



PIPING ENGINEERING

Piping Engineering involves

- Design & Analysis
- Drafting or 3d Modelling
- Fabrication
- Inspection & Testing
- Assembly & Erection -- of Piping Systems.

PIPING SYSTEM ???

Assembly of Pipe , Fittings, Special Elements, Supports, Valves & Instruments subject to same design conditions.



Process Piping???

Piping Systems found typically within the boundary of Process Plants including Oil & Gas Refineries, Chemical & Petrochemical Plants, Pharmaceutical Plants, Cement, Paper, Textile, Steel , Food & Water Processing, Cryogenic , Semi – Conductor Plants etc.



Application – Piping Systems

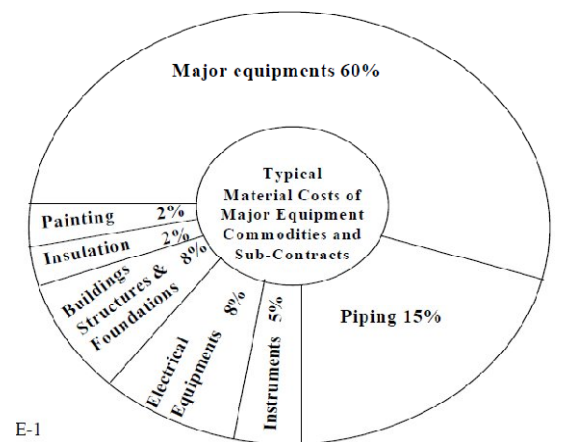
Used for transporting liquids, vapours, slurries, solids etc. under various conditions, as required by the process design of the plant. The piping system is subjected extremes of temperatures ranging from subzero to more than 1600 F and pressures from vaccum to more than 20,000 psi in Process Plants.

Introduction to Piping Engineering

Piping Systems are subjected to corrosion, erosion, toxic condition and radioactivity, all of which calls for proper piping design enabling trouble free operation of the plant over a long period of time.



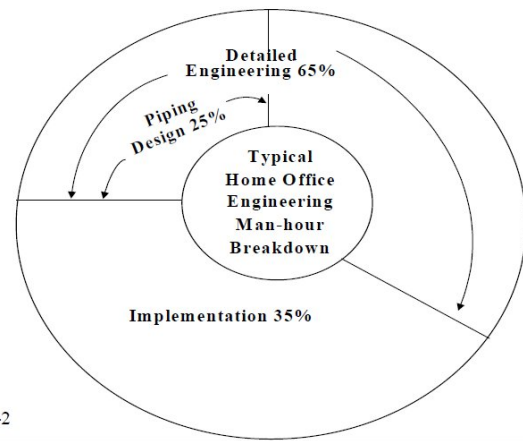
Typical Capital Cost of Piping Material in a Process Plant



E-1

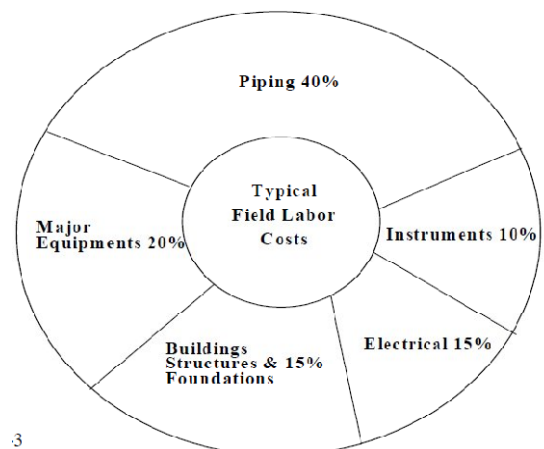


Typical Manhours for Piping Systems Design & Detailed Engineering



E-2

Typical Piping Field Labor Costs



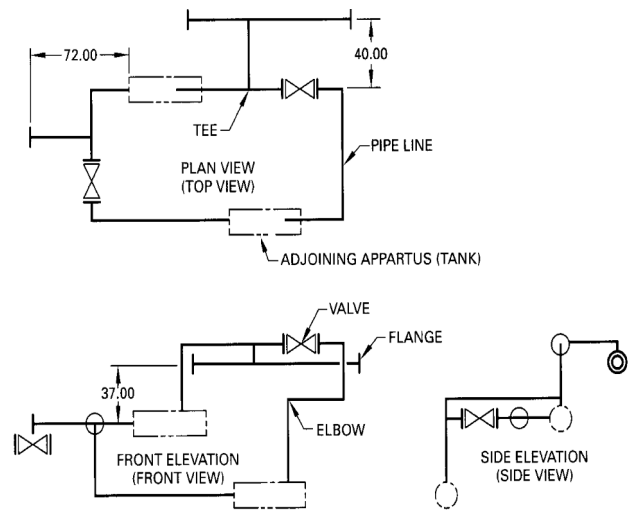
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Knowledge Required for Piping Design

- Good Understanding of Applicable Piping Codes & Standards – Must.
- Selection & Application of Piping Components, Valves, Flanges & Instruments
- Ability to Understand PFD's , P& ID's etc.
- Ability to Create Various Drawings including
 - o Piping Isometrics
 - o Piping Plans & Sections

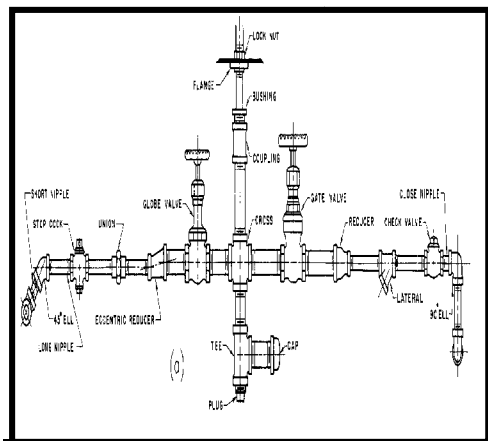
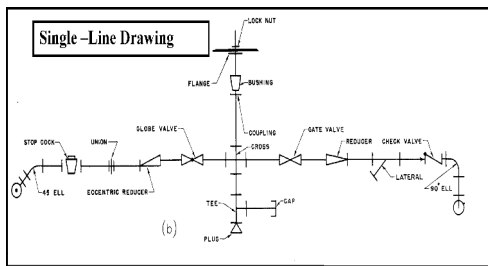
Introduction to Piping Engineering

- Equipment Layouts
- Routing of Piping for Various Static & Rotating Equipments.
- Knowledge of Piping Materials, Material Costs & Metallurgy.
- Piping Fabrication Methods
- Piping Loads including Static & Dynamic Loadings
- Strength of Materials, Knowledge of Structural engineering & Piping Supports
- Ability to Visualize 3D.
- Good Communication & Interpersonal Skill

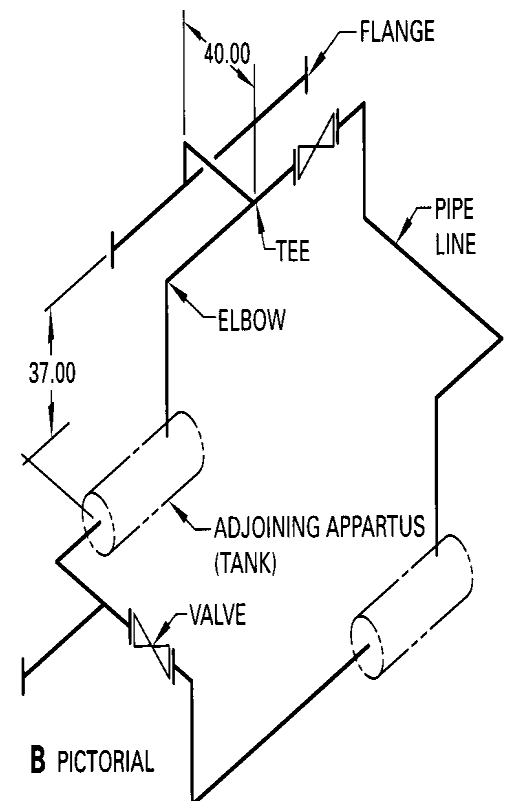


Orthographic pipe drawing

PIPING ORTHOGRAPHIC DRAWINGS



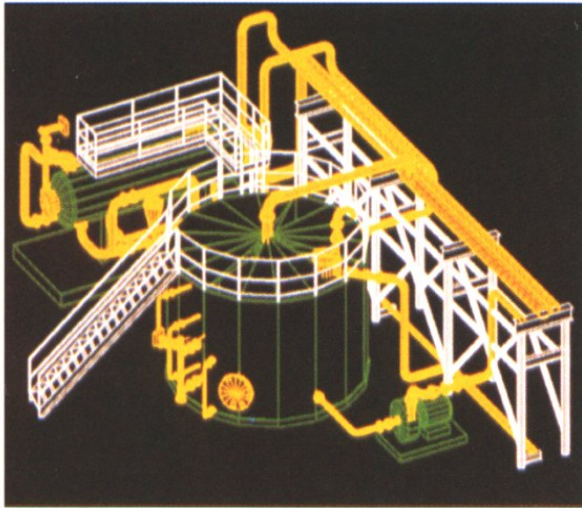
PIPING ISOMETRIC DRAWING



B PICTORIAL

Introduction to Piping Engineering

PIPING 3D MODELS



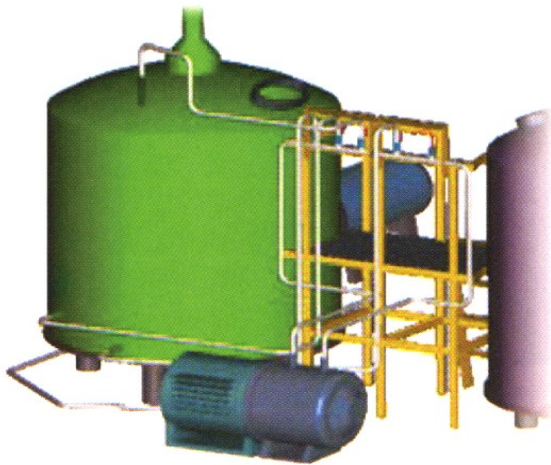
design & solve problems related to piping stresses or loadings.

Typical Piping Detailed Engineering / Drafting/ 3d Modelling Softwares

- PDMS
- PDS
- SP3d
- AutoPlant
- AUTOCAD Plant

Typical Piping Stress Analysis Softwares

- CAESAR- II
- ROHR-2
- CAEPIPE
- AUTOPIPE
- PIPEPAK

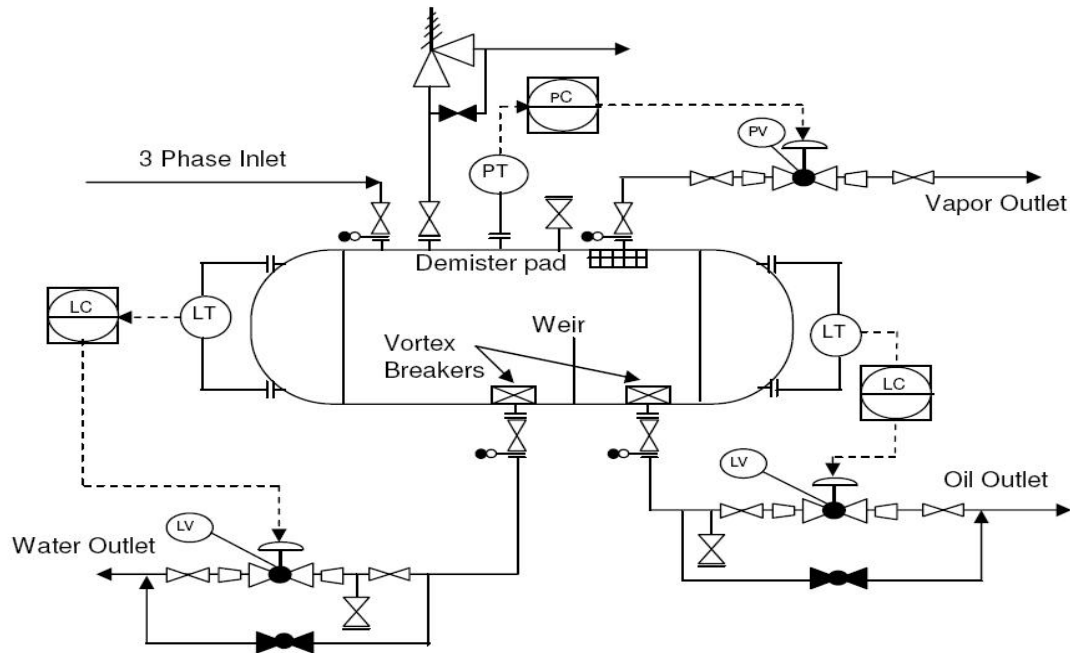


LATEST DEVELOPMENTS IN PIPING DESIGN

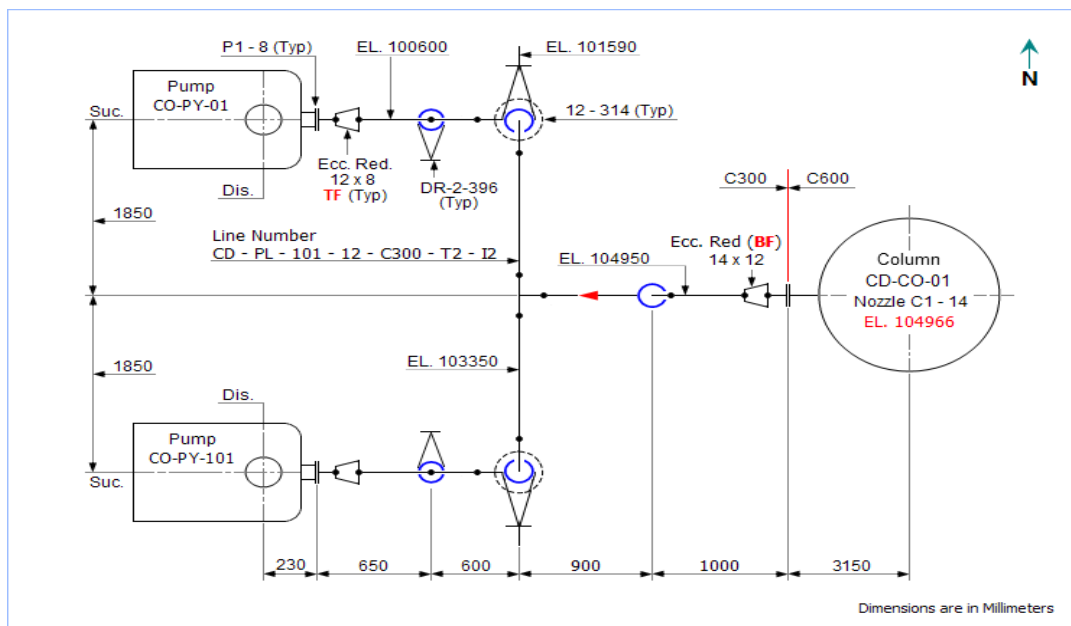
The trend in recent years has been to develop & employ better techniques in piping design to save time & also to improve accuracy. Piping related softwares are being extensively used to obtain speedy solutions to more complex problems of plant piping



WHY PIPING ENGINEERING IS CRITICAL???



Piping & Instrumentation Diagram



Piping General Arrangement Drawing

On the surface of it, Pipe seems very simple!!!



Pipe is the only equipment subjected to different loadings in the process plant over its life span.

- Pressures may vary from vacuum to more than 20,000 psi.
- Temperatures may vary from cryogenic to more than 1600 F – in some process or steam systems, or less than – 300 F in some cryogenic applications.
- As the pipe heats or cools, it has displacements or movements, Pipe Flexibility & piping supports must accommodate these movements.
- Pipe is supported at point locations, & must be able to support itself without sagging.
- Depending on operating conditions, the pipe material may degrade due to erosion, corrosion, stress corrosion cracking, creep, embrittlement etc.
- There are high number of different piping components, special elements, valves, supports, instruments accounting much more than 10,000 different components in a typical plant based on their size and pressure class ratings.
- Piping Systems installation is subject to irregularities in fabrication, assembly & erection. Pipe fabricators pull the pipe to “make the pipe fit”, this should be done within the fabrication tolerances.
- Chemical Process Equipments Thermal expansion also adds thermal movements into the piping systems causing severe displacements in the piping system.
- Piping Systems should absorb loadings like equipment vibration, seismic loads, wind loads & Fluid Impact Loads.