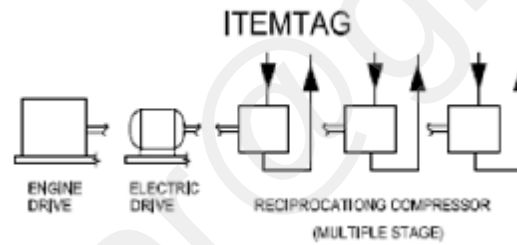
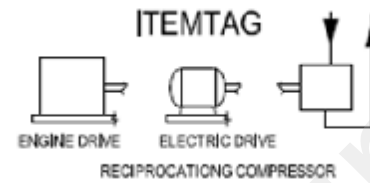
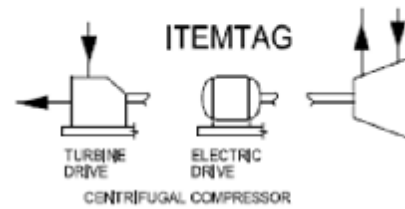






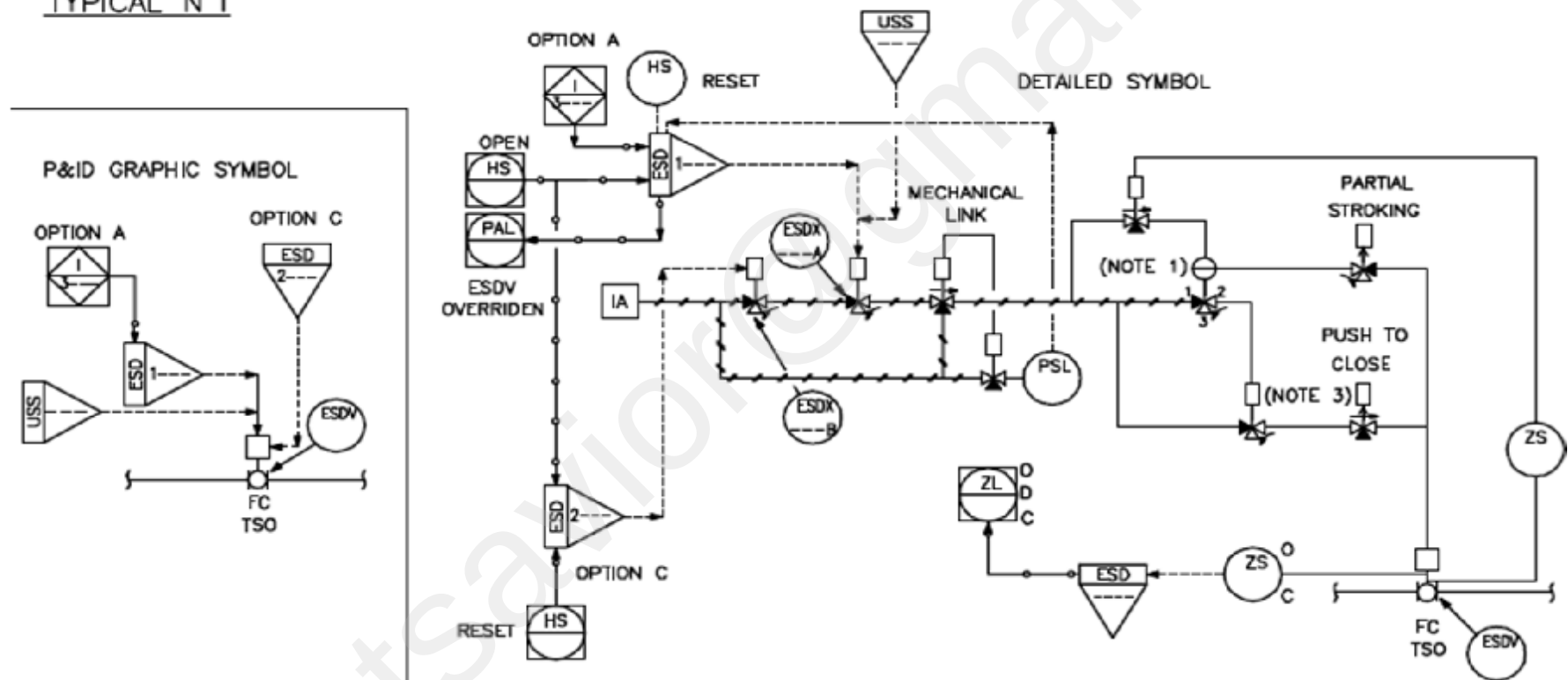


COMPRESSORS AND FANS



EMERGENCY SHUTDOWN VALVE (ESDV)
ACTIVATED BY ESD1 AND ESD2
TYPICAL N°1

OPTION A = PERMISSIVE TO OPEN
 FROM SD3
 OPTION C = ESDV ACTIVATED BY ESD2

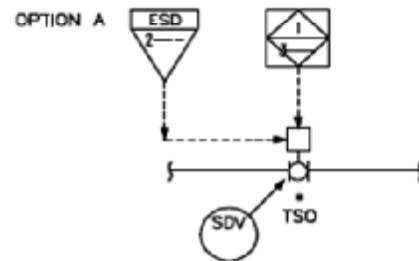


SHUTDOWN VALVE (SDV) ACTIVATED BY ESD2 AND SD3 (2 SOLENOIDS)

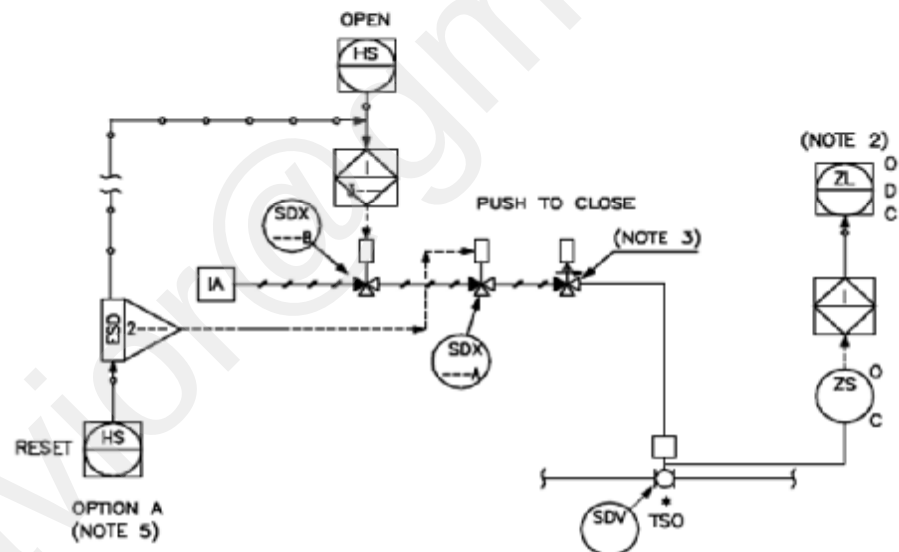
TYPICAL N°4

OPTION A = SDV ACTUATED BY ESD2

P&ID GRAPHIC SYMBOL



DETAILED SYMBOL



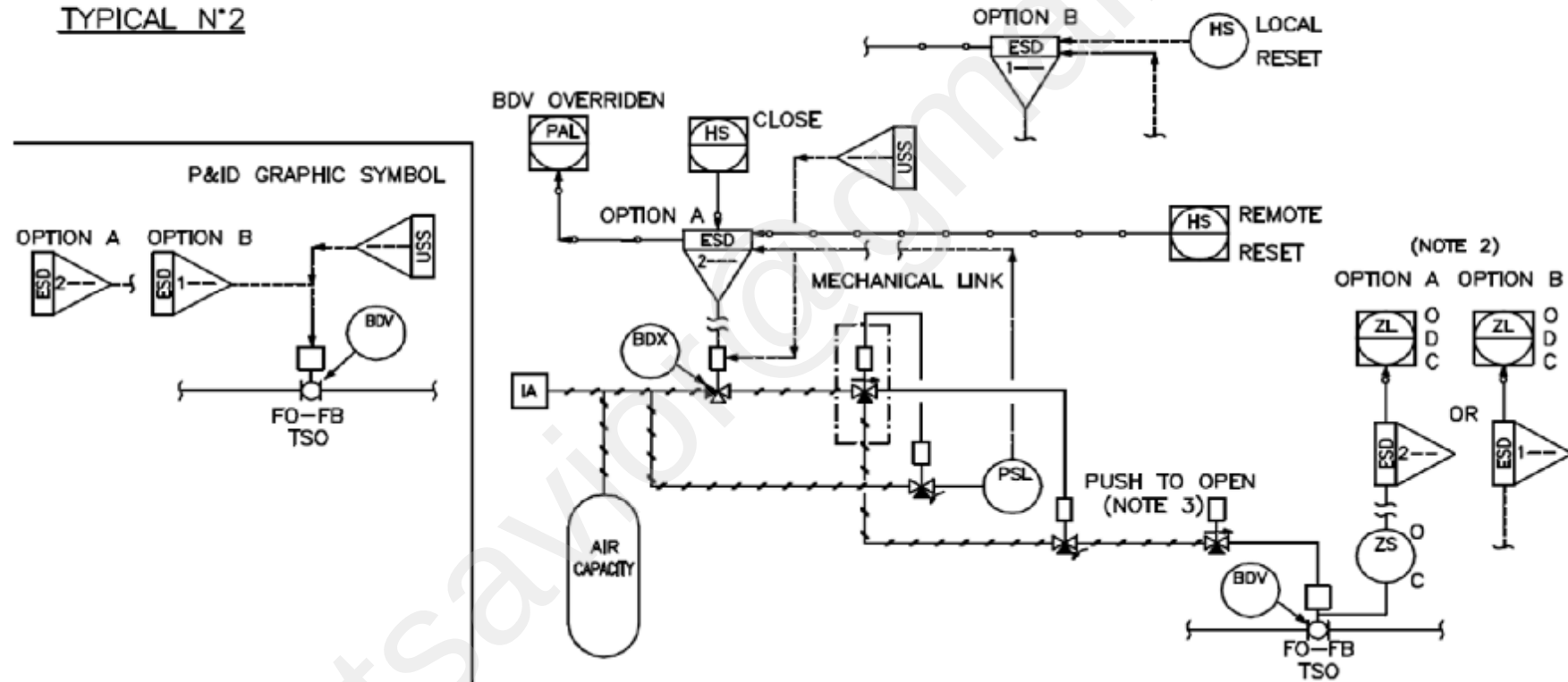
* AIR FAILURE POSITION SPECIFIED ON VALVE DATA SHEET AND PID.

BLOW DOWN VALVE (BDV) ACTIVATED BY ESD1 OR ESD2

TYPICAL N°2

DETAILED SYMBOL

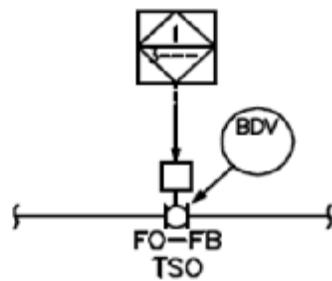
OPTION A = BDV ACTUATED BY SD2
OPTION B = BDV ACTUATED BY ESD1



BLOW DOWN VALVE (BDV) ACTIVATED BY SD3

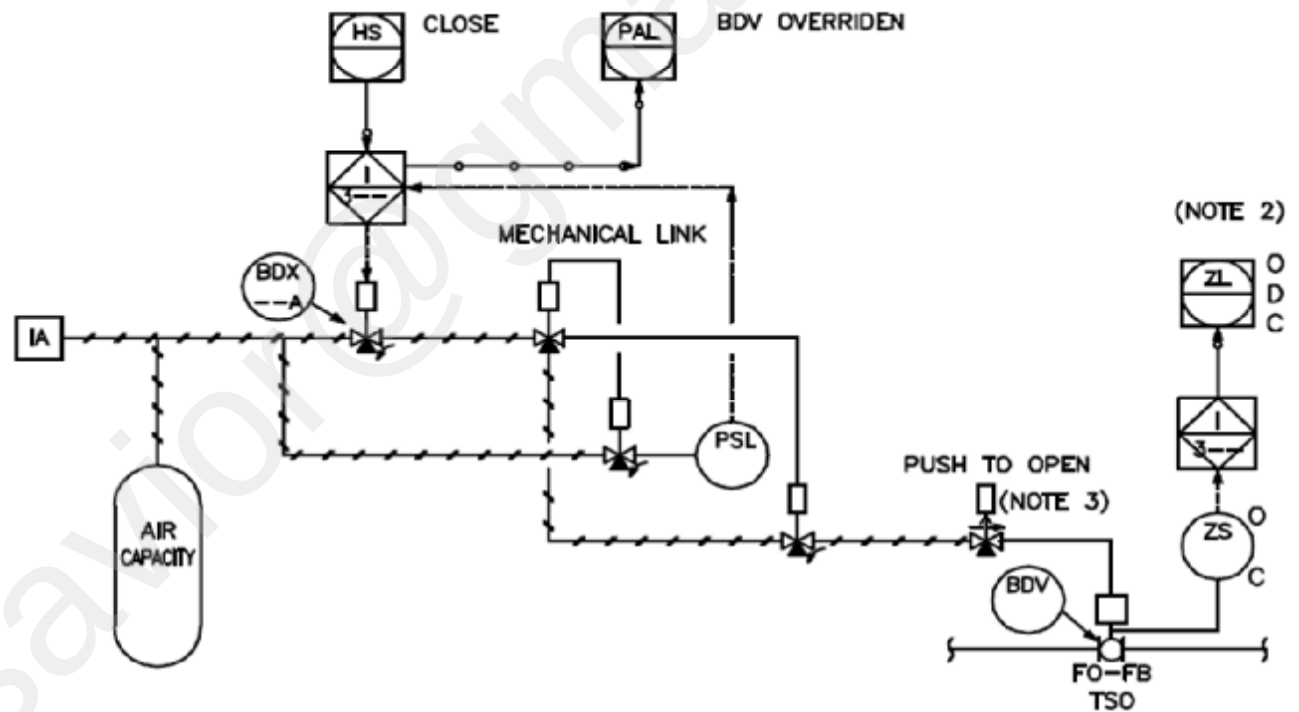
TYPICAL N°3

P&ID GRAPHIC SYMBOL

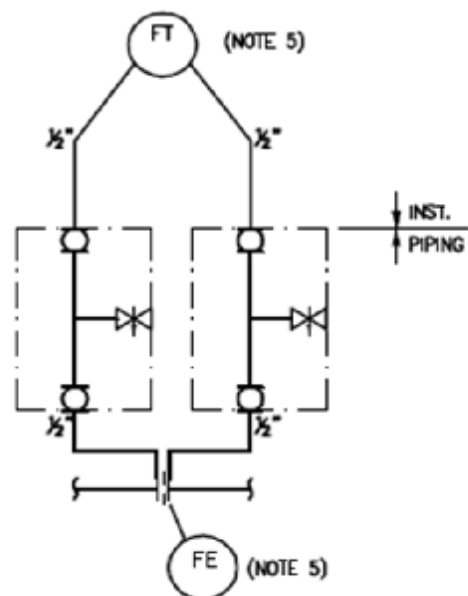


(NOTE 4)

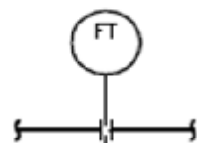
DETAILED SYMBOL



FLOW MEASUREMENT WITH ORIFICE PLATE (NOTE 1)

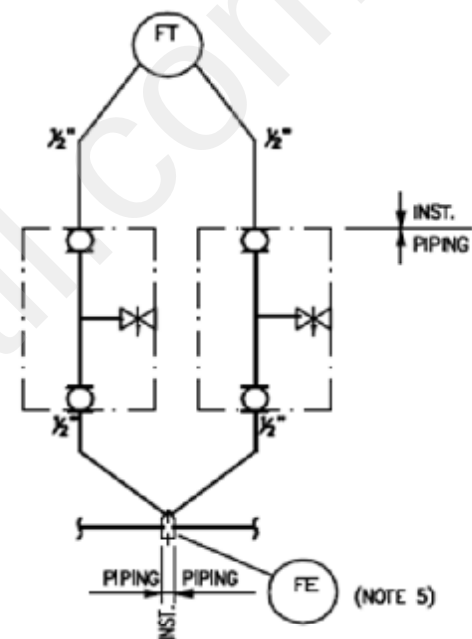


P & ID REPRESENTATION

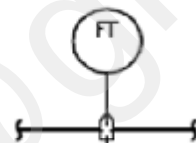


PRESSURE INSTRUMENT ON VESSEL (NOTE 1)

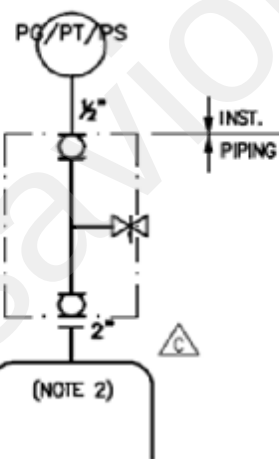
RETRACTABLE ORIFICE PLATE CARRIER (NOTE 1)



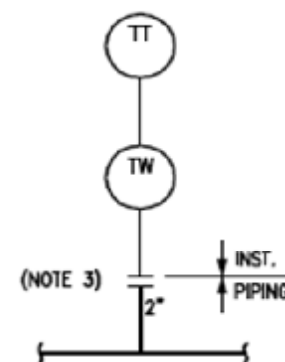
P & ID REPRESENTATION



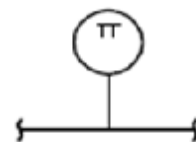
TEMPERATURE TRANSMITTER

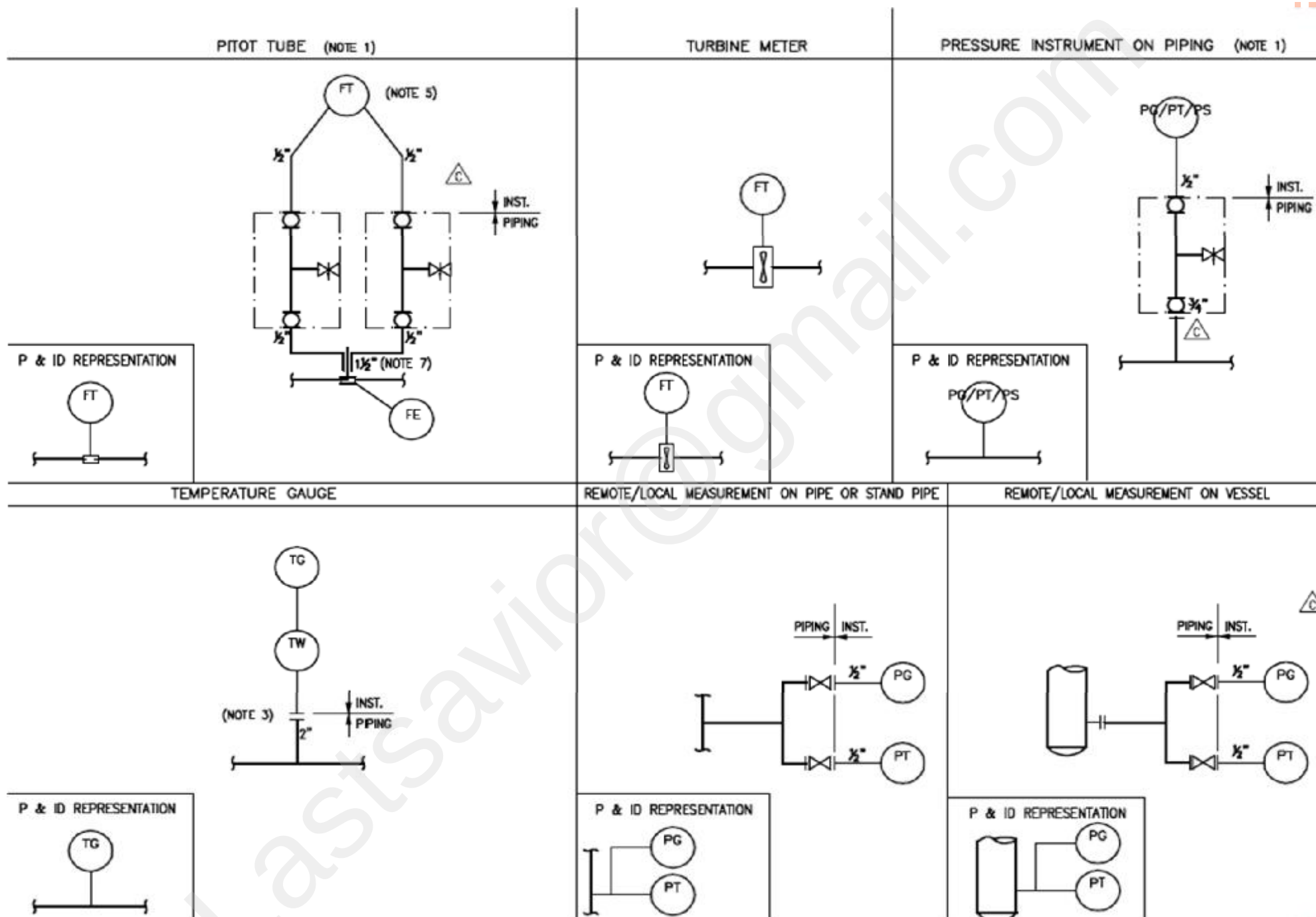


P & ID REPRESENTATION



P & ID REPRESENTATION

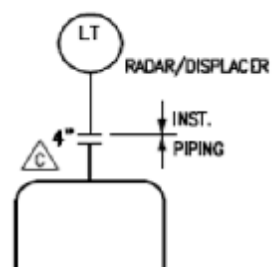
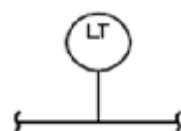




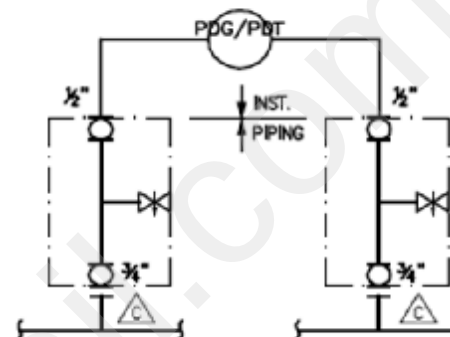
LEVEL INSTRUMENT ON VESSEL (DISPLACER OR RADAR)

DIFFERENTIAL PRESSURE INSTRUMENT ON PIPING (NOTE 1)

P & ID REPRESENTATION



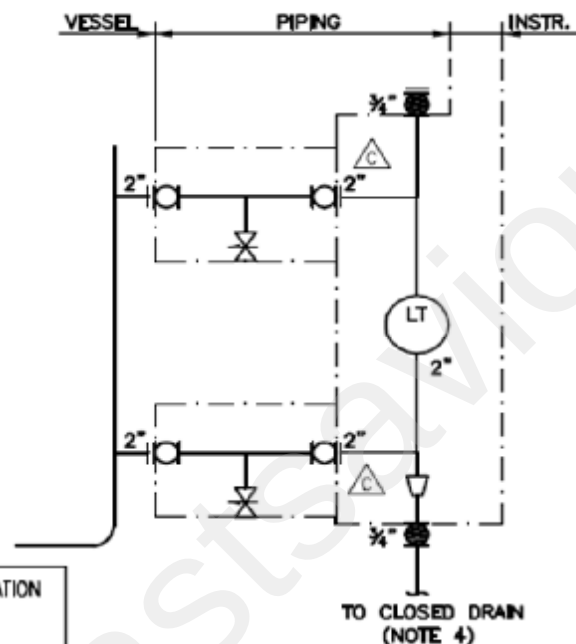
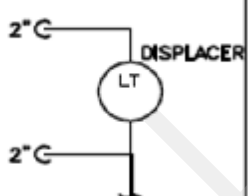
P & ID REPRESENTATION



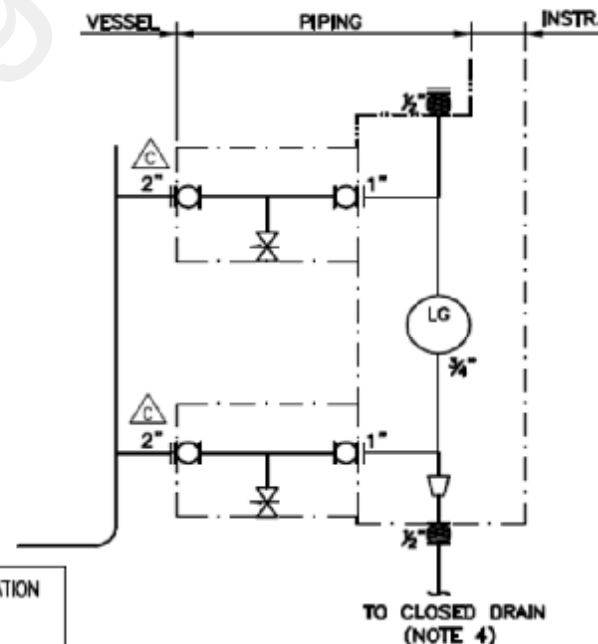
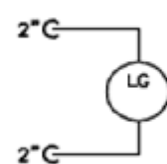
LEVEL TRANSMITTER DISPLACER TYPE (NOTE 1)

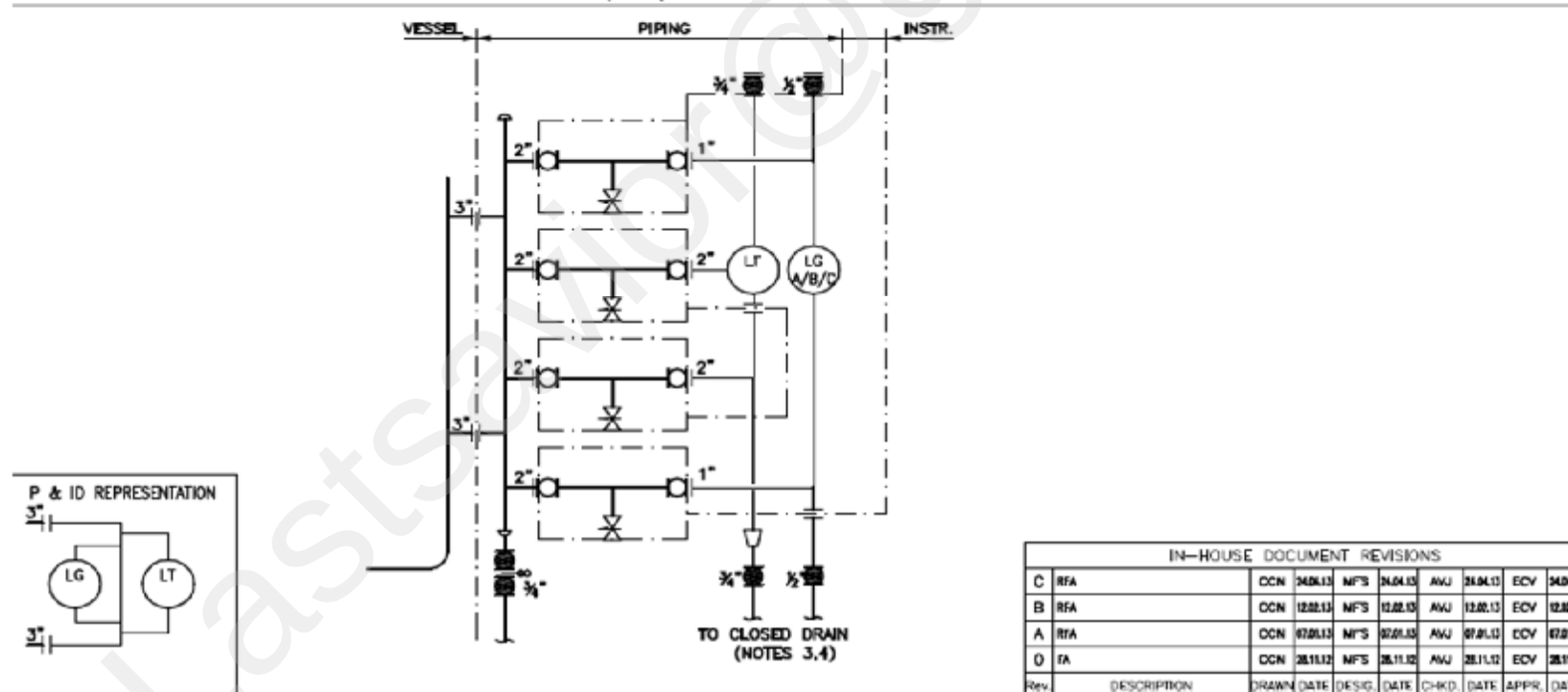
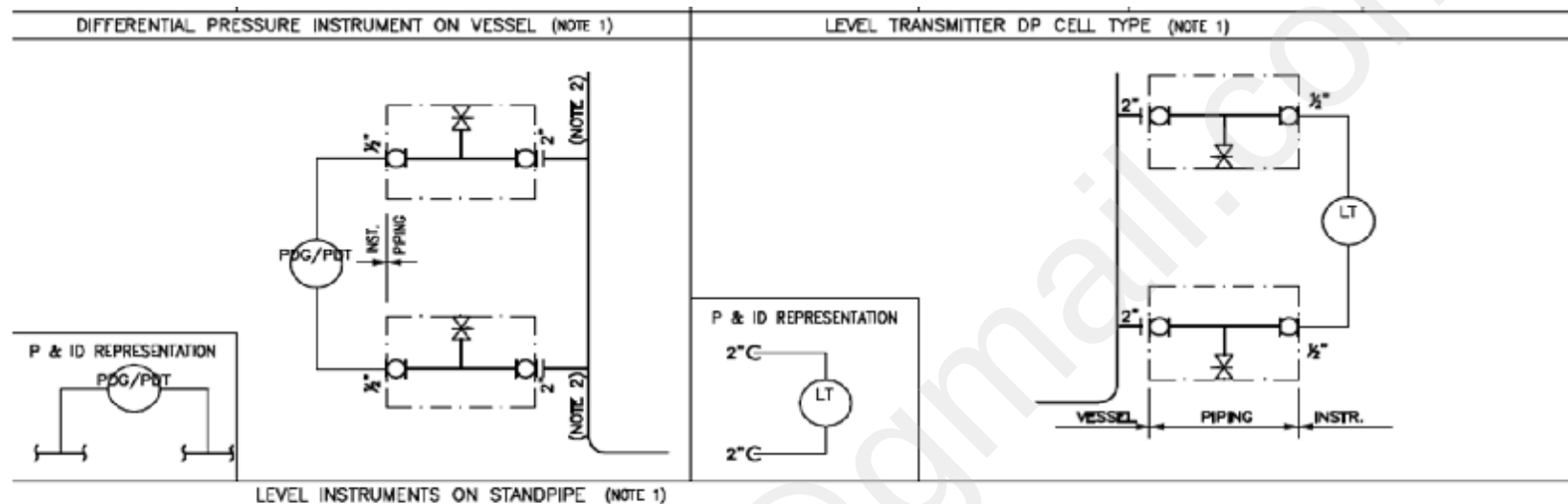
LEVEL GAUGE (NOTE 1)

P & ID REPRESENTATION



P & ID REPRESENTATION

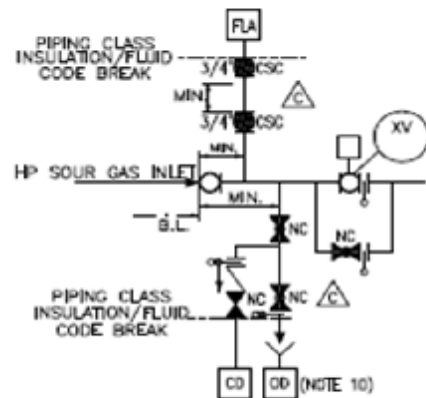




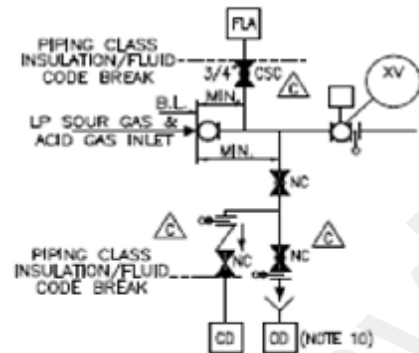
IN-HOUSE DOCUMENT REVISIONS									
C	RFA	CCN	24.04.13	MFS	24.04.13	AWJ	24.04.13	ECV	24.04.13
B	RFA	CCN	12.02.13	MFS	12.02.13	AWJ	12.02.13	ECV	12.02.13
A	RFA	CCN	07.01.13	MFS	07.01.13	AWJ	07.01.13	ECV	07.01.13
O	TA	CCN	28.11.12	MFS	28.11.12	AWJ	28.11.12	ECV	28.11.12
Rev.	DESCRIPTION	DRAWN	DATE	DESIG.	DATE	CHKD.	DATE	APPR.	DATE

TYPICAL - BATTERY LIMIT ISOLATION

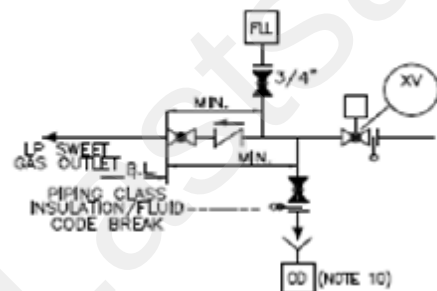
HP SOUR GAS (ANSI CLASS 600# OR MORE)



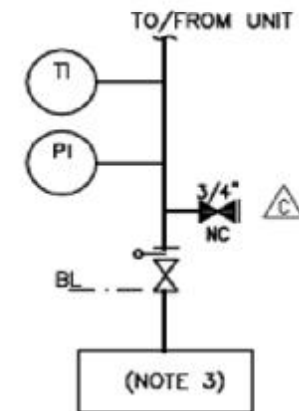
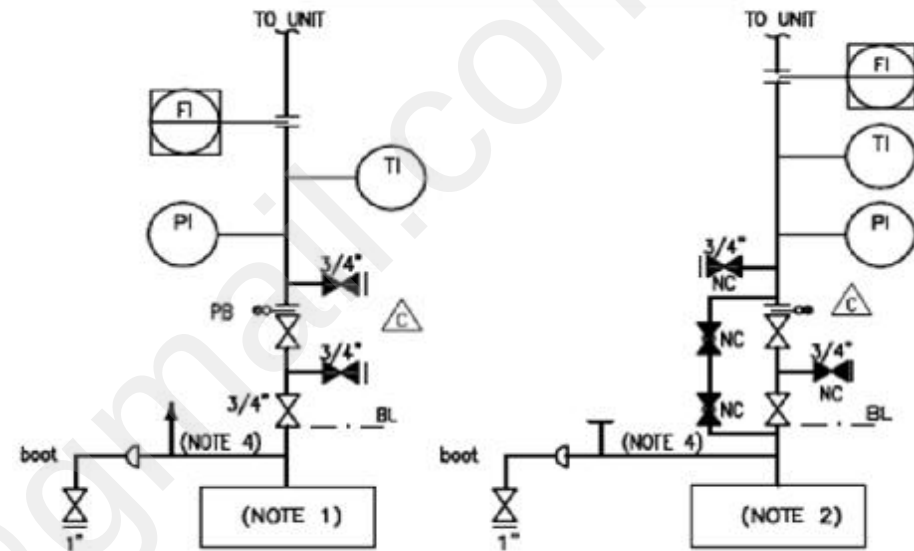
P SOUR GAS/ACID GAS (BELOW ANSI CLASS 600#)



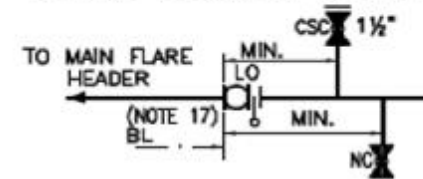
LP SWEET GAS (ANSI CLASS 600# AND BELOW)



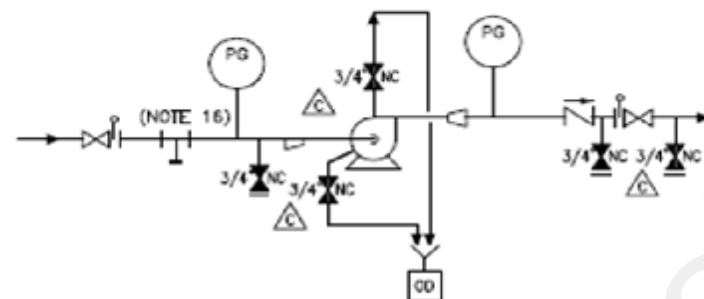
UTILITY - BATTERY LIMIT



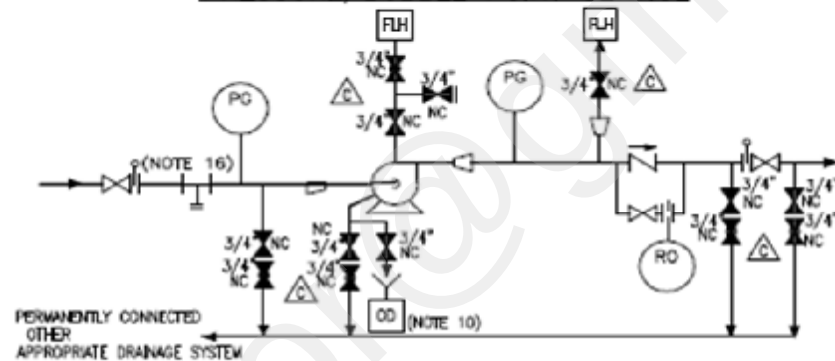
FLARE HEADER BATTERY LIMIT



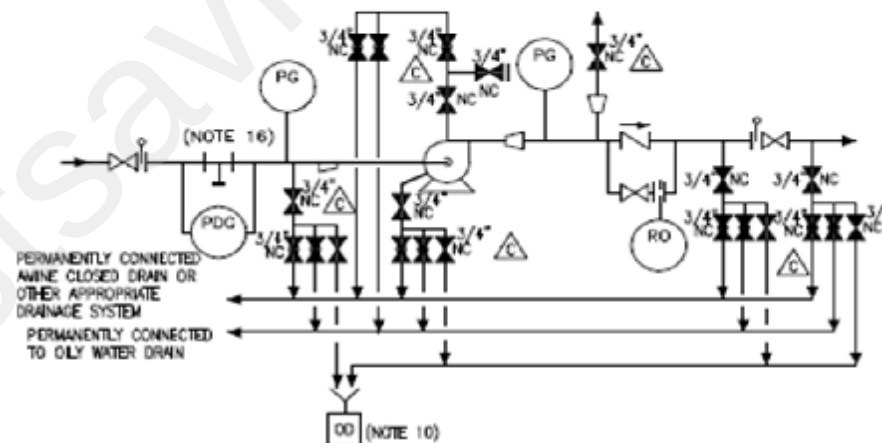
PUMP ISOLATION DETAIL "A1" – GENERAL SERVICE



DETAIL "A2" – HYDROCARBON SERVICE/HIGH VAPOUR PRESSURE/BUBBLE POINT SERVICE



DETAIL "A3" – AMINE SERVICE/TEG SERVICE OTHER CHEMICAL SERVICE



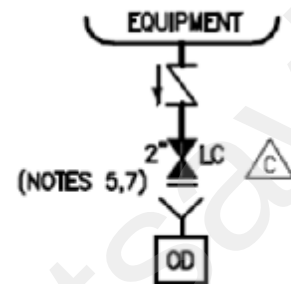
VESSELS

TABLE 1: VENTS AND DRAINS FOR VESSELS

VESSEL ID (mm)	DRAIN SIZE	VENT SIZE
1200 mm AND LESS	DN 40 (1½")	DN 40 (1½")
1200 TO 2500	DN 50 (2")	DN 50 (2")
2500 TO 3500	DN 80 (3")	DN 80 (3")
3500 TO 6000	DN 80 (3")	DN 100 (4")
6000 AND LARGER	DN 80 (3")	DN 100 (4")

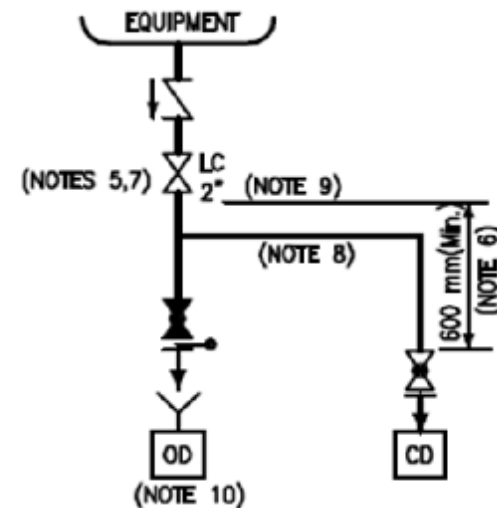
DETAIL "A4"

NON-FLAMMABLE &
NON-TOXIC



DETAIL "A5"

FLAMMABLE (Cat. A, B or C)
TOXIC & NON-TOXIC



DETAIL "A6"
DRAINS FOR LEVEL INSTRUMENTS IN HYDROCARBON, TOXIC
OR CHEMICAL SERVICE

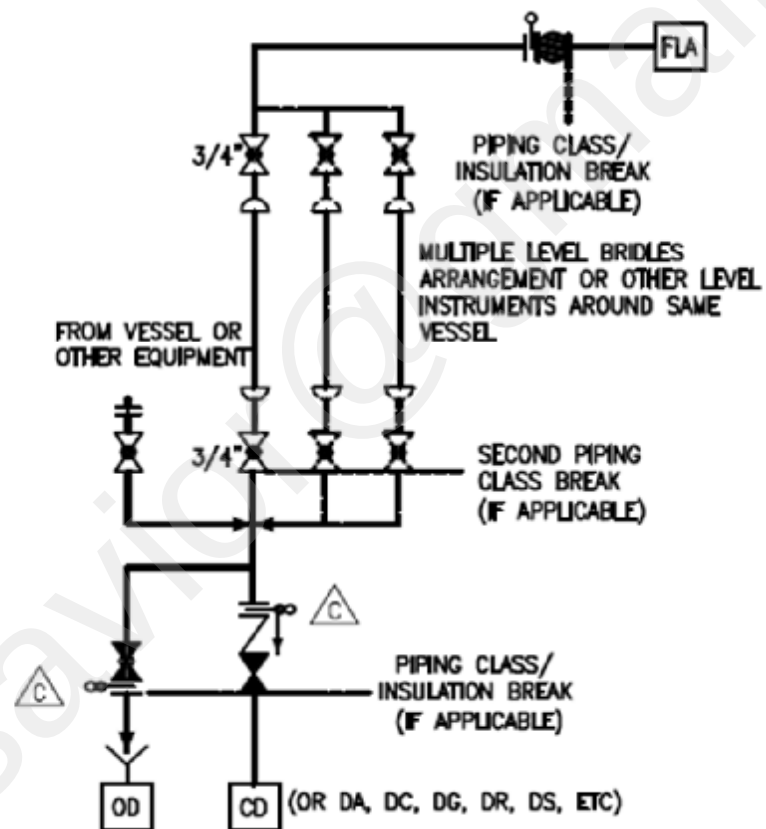


TABLE2: VENTS AND DRAINS FOR PIPING

PIPE SIZE (in)	VENT SIZE (in)	DRAIN SIZE (in)
below 4	3/4"	3/4"
4 to 8	3/4"	2"
8 & above	1"	3"

TABLE3: CONTROL VALVES

SERVICE	VALVE TYPE	UPSTREAM VENT	UPSTREAM DRAIN	DOWNSTREAM VENT	DOWNSTREAM DRAIN
PURE GAS	FO	Yes	No	No	No
	FC	Yes	No	Yes	No
SATURATED GAS	FO	Yes	Yes	No	No
	FC	Yes	Yes	Yes	Yes
PURE LIQUID	FO	No	Yes	No	No
	FC	No	Yes	No	Yes
FLASHING LIQUID	FO	No	Yes	No	No
	FC	No	Yes	Yes	Yes

Where: FO=Fail Open control valve
FC=Fail Close control valve

Based on the above, the vents and drains provided for a control valve can be combined together as shown below. Valve(s) type shall be as per applicable pipe class.

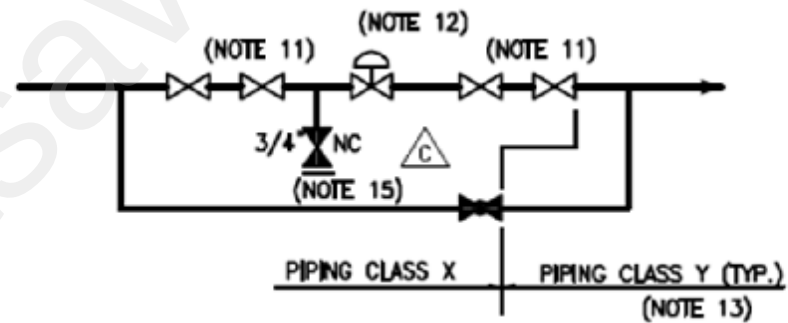
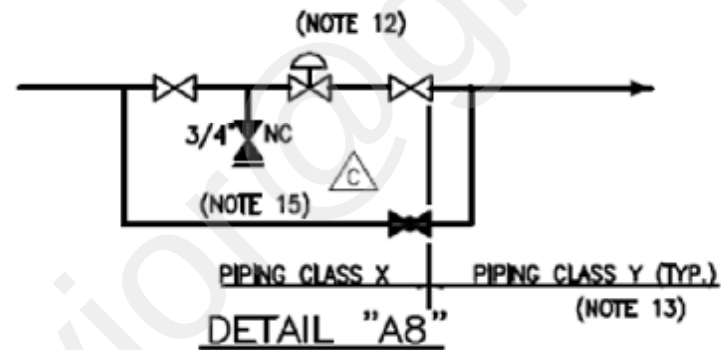


TABLE 4: VALVES ARRANGEMENT REQUIREMENTS

SERVICE	SWEET SERVICE 600#	SWEET SERVICE LESS THAN 600#	SOUR & STEAM SERVICE	
			600# AND MORE	LESS THAN 600#
CONTROL VALVES BLOCK VALVES	SINGLE	SINGLE	DOUBLED	SINGLE
CONTROL VALVES BY-PASS VALVES	SINGLE	SINGLE	DOUBLED	SINGLE

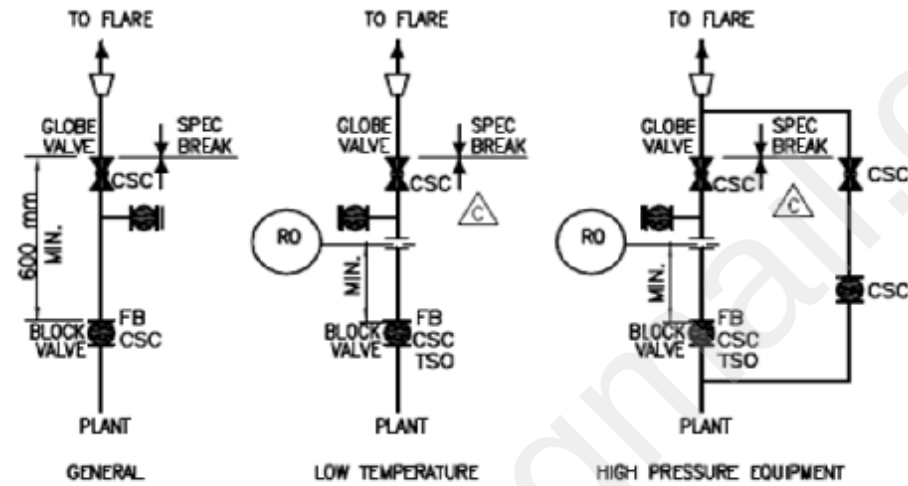
DETAIL "A7"

TYPICAL ISOLATION ARRANGEMENT



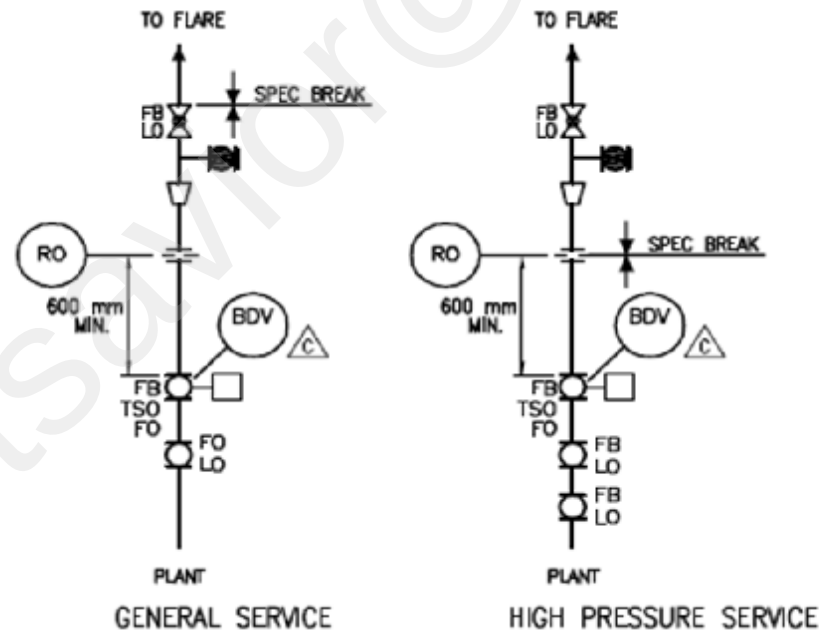
DETAIL "A9"

MANUAL BLOW DOWN



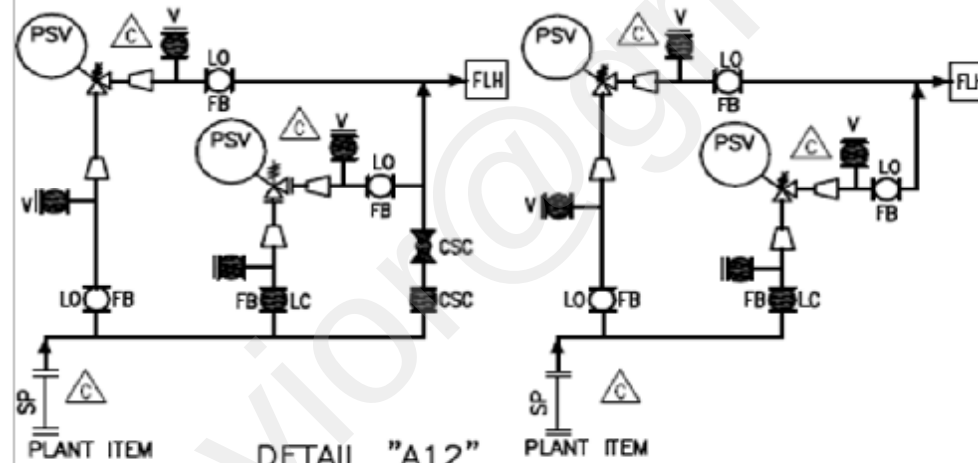
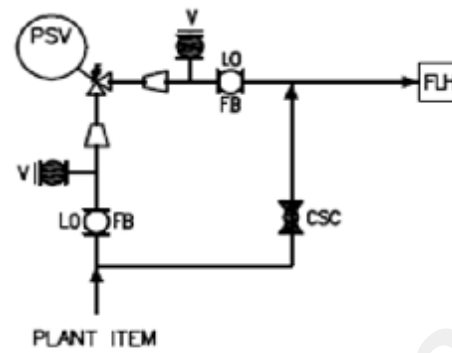
DETAIL "A10"

AUTOMATIC BLOW DOWN



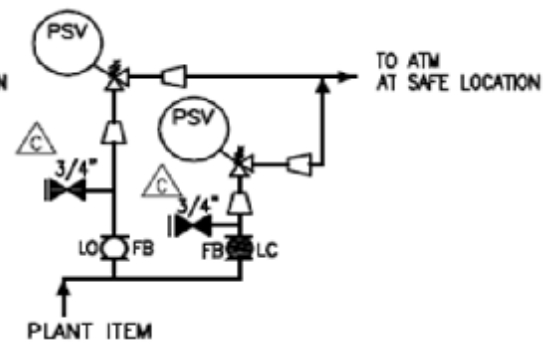
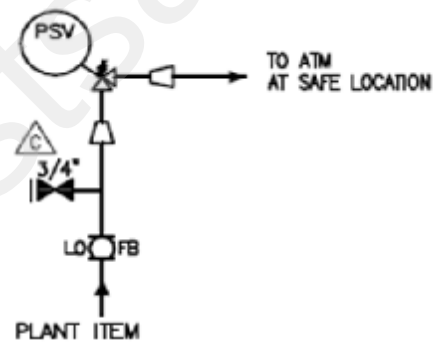
DETAIL "A11"

PRESSURE SAFETY VALVE
(TO FLARE)



DETAIL "A12"

PRESSURE SAFETY VALVE
(TO ATM)

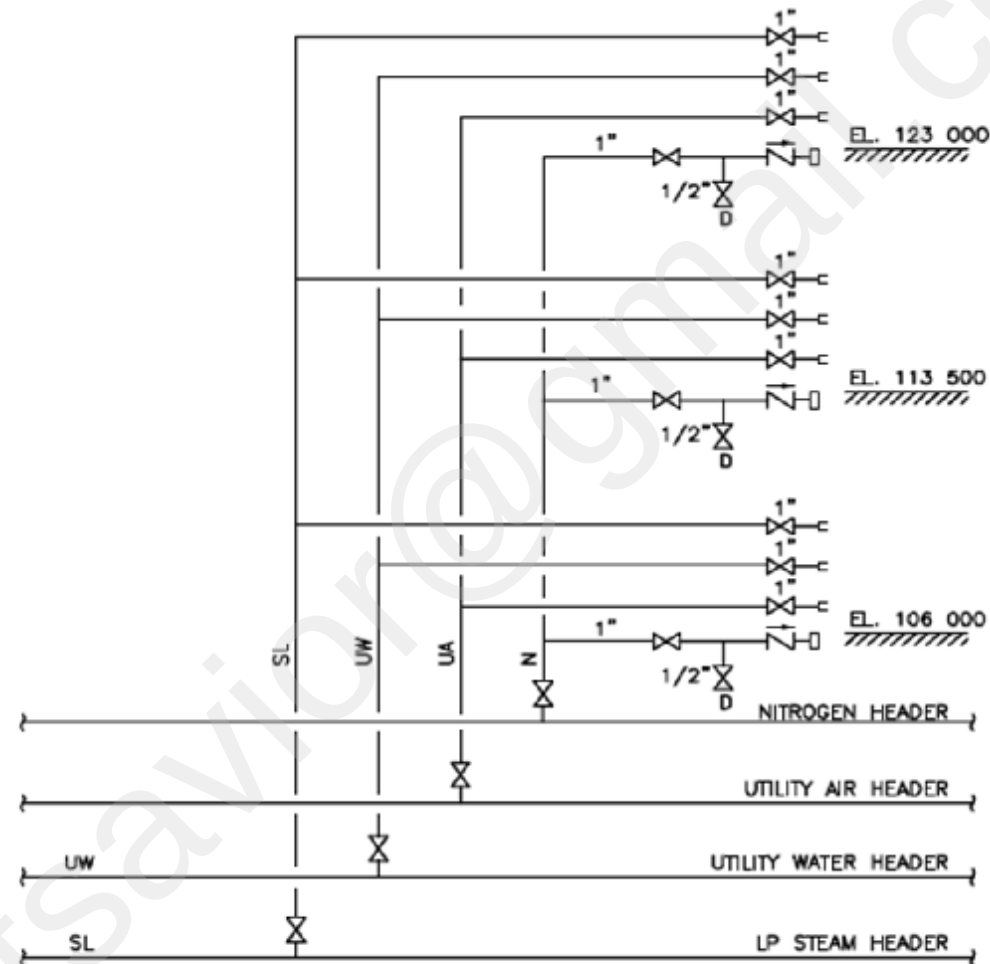


TYPICAL UTILITY STATION AT GRADE
(USE ONLY SERVICES REQUIRED)
US-A-XXX



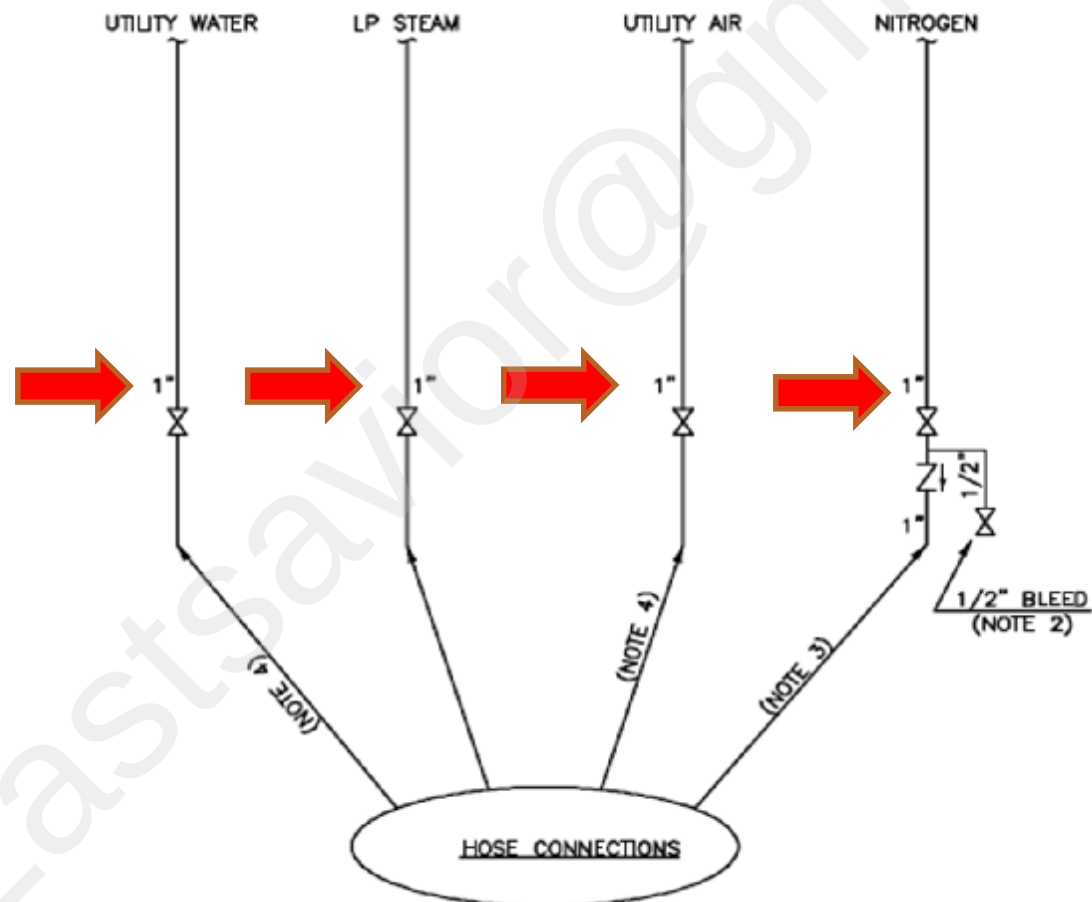
TYPICAL UTILITY STATION FOR ELEVATED/MULTIPLE INSTALLATION
(USE ONLY SERVICES REQUIRED)

US-B-XXX

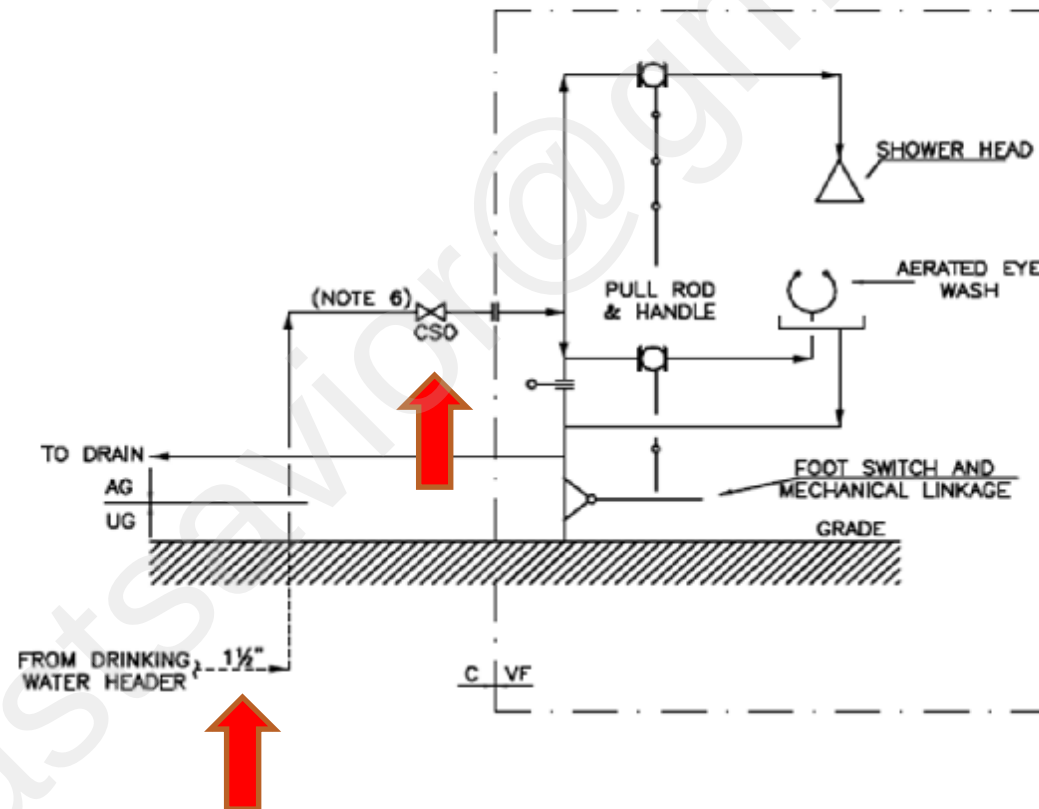


NUMBER OF CONNECTIONS	HEADER SIZE	
	NITROGEN	OTHERS
1	1"	1"
2	1½"	1"
3 OR MORE	2"	1½"

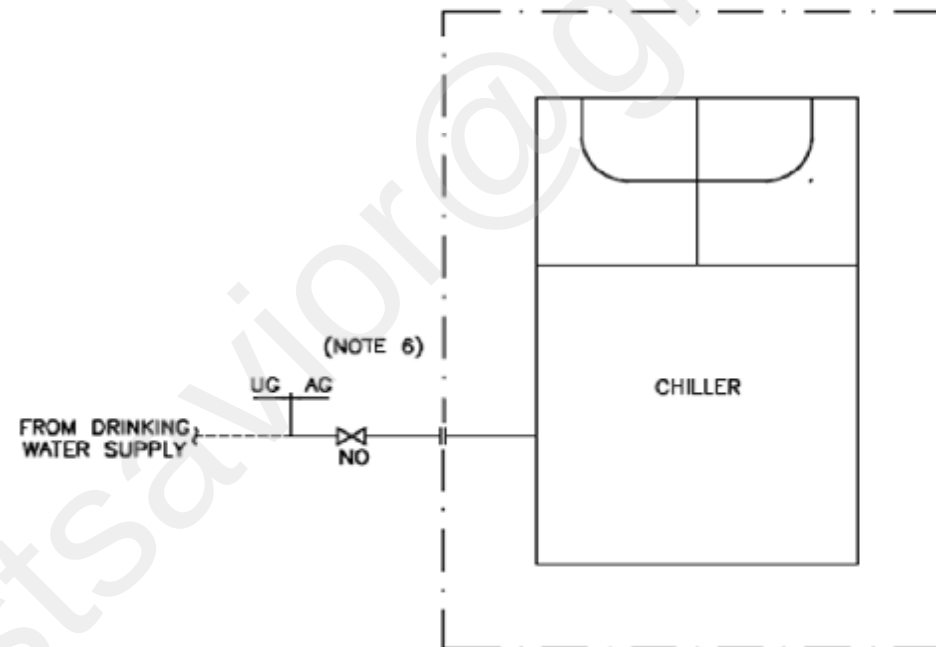
HOSE CONNECTION OF UTILITY STATION



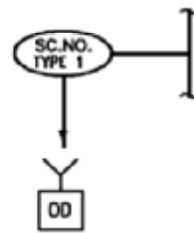
TYPICAL EMERGENCY EYEWASH & SAFETY SHOWER
(BY VENDOR)
(NOTE 5)



TYPICAL DRINKING WATER FOUNTAIN
(BY VENDOR)

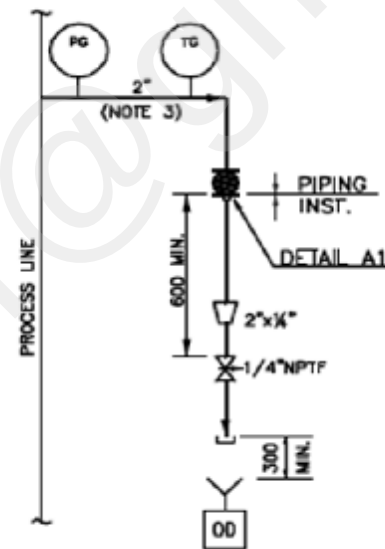


REPRESENTATION ON P&ID



REPRESENTATION ON DATA SHEET

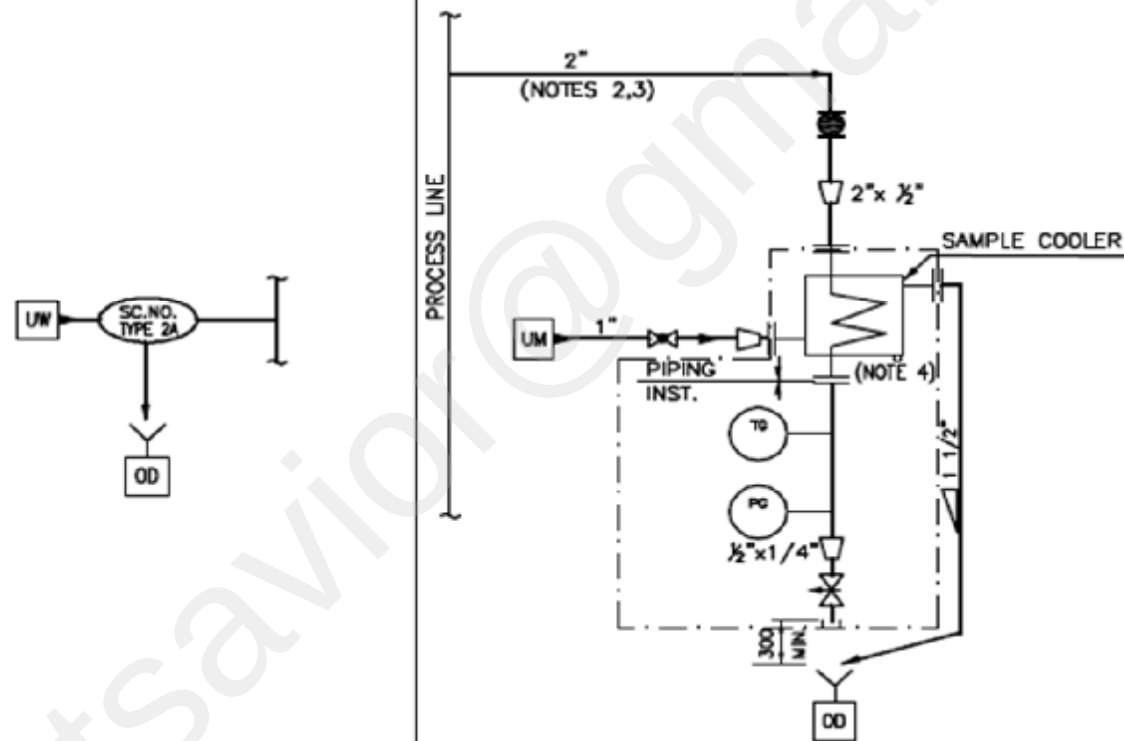
TYPE 1: FOR LIQUID SAMPLE BELOW 70°C WITH A VAPOUR PRESSURE BELOW THE ATM AND NON HAZARDOUS.



REPRESENTATION ON P&ID

REPRESENTATION ON DATA SHEET

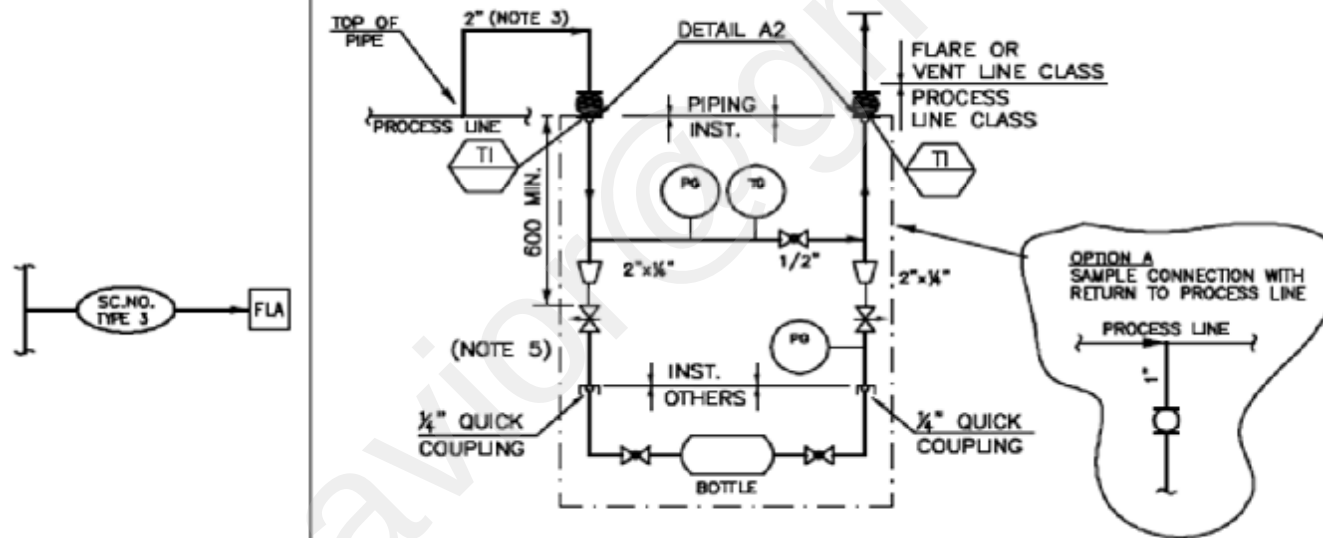
TYPE 2: FOR LIQUID SAMPLE ABOVE 70°C WITH A VAPOUR PRESSURE BELOW THE ATM AND NON HAZARDOUS.



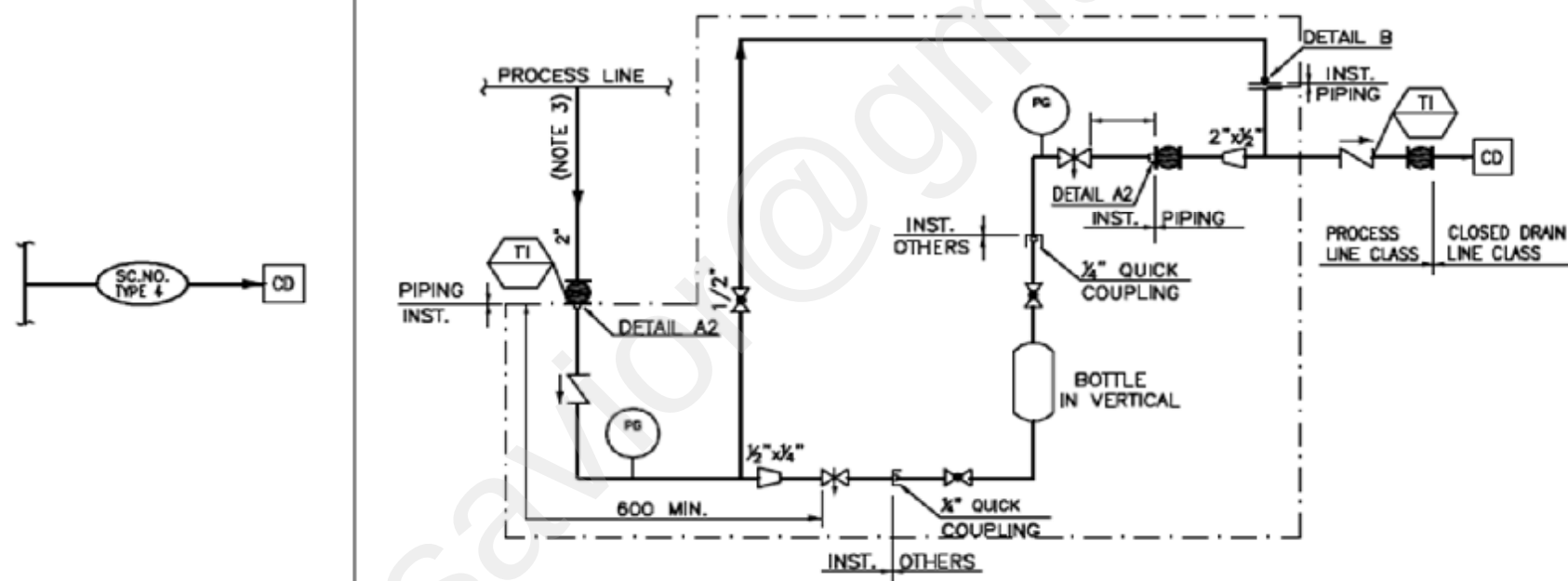
REPRESENTATION
ON P&ID

REPRESENTATION ON DATA SHEET

TYPE 3: FOR HC VAPOURS AND FUEL GAS BELOW 70°C.

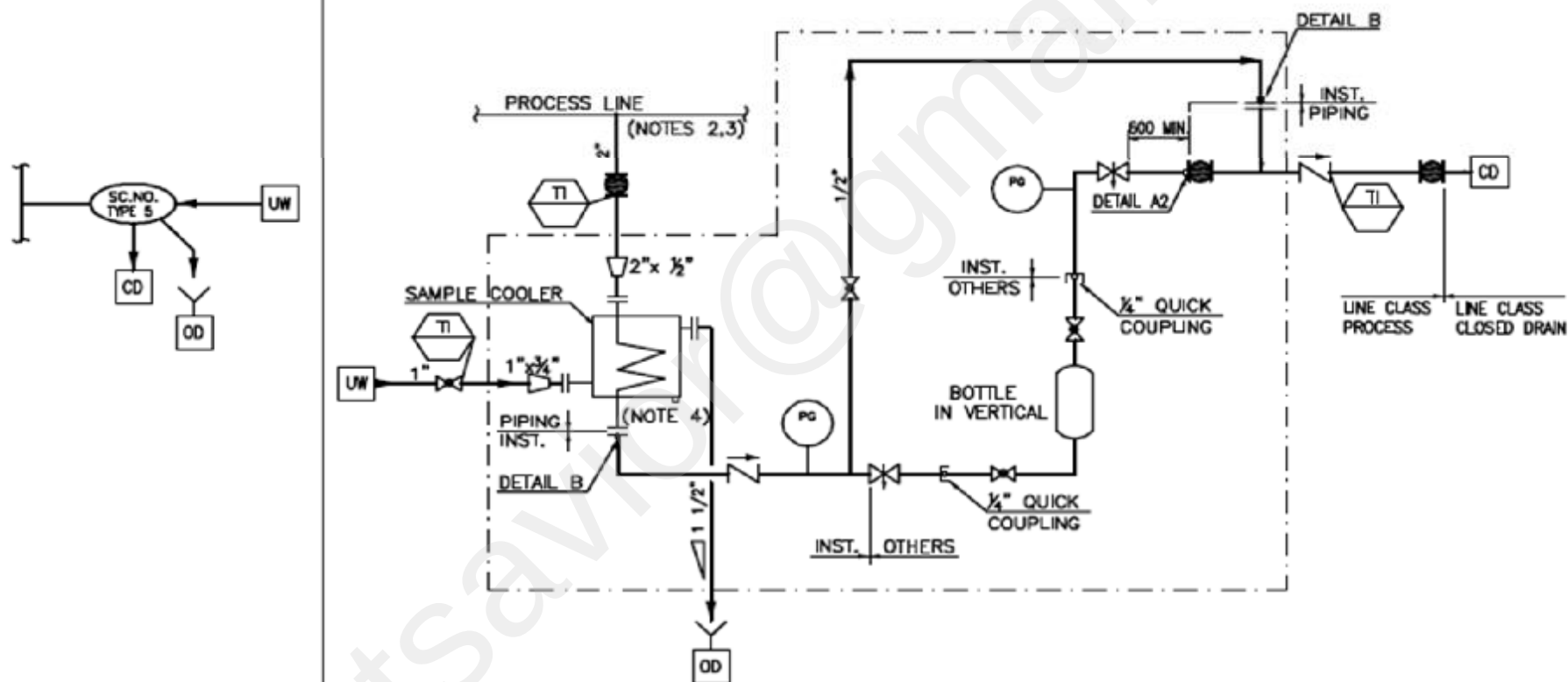


TYPE 4: FOR LIQUID SAMPLE BELOW 70°C WITH A VAPOUR PRESSURE ABOVE THE ATM OR HAZARDOUS.

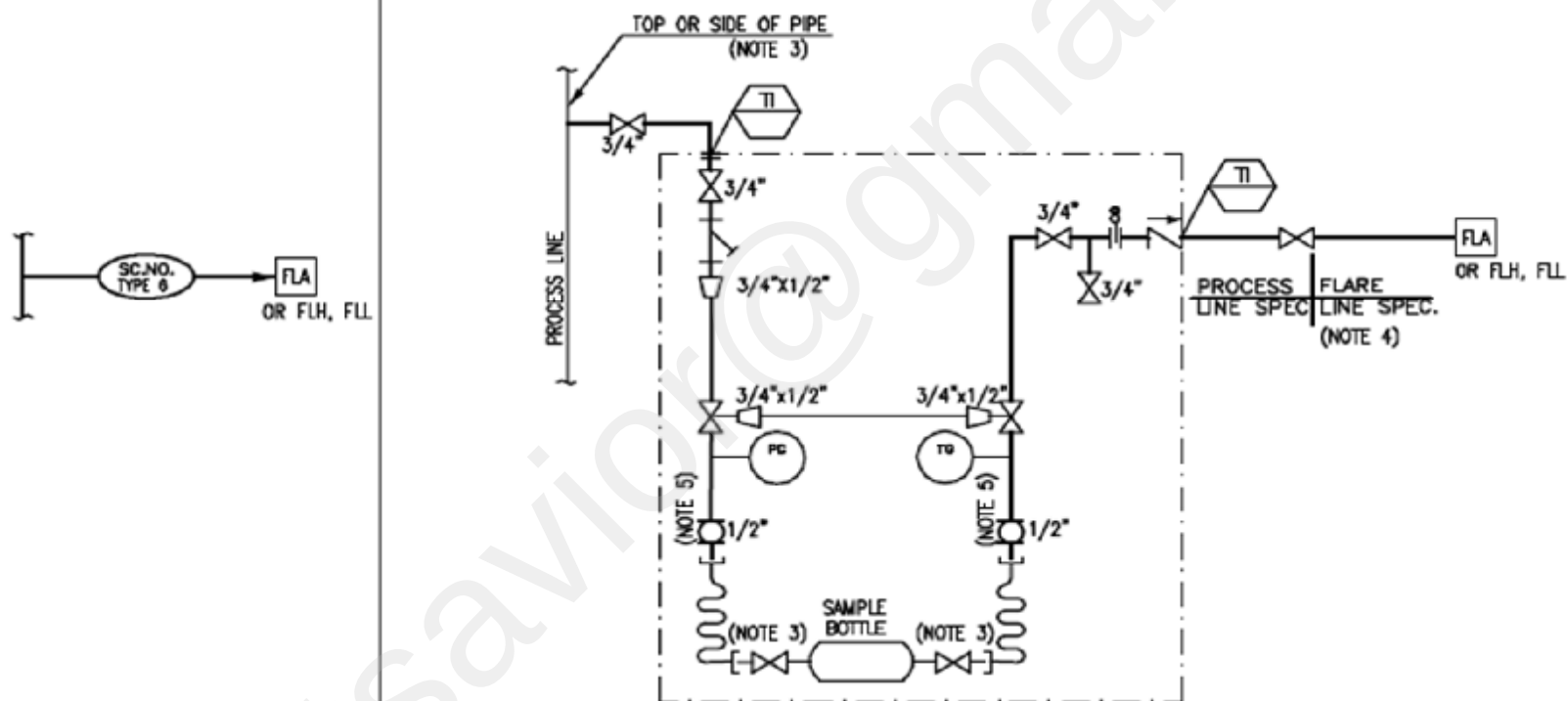


REPRESENTATION ON DATA SHEET

TYPE 5: FOR LIQUID SAMPLE ABOVE 70°C WITH A VAPOUR PRESSURE ABOVE THE ATM OR HAZARDOUS.



TYPE 6: FOR GAS SAMPLE BELOW 70°C OR HAZARDOUS.



TYPE 7: FOR GAS SAMPLE ABOVE 70°C OR HAZARDOUS.

TOP OR SIDE OF PIPE
(NOTE 3)

PROCESS LINE

3/4"

3/4"

TI

3/4"x1/2"

3/4"

UM

3/4"

3/4"

OD

3/4"x1/2"

PG

3/4"x1/2"

TG

1/2"

(NOTE 9)

1/2"

(NOTE 7)

SAMPLE BOTTLE

(NOTE 7)

PROCESS LINE SPEC

3/4"

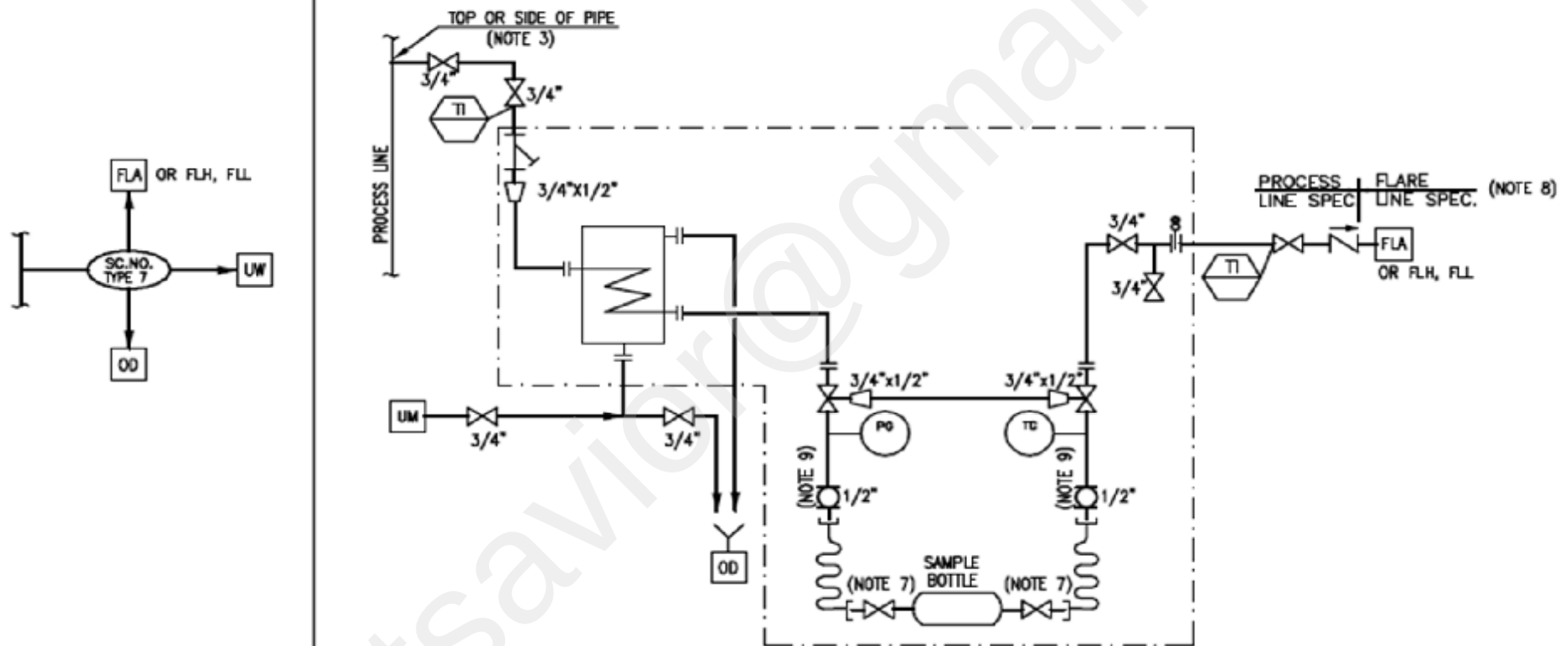
3/4"

TI

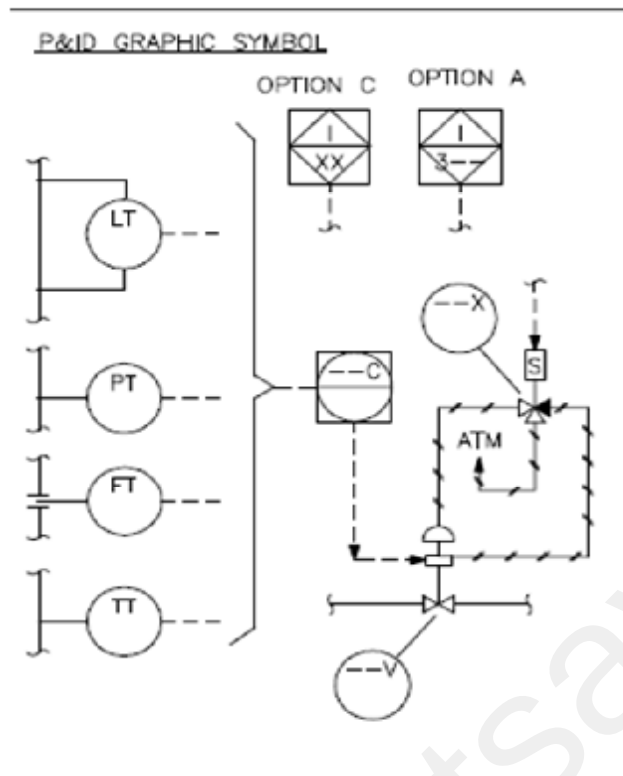
3/4"

3/4"

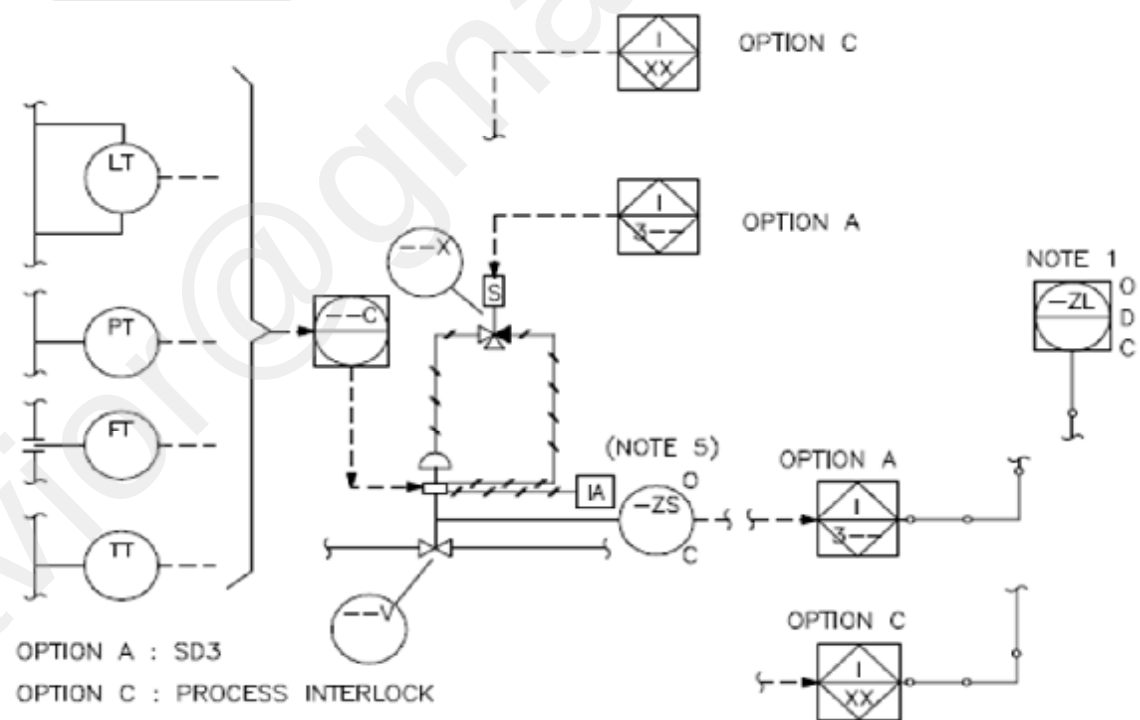
OR



CONTROL VALVE WITH SHUTDOWN SYSTEM TYPICAL N°7



DETAILED SYMBOL



SEQUENTIAL OPERATED VALVE / MOTOR OPERATED VALVE TYPICAL N°10

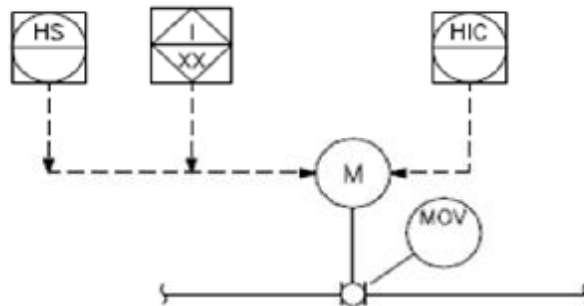
OPTION A : REMOTE OPEN/CLOSE

OPTION B : PROCESS INTERLOCK

OPTION C : REMOTE OPEN/CLOSE THROTTLING

P&ID GRAPHIC SYMBOL

OPTION A OPTION B OPTION C



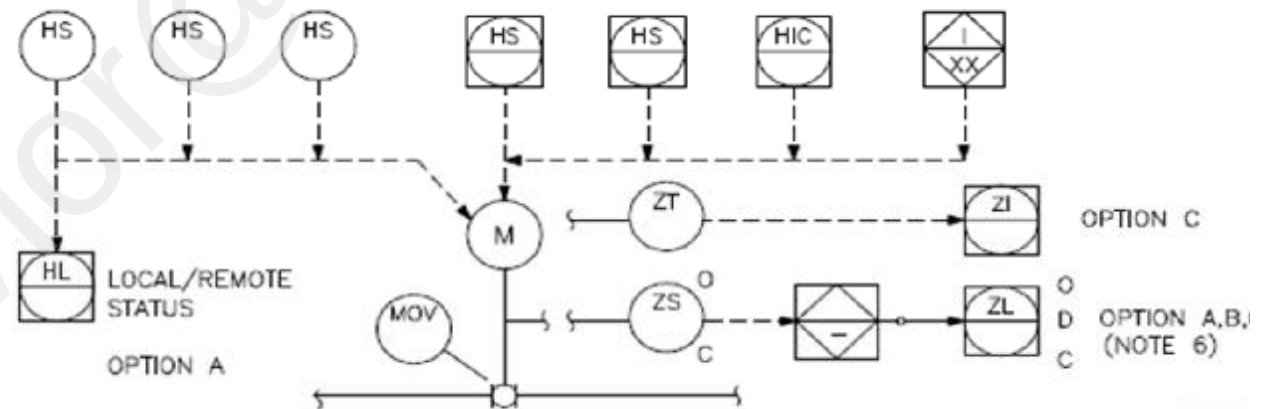
DETAILED SYMBOL

LOCAL/REMOTE

OPEN CLOSE

OPTION A

OPTION B



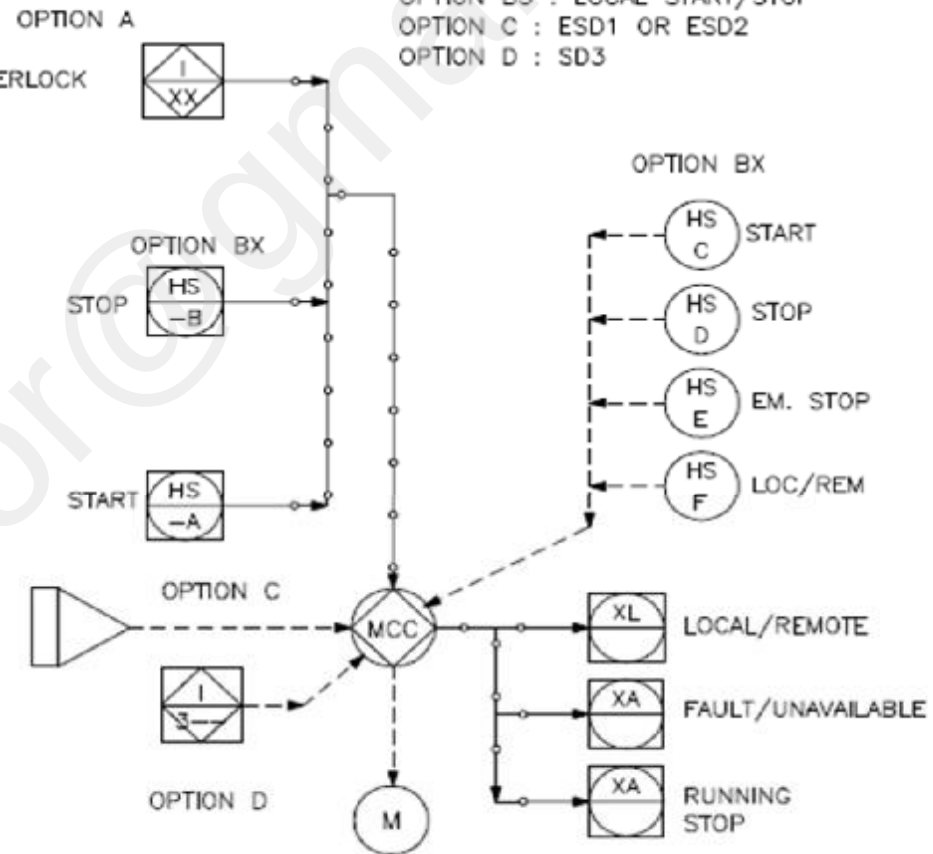
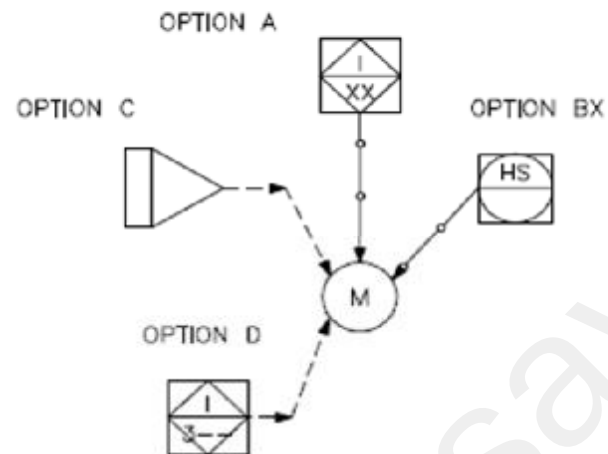
PUMP TYPICAL N°8

(NOTE 7)

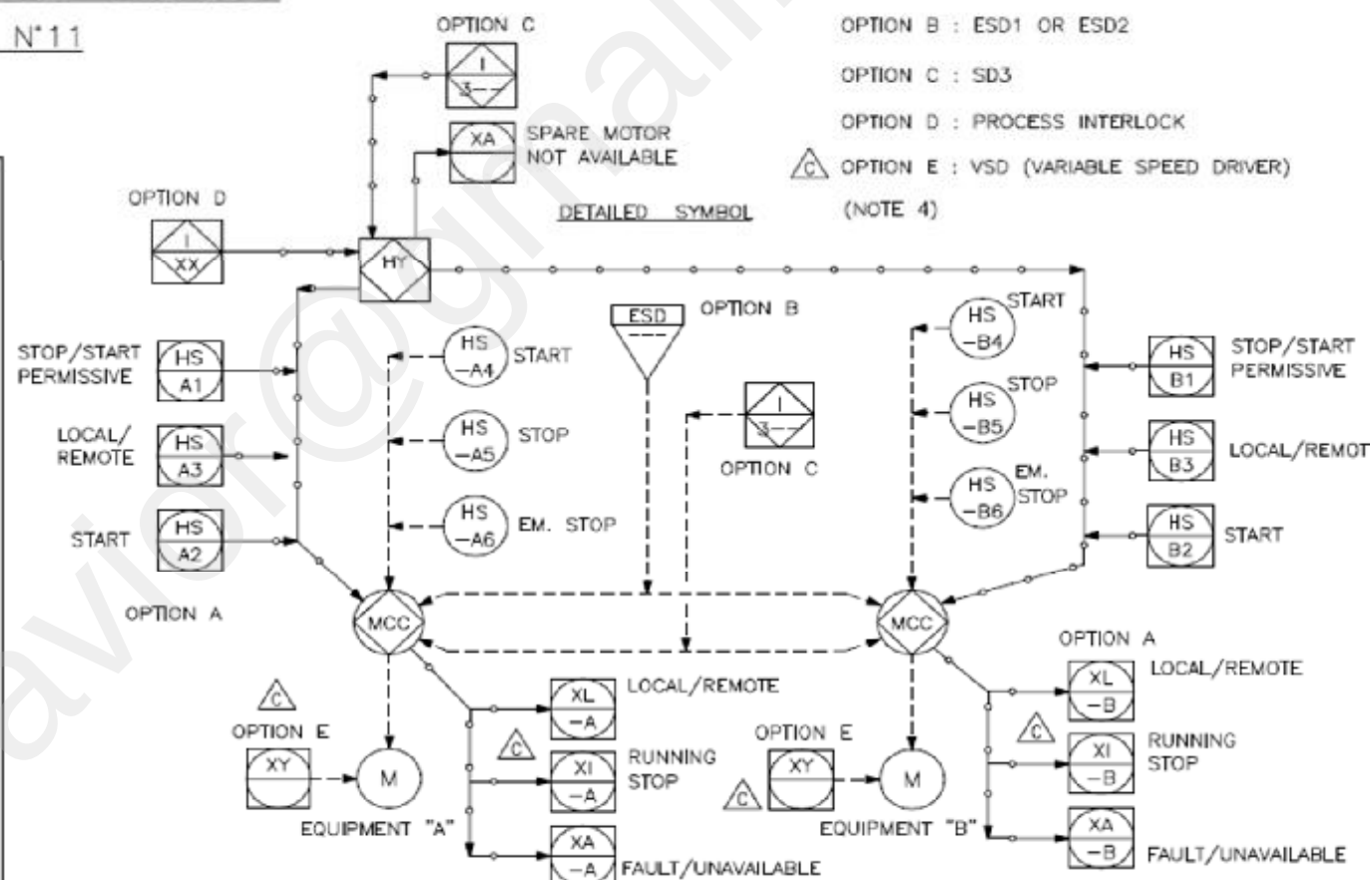
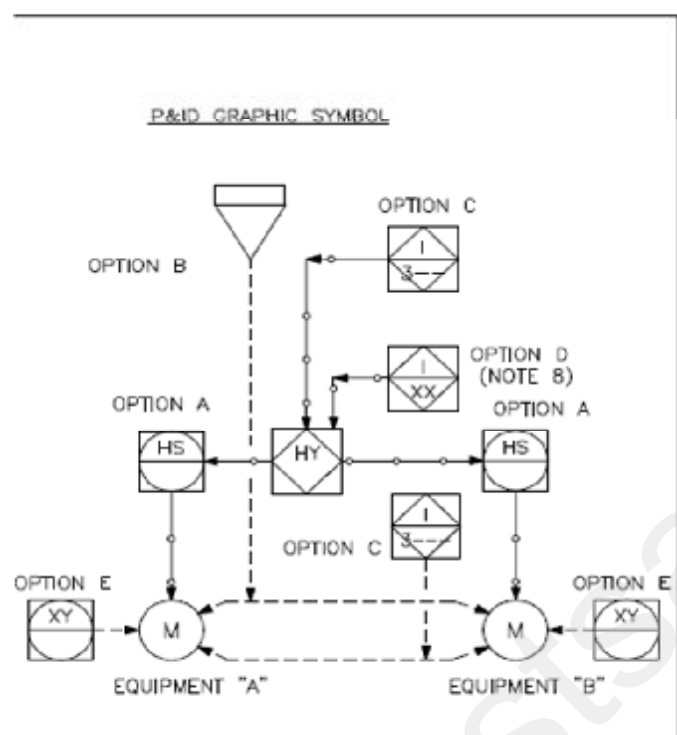
DETAILED SYMBOL

- OPTION A : PROCESS INTERLOCK
- OPTION B1 : LOCAL START/STOP AND
REMOTE STOP (FROM DCS)
- OPTION B2 : LOCAL START/STOP AND
REMOTE START/STOP (FROM DCS)
- OPTION B3 : LOCAL START/STOP
- OPTION C : ESD1 OR ESD2
- OPTION D : SD3

P&ID GRAPHIC SYMBOL

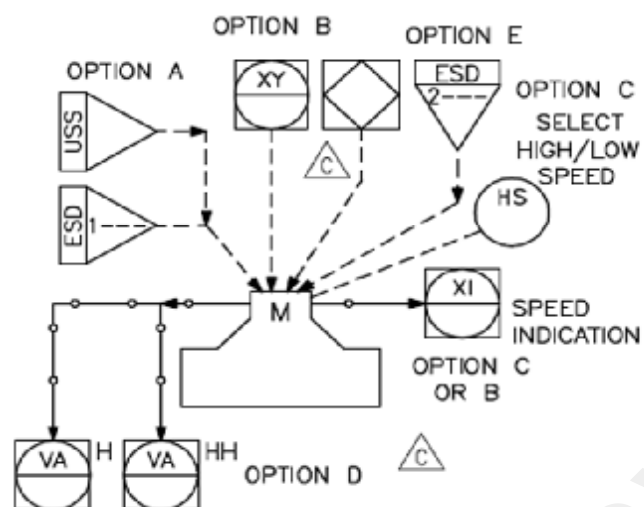


TYPICAL N°11

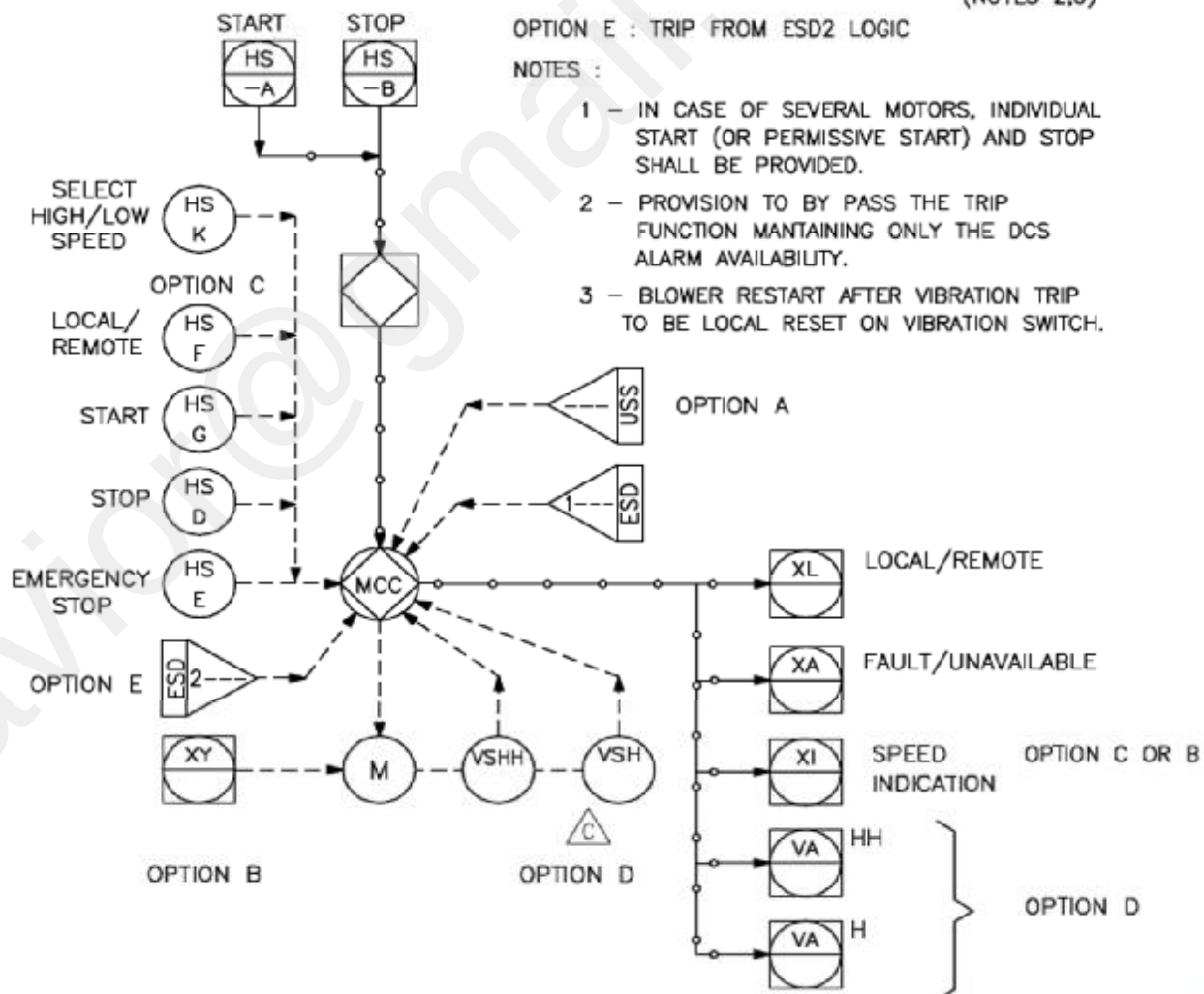


AIR BLOWER/AIR COOLER TYPICAL N°9

P&ID GRAPHIC SYMBOL



DETAILED SYMBOL



OPTION A : TRIP FROM ESD AND USS THROUGH EIS.

OPTION B : ANALOGIC CONTROL/VSD (VARIABLE SPEED DRIVER, (SPEED)

OPTION C : HIGH/LOW SPEED SELECTION C

OPTION D : VIBRATION ALARM (H AND HH) AND TRIP (HH) (NOTES 2,3)

OPTION E : TRIP FROM ESD2 LOGIC

NOTES :

- 1 - IN CASE OF SEVERAL MOTORS, INDIVIDUAL START (OR PERMISSIVE START) AND STOP SHALL BE PROVIDED.
- 2 - PROVISION TO BY PASS THE TRIP FUNCTION MAINTAINING ONLY THE DCS ALARM AVAILABILITY.
- 3 - BLOWER RESTART AFTER VIBRATION TRIP TO BE LOCAL RESET ON VIBRATION SWITCH.

FIRE ALARM EQUIPMENT

	CONTROL PANEL—BASIC SHAPE
	F&G CONTROL PANEL
	FIRE ALARM CONTROL PANEL
	FIRE SYSTEM CONTROL PANEL
	XX=CO2 CARBON DIOXIDE
	FO FOAM
	CA CLEAN AGENT
	DL DELUGE SPRINKLER
	CONTROL PANEL FOR HEATING, VENTILATION, AIR-CONDITIONING, EXHAUST STAIRWELL PRESSURIZATION, OR SIMILAR EQUIPMENT
	ILLUMINATED EXIT SIGN, SINGLE FACE
	ILLUMINATED EXIT SIGN, DOUBLE FACE
	MANUAL RELEASE STATION
	XX=CO2 CARBON DIOXIDE
	FO FOAM
	CA CLEAN AGENT
	DL DELUGE SPRINKLER
	IG INERT GAS
	MANUAL CALL POINT
	FIRE SERVICE OR EMERGENCY TELEPHONE STATION
	HEAT DETECTOR (THERMAL DETECTOR)
	HEAT DETECTOR —COMBINATION:RATE OF RISE AND FIXED TEMPERATURE
	HEAT DETECTOR —FIXED TEMPERATURE
	HEAT DETECTOR —RATE OF RISE ONLY
	HEAT DETECTOR —LINE—TYPE DETECTOR (HEAT-SENSITIVE CABLE)
	SMOKE/HEAT DETECTOR
	SMOKE DETECTOR—AIR
	SMOKE DETECTOR—AIR SAMPLING
	GAS DETECTOR

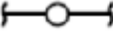
	GAS DETECTOR
	FLAME DETECTOR
	COMBINATION ULTRAVIOLET/INFRARED
	SPEAKER/HORN (ELECTRIC HORN)
	WATER MOTOR ALARM (WATER MOTOR GONG)
	HORN WITH LIGHTS AS ONE ASSEMBLY (R=RED; B=BLUE) (F & G DETECTION)
	ENTRY FORBIDDEN LIGHT (CO2 & INERT GAS SYSTEMS)
	IMMEDIATE EXIT LIGHT (CO2 & INERT GAS SYSTEMS)
	LIGHT (LAMP, SIGNAL LIGHT, INDICATOR LAMP, STROBE)
	BELL

FIRE FIGHTING EQUIPMENT

	FIRE WATER HYDRANT
	FIRE WATER HYDRANT WITH FIXED FOAM AND WATER MONITOR
	FIRE WATER HYDRANT WITH WATER MONITOR
	FIXED WATER MONITOR
	OS & Y-VALVES
	SECTIONING VALVES IN PITS
	DELUGE VALVE
	ALARM CHECK VALVE
	POST INDICATOR VALVE
	3/4" AUTO DRIP VALVE
	Y STRAINER
	CO2 SYSTEM AUTOMATICALLY ACTUATED
	CLEAN AGENT GAS FIRE EXTINGUISHING SYSTEM - AUTOMATICALLY ACTUATED
	WATER SPRAY SYSTEM
	FULLY SPRINKLERED SPACE
	WATER EXTINGUISHER
	FOAM EXTINGUISHER
	PORTABLE DRY POWDER EXTINGUISHER

	INERT GAS CYLINDER
	CARBON DIOXIDE CYLINDER
	POWDER CYLINDER
	NITROGEN CYLINDER
	HOSE REEL (GENERAL SYMBOL)
	POWDER/FOAM HOSE REEL
	QUICK COUPLING (HOSE CONNECTION)
	BLADER TANK FOAM SKID
	FOAM GENERATOR
	FOAM CHAMBER
	DELUGE VALVE WITH INSTRUMENTS
	FLAT NOZZLES (TANKCOOL SPRAY NOZZLES-SN TYPE I)
	CONIC JET NOZZLES (MEDIUM VELOCITY SPRAY NOZZLES-SN TYPE II)
	CONIC JET NOZZLES (HIGH VELOCITY SPRAY NOZZLES-SN TYPE III)

	WHEELED DRY POWDER EXTINGUISHER
	PORTABLE CO2 EXTINGUISHER
	WHEELED CO2 EXTINGUISHER
	HOSE HOSE
	HOSE REEL
	COMBINED SAFETY SHOWER/EYE BATH UNIT
	EYE WASH STATION
	FIRST AID KIT
	FIRE BLANKET
	TEMPORARY REFUGE
	WIND SOCK
	EMERGENCY EXIT
	MUSTER POINT

	UPRIGHT SPRINKLERS
	PENDENT SPRINKLERS



ABBREVIATIONS

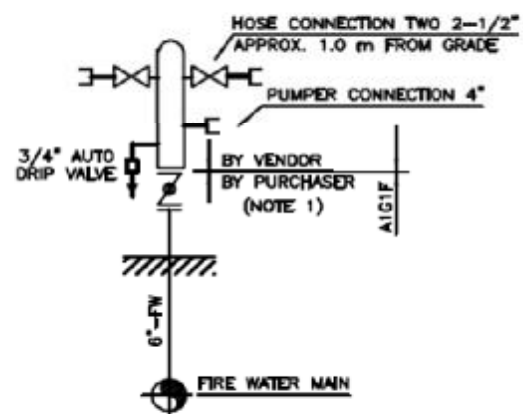
ACV	ALARM CHECK VALVE
AIT	COMBUSTIBLE GAS DETECTOR
CSC	CAR SEAL CLOSE
CSO	CAR SEAL OPEN
DV	DELUGE VALVE
EP	EXPLOSION PROOF
FAK	FIRST AID KIT
FD	FLAME DETECTOR
FG	FOAM GENERATOR
FLD	FLUSHING DEVICE
FFM	FIRE WATER HYDRANT WITH FIXED FOAM AND WATER MONITOR
FW	FIRE WATER
FWH	FIRE WATER HYDRANT
FWM	FIRE WATER HYDRANT WITH FIXED WATER MONITOR
HD	HEAT DETECTOR
HH	HOSE HOUSE
HR	HOSE REEL
HS	HOSE STATION (INTERNAL HYDRANTS)
LC	LOCKED CLOSED
LO	LOCKED OPEN
MP	MANUAL CALL POINT
P CO2	PORTABLE CO2 EXTINGUISHER
PIV	POST INDICATOR VALVE
PDP	PORTABLE DRY POWDER EXTINGUISHER
SD	SMOKE DETECTOR
SHD	SMOKE/HEAT DETECTOR (INTEGRAL TYPE)

SSE	SAFETY SHOWER & EYEWASH
SV	SECTIONING VALVE
W CO2	WHEELED CO2 EXTINGUISHER
WDP	WHEELED DRY POWDER EXTINGUISHER
WP	WEATHER PROOF
XAA	AUDIBLE ALARM
XVA	VISUAL ALARM

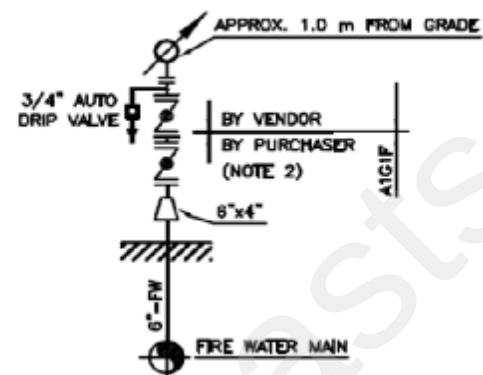


TYPICAL SCHEME FOR FIRE FIGHTING EQUIPMENT

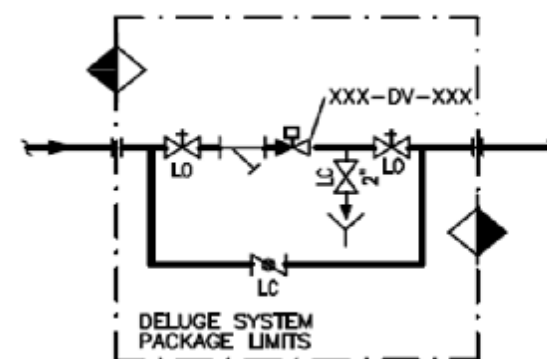
1 - FIRE WATER HYDRANT



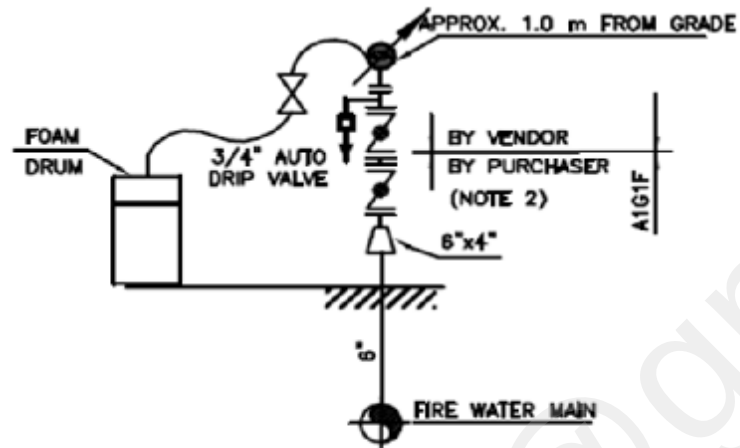
2 - FIXED WATER MONITOR



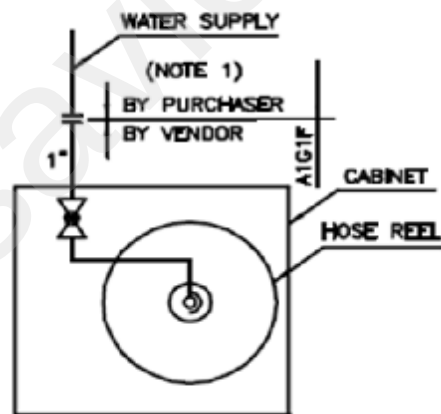
5 - DELUGE VALVE SYSTEM PACKAGE



3 – FIRE WATER HYDRANT WITH FIXED FOAM AND WATER MONITOR

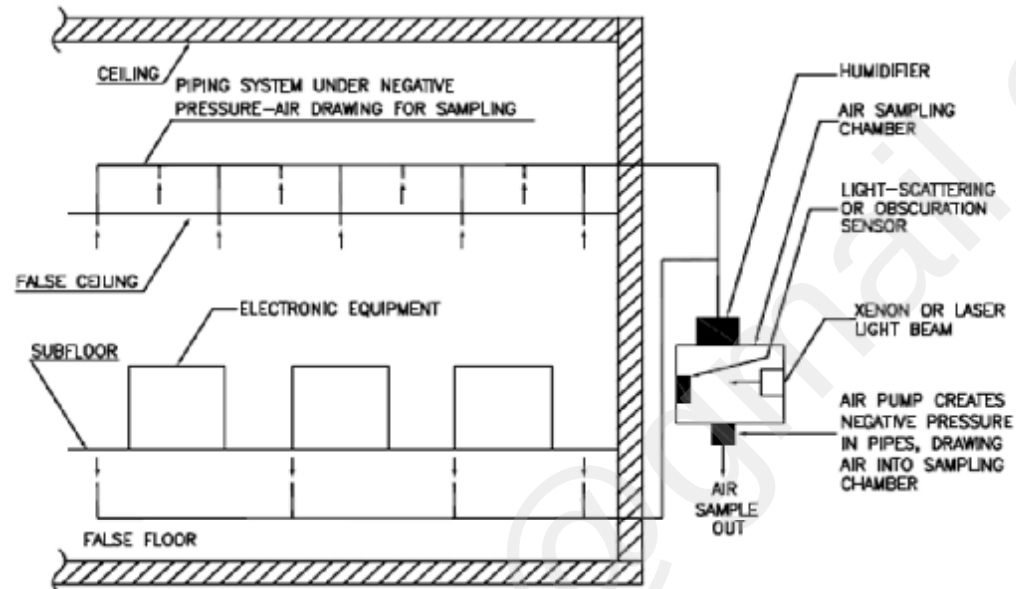


4 – HOSE REEL

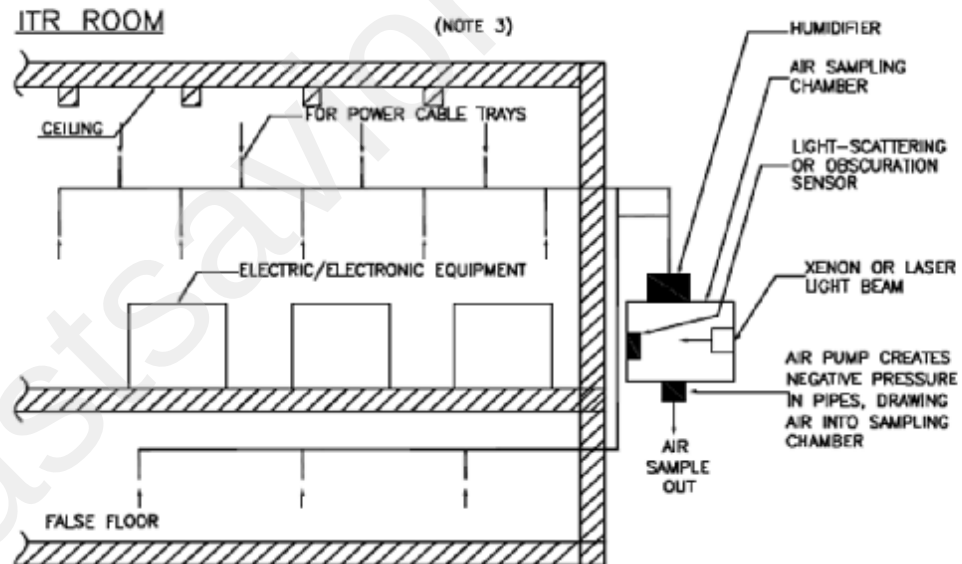


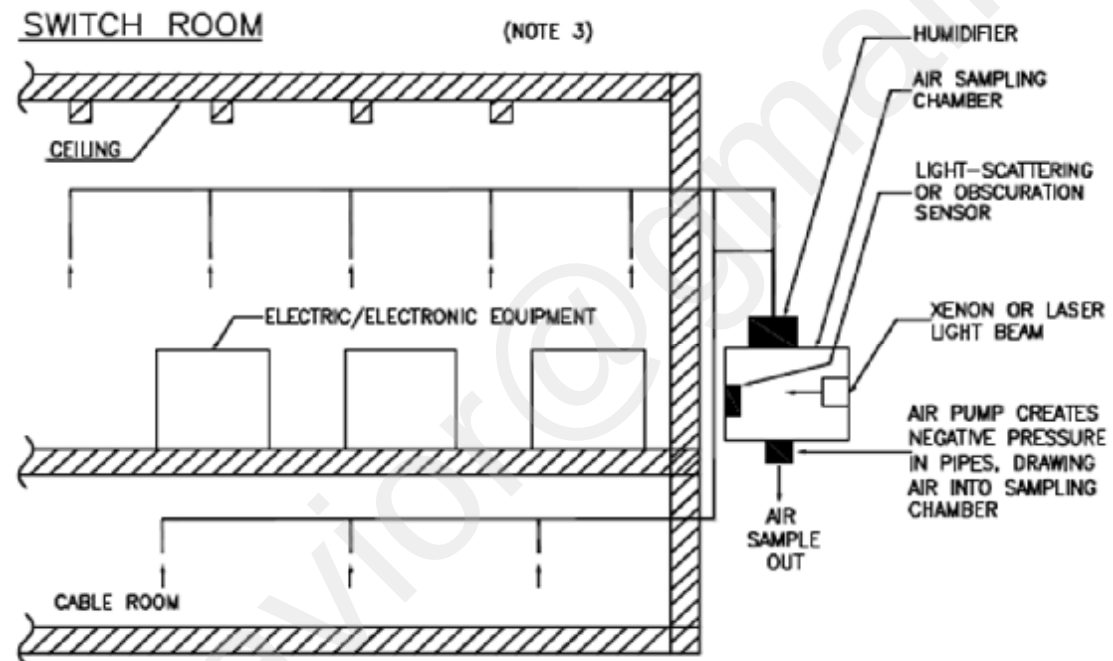
TYPICAL ARRANGEMENT FOR EARLY WARNING SMOKE DETECTOR

CONTROL ROOM (NOTE 3)

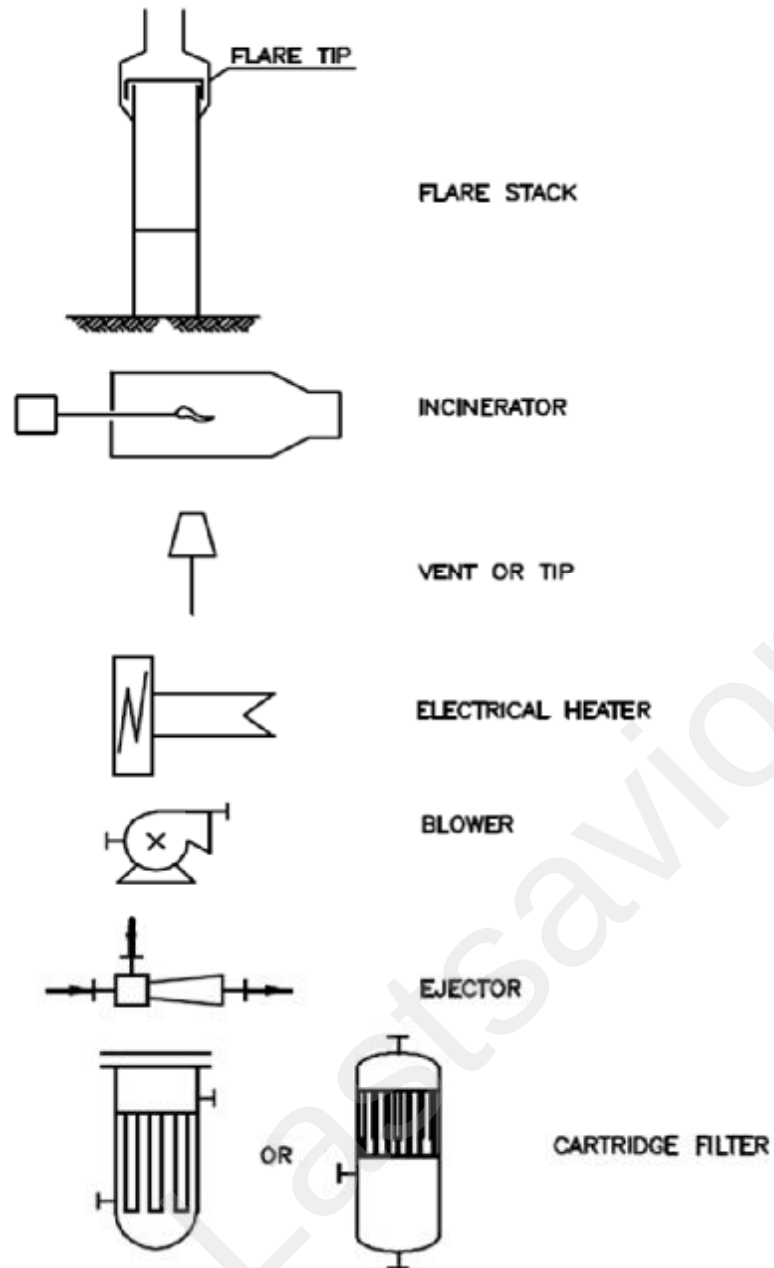


ITR ROOM (NOTE 3)



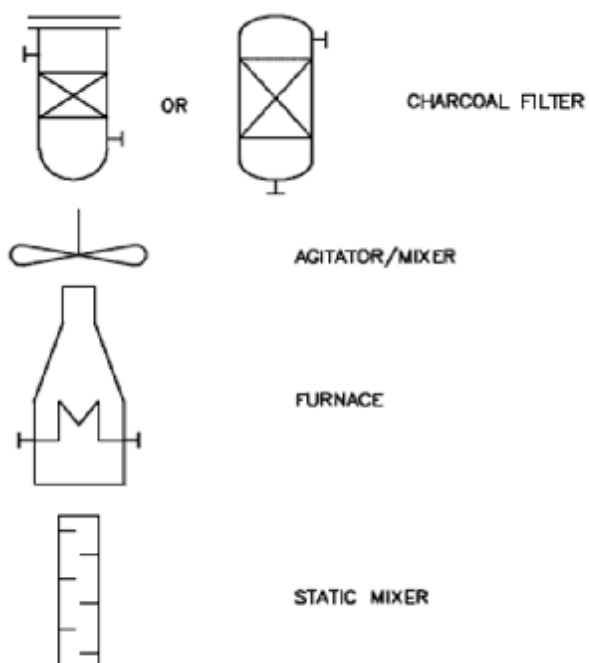


MISCELLANEOUS



TYPE OF VALVES STREAM IDENTIFICATION & CONDITION

	MANUAL VALVE
	CONTROL VALVE
	ACTUATED ON/OFF VALVE (REMOTE OPERATED VALVE)
	STREAM IDENTIFICATION
NNF	NORMALLY NO FLOW
	OPERATING PRESSURE (bar g)
	TEMPERATURE (°C)
	LIQUID FLOW RATE, m ³ /h
	GAS FLOW RATE, m ³ /h
	MASS FLOW RATE, kg/h
	TIE-IN
AF	ANTI-FOAM
CK	CORROSION INHIBITOR
CH	HIGH PRESSURE STEAM CONDENSATE
CL	LOW PRESSURE STEAM CONDENSATE
CM	MEDIUM PRESSURE STEAM CONDENSATE
DE	DEMULSIFIER
IG	INERT GAS



EQUIPMENT IDENTIFICATION

FIRST DIGIT -PROCESS FUNCTION

AIR COOLER	A
BOILER	B
COLUMN	C
DRUM	D
HEAT EXCHANGER	E
FILTER	F
FLARE	FL
ELECTRIC GENERATOR	G
HEATER	H
INCINERATOR	IN
EJECTOR	J
COMPRESSOR BLOWER,FAN	K
MIXER, AGITATOR	MX
METERING SYSTEM	ME
PUMP	P
REACTOR	R
STACK	ST
STORAGE TANK	T
PACKAGE UNIT	U
MOBILE EQUIPMENT	W
MISCELLANEOUS EQUIPMENT	X
SAFETY EQUIPMENT	Z

FLA	ACID GAS FLARE
FLH	HIGH PRESSURE FLARE
FLL	LOW PRESSURE FLARE
FG	FUEL GAS
N	NITROGEN
RD	REVERSE DEMULSIFIER
SH	HIGH PRESSURE STEAM
SL	LOW PRESSURE STEAM
SM	MEDIUM PRESSURE STEAM

LINES IDENTIFICATION

	MAIN PROCESS LINE
	SECOND PROCESS LINE
	FUTURE LINES & INSTALLATION LIMITS
	BATTERY & PACKAGE LIMIT
	UNDERGROUND LINE
	ELECTRICAL SIGNAL

INSTRUMENT IDENTIFICATION

	ANALYSIS INDICATOR		PRESSURE CONTROLLER
	FLOW CONTROLLER		PRESSURE DIFFERENTIAL CONTROLLER
	LEVEL CONTROLLER		TEMPERATURE DIFFERENTIAL CONTROLLER
	TEMPERATURE CONTROLLER		CASCADE CONTROL

SECOND DIGIT —SUPPORTING FUNCTION

DIESEL ENGINE

DE

GAS MOTOR

GE

ELECTRIC MOTOR

M

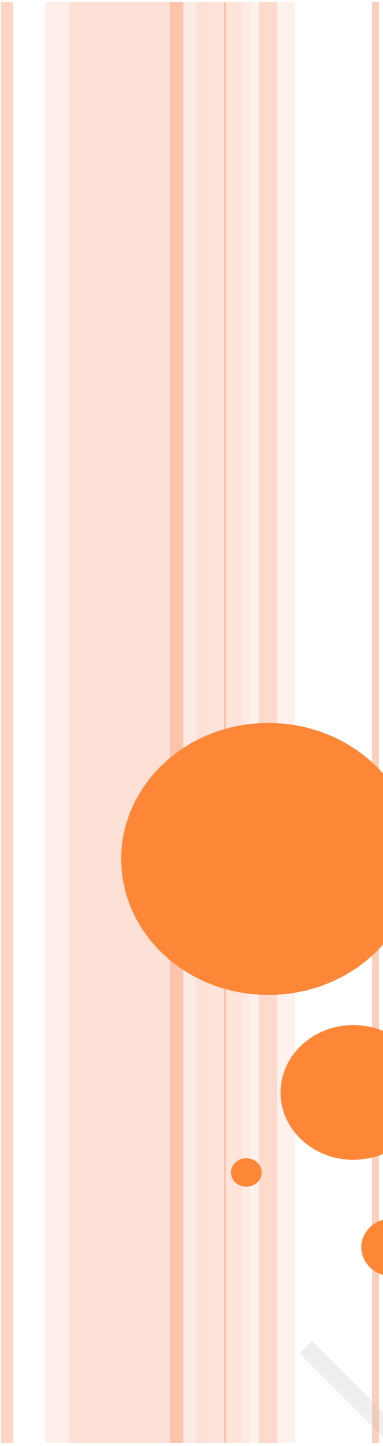
STEAM TURBINE

ST

GAS TURBINE

GT





DRAINAGE PHILOSOPHY

- ¢ Amine and glycol shall also have their own dedicated closed drain systems.
- ¢ The design of all piping shall seek to minimize high point pockets in liquid lines, and low point pockets in vapor/condensate lines.
- ¢ Hydrostatic vents and drains are not required to be shown on P&IDs.



- ¢ In general, for non-hazardous service, the vents and drains for equipment and piping shall be provided with 3/4" valves (unless otherwise shown).
- ¢ Drainage lines for hazardous or valuable process chemicals shall be accessible for inspection and maintenance.
- ¢ Drainage from such equipment shall be permanently piped to a sump tank provided with means for emptying.



- Small connections from hazardous service lines, e.g. nipples for vents, drains, sample points, (excluding connections from orifice flanges, carriers and other instrumentation) shall be DN 25 (NPS 1) minimum f or strength.



Table 3.1. Vent and drain for piping

Pipe Size (in)	Vent Size (in)	Drain size (in)
4 & below	3/4"	3/4"
6 to 10	3/4"	1"
12 & above	1"	2"



- Vent connections shall be provided on high point of piping 2 inch and larger and drain connections on low points of all lines.



- ❖ Operational vents, sample points and drains which may discharge flammable fluids shall be
- ❖ minimized and shall be not less than 15 m minimum from possible sources of ignition, e.g. furnaces, hot lines, and rotating machinery.



- ¢ Separate arrangements should be made for the drainage and the tracing of lines containing
- ¢ materials likely to solidify. Provision should be made for rodding and high pressure water cleaning.
- ¢ No high point vent connection on piping shall be required for the systems of air, inert gas and process gas except for hydrostatic test purposes. Valves are not required on vents used only
- ¢ during hydrostatic testing of piping. These shall be blind flanged or weld capped in accordance with the applicable pipe class.



- ⌘ Depending on the line size, utilities header will be equipped either with a blind flange or with a cap fitted with a 3" valve and blind flanges.
- ⌘ Flare headers and sub-headers will be provided with a 2" valve and blind flanges for purging with nitrogen.
- ⌘ All steam vents, used for long duration during start-up phases, will be equipped with individual
- ⌘ dedicated silencers on each vent.



Table 4.1. Vent and drain for vessels

Volume or diameter of vessel (m³ or mm)	Vent size	Drain size
$V \leq 75$ or $D \leq 4\,500$	2"	2"
$75 < V \leq 220$ or $4500 < D \leq 6\,000$	3"	3"
$220 < V \leq 420$ or $D > 6\,000$	4"	4"
$V > 420$	6"	4"



- ¢ 1. Generally one vent and one drain shall be provided. 2" connections to a vessel to be class 300 # as a minimum.
- ¢ 2. Drain connections should be connected at the lowest point to allow complete drainage of the vessel.
- ¢ 3. Where a process connection is provided at the vessel low point, the drain shall be incorporated on the piping upstream of the vessel isolation (process piping to be at least equal to the drain connection size).



- ¢ 6. Vent connections shall be positioned such that discharge from them is not directed towards maintenance personnel when operated.



- ☛ Drainage from gage glasses, external float and displacer chambers shall be led via a tundish to a suitable drain at grade. A closed disposal system shall be provided for drainage of vaporizing liquids which evolve H_2S , other toxic gas or large volumes of flammable vapor.



- ¢ The drain valve will be provided as follows:
- ¢ - For low pressure services, up to design pressure of 3800 kPa (38 barg), provide single block valve with blind plate.



- ¢ - For high pressure services over design pressure of 3800 kPa (38 barg), or where the nature of liquid requires it, provide double block valves with blind plate.
- ¢ Vent gas from pump casing drains and vents shall be routed to closed system such as flare for the following services:
 - ¢ a) fluids containing toxic material ;
 - ¢ b) fluids with a Reid vapor pressure greater than 0.35 bar(a) at pump operating temperature.



- In addition to the above, the vent of casing for the vacuum service should be routed back to the suction vessel to make out the pressure balance prior to the pump operation. Drain of hydrocarbon pumps shall also have disposal to oily water sewer in all cases in addition to the above requirements unless otherwise specified



اصطلاحات متفاوت با معانی یکسان در زبانهای انگلیسی و آمریکایی

Different words are used, in different countries, to describe the same job or piece of equipment. Some of the principal differences between the United States and the United Kingdom are listed here. Within each country, however, there are differences between companies.

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Management Terms

Job	U.S.	UK
Operator of plant	Operator	Process worker
Operator in charge of others	Lead operator	Chargehand or Assistant foreman or Junior supervisor
Highest level normally reached by promotion from operator	Foreman	Foreman or Supervisor
First level of professional management (usually in charge of a single unit)	Supervisor	Plant manager
Second level of professional management	Superintendent	Section manager
Senior manager in charge of site containing many units	Plant manager	Works manager
Plant personnel	Craftsman or mechanic	Fitter, electrician, etc.

اصطلاحات متفاوت با معانی یکسان در زبانهای انگلیسی و آمریکایی

The different meanings of the terms *supervisor* and *plant manager* in the U.S. and UK should be noted.

In this book I have used the term *foreman* as it is understood in both countries, though its use in the UK is becoming outdated. *Manager* is used to describe any professionally qualified person in charge of a unit or group of units. That is, it includes people who, in many U.S. companies, would be described as supervisors or superintendents.

Certain items of plant equipment have different names in the two countries. Some common examples are:

اصطلاحات متفاوت با معانی یکسان در زبانهای انگلیسی و آمریکایی

Chemical Engineering Terms

U.S.	UK
Accumulator	Reflux drum
Agitator	Mixer or stirrer
Air masks	Breathing apparatus (BA)
Blind	Slip-plate
Carrier	Refrigeration plant
Cascading effects	Knock-on (or domino effects)
Check valve	Nonreturn valve
Clogged (of filter)	Blinded
Consensus standard	Code of practice
Conservation vent	Pressure/vacuum valve
Dike, berm	Bund
Discharge valve	Delivery valve
Division (in electrical area classification)	Zone
Downspout	Downcomer
Expansion joint	Bellows
Explosion proof	Flameproof
Faucet	Tap
Fiberglass-reinforced plastic (FRP)	Glass-reinforced plastic (GRP)
Figure-8 plate	Spectacle plate
Flame arrestor	Flame trap
Flashlight	Torch
Fractionation	Distillation
Gasoline	Petrol
Gauging (of tanks)	Dipping
Generator	Dynamo or alternator
Ground	Earth
Horizontal cylindrical tank	Bullet
Hydro (Canada)	Electricity
Install	Fit
Insulation	Lagging
Interlock*	Trip*
Inventory	Stock
Lift-truck	Forklift truck
Loading rack	Gantry

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اصطلاحات متفاوت با معانی یکسان در زبانهای انگلیسی و آمریکایی

U.S.	UK
Manway	Manhole
Mill water	Cooling water
Nozzle	Branch
OSHA (Occupational Safety and Health Administration)	Health and Safety Executive
Pedestal, pier	Plinth
Pipe diameter (internal)	Pipe bore
Pipe rack	Pipebridge
Plugged	Choked
Rent	Hire
Rupture disc or frangible	Bursting disc
Scrutinize	Vet
Seized (of a valve)	Stuck shut
Shutdown	Permanent shutdown
Sieve tray	Perforated plate
Siphon tube	Dip tube
Spade	Slip-plate
Sparger or sparge pump	Spray nozzle
Spigot	Tap
Spool piece	Bobbin piece
Stack	Chimney
Stator	Armature
Tank car	Rail tanker or rail tank wagon
Tank truck	Road tanker or road tank wagon
Torch	Cutting or welding torch
Tower	Column
Tow motor	Forklift truck
Tray	Plate
Turnaround	Shutdown
Utility hole	Manhole
Water seal	Lute
Wrench	Spanner
C-wrench	Adjustable spanner
Written note	Chit

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اصطلاحات متفاوت با معانی یکسان در زبانهای انگلیسی و آمریکایی

SM	Thousand dollars
SMM	\$M or million dollars
STP	60°F, 1 atmosphere
32°F, 1 atmosphere	STP
NTP	32°F, 1 atmosphere

**In the UK, interlock is used to describe a device that prevents someone opening one valve while another is open (or closed). Trip describes an automatic device that closes (or opens) a valve when a temperature, pressure, flow, etc., reaches a preset value.*

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Fire-Fighting Terms

U.S.	UK
Dry chemical	Dry powder
Dry powder	Dry powder for metal fires
Egress	Escape
Evolutions	Drills
Excelsior (for fire tests)	Wood wool
Fire classification:	
Class A: Solids	Class A: Solids
Class B: Liquids and gases	Class B: Liquids
Class C: Electrical	Class C: Gases
Class D: Metals	Class D: Metals
Fire stream	Jet
Nozzle	Branchpipe
Standpipe	Dry riser
Tip	Nozzle
Wye connection	Dividing breeching

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مدارک Legend و Symbolism یک پروژه

FIRE & GAS FUNCTION SYMBOLS	
	FLAMMABLE GAS DETECTOR
	SMOKE DETECTOR
	TOXIC GAS DETECTOR
	HYDROGEN GAS DETECTOR
	MANUAL ALARM CALL POINT
	FLAME DETECTOR (UV/IR)
	FUSIBLE HEAT DETECTOR
	HEAT DETECTOR (RATE OF RISE)
	HEAT DETECTOR (FIXED TEMPERATURE)
	BEAM GAS DETECTOR
	DELUGE VALVE
	SPRINKLER VALVE

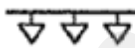
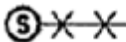
تهیه کننده: محمد بهزادی

مدارک Legend و Symbolism یک پروژه

	WATER HYDRANT (TWO WAY)		FLAME DETECTOR
	WATER HYDRANT (THREE WAY)		MANUAL ALARM CALL POINT
	COMBINED WATER MONITOR/HYDRANT (TWO WAY)		BEAM TYPE FLAMMABLE GAS DETECTOR
	COMBINED FOAM WATER MONITOR/HYDRANT (TWO WAY)		POINT TYPE GAS DETECTOR (FLAMMABLE)
	COMBINED WATER MONITOR/HYDRANT (THREE WAY)		POINT TYPE GAS DETECTOR (HYDROGEN)
	COMBINED FOAM WATER MONITOR/HYDRANT (THREE WAY)		TOXIC GAS DETECTOR (H ₂ S)
	FIXED WATER MONITOR		MCS-MANUAL CONTROL STATION-CO ₂ EXTINGUISHANT (MANUAL START SWITCH FOR CO ₂ SYSTEM)
	FIXED FOAM/WATER MONITOR		DAS-FIRE AND GAS ALARM SOUNDER (PRE-DISCHARGE ALARM HORN FOR CO ₂ SYSTEM) • DAS : DISCHARGE ALARM SOUNDER
	ELEVATED FIXED WATER MONITOR		DAL-4 ELEMENT STATUS LAMP-CO ₂ EXTINGUISHANT (WARNING LIGHT CLUSTERS FOR CO ₂ SYSTEM) • DAL : DISCHARGE ALARM LIGHT

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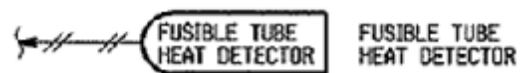
مدارک Legend و Symbolism یک پروژه

	FIRE HOSE CABINET C/W CONTENTS		CASTELL BLOCK VALVE WITH LIMIT SWITCH
	45kg MOBILE TROLLEY POWDER EXTINGUISHER		DELUGE VALVE
	8kg PORTABLE POWDER EXTINGUISHER		FIXED DELUGE
	SPRINKLER VALVE		HEAT DETECTOR (RATE OF RISE)
	DELUGE SYSTEM		HEAT DETECTOR (FIXED TEMPERATURE)
	DELUGE VALVE SKID ASSEMBLY		SMOKE DETECTOR (POINT TYPE OPTICAL)
	FOAM SYSTEM		ASPIRATED SMOKE DETECTION SYSTEM
	HOSE REEL/DRUM		FIRE BLANKET
	FUSIBLE PLUG HEAT DETECTOR		CO ₂ PORTABLE EXTINGUISHER
			DUAL AGENT EXTINGUISHING UNIT

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تهیه کننده: محمد بهزادی

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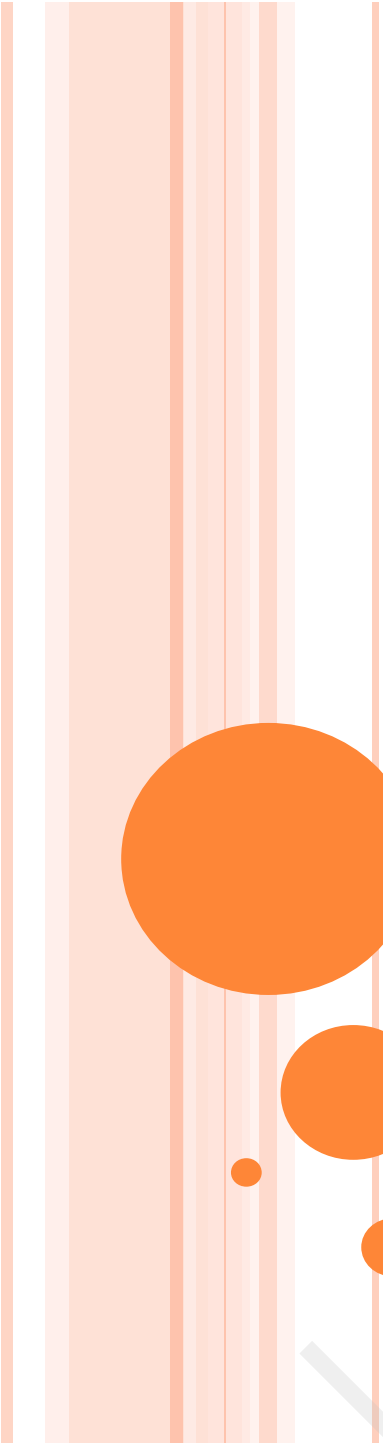


BA BREATHING APPARATUS

LJ LIFEJACKET STORAGE

CO₂ CO₂ SYSTEM

HRE HELIDECK RESCUE EQUIPMENT



ABBREVIATIONS

ABBREVIATIONS

MV : MICROVOLT

AC : ALTERNATIVE CURRENT

AF : ANTI FOAM (PROCESS)

AFF : ACTIVE FIRE FIGHTING

AGA : AMERICAN GAS ASSOCIATION

ATM : ATMOSPHERE

BDV : BLOW-DOWN VALVE

BLEVE : BOILING LIQUID EXPANDING VAPOUR EXPLOSION

BTU : BRITISH THERMAL UNIT

CA : CORROSION ALLOWANCE

CCR : CENTRAL CONTROL ROOM

CF : CERTIFICATE OF FITNESS (HVAC)
CGD : CATALYTIC GAS DETECTOR
CP : CONTROL PANEL (INSTRUMENTATION)
CPU : CENTRAL PROCESSING UNIT
D&ID : DUCT AND INSTRUMENTATION DIAGRAM (HVAC)
dB : DECIBEL
DC : DIRECT CURRENT
DCS : DISTRIBUTED CONTROL SYSTEM
DHSV : DOWN-HOLE SAFETY VALVE
DISC : DISCIPLINE
DO : DIESEL OIL
DO : DIGITAL OUTPUT
DOE : DEPARTMENT OF ENERGY (UK)
DWG : DRAWING
EDP : EMERGENCY DE-PRESSURISATION
ER : EMERGENCY RESPONSE
ESD : EMERGENCY SHUT DOWN
ESDV : EMERGENCY SHUT DOWN VALVE
F&G : FIRE AND GAS
FAT : FACTORY ACCEPTANCE TEST
FB : FULL BORE
FD : FLAME DETECTOR
FDS : FIRE DETECTION SYSTEM
FW : FIREWATER
FWKO : FREE WATER KNOCK OUT
GA : GENERAL ARRANGEMENT
GD : GAS DETECTOR
GD : GENERATOR DIESEL
GHz : GIGAHERTZ

GRP : GLASS FIBRE REINFORCED POLYESTER
HAZAN : HAZARDS ANALYSIS
HAZID : HAZARD IDENTIFICATION
HAZOP : HAZARD OPERABILITY STUDY
HD : HEAT DETECTOR
HF : HYDROCARBONS FIRE
HIPPS : HIGH INTEGRITY PRESSURE PROTECTION SYSTEM (PROCESS)
HIPS : HIGH INTEGRITY PROTECTION SYSTEM (SAFETY)
HP : HIGH PRESSURE
HV : HIGH VOLTAGE
HVAC : HEATING, VENTILATION AND AIR CONDITIONING
Hz : HERTZ
I/O : INPUT / OUTPUT
IRGD : INFRA-RED GAS DETECTOR
IS : INTRINSICALLY SAFE
ISO : INTERNATIONAL STANDARDISATION ORGANISATION
ISO : PIPING ISOMETRIC DRAWING
JB : JUNCTION BOX
JF : JET FIRE
KHz : KILOHERTZ
KO : KNOCK OUT
L/O : LAYOUT
LDE : LEAD DISCIPLINE ENGINEER
LFL : LOWER FLAMMABILITY LIMIT
LP : LOW PRESSURE (HVAC)
LV : LOW VOLTAGE
MAWP : MAXIMUM ALLOWABLE WORKING PRESSURE
MAC : MANUAL ALARM CALL POINT
MCC : MOTOR CONTROL CENTRE

MDRS : MASTER DOCUMENT REGISTER SCHEDULE
MEG : METHYL ETHYLENE GLYCOL
MET : METEOROLOGICAL
MHR : MAN HOUR
MOM : MINUTES OF MEETING
MOV : MOTOR OPERATED VALVE
MSL : MEAN SEA LEVEL
MTBF : MEAN TIME BETWEEN FAILURE
MTO : MATERIAL TAKE OFF
MV : MASTER VALVE
N/A : NOT APPLICABLE
NDT : NON DESTRUCTIVE TEST
NTS : NOT TO SCALE
PA : PASCAL
PABX : PRIVATE AUTOMATIC BRANCH EXCHANGE
PAGA : PUBLIC ADDRESS AND GENERAL ALARM
PB : PUSH BUTTON
PC : PERSONAL COMPUTER
PCM : PULSE CODED MODULATION
PCS : PROCESS CONTROL SYSTEM
PFD : PROCESS FLOW DIAGRAM
PLC : PROGRAMMABLE LOGIC CONTROLLER

PM : PROJECT MANAGER
PMS : PIPELINE MANAGEMENT SYSTEM
PO : PURCHASE ORDER
PP : PROJECT PROCEDURE
PPM : PARTS PER MILLION
PSS : PROCESS SHUT DOWN SYSTEM
PSV : PRESSURE SAFETY VALVE
PTR : PROJECT TECHNICAL REVIEW
PWHT : POST WELD HEAT TREATMENT
QA : QUALITY ASSURANCE
QC : QUALITY CONTROL
QRA : QUANTIFIED RISK ASSESSMENT
RB : REDUCED BORE
RH : RELATIVE HUMIDITY
RP : RECOMMENDED PRACTICE
RPM : ROUND PER MINUTES
SAC : (COMPOSITE) SAFETY ANALYSIS CHART
SAFE : SAFETY ANALYSIS FUNCTION EVALUATION (CHART)
SAT : SAFETY ANALYSIS TABLE
SCADA : SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEM
SD : SHUT DOWN (INSTRUMENTATION)
SD : SMOKE DETECTOR (SAFETY)
SDV : SHUT DOWN VALVE
SI : SYSTÈME INTERNATIONAL
SIL : SAFETY INTEGRITY LEVEL
SIMOPS : SIMULTANEOUS OPERATIONS
SK : SKETCH
SSV : SURFACE SAFETY VALVE
SWL : SEA WATER LEVEL
TBA : TO BE ADVISED
TGD : TOXIC GAS DETECTOR
TOS : TOP OF STEEL
TSV : THERMAL SAFETY (RELIEF) VALVE
Tx : TRANSMITTER
UFD : UTILITY FLOW DIAGRAM

UPS : UNINTERRUPTED POWER SUPPLY
UV : ULTRA-VIOLET
UW : UTILITY WATER
VCE : VAPOUR CLOUD EXPLOSION
VDU : VISUAL DISPLAY UNIT
WCP : WELLHEAD CONTROL PANEL
WT : WALL THICKNESS
Wt : WEIGHT
WV : WING VALVE
XV : ON/OFF VALVE

- ¢ **Plant Shutdown:** The shutting in of all process stations of a Plant Production process and all support equipment for the process.
- ¢ **Process Shutdown:** The isolation of a given process station from the process by closing appropriate SDVs to shut-in flow to the process station or divert flow to another process station.
- ¢ **Shutdown Valve (SDV):** An automatically operated Normally Closed valve used for isolating a process station.
- ¢ **Emergency Shutdown System (ESD):** A system of stations which when activated initiate plant shutdown.

Pressure Safety Valve (PSV): A pressure relief device designed to open and relieve excess pressure and to reclose and prevent the further flow of fluid after normal conditions have been restored.

Depressurization: When metal exposed to fire on one side with vapor on the other side, the metal temp. may reach a level at which metal rupture due to stress may occur, even though the pressure does not exceed the allowable overpressure. An emergency depressurization (blow down) system is provided to avoid such an occurrence.

P&ID Symbols from walas

مثالی از روشهای مختلف کنترل

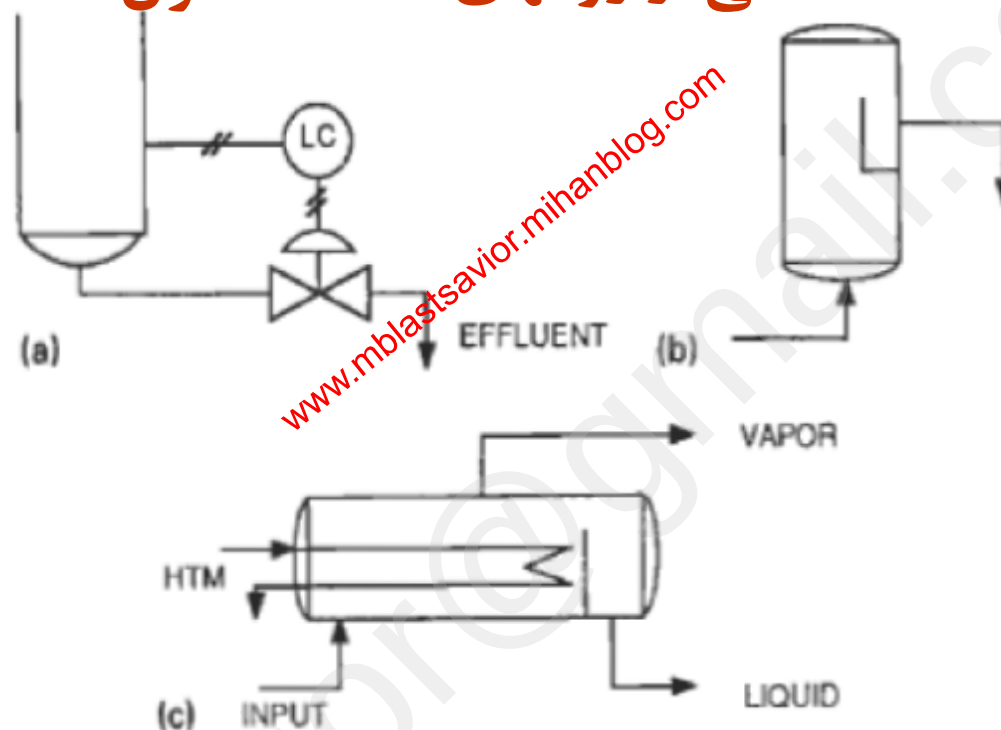


Figure 3.6. Some modes of control of liquid level. (a) Level control by regulation of the effluent flow rate. This mode is externally adjustable. (b) Level control with built in overflow weir. The weir may be adjustable, but usually only during shutdown of the equipment. (c) Overflow weir in a horizontal kettle reboiler. The weir setting usually is permanent.

مدارک پایپینگ

بسیار حائز اهمیت است که هر کدام از شاخه ها از هدف کاری که توسط شاخه های دیگر در حوزه تخصصی آنها انجام می گیرد آگاه باشند و همکاری و همگامی با شاخه های دیگر داشته باشند.

از فلوشیت مکانیکال تجهیزات یا پایپینگ و نقشه های ابزار دقیق تهیه شده، اطلاعات لازم برای تهیه، خریداری یا ساخت تجهیزات و ماشین آلات لازم به دست می آید.

(plot Plant)

جانمایی سایت، محدوده های جغرافیایی زمینی که کارخانه قرار می گیرد را تعریف می کند.

نقشه های مخازن و تجهیزات

این نقشه ها برای نمایش پیرامون تجهیزات به همراه حداقل احتیاجات نازل تهیه می شوند و ممکن است شامل جزئیات ساخت در جاهایی که مورد نیاز است شود.

مدارک پایپینگ

نقشه های ایزومتریک

- این نقشه ها برای دستیابی به اهداف ذیل تهیه می شوند:
- ایزومتریکهای سیستم برای نشان دادن پایپینگ کامل سیستم (شامل زانویی ها)
 - ایزومتریکهای تنش اولیه - برای تخمین تنش اولیه لوله ها (توسط نرم افزار سزار)
 - ایزومتریکهای تنش نهایی - لوله های ایزومتریک تهیه شده براساس آنالیز تنش تکمیلی
 - نقشه های ایزومتریک از برشهای (Spool)-نقشه های اسپول سیستم که برای ساخت یا مونتاژ قبل از نصب مناسب هستند.

مدارک پایپینگ

لیست تجهیزات (Equipment list)

لیست تجهیزات برای هر سیستم به طور جداگانه تهیه می شود و تعداد هر یک از تجهیزات و همچنین اندازه، محل و موقعیت آنها را شرح می دهد.

لیست شیرها (valve list)

لیست شیرها برای هر سیستم از اطلاعاتی که از P&ID استخراج می شود، تهیه می گردد.

لیست خطوط (line list)

لیست خطوط بایستی با استفاده از اطلاعاتی که از P&ID به دست می آید تهیه می شود. هدف از تهیه این لیست، شماره بندی خطوط در ارتباط با چیدمان کلی پایپینگ و نقشه های مختلف ایزومتریک می باشد.

جدول آویزها (Hanger schedule)

جداولی که در ارتباط با سیستمهای پایپینگ تهیه می شوند تا امکان تهیه متریال اولیه لازم جهت ساپورت گذاری لوله کشی فراهم شود.

(As built) نقشه های ازبیلت

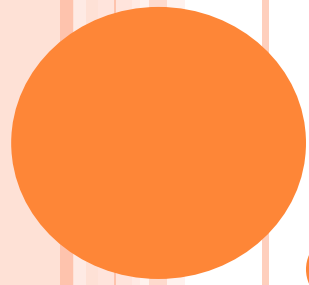
نقشه های ازبیلت کپی هایی از نقشه های قرارداد هستند که تغییراتی که در حین ساخت در پروژه انجام گرفته در آنها اعمال می شود.

(Report drawings) نقشه های گزارشی

برای نمایش آیتمهای خاص که در گزارشها به آنها اشاره شده به کار می روند. جزئیات بایستی حداقل باشند و وضوح و کیفیت نمایش متریال مورد نظر مد نظر قرار گیرند.

(Foreign drawings) نقشه های خارجی

نقشه های اسناد دیگری هستند که توسط پیمانکاران یا فروشندگان و تامین کنندگان خارج از شرکت تهیه شده اند تا جزئیات کار، پروژه یا دستگاهی که توسط آنها تامین می شوند را ارائه می دهند.



IPS

بخش

PFD – P&ID

PROCESS FLOW DIAGRAM

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

Phase I: Basic Design Stages (containing seven Standards)

Phase II: Detailed Design, Engineering and Procurement Stages (containing two Standards)

Phase III: Start-Up Sequence and General Commissioning Procedures (containing two Standards)

PHASE I: BASIC DESIGN STAGES (CONTAINING 7 STANDARDS)

STANDARD CODE

STANDARD TITLE

I) Manuals of Phase I (Numbers 1 - 7)

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-230

"Piping & Instrumentation Diagrams (P&IDs)"

IPS-E-PR-250

"Performance Guarantee"

IPS-E-PR-308

"Numbering System"

منابع IPS برای این بخش

PHASE II: DETAILED DESIGN, ENGINEERING AND PROCUREMENT STAGES (CONTAINING 2 STANDARDS)

I) Manuals of Phase II (Numbers 8&9)

<u>IPS-E-PR-260</u>	"Detailed Design, Engineering and Procurement"
<u>IPS-E-PR-300</u> Dossiers)"	"Plant Technical and Equipment Manuals (Engineering

Phase III: Start-Up Sequence and General Commissioning Procedures (containing two Standards)

III) Manuals of Phase III (Numbers 10&11)

<u>IPS-E-PR-280</u>	"Start-Up Sequence and General Commissioning Procedures"
<u>IPS-E-PR-290</u>	"Plant Operating Manuals"

SCOPE

This Standard is also intended to establish uniform symbols for equipment, piping and instrumentation on P&IDs and UDFDs throughout the Oil, Gas and Petrochemical (OGP) projects.

Nomenclature or Terminology

FLOWSHEETS

the Piping and Instrumentation Diagrams (P&IDs)

Utility Distribution Flow Diagrams (UDFDs,UHD,UFD)

Process flow diagram(PFD)

REFERENCES

ASME (AMERICAN SOCIETY OF MECHANICAL ENGINEERS)

ASME Code.

ANSI (AMERICAN NATIONAL STANDARD INSTITUTE)

ANSI B 16.1 "Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250
and 800"

1st. Ed., 1989

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-PR-200

"Basic Engineering Design Data"

IPS-E-PR-308

"Numbering System"

IPS-E-PR-725

"Process Design of Plant Waste Sewer Systems"

IPS-G-IN-160

"Control Valves"

IPS-D-AR-010

"Abbreviations & Symbols for HVAC&R Drawings"

IPS-D-AR-011

"General Notes for HVAC & R System"

REFERENCES

ISA (INSTRUMENT SOCIETY OF AMERICA)

- ISA-S5.1 "Instrumentation Symbols and Identification" 1st. Ed., 1984
- ISA-S5.2 "Binary Logic Diagrams for Process Operations" 2nd. Ed., 1981 (Reaffirmed 1992)
- ISA-S5.3 "Graphic symbols for distributed control / shared display instrumentation, logic and computer systems "Ed.,1983
- ISA-S5.4 "Instrument Loop Diagrams" Ed., 1991
- ISA-S5.5 "Graphic Symbols for Process Displays" 1st. Ed., 1985
- ISA-S18.1 "Annunciator Sequences and Specifications" 1st. Ed., 1979 (Reaffirmed 1992)
- ISA-S50.1 "Compatibility of analogue signals for electronic industrial process instruments" 1st. Ed., 1975 (Reaffirmed 1995)
- ISA-S51.1 "Process Instrumentation Terminology" 1st. Ed., 1979

REFERENCES

ISO (INTERNATIONAL ORGANIZATION FOR STANDARDIZATION)

ISO 3098: Part 1 "Technical Drawings-Lettering, Part 1: Currently Used Characters"
1st. Ed. 1974

ISO 3511: Part 1 & Part 4 "Process measurement control functions and instrumentation-symbolic representation-Part 1: Basic requirements, 1st.Ed. 1977;Part 4: Basic symbols for process computer, Interface, and shared display/control functions" Ed. 1985
1st. Ed., 1984

ISO 6708 "Pipe component definition of nominal size" Ed., 1995.

API (AMERICAN PETROLEUM INSTITUTE)

API Standard 602 "Compact steel gate valves-flanged, threaded, welding and extended body ends "nine Ed., 1995

GPSA (Gas Process System Analysis)

TERMINOLOGY:

Company or Employer/Owner :

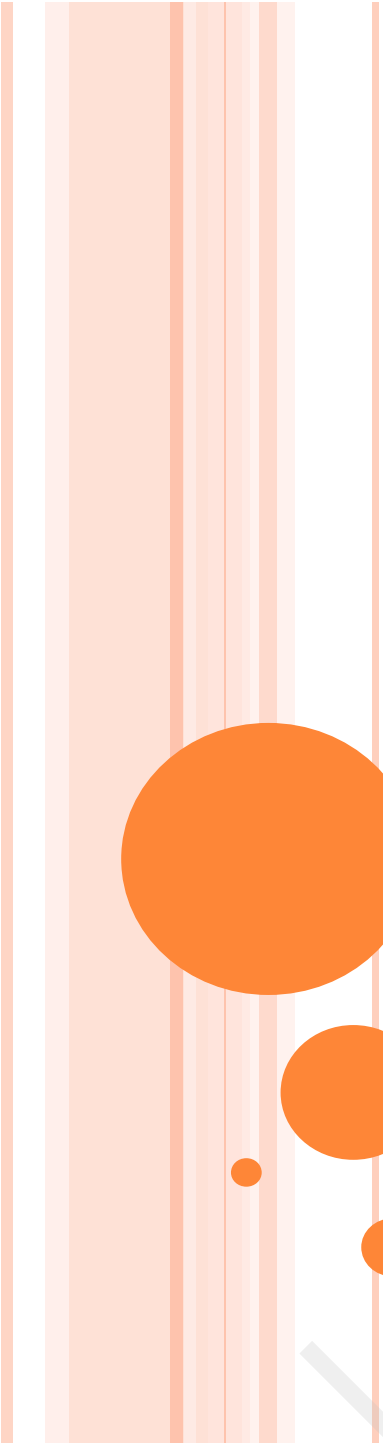
affiliated companies of the Iranian ministry of petroleum :

National Iranian Oil Company (NIOC)

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National Iranian Gas Company (NIGC)

National Petrochemical Company (NPC)



SYMBOLS AND ABBREVIATIONS

IMORTANTS AND COMMONS IN **RED**

قرمزها حفظ گردد

DRAIN / SEWER SYMBOLS

AMN	Amine Drains (MEA,MDEA)
AY	Amine Drain Funnel (MEA,MDEA)
CAU	Caustic Sewer(NAOH)
CDB	Concrete Drain Box
CSW	Chemical Sewer
CY	Chemical Drain Pit
DC	Drain Connection
DWW	Desalter Waste Water
NSW	Non Oily Water Sewer
OPD	Open Drain
OSW	Oily Water Sewer
SSW	Sanitary Water Sewer
SWA	Stripped Sour Water
TY	Toxic Drain Funnel
Y	Drain Funnel (General)

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تهیه کننده: مهدی بهزادی

LETTERS AT INDIVIDUAL VALVES DESIGNATIONS

B	Monel Valve (grease sealed seat and packing)
BV	Ball Valve
CAO	Close-Automatic-Open
CC	Cable Control
CO	Chain Operated
CHV	Check Valve
D	Drain
FB	Full Bore
FC	Fail Close (closes on minimum signal to valve actuator)
FO	Fail Open (opens on minimum signal to valve actuator)
FD	Flex Disc Valve (Diaphragm Valve)

Monel الیاژی از نیکل و کبالت که در برابر خوردگی مقاوم است

Flex خم شو

354

LETTERS AT INDIVIDUAL VALVES DESIGNATIONS

MOV	Motorized Valve(motor operated valve)
NC	Normally Closed(like by-pass valve for control valves)
NO	Normally Open
NV	Needle Valve (Plug valve)
OV	Operating Valve
PIVA	Post Indicator Valve(if it is Closed or open)
PSE	Rupture Disk Assembly (Pressure Safety Equipment)
PSV	Pressure Safety Relief Valve
P	Plugged
SR	Split Range
SSV	Stainless Steel Valve
T	Trap
V	Vent
WP(J)	Jacketed Plug Valve
XCV	Steam Trap with Integral Strainer

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تهیه کننده مباحث ای

PIPING ABBREVIATIONS

CS	Carbon Steel
DN	Diameter Nominal
FF	Flat Face
FS	Forged Steel
LJ	Lap Joint
MI	Malleable Iron
PN	Pressure Nominal
RF	Raised Face
RS	Removable Spool
SF	Socket Weld Line Blind with Flexitallic Gaskets
SB	Spectacle Blind
SO	Slip on
SS	Stainless Steel
ST(H)	Steam Trap (Heat Conservation)
SW	Socket Weld
WN	Weld Neck

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تهیه کننده: محمد بهزادی

MISCELLANEOUS DESIGNATIONS

AG	Above Ground
BL	Battery Limit
DCS	Distributed Control System
HCB	Hydrocarbon
HCH	Hydrocarbon with Hydrogen
HHLL	High High Liquid Level
HLL	High Liquid Level
LG	Level Gage
LLL	Low Liquid Level
LLLL	Low Low Liquid Level
MW	Manway
NLL	Normal Liquid Level
P	Pressure
PB	Push Bottom
PFD	Process Flow Diagram
PG	Pressure Gage
PI	Pressure Indicator

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تهیه کننده: مهدی بهزادی

MISCELLANEOUS DESIGNATIONS

P&ID

Piping & Instrumentation Diagram

PO

Pump Out

PT

Pressure Test Connection

RES

Residue

RG

Refrigerant Gas

RL

Refrigerant Liquid

RTD

Resistance Temperature Detector

RVP

Reid Vapor Pressure

SC

Sample Connection

SCL

Sample Cooler

SG

Sight Glass

SP

Set Point

SP.GR.

Relative Mass Density (Specific Gravity)

STO

Steam Out

TI

Temperature Indicator

T/T

Tangent to Tangent

UFD

Utility Flow Diagram

UG

Under Ground

VB

Vortex Breaker

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تهیه کننده: محمدرضا میرزایی

UTILITY SERVICES ABBREVIATIONS

BFW	Boiler Feed Water
CLW	Chlorinated Water
CW	Cooling Water
CWR	Cooling Water Return
CWS	Cooling Water Supply
DMW	Demineralized Water
DSW	Desalinated Water
DWA	Drinking Water
FLG	Fuel Gas
FLR	Flare Discharge
FOR	Fuel Oil Return
FOS	Fuel Oil Supply
FWA	Fire Water
HBW	High Pressure Boiler Feed Water
HPC	High Pressure Condensate
HPS	High Pressure Steam

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تهیه کننده: محمدرضا میرزایی

UTILITY SERVICES ABBREVIATIONS

ISA
LLPS
LPC
LPS
MBW
MPC
MPS
NG
NIT
PLA
PWA
RFO
RFW
RWA
SWA
TWA
WAT

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Instrument Air
Low Low Pressure Steam
Low Pressure Condensate
Low Pressure Steam
Medium Pressure Boiler Feed Water
Medium Pressure Condensate
Medium Pressure Steam
Natural Gas
Nitrogen
Plant Air
Plant Water(service water)
Refinery Fuel Oil
Refrigerated water
Raw Water
Sour Water
Treated Water
Water

تهیه کننده: مهندس مازی

POWER SUPPLY

AS

Air Supply

ISA

Instrument Air

PLA

Plant Air

ES

Electric Supply

GS

Gas Supply

HS

Hydraulic Supply(Water)

NS

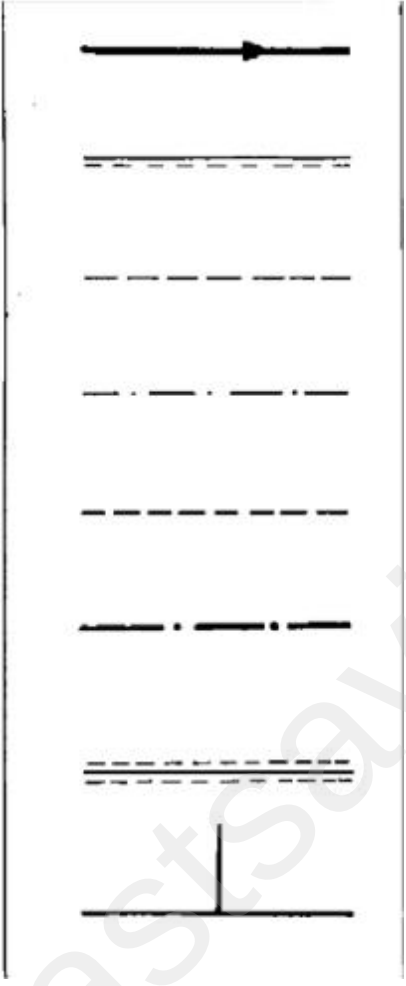
Nitrogen Supply

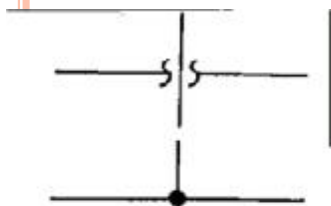
SS

Steam Supply

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تهیه کننده: محمد بهزادی

SYMBOL	DESCRIPTION
انواع خطوط 	Main process line (arrow indicates Direction of fluid flow) Heat traced pipe line Underground pipeline Existing line Future line Vendor package Jackated or double containment pipeline Line crossing (connected)



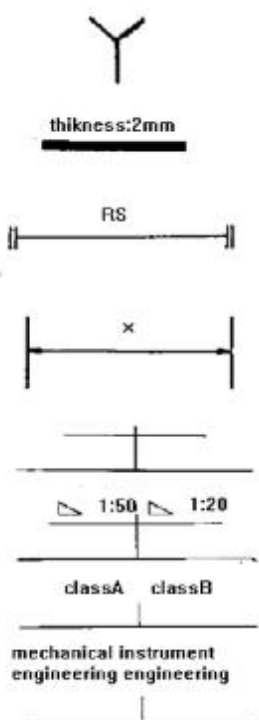
**Line crossing (nconnected)
Lines junction**

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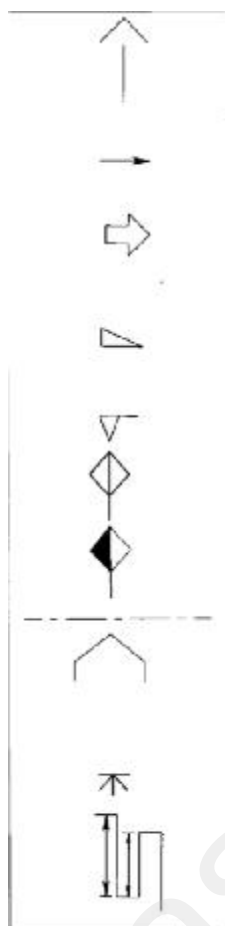
**Dripe funnel
Platform
Removable spoolpiece
Minimum distance**

Indication of point of change:

- a) change in sloop**
- b) change in piping class**
- c) change in responsibility**



تهیه کننده: محمدرضا میرزایی



Outlet to the atmosphere for steam / gas

Flow / motion in diraction of arrow

Arrow for inlet or outlet of essential substances

Slope

Level reference

Limit , general

Contractor/ vendor

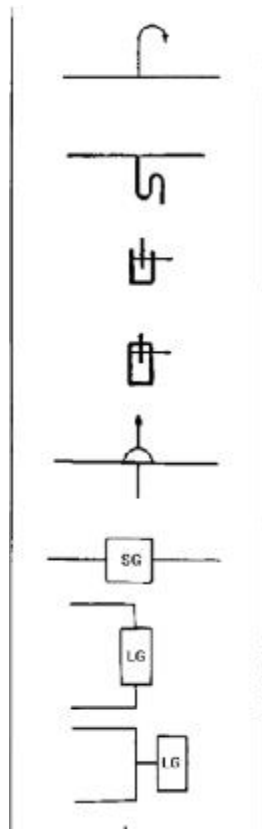
Battery limit

Hood , general (Furnace)

Distribution device for fluids , spray nozzle

Siphon with dip length

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Open vent

Syphon drain(seal leg)

Liquid seal, oen

Liquid seal ,closed

Butsting disc

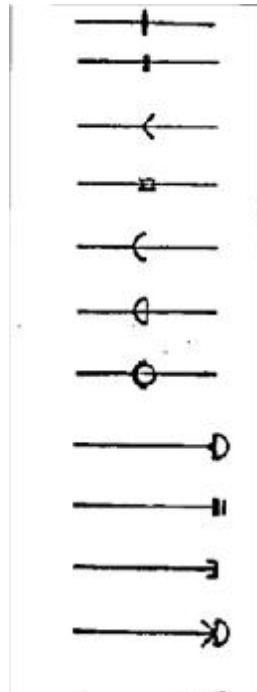
Sight glass

Level gage

Level gage on standpipe (vertical pipe)

INTERLOCK LOGIC SYMBOLS

symbol	description
  or	output exists if one or more input exists
  and	output exists if and only if all the input exists
  not	no output exists if one and only one input exists
 	time delay output exists after preset time
  exclusive	output exists if one and only one input exists
 	sequential logic control connection



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Butt welded joint

Flanged joint

Screwed joint (arrow : 90)

Socket welded joint

Socket and spigot joint

Compression joint

Swivel joint

End cap ,but welded

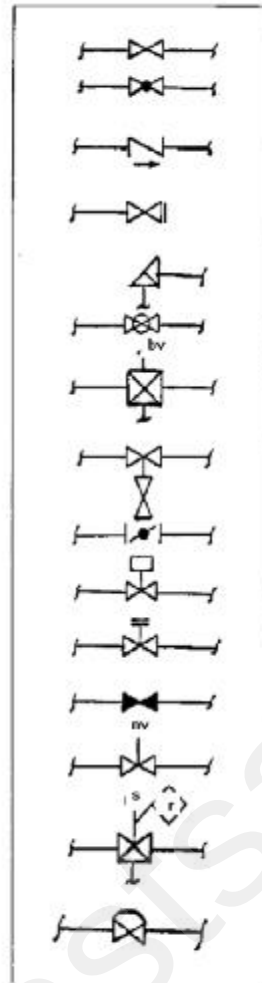
End flanged and bolted

End cap ,fillet welded (socket)

End cap ,screwed (arrow:90)

SYMBOLS FOR MANUALLY OPERATED AND MISCELLANEOUS VALVES AND MONITORS

!!



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Gate valve (basic symbol)

Globe valve

Check valve (general)

Gate valve behind off

Angle valve

Ball valve

Fourway valve

Gate valve with body bleed

Butterfly valve

Hydraulic control (water force)

Metering cock

Needle valve

Plug valve

S=solenoid valve

R= Manual reset when indicated

Diaphragm valve

تهیه کننده: مهدی میرزایی

Distributed control/shared display symbols

symbol	description
	field mounted instrument (not normally accessible to operator)
	indicator/controller/alarm (normally accessible to operator)
	auxiliary operators interface device

اشکال مختلف ابزار دقیق برای سیستم DCS

اشکال مختلف ابزار دقیق برای سیستم PLC

Programmable logic controller (PLC) function symbols

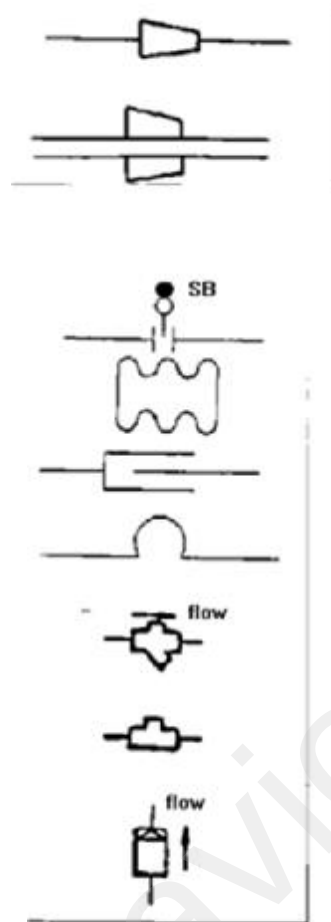
symbol	description
	field mounted PLC integral to DCS not normally accessible to operator
	control mounted PLC integral to DCS not normally accessible to operator
	control board mounted auxiliary location normally accessible to operator
	behind of control board not normally accessible to operator
	behind of control board auxiliary location not normally accessible to operator

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General instrument or function symbols

SYMBOL	DESCRIPTION
	field mounted instrument
	panel mounted instrument
	instrument mounted behind control panel in control room
	local panel mounted instrument
	instrument mounted behind local panel
	instrument sharing common housing with two function
	steam traced instrument
	electric traced instrument
	light (color R=RED G=GREEN)
	valve position indicating lamp

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Concentric reducer

Eccentric reducer (flush bottom)

Eccentric reducer (flush top)

spectacle blind (normally open)

expansion bellow

sleeve extension

expansion loop

steam trap with built-in strainer (thermostatic or thermodynamic type)

steam trap without built-in strainer (thermostatic or thermodynamic type)

steam trap with integral check valve (bucket type)

کاهنده متقارن

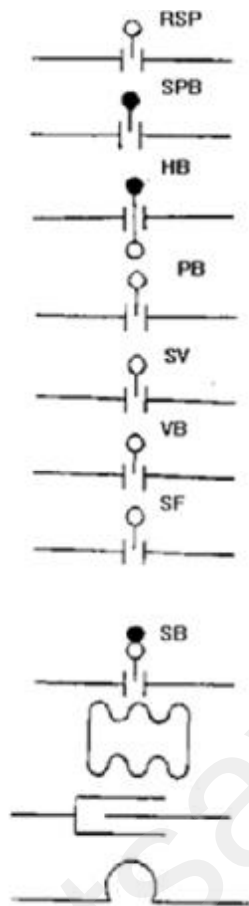
کاهنده نامتقارن

صفحه عینکی

تله بخار با صافی

تله بخار بدون صافی

تله بخار با شیر یک طرفه



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Ring spacer

Spade blind

Hammer blind

Pressure blind in welded line

Standard socket weld line blind union W/viton gaskets

6mm thick blind to blank off equipment (vapor blind)

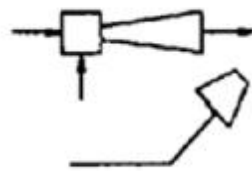
standard socket weld line blind union W/flexitallic gaskets

spectacle blind (normally open)

expansion bellow

sleeve extension

expansion loop



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Ejector

Jet mixer

Ring header

Flame arrestor (general)

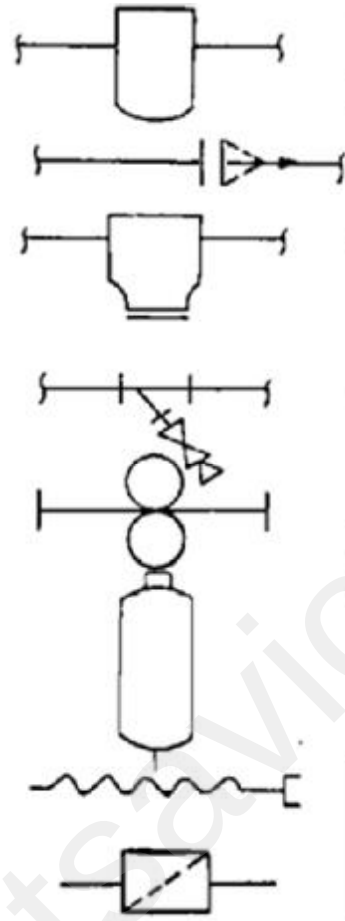
Explosion-proof flame arrestor (explosion comes
From the side of the rectangular)

Detonation-proof flame arrestor

Fire-resistant detonation-proof flame arrestor with
Outlet to the atmosphere

Fire_resistance flame arrestor

Silencer



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Bucket (basket)type strainer

Temporary strainer (cone type)

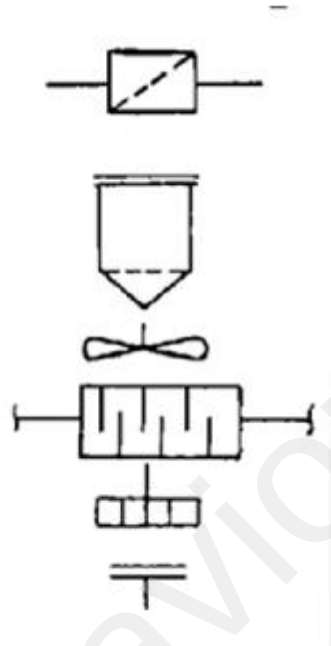
T-type strainer

Y-type strainer (with valved drain)

Duplex strainer

Pulsation dampener

Flexible hose with quick coupling



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Flexible hose with quick coupling

Filter (general)

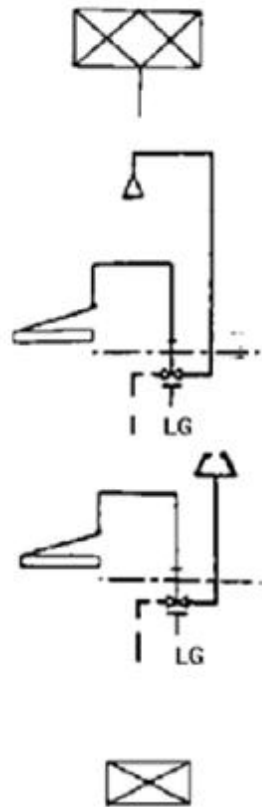
Cartridge type filter

Propeller mixer

In-line mixer (static)

Turbine mixer

Nozzle (blinded off)



Breather

Emergency (safety) shower equipped with no freezing drain valve

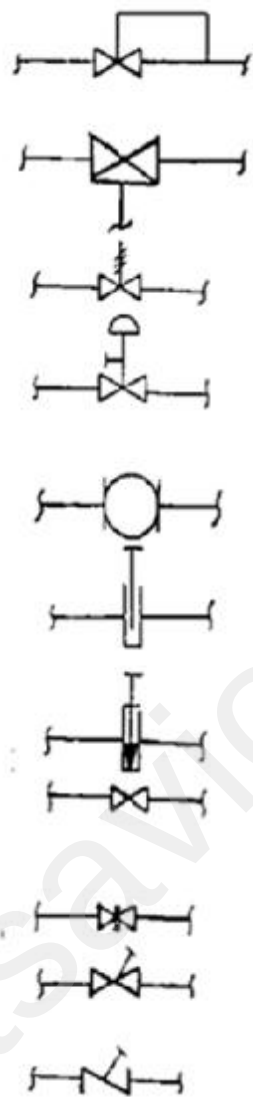
Eyewasher equipped with no freezing drain valve

Vortexx breaker



Manway

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Self contained regulator

Treeway valve

Spring loading valve

Control valve with handwheel

Rotary valve

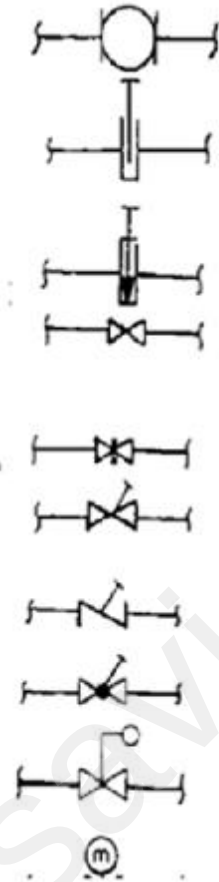
Slide valve

Knife valve

Post indicator valve

Piston valve

Y-type below down valve



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Rotary valve

Slide valve

Knife valve

Post indicator valve

Piston valve

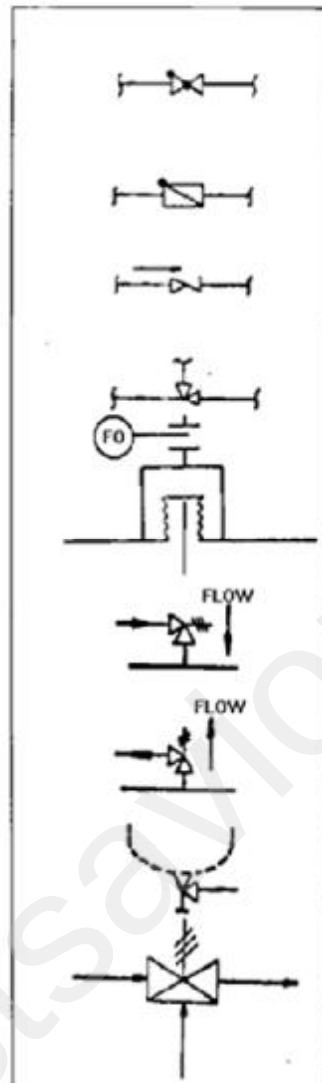
Y- type below down valve

Y-type stop check valve

Y-type globe valve

Float valve

Motor operated valve



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Lift check valve

Swing check valve

Stop check

Stop check , non -return valve

Trip valve (low lube oil ppressure)

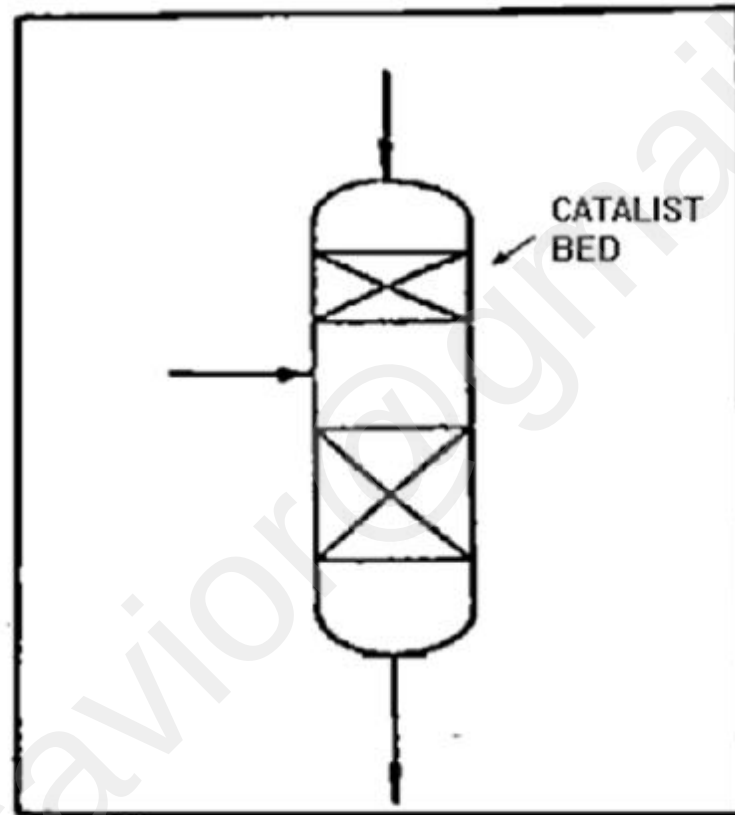
Relief valve (angle ,vaccum)

Relief valve (angle ,pressure)

Flush bottom valve

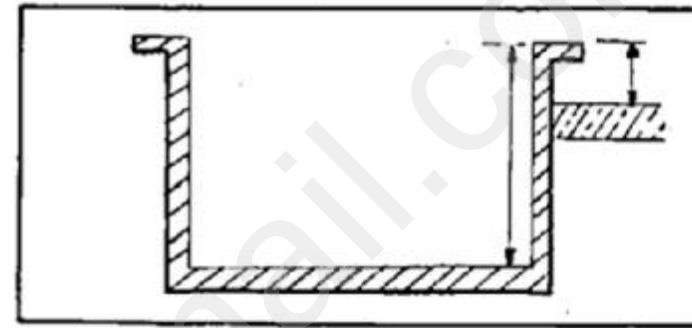
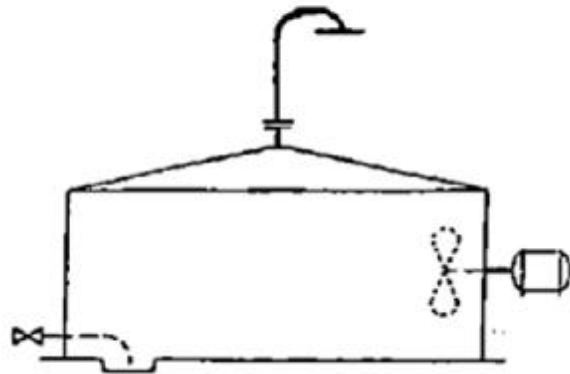
Pressure/ vaccum valve

Foot valve with strainer

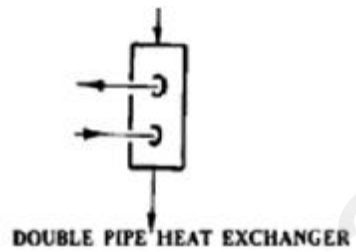


REACTOR

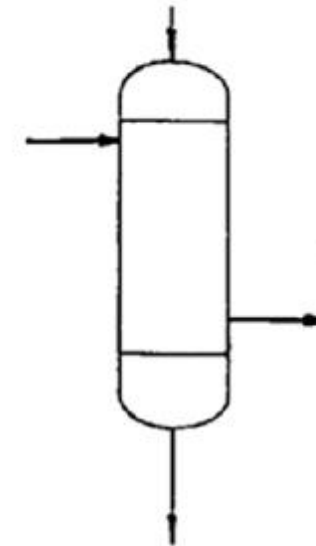
OPEN VENT WITH SCREEN



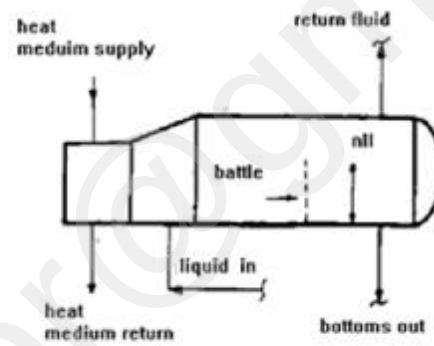
CONCRETE SUMP



DOUBLE PIPE HEAT EXCHANGER



vertical shell tube heat exchanger (general)



kettle type reboiler u tube type (general configuration)

A.2.3.4.3 GENERAL SYMBOLS FOR DRIVERS



ELECTRIC MOTOR GENERAL



COMBUSTION ENGINE



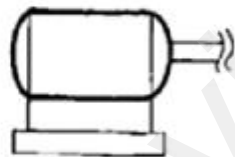
GEAR BOX



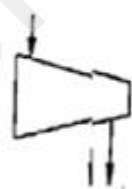
DISEL MOTOR



GAS TURBINE MOTOR



ELECTRIC DRIVE

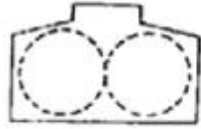


TURBINE (BASIC SYMBOL)



EXPANDER

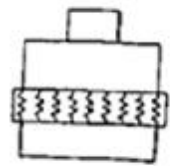
Crusher



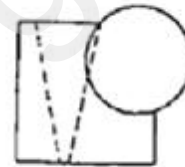
ROLL CRUSHER



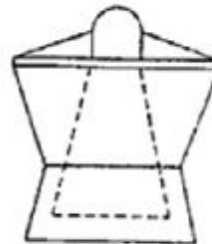
HAMMERMILL CRUSHER



CONE CRUSHER



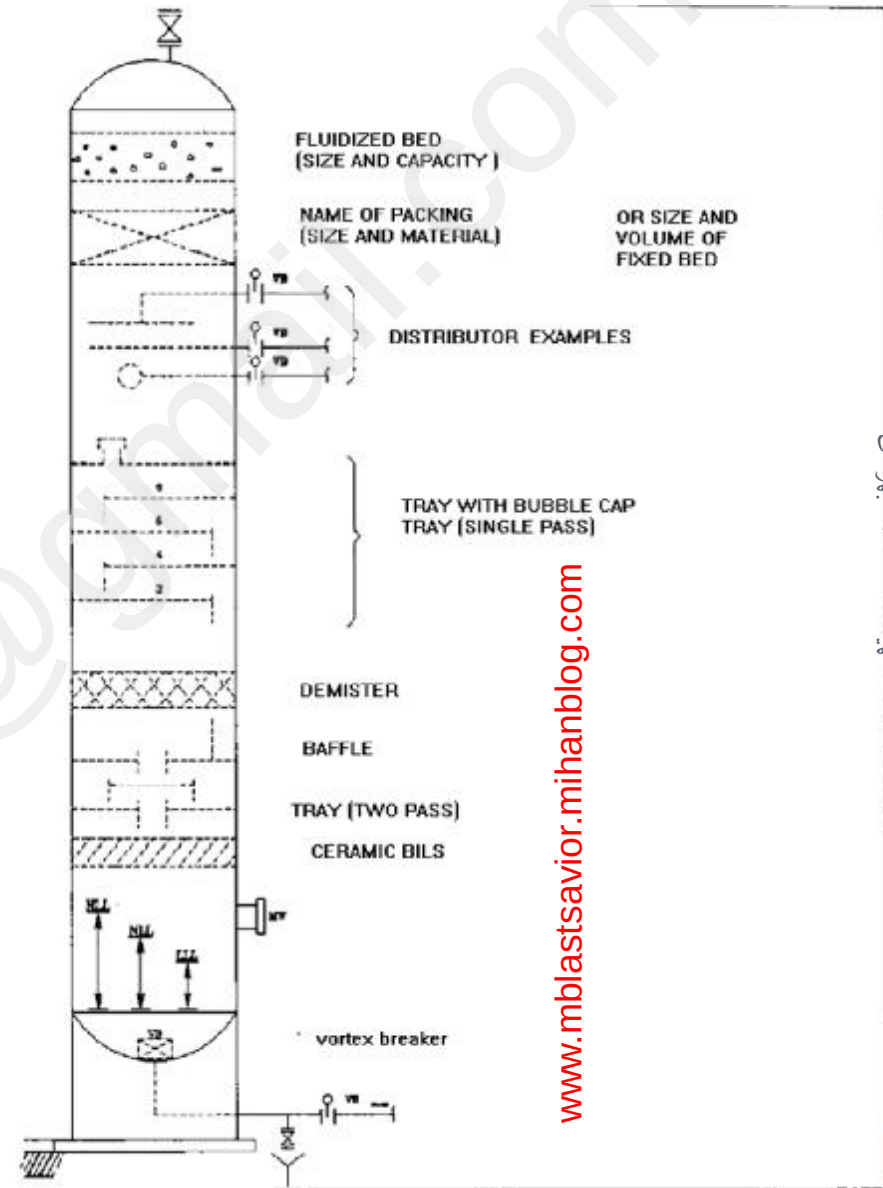
JAW CRUSHER



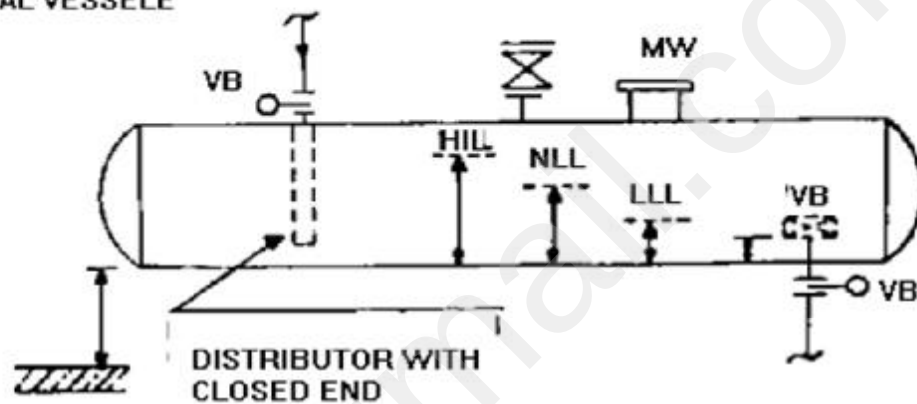
GYRATORY CRUSHER

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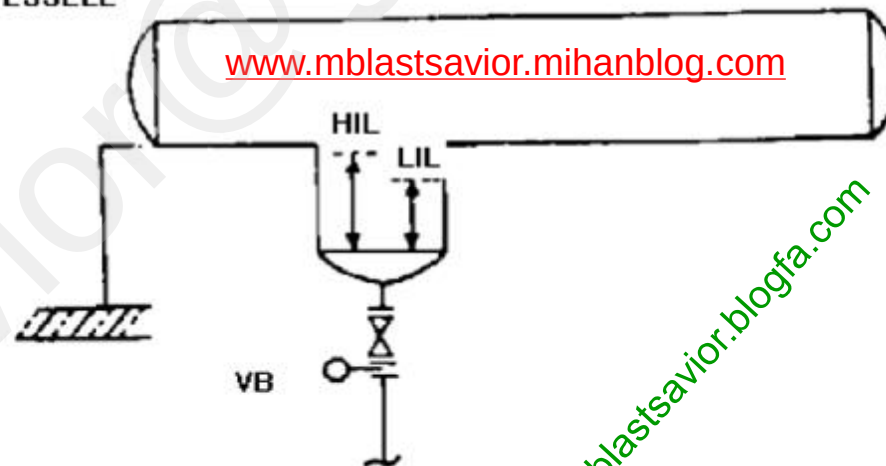
EQUIPMENT:TOWER, COLUMN, VESSEL AND REACTOR



A.2.3.1.2 HORIZONTAL VESSELE



(A) HORIZONTAL VESSELE

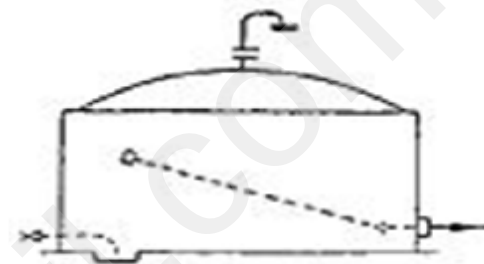


B) HORIZONTAL VESSELE WITH BOOT

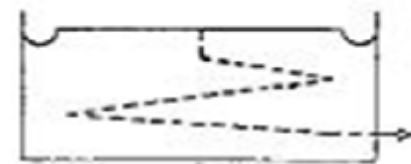
www.mblastsavior.blogfa.com

Note:

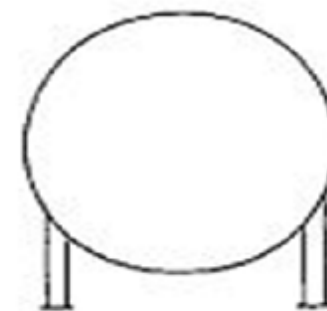
All tanks and spheres on each flow diagram are to be shown in Approximate relative size to each other



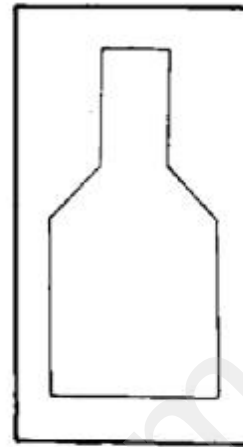
DOME ROOF
WITH SWING PIPE FLOAT TYPE



FLOATING ROOF

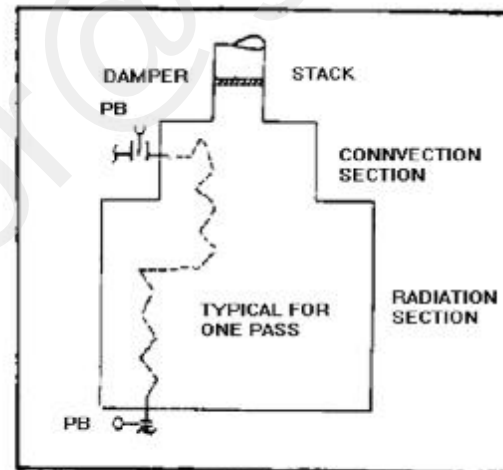


SPHERE

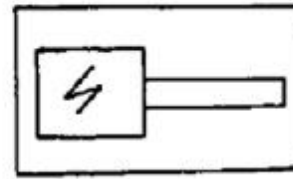


A) FURNACE (BASIC SYMBOL)

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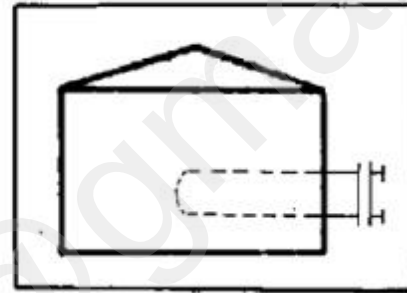


B) FIRED HEATER (BOX OR CYLINDRICAL TYPE) WITH COVECTION SECTION



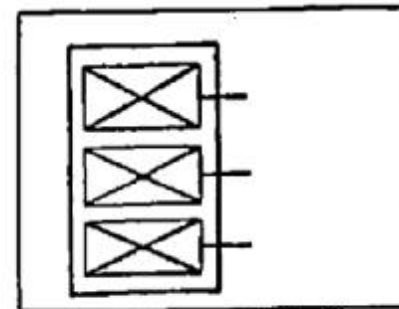
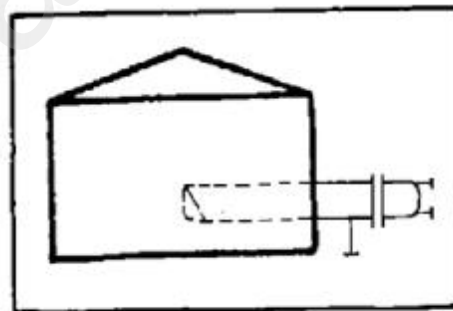
C) ELECTRICAL HEATER

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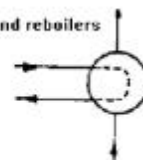


D) TANK HEATER

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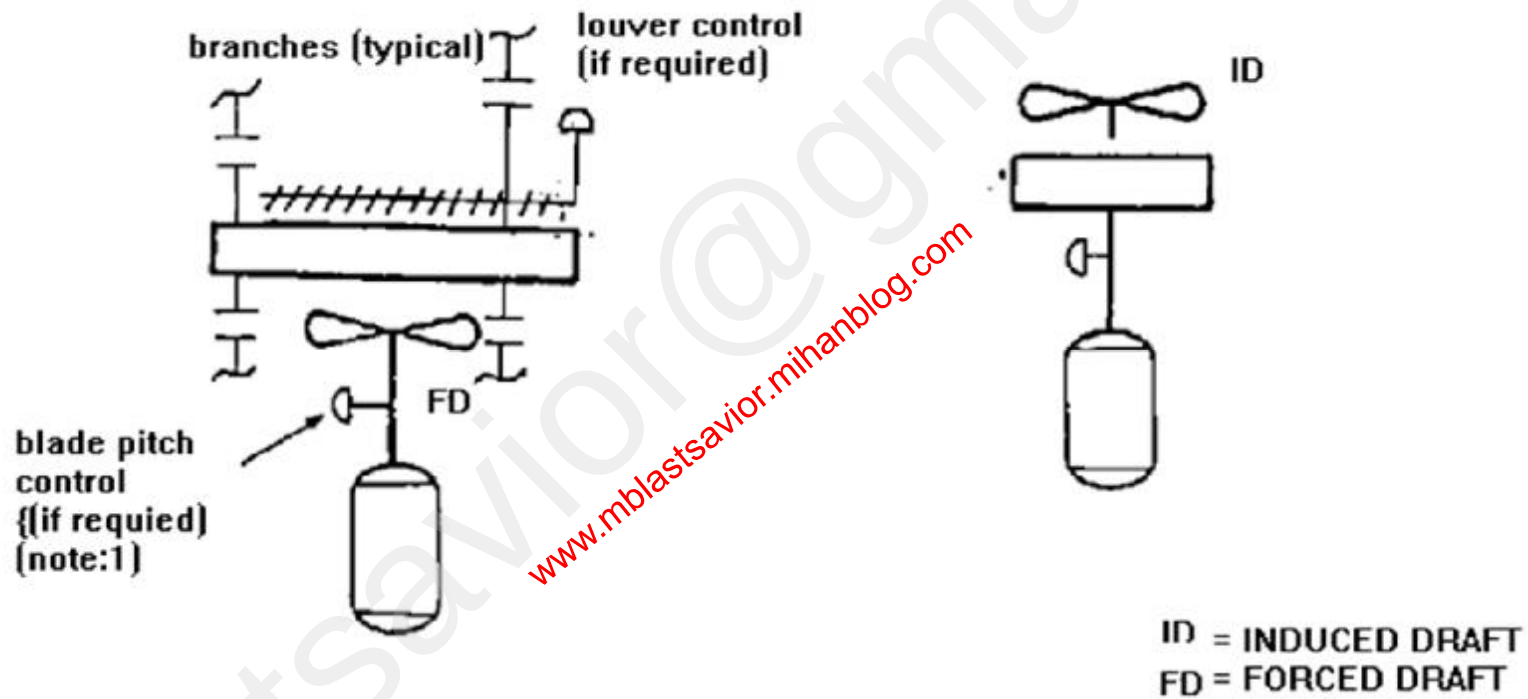
A.2.3.3.2 exchangers water coolers and reboilers



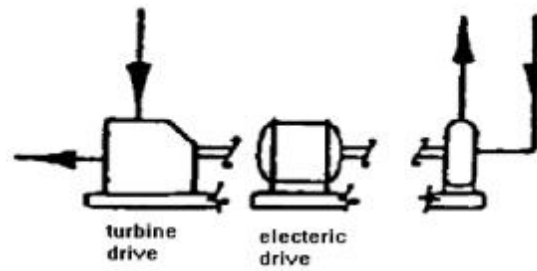
shell and tube heat exchanger(basic symbol)

	heat exchanger/cooler/condenser with floating head
	heat exchanger/cooler/condenser u tube
	heat exchanger/cooler/condenser fixed tube sheet
	cooler/ condenser with floating head and cover plate
	horizontal reboiler fixed tube sheet
	kettle type reboiler u-tube
	kettle type vaporizer floating head
	kettle type vaporizer fixed tube sheet

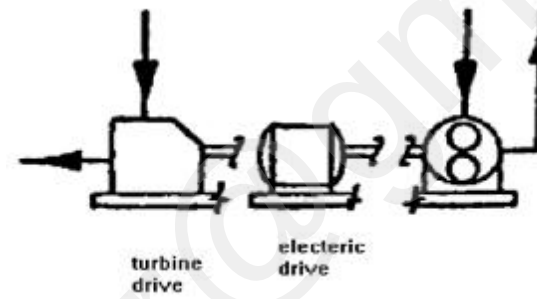
AIR COOLERS



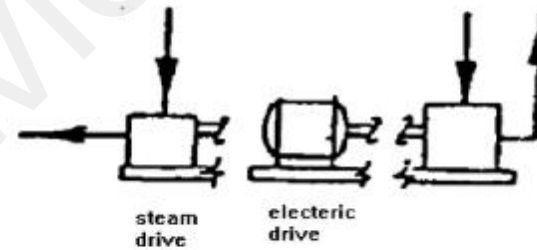
PUMPS



centrifugal pump

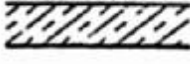
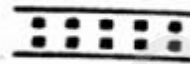


rotary pump
(gear pump)



reciprocating pump

Concrete/Brick/Soil

SYMBOL	DESCRIPTION
	Brickwork
	Concrete (reinforced)
	Refractory clay, Refractory bricks
	Soil

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NOZZLES IDENTIFICATIONS ON VESSELS, REACTORS AND TOWERS

<u>NOZZLE</u>	<u>IDENTIFICATION SYMBOL</u>
A, A2	Inlets
B	Outlet
C	Condensate
D	Drain or Draw-off
E*	
F	Feed
G	Level gage or gage glass
H	Handhold
J	Pumpout
K*	
L	Level instrument (also LT, LI)
M	Manhole
N	Reboiler connection
P	Pressure connection (also PT, PI)
R	Reflux
S	Steam or sample connection
T	Temperature connection (also TI, TE, TW)
V	Vapor or vent
W	Relief valve connection (Oversize unless actual size known)

*Use E or K when non of the other symbols apply. Do not use I, O, Q, U, X, Y, or Z.

LINE WIDTHS

ضخامت خطوط برای جریانهای مختلف

To obtain a clear representation, different line widths shall be used. Main flow lines or main piping shall be highlighted.

The following line widths shall be applied:

- 0.8 mm for main process lines;
- 0.5 mm for other process lines; utility lines, and underground lines;
- 0.5 mm for graphical symbols for equipment and machinery, except valves and fittings and piping accessories;
- 0.5 mm for rectangular boxes for illustrating Unit operations, process equipment, etc.;
- 0.5 mm for subsidiary flow lines or subsidiary product lines and for energy carrier lines and auxiliary system lines;
- 0.4 mm for class changes designation;
- 0.3 mm for graphical symbols for valves and fittings and piping accessories and for symbols for process measurement and control functions, control and data transmission lines;
- 0.3 mm for all electrical, computer and instrument signals;
- 0.3 mm for reference lines;

Line widths of less than 0.3 mm shall not be used.

DRAWINGS TITLE BLOCK SIZE

Drawing sizes to be used are:

Size Designation	Drawing Dimensions (mm x mm)	Title Block Size (mm x mm)
A4	210 x 297	75 x 120
A3	297 x 420	—
A2	420 x 594	100 x 155
A1	594 x 841	130 x 175
A0	841 x 1189	180 x 190

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Note:

The final (As Built) isometric drawings shall include the material take off table and should be in A3 size.

DRAWING SCALES

Drawings scales shall be any of the following:

1: 10

1 : 20

1: 25

1 : 33-1/3

1 : 50

1 : 100

1 : 250

1 : 500

1 : 1000

1 : 2500 (Overall Plot Plan Only)

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NUMBERING OF PROJECT SPECIFICATIONS AND DATA SHEETS

اختصارات حروف انواع مختلف مدارک

SP

DW

PC

FS

DS

PR

CE

WS

IR

CA

MU

OT

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- Specification
- Drawings
- Performance Curves
- Fabrication Schedule
- Data Sheets
- Procedures
- Certificates
- Welding Specification
- Inspection Record
- Calculations
- Manuals
- Others

ENGINEERING DISCIPLINES CODING

اختصارات حروف دیسپلینهای مختلف

AC	Engineering	Heating, Ventilation, Air conditioning & Refrigeration
CI		Civil Engineering (General) including Architectural
EL		Electrical Engineering
GM		General Machineries
GN		General
HM and/or Engineering)		Heat and Mass Transfer Engineering (Thermal Equipment
IN		Instrumentation Engineering
ME		Fixed Mechanical Equipment Engineering (Non Rotating Equipment Engineering)
PI		Piping Engineering (General Mechanical and Interconnection Engineering)
PR		Process and Chemicals Engineering
PV		Pressure Vessel Engineering (Generally, Vessels Engineering)
RE and/or (PM)		Rotating Equipment and/or (Process Machineries) Engineering
SF		Safety, Fire Fighting & Environmental Control Engineering
ST		Structural Engineering
TC		Telecommunication Engineering
TP		Technical Protection Engineering

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کتابخانه محمد بهزادی

COMMODITY ACCOUNT No.:

- Civil	01
- Instrumentation	02
- Electrical	03
- Machinery	04
- Heaters	05
- Heat Exchangers (including reboilers, coolers, double pipe heat exchangers, coils, plate heat exchangers, etc.)	06
- Vessels, Towers or Drums	07
- Tanks and Spheres	08
- Package Units	09
- Miscellaneous Mechanical	10
- Piping	11
- Management	12
- Site Construction	13
- Miscellaneous	14

PROJECT SECTIONS CODING

AC	Accounting
CC	Cost Control
CN	Construction
DC	Document Center
FN	Finance
GN	General
PC	Project Coordination
PE	Project Engineering
PN	Planning
PM	Project Management
PQ	Procurement
QA	Quality Assurance
QC	Quality Control

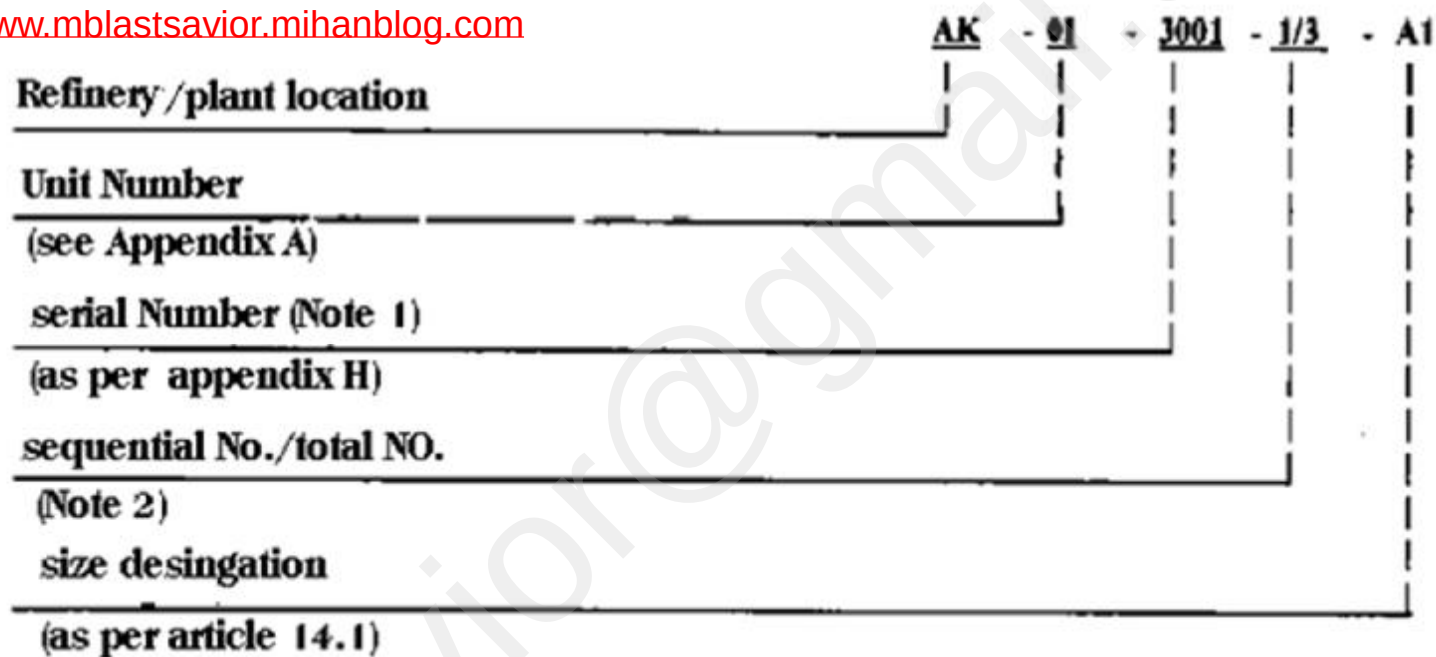
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تهیه کننده: محمدرضا بهزادی

Numbering of Drawings

نامگذاری مدارک

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تهیه کننده: محمد بهزادی

Notes:

- 1) Two drawings may have the same serial number but different unit number.
- 2) When drawings have same title and function, they shall have the same serial number and shall be identified by using Sequential No./Total No.

NUMBERING OF ISOMETRIC DRAWINGS

NUMBERING OF ISOMETRIC DRAWINGS SHALL BE THE SAME AS THE PIPING LINE NUMBER WHICH IS SHOWN ON THE ISOMETRIC DRAWING.

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piping line No.

(Refer to article 11.1)

sequential No. /total No.

**(for requirements more than one for
same line , if needed**

CRD-01-0001A

1/3

SYMBOLS AND ABBREVIATIONS

SYMBOL/ABBREVIATION

AK

BD

CRD

DN

HVAC

LG

PDB

PFD

P & IDs

PO

PS

PSV

SI

TEL

DESCRIPTION

Arak

Building

Crude

Diameter Nominal, in (mm)

Heating Ventilation and Cooling

Level Gage

Distribution Panel Board

Process Flow Diagram

Piping and Instrument Diagrams

Purchase Order

Pipe Support

Pressure Safety Valve

System International

Tetra Ethyl Lead

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تهیه کننده اسناد فنی

DRAWING SERIAL NUMBER

شماره سریال انواع مختلف مدارک

TYPE OF DRAWING (4 Digits)

- PROCESS FLOW DIAGRAM
- MECHANICAL FLOW DIAGRAMS (P & IDs)
- UTILITY FLOW DIAGRAM
- PLOT PLAN
- CONCRETE
- STRUCTURAL STEEL
- VESSEL
- PIPING
- ELECTRICAL
- INSTRUMENT
- 7999
- INSULATION
- MISCELLANEOUS

SERIAL NUMBER

0001 - 0099
0100 - 0199
0200 - 0399
0500 - 0599
1000 - 1999
2000 - 2999
4000 - 4999
5000 - 5999
6000 - 6999
7000
8000 - 8999
9000 - 9999

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تهیه کننده: محمد بهزادی

SPECIAL CHEMICAL AND SOLVENT SYSTEMS

AMN	Amine
AMO	Ammonia
CAU	Caustic Soda
CHM	Chemicals
DEA	di-Ethanol Amine
DGA	di-Glycole Amine
MEA	mono-Ethanol Amine
MEK	Methyl Ethyl Ketone
TOL	Toluene

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FLUID ABBREVIATION SYMBOLS

a) Air Systems

ISA Instrument Air
PLA Plant Air

b) Blowdown and Pump Out Systems

BDN Blowdown
CBD Continuous Blowdown
IBD Intermittent Blowdown

c) Condensate Systems

COC Cold Condensate
HPC High Pressure Condensate
LPC Low Pressure Condensate
MPC Medium Pressure Condensate

d) Drain (Sewer) Systems

CSW Chemical Sewer
NSW Non Oily Sewer
OSW Oily Sewer
SSW Sanitary Sewer

FLUID ABBREVIATION SYMBOLS

e) Flare Systems

FL	Flare (Normal)
HFL	High Pressure Flare
LFL	Low Pressure Flare

f) Fuels

FLG	Fuel Gas
FLO	Fuel Oil
NG	Natural Gas
RFO	Refinery Fuel Oil

g) Special Gas Systems

ACG	Acid Gas
CHL	Chlorine
HEL	Helium
HYD	Hydrogen
NIT	Nitrogen
OXY	Oxygen
UTA	Utility Air

FLUID ABBREVIATION SYMBOLS

i) Oil Utility Systems

LBO	Lubricating Oil
SLO	Seal Oil
FGO	Flushing Oil

j) Steam systems

DLS	Dilution Steam
HOR	Hot Oil Return
HOS	Hot Oil Supply
HPS	High Pressure Steam
LLS	Low Low Pressure Steam
LPS	Low Pressure Steam
MPS	Medium Pressure Steam

FLUID ABBREVIATION SYMBOLS

I) Water Systems

BFW	Boiler Feed Water
CLW	Chlorinated Water
CWR	Cooling Water Return
CWS	Cooling Water Supply
DIW	Distilled Water
HWS	Hot Water Supply
HWR	Hot Water Return
TWR	Tempered Water Return
TWS	Tempered Water Supply
DMW	Demineralized Water
DWA	Drinking Water
FWA	Fire Water
HBW	High Pressure Boiler Feed Water
HCW	Hot and Chilled Water
MBW	Medium Pressure Boiler Feed Water
PRW	Process Water
PWA	Plant Water
RWA	Raw Water
SWA	Sour Water
TWA	Treated Water
WAT	Water

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تهیه کننده: محمد بهزادی

FLUID ABBREVIATION SYMBOLS

k) Process Services

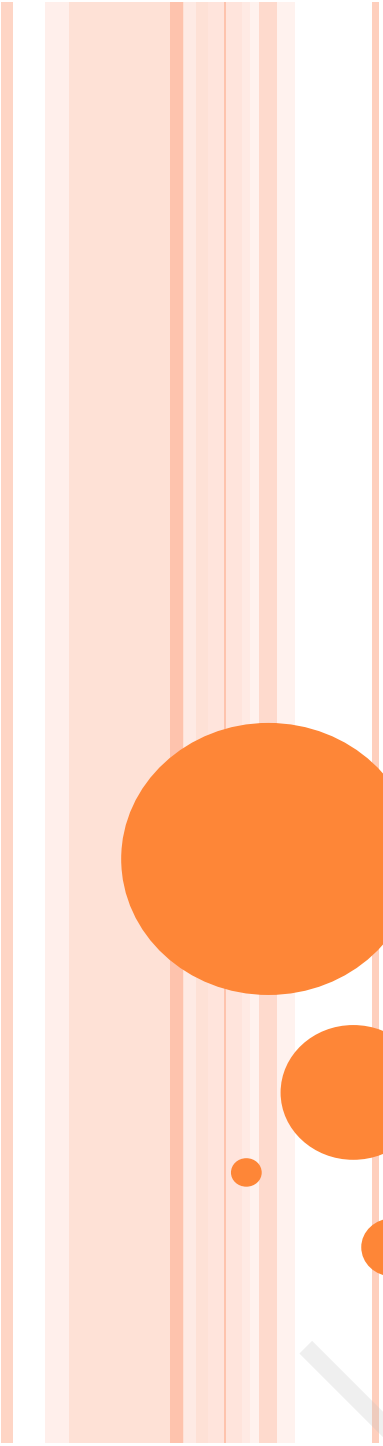
ACE	Acetylene
ALC	Alcohol
ASP	Asphalt
BZN	Benzene
BUT	Butane
CAT	Catalyst
ETA	Ethane
ETN	Ethylene
FOP	Fuel Oil Product
GAS	Gas
GSL	Gasoline
GSO	Gas oil
HRG	Hydrogen Rich Gas
HCB	Hydrocarbon
HCH	Hydrocarbon with Hydrogen
JP4	Jet Fuel (JP-4)
JTA	Jet A-1
KER	Kerosene
NGH	Natural Gas with Hydrogen
RGH	Reformed Gas with Hydrogen

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FLUID ABBREVIATION SYMBOLS

LNA	Light Naphtha
LPG	Liquefied Petroleum Gas
MEL	Methanol
MET	Methane
NAP	Naphtha
PNT	Pentane
PRP	Propane
PPN	Propylene
PRA	Process Air
PRO	Process Fluid
RAF	Raffinate
REF	Reformate
REG	Recycle Gas
RES	Residue
SLG	Sludge
SLP	Slop
SUL	Sulfur

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APPENDIX I

استانداردهای معروف برای دیسیپلین های مختلف

414

استانداردهای معروف برای دیسیپلین های مختلف

1. PROCESS

API RP 14E

Recommended Practice for Design and Installation
of Offshore Production Platform
Piping System

API RP 520

Sizing, Selection, and Installation of Pressure –
Relieving Devices in Refineries

Part 1 : Sizing and Selection

Part 2 : Installation

API RP 521

Guide for Pressure-Relieving and Systems Fourth Edition

2. SAFETY

ANSI B-31-4	Liquid transportation system for hydrocarbon lick petroleum gas, anhydrous ammonia and alcohol
ANSI b-31-8	Gas transmission and distribution piping systems
API 4615	Emission Factors for Oil & Gas Operations
API RP 14B	Recommended Practice for Design, Installation, Repair & Operation of Sub-Systems Valve (SSSV) Systems.
API RP 14C	Recommended Practice for Analysis, Design, Installation & Testing of Basic Surface Safety Systems on Offshore Production Platforms
API RP 14E	Recommended practice for Design and Installation of Offshore Platform Pipping Systems
API RP 14G	Recommended Practice for Fire Prevention and Control on Open Type off-shore Production Platforms
API RP 14J	Recommended Practice for Design and Hazards Analysis for Offshore Production Facilities
API RP 520	Sizing, Selection & Installation of Pressure Relieving Devices in Refineries
API RP 521	Guide for Pressure Relieving & Depressuring Systems
API SP 14A	Specification for Subsurface Safety Valve Equipment (containing ISO 10432 : 1993)
API 6A	Specification for Wellhead and Christmas tree Equipment
API ST 2000	Venting Atmospheric and Low Pressure Storage Tanks
ASME 8 div. 1	pressure Vessels

ASTM D-635	Burning Rate and Burning Time after Ignition for Basic Epoxy Resin
ASTM E-119	Standard Test Methods for Fire Tests of Building Construction Materials
ASTM E-136	Standard Test Method for Behaviour of Materials in a Vertical Tube Furnace at 750 °C
ASTM E-515	Effect of Overheating Steel
ASTM E-760	Standard Test Method for Effect of Impact on Bonding of Spayed Fire-Resistive Material applied to Structural Members
BS 3900	Test Methods for Impact Effects on PFP
BS 476	Fire Tests on Building Material for Design & Installation
BS 6755	Testing of Valves
CFR	Titles 49, Chapter I, par. 179.105-4
DOE Section 13	Fire protection
IACO	International Civil Aviation Authorities
IALA	International Association of Lighting Authorities
IES-7910	Classification of hazardous areas
IEC-61508	Functional safety : safety related systems
IP Code : Part 15	Part 15. Area Classification Code for Petroleum Installations
ISO/CD 13 702	(under progress) Petroleum and natural gas industries -Control and mitigation of fires and explosions an offshore installations – Requirements and guidelines

MARPOL	Convention international de 1973 pour la prévention de la pollution par les navires
NFPA 10	Portable Fire Extinguishers
NFPA 11	Foam extinguishing systems
NFPA 12	CO2 extinguishing systems
NFPA 13	Installation of Spinkler Systems
NFPA 14	Installation of Standpipe and Hose Systems
NFPA 15	Water spray fixed systems
NFPA 17	Dry Chemical Extinguishing Systems
NFPA 70E	Standard for Electrical Safety Requirements for Employees Workplaces
NFPA 72	National Alarm Fire Code
NFPA 80	Standard for Fire Doors and Fire Windows
NFPA 90A	Installation of Air Conditioning and Ventilating Systems
NFPA 90B	Installation of Warm Air Heating and Air Conditioning Systems
NFPA 92A	Recommended Practice for Smoke-Control Systems
NFPA101	Code for safety to Life from Fire in Buildings and Structures
SOLAS	Chapter III, Part C section VI (regulation 48)

SOLAS	Chapter III, Part C section IV (regulations 41, 44, 45 and 46)
SOLAS	Chapter III, Part C section II (regulation 31 and 32)
UL 1709	Standard for Rapid Rise Fire Tests of Protection Materials for Structural Steel
UL 263	Standard for Fire Tests of Building Construction and Materials

3. STRUCTURAL

AISC 9th Edition
API RP 2A WSD 20th edition

API RP 2A LRFD

DOE 1990 4th Edition
API spec. 2C, 4th Edition
ANSI/AWS D 1.1. 1996
DNV 1981
DNV Rules

DNV RP B401, 93
Règles Neige et Vent

American Institute of Steel Construction
Recommended Practice for Planning,
Designing and Constructing Fixed Offshore
Platforms issued by American Petroleum Institute).
1st edition Recommended practice for planning,
designing and constructing fixed offshore platforms - Load
and Resistance Factor Design.
Structural Design of Helicopter Landing Area.
Specification for Offshore Cranes.
American Welding Society
Buckling of plate, etc.
Rules for design, construction and inspection of
offshore structures, Appendix B - Loads –
1977 Hydrodynamic coefficients for non circular members.
Cathodic Protection.

4. MECHANICAL

4.1. VESSELS

BS 5500
ASME VIII Div. 1
ASME II
ASME V
ASME IX

Unfired fusion welded pressure vessels
Pressure vessels
Material Specification
Non-destructive Specifications
Welding and brazing qualifications

4.2. CRANES

EN 10204
AWS D1.1

ICAO

ASTM A320

API spec 2C
API 7B-11-C
ASME PTC 17

Metallic products - types of inspection document
Structural welding code issued by the American
Welding Society
International Civil Aviation Organization
(applicable code for obstruction lights)
Alloy-steel Bolting Materials for Low Temperature
Service
Specification for offshore cranes
ASME PTC 26
ASTM D975-92

4.3. DIESEL ENGINES

ISO 1940/1

ISO 3046 Part I to VII
ISO 2954

API STD 7B-11C
ASME PTC 17
ASME PTC 26

ASTM D 975-92
IP 15

Mechanical vibration - Balance quality requirements of
rigid rotors - Determination of permissible residual
unbalance.
Reciprocating internal combustion engines
Mechanical vibrations of rotating and reciprocating
machinery - Requirements for instruments machinery -
Requirements for instruments for measurement of
vibration severity.
Internal Combustion Reciprocating Engines.
Reciprocating Internal Combustion Engines.
Speed governing systems for internal combustion Engine -
Generator Units.
Standard specification for Diesel Fuel oil.
Area classification for petroleum Installation.

4.4. CENTRIFUGAL PUMPS

ISO 1940/1

Mechanical vibration - Balance quality requirements of rigid rotors - Determination of permissible residual unbalance.

API 610

Centrifugal pumps for general refinery services

ISO 2548

Centrifugal, mixed flow and axial pumps -

Code for acceptance tests - Class C

ISO 1940/1

4.5. AIR COMPRESSORS

ISO 2954	Mechanical vibrations of rotating and reciprocating machinery - Requirements for instruments for measurement of vibration severity.
ISO 1940/1	Mechanical vibration - Balance quality requirements of rigid rotors - Determination of permissible residual unbalance.

4.6. ELECTRICAL REGULATIONS FOR ROTATING EQUIPMENT (GENERAL)

I.E.C. 34	Rotating Electrical Machines
I.E.C. 72	Dimensions and Output ratings for Rotating Electrical machines
I.E.C. 79	Electrical Apparatus for Explosive Gas Atmosphere
I.E.C. 85	Classification of Materials for the Insulation
CENELEC	Applicable Standards

4.7. ELECTRICAL REGULATIONS FOR DIESEL ENGINES

I.E.C. 157	Low voltage Switchgear and Control Gear
I.E.C. 158	Low voltage Control Gear
I.E.C. 439	Factory built Assemblies of low voltage switchgear and control gear

5. PIPING

ASME B 31.3	Process Piping
ASME/ANSI B1.1	Unified Screw Threads
ASME/ANSI B1.2	Gages and Gaging for Unified Screw Treads
ASME/ANSI B1.20.1	Pipes Threads, general purpose (inch)
ASME/ ASME/ANSI B16.5	Steel Pipe Flanges and Flanged Fittings
ASME/ANSI B16.9	Factory Made Wrought Steel Butt-welding Fittings
ASME/ANSI B16.10	Face to Face and End to End Dimensions of valves
ASME/ANSI B16.11	Forged Steel Fittings, Socket-welding and Threaded
ASME/ANSI B16.20	Ring-Joint Gaskets and Grooves for Steel Pipe Flanges
ASME/ANSI B16.21	Non-metallic Gaskets for Pipe Flanges
ASME/ANSI B16.24	Bronze pipe Flanges and Flanged Fittings
ASME/ANSI B16.34	Steel Valves
ASME/ANSI B 16.36	Steel Orifice Flanges
ASME/ANSI B 16.47	Large Diameter Steel Flanges (formerly API 605 + MSS-SP-44)
ASME/ANSI B18.2.1	Square and Hexagonal Bolts and Screws
ASME/ANSI B18.2.2	Square and Hexagonal Nuts
ASME/ANSI B36.10	Welding and Seamless Wrought Steel Pipe
ASME/ANSI B36.19	Stainless Steel Pipe

ASME/ANSI B46.1	Surface Texture
API 5 L	Line Pipe
API 6D	Pipeline Valves
API 6FA	Fire Test for Valves
API 594	Wafer-Type Check Valves
API 598	Valves Inspection and Test
API 600	Steel Gate Valves Flanged or Buttwelding Ends
API 601	Metallic Gaskets
API 602	Compact Steel Gate Valves
API 607	Fire Test for Soft-Seated Quarter-Turn Valves
API 609	Butterfly Valves Lug-Type and Water-Type
ASTM	(Various material standards)
DIN 3754	Compressed Asbestos Fiber Sheets, Dimensions, Requirements, Tests
MSS SP-6	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-Ends Flanges of Valves and Fittings
MSS SP-9	Spot Facing for Bronze, Iron, and Steel Flanges
MSS SP-25	Standard Marking System for Valves; Fittings, Flanges and Unions
MSS SP-42	Corrosion Resistant Gate, Globe, Angle and Valves with Flanged and Buttweld Ends
MSS SP-43	Wrought Stainless Steel Butt-Welding Fittings
MSS SP-45	By-pass and Drain Connection Standard
MSS SP-61	Pressure Testing of Steel Valves
MSS SP-70	Cast Iron Gate Valves, Flanged and Threaded Ends
MSS SP-72	Ball Valves with Flanged or Butt-welding Ends for General Service
MSS SP-75	High Test Wrought Welding Fittings
MSS SP-80	Bronze Gate, Globe, Angle and Check Valves
NACE AR.01.75	Sulfide stress cracking resistant metallic materials for oil field equipment

6. ELECTRICAL

Design and construction of the equipment shall be in accordance with the current edition of the following documents listed in order of precedence :

- Applicable international electrotechnical commission (I.E.C.) publications.
- Applicable CENELEC standards.
- Applicable recognised standards and codes (UTE, BS, VDE etc...) when IEC

7. INSTRUMENTATION

All work specified shall be in accordance with all applicable sections of the latest editions of the following Codes and Standards (and their current amendments), listed in alphabetical order of issuing authorities and numerical order of designation.

American National Standard Institute (ANSI)

ASME/ANSI B16.5	Pipe flanges and flanged fittings.
ASME/ANSI B 16.34	Hydraulic tests for control valves
ANSI MC 96.1	Temperature measurement, Thermocouples.

FCI 70-2 (Formerly ABSI b16.104)

American Petroleum Institute (API)

Manual of petroleum Measurement Standards.

API RP 14 C	Recommended practice for analysis, design, installation and testing of basic surface safety systems on offshore production platforms.
API Spec 14 D	Specification for wellhead surface safety valves and under water safety valves for offshore service.
API RP 520	Recommended practice for the design and installation of pressure relieving systems.
API RP 521	Guide for pressure relief and depressurising systems (for information purpose only).
API RP 526	Flanged steel safety relief valves.
API RP 527	Seat tightness of safety relief valves.
API 551	Process measurement instrumentation.
API 552	Transmission system
API 554	Process instrumentation.
API 555	Process Analysers.
API 598	Valve Inspection and testing.
API 2000	Tank Breather Valves.

American Society of Mechanical Engineers (ASME).

- ASME Code Section VIII Div. 1 Flange Rating when Temperature Exceeds the Limits of Sect. VIII, ap. 2 ANSI B 16-5.
- Hydraulic Test for Safety Relief Valve Sect. VIII.

British standards (BS)

- BS 6121 Cable glands.

Deutsches Institut für Normung (DIN)

- DIN 43 760 Temperature measurement

Electronic Industries Association (EIA)

- TIA 232 E Interface Between Data Terminal Equipment and Data Circuit. Terminating Equipment Employing Serial Binary Data Interchange.

Institute of Electrical and Electronics Engineers (IEEE)

- IEEE 472 Surge Protection Criteria

International Electrotechnical Commission (IEC)

- IEC 68-2 Basic Environmental Testing Procedures for Electronic Components and Electronic Equipments.
- IEC 79-0 General.
- IEC 79-1 Construction and test; flameproof enclosure of electric apparatus
- IEC 79-2 Electric apparatus - type of protection "p".
- IEC 79-7 Electric apparatus - type of protection "e".
- IEC 79-10 Classification of hazardous areas.
- IEC 79-11 Electric apparatus - type of protection "i".
- IEC 92-352 Choice and laying of cables for low voltage power supply.

IEC 189-1 to 7	Cables and wires for low frequency PCV insulated and in PCV protective sleeve.
IEC 227-1 to 5	Conductors and cables insulated with vinyl polychloride, of nominal voltage of more than 450/750 V.
IEC 801 Part 3	"EMI and RFI immunity".
IEC 245-1 to 4	Conductors and cables rubber insulated having nominal voltage of more than 450/750V.
IEC 331	Characteristics of fire resisting electric cables.
IEC 332.1 and 3	Testing of electric cables submitted to fire.
IEC 529	Classification of degrees of protection provided by enclosures.
IEC 584	Thermocouples.
IEC 751	Industrial Platinum Resistance Thermometer Sensors.

Instrument Society of America (ISA)

ISA RP 4-1	Uniform face to face dimensions for flanged Control Valves.
ISA RP 12-6	Installation of intrinsically safe circuits.
ISA RP 55-17	Hardware Testing of Digital Process Computer Codes of Practices for Testing Computer Based System.
ISA S 75-01	Control valve sizing equations.
ISA S 75-02	Control valves capacity test procedure.
ISA S 75-03	Uniform face to face dimensions for flanged globe style control valve bodies.
ISA S 75-04	Face to face dimensions of flangeless control valves.
ISA RP 84-01	Application of Safety Instrumented Systems for the Process Industries.

International Standard Organisation (ISO)

ISO 31	Size, units, symbols, conversion factors and conversion tables.
ISO 5167	Fluid measurement with Orifice plates, nozzle and venturi inserted in filled piping of circular profile.
ISO 5168	Flow measurement : calculation of errors

National Association of Corrosion Engineers (NACE)

MR0175	Sulfide Stress Cracking Resistant Metallic Materials for Oil Field Equipment.
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National Fire Protection Association (NFPA)

NFPA 72 E	Automatic Fire Detectors
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8. HVAC/ARCHITECTURE

8.1. HVAC

ASHRAE

American Society of Heating, Refrigerating and Air conditioning Engineers handbooks and standards

OCMA

Oil Companies Materials Associations

AMCA

Air moving and Air Conditioning Institute

ARI

Air Conditioning and Refrigeration Institute

AFI

American Filtering Institute

ADC

Air Diffusion Council

AGA

American Gas Association

IEC

Internal Electro Technical Commission

8.2. ARCHITECTURE

SOLAS	International Convention for safety of life at Sea, 1974 and amendments of November 1981, Protocole 1983 and amendments until may 1991
MODU code	Code for the construction and equipment of drilling mobile units
DOE	Guidance on Design and Construction of Offshore Installation 1984 and amendments of September 1984 and April 1985
S.I. 289	Offshore Installation (construction and Survey) regulation 1974
S.I. 611	Offshore Installation (fire fighting equipment) regulations 1978
NFPA	National Fire Protection Association
API RPZA	RP : for planning, designing and construction fixed offshore platforms issued by API 20 th edition

9. TELECOMMUNICATION

- ITU recommendations, including ITU-R and ITU-T,
- EIA, IEE, IEEE, ISO and IEC standards,
- DTI MPT Specifications
- IMO Regulations,
- ICAO Regulations
- CENELEC Standards,
- EUTELSAT EES Standards
- SOLAS
- CEPT

10. PIPELINE

10.1. DESIGN

Main Codes :

API Recommended Practice 1111, 2nd Edition, November 1993 : "Design, Construction, Operation and Maintenance of Hydrocarbon Pipelines"

- For the 32" production lines : ANSI/ASME B 31.8 1995 Edition "Gas Transmission and Distribution Piping Systems"
- For the 4" lines : ANSI/ASME B31.4 1992 Edition "Liquid Transportation systems"

Additional Codes :

- Veritec (Dn V) RP E 305 "On-bottom Stability Design of Submarine Pipelines" – October 1988.
- DnV 1976 "Rules for the Design, Construction and Inspection of Submarine Pipelines and Pipelines Risers"
- DnV 1981 "Rules for Submarine Pipelines Systems"

10.2. FABRICATION OF SEAMLESS PIPES FOR PIPELINES (SWEET EFFLUENT)

- American Petroleum Institute (API) :

Spec 5L	Specification for Line Pipe
RP 5L1	Railroad Transportation of Linepipe
RP 5LW	Transportation of Linepipe on Barges and Marine Vessels

- American Society for Testing and Materials (ASTM) :

A370	Mechanical Testing of Steel Products.
A 578	A578 Straight-beam ultrasonic examination of plain and clad steel plates of special application.
	Straight-beam ultrasonic examinations of plain and clad steel plates of special application
E23	Notched Bar Impact Testing of Metallic Materials.
384	Guide for Test Method for Micro hardness of Materials.

- American Society of Mechanical Engineers (ASME) :

Pressure Vessel Code, Section V Non-destructive Examinations

10.3. FABRICATION OF BENDS FOR PIPELINES (SWEET EFFLUENT)

- Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS) :

SP-75	Specification for high test wrought butt welding fittings.
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- American National Standards Institute (ANSI) :

ASME/B16.9	Factory-Made Wrought Steel Butt welding Fittings.
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- American Petroleum Institute (API) :

Spec 5L	Specification for Line Pipe
P 5L1	Railroad Transportation of Line Pipe
RP 5LW	Transportation of Line pipe on Barges and Marine Vessels

- American Society for Testing and Materials (ASTM) :

A370	Mechanical Testing of Steel Products
A578	Straight-beam ultrasonic examination of plain and clad steel plates of special application
E23	Notched Bar Impact Testing of Metallic Materials
E384	Guide for Test Method for Micro hardness of Materials

- American Society of Mechanical Engineers (ASME) :

- . Boiler and Pressure Vessel Code, Section V : Non-destructive Examinations
- . Boiler and Pressure Vessel Code, Section VIII, Division 1

- International Standards Organisation (ISO) :

ISO 148	Charpy Impact Test (V-notch)
ISO 1027	Radiographic Image Quality Indicators for non-destructive testing. Principles and identification
ISO 6507	Hardness test – Vickers test – Part 1 : HV5 to HV10
ISO 9002	Quality systems : Model for quality assurance in production, installation and servicing.
ISO/DIS 12096	Radiographic testing of longitudinal and spiral welds for the detection of imperfections

- EURONORM/European Standard

EN 10204 Types of inspection documents

BS-EN 473 Qualification and certification of non-destructive testing personnel

- COFREND

Comité Français des essais non-destructifs
(French Committee of non-destructive testing)
Qualification and certification of non-destructive personnel

10.4. FABRICATION OF LONGITUDINALLY SUBMERGED ARC WELDED PIPES FOR PIPELINES (SOUR EFFLUENT)

- American Petroleum Institute (API) :

. Spec 5L Specification for Line Pipe
. RP 5L1 Railroad Transportation of Line Pipe
. RP 5L5 Marine Transportation of Line Pipe

- American Society for Testing and Materials (ASTM) :

A370 Mechanical Testing of Steel Products
A578 Straight-beam ultrasonic examination of plain and clad steel plates of special application
E23 Notched Bar Impact Testing of Metallic Materials
E165 Practice for Liquid Penetrant Inspection Method
E384 Guide for Test Method for Micro hardness of Materials
E709 Guide for Practice for Magnetic Particle Examination

- American Society of Mechanical Engineers (ASME) :

. Pressure Vessel Code, Section V : Non-destructive Examination

- Deutsches Institut für Normung (DIN) :

DIN 50 049 Certificates on Material Testings
DIN 54 109 Non-Destructive Testing ; Image Quality of X-Ray and Gamma Ray Radiographs of Metallic Materials

- National Association of Corrosion Engineers (NACE) :

Standard TM-02-84	Evaluation of Pipeline Steels for Resistance to Stepwise Cracking
Standard TM-01-77	Testing of Metals for Resistance to Sulphuride Stress Cracking at Ambient Temperatures
Standard MR0175	Sulphide Stress Cracking Resistant Metallic Materials for Oil Field Equipment
Standard MR-01-75	Sulphide Stress Cracking Resistant Metallic Materials for Oil Field Equipment

- British Standards Institution (BSI) :

BS 5996	Methods for Ultrasonic testing and Specifying Quality Grades of Ferritic Steel Plate
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- International Standards Organisation (ISO) :

ISO/R 1027 :	Radiographic Image Quality Indicators
ISO 2504 :	Radiography of welds and viewing conditions. Utilisation and recommended patterns of image quality indicators.

- Certification Scheme for Weldment Inspection Personnel (CSWIP) :

CSWIP-UST-1	Requirements for the certification of personnel engaged in the ultrasonic examination of fusion welded ferritic steels in thickness greater than 6 mm.
CSWIP RAD 2	Fusion Welded Joints in Ferrous and Non Ferrous Wrought and Cast Materials by X-Radiography up to 400 kv and with conventional X-Ray Sources.
CSWIP-MAG/PEN	Requirements for the certification of personnel engaged in the magnetic particle examination and dye penetrant examination of materials.

- American Society for Non-Destructive Testing (ASNT) :

ASNT-TC-1A	Recommended Practice
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10.5. FABRICATION OF BENDS FOR PIPELINES (SOUR EFFLUENT)

- American Petroleum Institute (API) :

Spec 5L :	Specification for Line Pipe
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- American Society for Testing and Materials (ASTM) :

A370	Mechanical Testing of Steel Products
A578	Straight-beam ultrasonic examination of plain and clad steel plates of special application
E23	Notched Bar Impact Testing of Metallic Materials
E165	Practice for Liquid Penetrant Inspection Method.
E384	Guide for Test Method for Micro Hardness of Materials.
E709	Guide for Practice for Magnetic Particle Examination

- American Society of Mechanical Engineers (ASME) :

- . Boiler and Pressure Vessel Code, Section V : Non-destructive Examinations
- . Boiler and Pressure Vessel Code, Section VIII, Division 1.

- Deutsches Institut für Normung (DIN) :

DIN 50 049	Certificates related to Material Testings
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- British Standards Institution (BSI) :

BS 5996	Methods for Ultrasonic testing and Specifying Quality Grades of Ferritic Steel Plate.
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- International Standards Organisation (ISO) :

ISO/R 1027	Radiographic Image Quality Indicators
ISO 2504	Radiography of welds and viewing conditions. Utilisation and recommended patterns of image quality indicators.

- Certification Scheme for Weldment Inspection Personnel (CSWIP) :

CSWIP-UST-1	Requirements for the certification of personnel engaged in the ultrasonic examination of fusion welded ferritic steels in thickness greater than 6 mm.
CSWIP-RAD-2	Fusion welded joints in ferrous wrought and cast materials by X-Radiography up to 400 Kv and with conventional X-Ray sources.
CSWIP-MAG/PEN	Requirements for the certification of personnel engaged in the magnetic particle examination and dye penetrant examination of materials.

- American Society for Non-Destructive Testing (ASNT) :

ASNT-TC-1A	Recommended Practice
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10.6. FABRICATION OF FLANGES

- Manufacturers Standardisation Society of Valve and Fittings Industry, Inc. (MSS) :

MSS SP-44	Steel pipe line flanges
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- American Society for Testing and Materials (ASTM) :

ASTM E10	Test method for Brinell Hardness of Metallic Materials (Sweet effluent only)
ASTM E23	Method for Notched Bar Impact Testing of Metallic Materials
ASTM E 709	Guide for Practice of Magnetic Particle Examination
ASTM E 384	Guide for test Method for Micro-Hardness Examination (Sour effluent only)
ASTM A194/A194M	Carbon and Alloy Steel Nuts for High-Pressure and High Temperature Service
ASTM A320/A320M	Specification for Alloy Steel-bolting Materials for Low Temperature Service
ASTM A 370	Test Methods and Definitions for Mechanical testing of Steel Products
ASTM A388/A388M	Practice for Ultrasonic Examination of Heavy Steel Forings
ASTM A694/A694M	Specification for Forgings, Carbon and Alloy Steel for Pipe, Flanges, fittings, Valves and Parts for High-Pressure Transmission Services

- American Society of Mechanical Engineers (ASME) :

ASME V	Boiler and Pressure Vessel Code, Section V. Non-destructive Examination
ANSI B 16.5	Pipe flanges and flanged fittings
ANSI B 16.20	Ring-joint Gaskets and Grooves for Steel Pipe Flanges

- International Standards Organisation (ISO)

ISO 148	Charpy impact test (V-notch)
ISO 9002	Quality systems : Model for quality assurance in production, installation and servicing

- EURONORM/European Standard

EN 10 204	Types of inspection documents
BS-EN-473	Qualification and certification of non-destructive testing personnel

- COFREND

Comité Français des essais non-destructifs (French Committee of non-destructive testing)
Qualification and certification of non-destructive personnel

10.7. FABRICATION OF TEES (SOUR EFFLUENT)

- Manufacturers Standardisation Society of the Valve and fittings Industry, Inc. (MSS) :

MSS SP-75	Specification for high test wrought buttwelding fittings
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- American National Standards Institute (ANSI) :

B 16.9	Factory-Made Wrought Steel Butt welding Fittings
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- American Society for Testing and Materials (ASTM) :

A 283	Low and Intermediate Tensile Strength Carbon Steel Plate
A 370	Mechanical Testing of Steel Products
A 578	Straight-beam ultrasonic examination of plain and clad steel plates of special application
E 23	Notched Bar Impact Testing of Metallic Materials
E 384	guide for Test Method for Micro-hardness of Materials
A 709	Guide for Practice of Magnetic Particle Examination

- American Society of mechanical Engineers (ASME)

- Boiler and Pressure Vessel code, Section V : Non-destructive examination
- Boiler and Pressure vessel Code, Section VIII, Division 1

- International standards Organisation (ISO)

ISO 148	Charpy impact test (V-notch)
ISO 1027	Radiographic Image Quality Indicators for non-destructive testing. Principles and Identification
ISO 6507	Hardness test-Vickers test – Part & : HV5 to HV10
ISO 9002	Quality systems : Model for quality assurance in production, installation and servicing
ISO/DIS 12096	Radiographic testing of longitudinal and spiral welds for detection of imperfections

- EURONORM/EUROPEAN STANDARD

EN 10 204	Types of inspection documents
BS-EN 473	Qualification and certification of non-destructive testing personnel

- COFREND :

Comité Français des essais non-destructifs (french Committee of non-destructive testing) Qualification and certification of non-destructive personnel

10.8. FABRICATION OF SCRAPER TRAPS

ANSI B16.5	Pipe Flanges and Flange fittings
ANSI B16.9	Factory made Wrought Steel Butt welding Fittings
ASTM B31.8	Gas Transmission and Distribution Piping Systems
ASME V	Non-Destructive Examination
ASME VIII, Div.1:	Unfired Pressure Vessels
MSSP-SP 44	Steel Pipe Line Flanges
MSS SP 75	High Test Wrought Butt Welding Fittings

8.9. SITE WELDING OF CARBON STEEL PIPELINES TO API 1104

- ANSI/ASME Code

B31.4	Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols.
B31.8	Gas Transmission and Distribution Piping Systems

- American Petroleum Institute (API) :

API 1104	Standard for Welding Pipelines and Related Facilities
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- American Society for Testing and Materials (ASTM) :

ASTM E-384	Guide for Test Method for Micro hardness of Materials.
ASTM E-709	Guide for Magnetic particle Examination.
ASTM A-578	Straight Beam Ultrasonic Examination of Plain and Clad Steel Plates for Special Application.
ASTM E-23	Notched Bar Impact Testing of Metallic Materials
ASTM A-370	Mechanical Testing of Steel Products.

- British Standard Specification (BS) :

BS 4365	Industrial Argon
BS 4105	Liquid Carbon Dioxide : Industrial
BS 5762	Methods for Crack Opening Displacement (COD) Testing

- Deutsches Institute Fur Normung (DIN) :

DIN 50 049	Certificates related to Materials Testing.
DIN 54 109	Non-Destructive Testing ; Image Quality of X-Ray and gamma Ray Radiographs of Metallic Materials

- Certification for Weldment Inspection Personnel :

CSWIP	Certification Scheme for Weldment Inspection Personnel.
COFREND	Comité Français des Essais Non Destructifs.
A.S.N.T.	Recommended Practice SNT-TC-IA.

- COMPANY Specifications :

SP-STR-533	Fabrication of Seamless Pipes for Pipelines (Sour Effluent).
SP-STR-534	Fabrication of Submerged Arc Welded Pipes for Pipelines (Sour Effluent).
SP-STR-536	Fabrication of bends for Pipelines (Sour Effluent).

10.10. HYPERBARIC WELDING OF CARBON STEEL PIPELINES TO API 1104 (SOUR EFFLUENT)

- American Petroleum Institute (API)

API 1104	Standard for Welding Pipelines and Related Facilities.
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- American Society for Testing and Materials (ASTM)

ASTM E-23	Notched Bar Impact Testing of Metallic Materials.
ASTM A-370	Mechanical Testing of Steel Products.
ASTM A-578	Straight Beam Ultrasonic Examination of Plain and Clad Steel Plates for Special Application.
ASTM E-384	Guide for Test Method for Micro hardness of Materials.
ASTM E-709	Guide for Magnetic particle Examination

- British Standard Specification (BS) :

BS 4365	Industrial Argon
BS 4105	Liquid Carbon Dioxide : Industrial
BS 5762	Methods for Crack Opening Displacement (COD) Testing

- Deutsches Institute Fur Normung (DIN) :

DIN 50 049	Certificates related to Materials Testing.
DIN 54 109	Non-Destructive Testing ; Image Quality of X-Ray and Gamma Ray Radiographs of Metallic Materials.

- Certification of Inspection Personnel :

CSWIP	Certification Scheme for Weldment Inspection Personnel
COFREND	Comité Français des Essais Non Destructifs.
A.S.N.T.	Recommended Practice SNT-TC-IA.

10.11. CATHODIC PROTECTION OF SEALINES

- Veritas Offshore Standards – Recommended practice. RP B401 – Cathodic protection design.
- NACE RP-01-69 – Recommended practice. Control external corrosion on underground or submerged metallic piping systems.

10.12. CATHODIC PROTECTION OF ONSHORE GATHERING AND TRUNK LINES

NACE RP-01-69
 NACE RP-05-72
 NACE RP-01-77
 BS1-CP-1021-1973
 AES-P-125-01
 AES-P-125-04

10.13. SACRIFICIAL ANODES FOR CATHODIC PROTECTION

- Impressed Current Test Method for Laboratory Testing of Aluminium Anodes, NACE TM 0190.
- Metallurgical and Inspection Requirements for Cast Sacrificial Anodes for Offshore Applications, NACE RP 0387.
- Metallurgical and Inspection Requirements of Offshore Pipeline Bracelet Anodes, NACE RP 0492.
- Cathodic Protection Design, Det Norske Veritas RP B401.
- Specifications for Line pipe, American Petroleum Institute API 5L.
- Hot Rolled Products of Non-Alloy Structural Steels and their Technical Delivery Conditions, British Standards Institution BS EN 10025.
- Structural Welding Code, American Welding Society D.1.1.
- Specification for Substitute Ocean Water, American Society for Testing and Materials D-1141.

In case of conflict between applicable documents the order of precedence shall be :

- 1) the project Particular Specification,
- 2) this Specification,
- 3) the applicable codes and standards.

10.14. HOT ENAMEL PIPE COATING

- ANSI/AWWA – C203. American National Standard for Coal – Tar Protection Coatings and Lining for Steel Water Pipelines – Enamel and Tape – Hot Applied.
- Recommendations for applying coal-tar pipe coatings issued by the Chambre Syndicale de la Recherche et de la Production du Pétrole et du Gas Naturel – Comité des techniciens – December 1977.
- Recommendations for applying coal-tar pipe coatings issued by the Chambre Syndicale de la Recherche et de la Production du Pétrole et du Gas Naturel – Comité des techniciens – December 1977.
- ISO Standard ISO 8501-1.
- French Standard NF A 49-702 – Steel tubes – External and internal hot dip coatings based on hydrocarbon bearing bonding agents.
- British Standard BS 4164.

10.15. LAYER POLYETHYLENE EXTERNAL COATING FOR PIPELINES

ASTM B 117	Salt spray (fog) testing.
ASTM D 149	Test methods for dielectric breakdown voltage and dielectric strength of solid electrical insulating materials at commercial power frequencies.
ASTM D 257	Test methods for D.C. resistance or conductance or insulating.
ASTM D 543	Test method for resistance of plastics to chemical reagents.
ASTM D 570	Test method for water absorption of plastics.
ASTM D 638	Test method for tensile properties of plastics.
ASTM D 746	Test method for brittleness temperature of plastics and elastomers by impact.
ASTM D 792	Test methods for specific gravity and density of plastics by displacement.
ASTM D 1002	Test method for strength properties of adhesives in shear by tension loading.
ASTM D 1076	Standard specification for rubber, concentrated, ammonia preserved, creamed and centrifuged natural latex.
ASTM D 1238	Test method for flow rates of thermoplastics by extrusion plastomer.
ASTM D 1505	Test method for density of plastics by the density-gradient technique.
ASTM D 1525	Test method for vicat softening temperatures of plastics.
ASTM D 1963	Test method for environmental stress cracking of ethylene plastics.
ASTM D 2117	Test method for melting point of semicrystalline polymers.
ASTM D 2240	Test method for rubber property. Durometer hardness.
ASTM D 2370	Test for tensile properties or organic.
ASTM E 28	Test method for softening point by ring and ball apparatus.
ASTM E 96	Test methods for water vapor transmission of materials.
ASTM G 8	Test methods for cathodic disbonding of pipeline pipeline coating.
ASTM G 14	Test method for impact resistance of pipeline coatings (falling weight test).
ASTM G 17	Test method for penetration resistance

CARL FISHER Method DIN 30 670	Moisture content.
DIN 53-151	Polyethylene coatings of steel pipes and components.
DIN 53 153	Testing of paints, varnishes and similar coating materials, cross-cut test on paint coatings and similar coatings.
NF A 49-710	Testing of paints, varnishes and similar coating materials ; Buchholz indentation test on paint coatings and similar coating.
BS 3900-E1	Steel pipes : polyethylene externe.
BS 3900- E 10	Coating : application by extrusion.
SIS 0559 00	Bend test (Cylindrical Mandrel).
	Pull off test for adhesion.
	Pictorial surface preparation standards for painting steel surfaces.

1.16. NEOPRENE OR EPDM COATING FOR RISER

BS 903	Method of testing Vulcanised Rubber.
BS 903 A1	Determination of density and specific gravity.
BS 903 A2	Determination of tensile stress –strain properties.
BS 903 A3	Determination of tear strength.
BS 903 A6	Determination of compression set.
BS 903 A7	Determination of hardness.
BS 903 A16	Determination of swelling in liquids.
ASTM 1149	Test for rubber deterioration.
	Surface ozone cracking in a chamber (flat specimen).
DIN 53 516	Testing of rubber and elastomer.
	Determination of abrasion resistance.
SIS 0559 00	Surface preparation Swedish Standard
SSPC SP1	Steel structures painting council. Surface Preparation Specification N°1 : Solvent Cleaning

10.17. CONCRETE COATING

- European Standards

BS 3148	Method of test for water for making concrete (including notes on the suitability of the water)
BS 1881	Method of testing concrete
BS 4483	Steel fabrication for the reinforcement of concrete
SIS-0559 00	Surface preparation Swedish Standard

- American Standards

ASTM C 33	Concrete Aggregates
ASTM C 150	Portland Cement
ASTM C 309	Liquid membrane – Forming Compounds for Curing Concrete

10.18. INSTALLATION OF SUBMARINE PIPELINES

DnV 1981	Rules for Submarine Pipeline Systems 1981
API RP 1111	Design, Construction, Operation, and Maintenance of Offshore Hydrocarbon Pipelines 1993
ANSI B 31-4	American National Standard Liquid Petroleum Transportation Liquid Systems 1992
ANSI B 31-8	1992 – American National Standard Gas Transportation and Distribution System
RPE 305 VERITEC – 1988	On bottom stability design of submarine pipelines
API 5L	Specification for Line Pipe
API 5LW	Recommended Practice for Transportation of Line Pipe on Barges and Marine Vessels
API 1104	Standard for Welding Pipelines and Related Facilities
BS 4515	Ed 1984 – Process of Welding of steel pipelines on land and offshore
NACE MR 01 75	Sulfide Stress Cracking Resistant Metallic Materials for Oilfield equipment

10.19. SUBMARINE PIPELINES PROTECTION

ASTM A-82	Specification for cold redwood steel wire for reinforcement of concrete
ASTM C 33	Concrete Aggregates
ASTM C 150	Portland Cement
ASTM C 309	Liquide membrane. Forming compounds for curing concrete
ASTM E-709	Practice for Magnetic Particle Examination
ASTM E-165	Practice for Liquid Penetrant Inspection Method
API 5LW	Recommended practice for marine transportation of line pipe
API 5L	Specification for high-test line pipe
AWS A5.1	Specification for carbon steel covered arc Welding electrodes

8.20. PRECOMMISSIONING OF SUBMARINE GAS PIPELINES

- Gas transmission and Distribution Piping System – ANSI/ASME B 31.8
- Liquid Transportation systems ANSI/ASME B 31.4



سخن پایانی

به نظر می رسد در عصری که آن را عصر انفجار اطلاعات نامیده اند و من آن را عصر روشن ایران می نامم، مهمترین دغدغه برای پیشرفت و ترقی پیدا کردن منابع درست مطالعاتی می باشد. در جزوات اخیر سعی شده است بر اساس تجربه و مطالعه چندین منبع مختلف بهترین سیستم آموزشی برای سریعترین نتیجه گیری ارائه شود. مطمئن باشید که با بخشش علمی به اطرافیان درهای پنهان و ناگشوده علم را بر روی خود گشوده خواهید دید! این درسی است که از طبیعت گرفتم. قدرتمندی و ویران کنندگی یک گردباد به میزان خلا درون آن بستگی دارد. انتقال دانش به دیگران همان منشا خلا علمی شماست.

این جزوه تقدیم می شود به پدر و مادرم که پشتوانه ای بی بدیل برای این حقیر بودند.

و با تشکر از تمام کسانی که صمیمانه در این راه یاورم بودند که امیدم به ایران فردا به دلیل بخشندگی و تواضع علمی این گروه اندک است !!
از منابع دوستان با تشکر فراوان از زحمات این عزیزان در جزوات استفاده شده است:

نوشته رضا درستی - غلامرضا باغمیشه

نوشته رضا درستی - غلامرضا باغمیشه

نوشته محمد پوربافرانی

مهندسین مشاور تهران رایمند

مهندس محسن تقوی فر

Carl Branan
ernest ludwig
Stanley walas

Hysys آموزش
Aspen Plus آموزش
Aspen Plus آموزش
روشهای کنترل فرآیند
ابزار دقیق و کنترل فرآیند
Rules of thumb for chemical engineers
Applied process design
Chemical process equipment

به طور قطع این جزوه خالی از اشکال نمی باشد. خواهشمند است در تصحیح و بهتر نمودن آن از طریق تماس این حقیر را یاری نمایید.
در صورت تمایل آماده به همکاری علمی با دوستان جدیدم برای افزایش سطح علمی طرفین خواهیم بود!
برای دریافت رایگان جزوات با اینجانب تماس و هماهنگی فرمایید.
همواره آخرین جزوه به روز شده هر مبحث از طریق وبلاگ قابل دانلود می باشد. (بخش مهندسی شیمی)

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