

# Process Piping - Piping Material Management Rating

Course No. M-6023

An Online Continuing Education Course for Engineers

**Credit: 6 PDH**

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# Process Piping – Piping Material Management Rating

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Piping Material Management is the branch of logistics that deals with the procurement and supply of the piping system as individual pieces or as an assembly in the form of spool pieces.

The objective of sound material management is:

1. To have necessary materials in hand when needed.
2. To pay the lowest possible price, consistent with quality and value requirements for material purchases.
3. To minimize the inventory investment.
4. To operate efficiently.

It involves the quality control of purchasing and ordering, and the standards involved in ordering, shipping, and warehousing the said material.

The 6-hour course explains the roles and responsibilities of the material engineering and purchasing department to ensure that enough material is always available on schedule, so that the construction continues smoothly.

This course is the – 5<sup>th</sup> of the 9 modules in series that cover the entire gamut of piping engineering in easy to learn format. All topics are introduced to readers with no or limited background on the subject.

This module is divided in six (6) chapters:

**CHAPTER -1: PIPING MATERIAL MANAGEMENT**

The chapter describes the various inputs to the piping material activities such as the type of fluid service as per ASME B31.3, Process Flow Diagrams (PFD's), Piping and Instrumentation Diagrams (P&ID's), the line lists, the equipment data sheets and the nozzle schedules.

**CHAPTER – 2: PIPING DESIGN CRITERIA**

This chapter covers some good engineering practices to aid piping engineers and designers to carry out the design activities. It discusses the engineering guidelines for pipes, fittings, valves, insulation, corrosion, supports and anchors, expansion and contraction, vents and drains, utility stations, pipe line welding, non-destructive examination and heat tracing. Reference is made to appropriate codes and standards.

CHAPTER– 3: PIPING MATERIAL SPECIFICATION (PMS)

This chapter describe how PMS is generated, typical format of material specification, line numbering system, pipe class designation, fluid service designation, insulation service and piping material index.

CHAPTER– 4: PIPE FABRICATION AND INSTALLATION

This chapter describe the difference between the field fabrication, shop fabrication for generating spools and modular skid fabrication. It discusses the pros and cons of installation approaches and the technical requirements for shop fabrication.

CHAPTER– 5: MATERIAL REQUISITION AND CONTROL

This chapter describe the different stages of material take-offs, roles and responsibilities of procurement vs engineering, preparation of material requisition, technical requirements for materials, inspection and testing requirements, quality assurance plan, material traceability requirements, certification, storage and handling requirements, different attachments to material requisition and testing requirements.

CHAPTER– 6: BID TABULATION

This chapter describes the process of technical evaluation, commercial evaluation, qualifying criteria for bidders, purchase order and vendor document review and approval process.

## CHAPTER 1

### PIPING MATERIAL MANAGEMENT

Piping Material Management is the branch of logistics that deals with the procurement and supply of the piping system as individual pieces or as an assembly in form of spool pieces. The objective of a sound material management is:

1. To have necessary materials in hand when needed.
2. To pay the lowest possible price, consistent with quality and value requirement for purchases materials.
3. To minimize the inventory investment.
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The procurement strategy is very frequently influenced by the installation strategy, which follows its fabrication. The installation of pipe can be accomplished in three ways or combinations thereof:

- **Field Fabrication**
  - Field fabrication and installation is just what it implies. The pipe is fabricated at an on-site field fabrication area and then erected.
- **Shop Fabrication**
  - Shop fabrication involves pipe spools. The term "pipe spool" or "spool piece" refers to prefabricated assembly of piping components that includes the pipe, fittings and flanges. The spools fabricated in remote shops are labeled with an identifier and transported to the job site for installation.
- **Skid Assembly**
  - A modular assembly is a pre-packaged assembly of process system containing one skid or, depending on size restraints, may comprise multiple skids. They are sometimes called "a system in a box." They provide the advantage of parallel construction, where process systems are built off-site in a fabrication facility while civil site upgrades are completed at the plant site simultaneously.

In all these three installation approaches, the role of piping and procurement is absolutely critical.

### **1.1. ROLES & RESPONSIBILITIES OF PIPING**

Piping department is concerned with development of Plot plan, Equipment layouts, Piping layouts, Isometrics Drawings, 3D Models; piping material specification, stress analysis of piping systems, providing input to other departments like Civil, Structural, Electrical, Instrumentation, Process etc. The piping material management group is involved in

- Preparation of project specification documents
- Prepare 3D model, extract Isometrics (for material take-off, fabrication of spool pieces and construction).
- Estimate Material take-off (MTO) and Bill of Materials (BOM).
- Preparation of Material Requisition based on Bill of Quantities (BOQ).
- Technical Bid Evaluation
- Vendor document review/approval (post award)

### **1.2. ROLES & RESPONSIBILITIES OF PROCUREMENT**

The Procurement Department's job is to make sure that the various materials, equipment's, instruments etc. etc. reaches site in a timely delivery in most economical costs. The scope includes:

- Purchasing
- Expediting
- Logistics and material handling
- Inspection visits to vendor and fabrication shops and Quality management of final purchased products.
- Change management

### **1.3. ROLES & RESPONSIBILITIES OF OTHER DISCIPLINES**

The work of piping design tends to overlap with other disciplines; therefore, it is important that a piping engineer work in close coordination with other related departments all the while maintaining a broad and comprehensive view of the plant.

- Mechanical group provides the Mechanical Data Sheet of Equipment. In the later stages of design, Vendor Prints (VPs) are made available.
- Civil/ Structural/ Architectural group provides the required foundation for equipment, structures for racks/ equipment, underground trenches, pits, structures for Miscellaneous Pipe Supports etc.

- Instrumentation group supplies the data for inline and online instruments, control valves, relief valves.
- Electrical gives the hazardous area classification drawings, cable layout etc.

All these disciplines are also involved in preparing the Plot Plans. A good piping designer coordinates and interacts with all disciplines regularly to ensure the design teams are using the most up-to-date information.

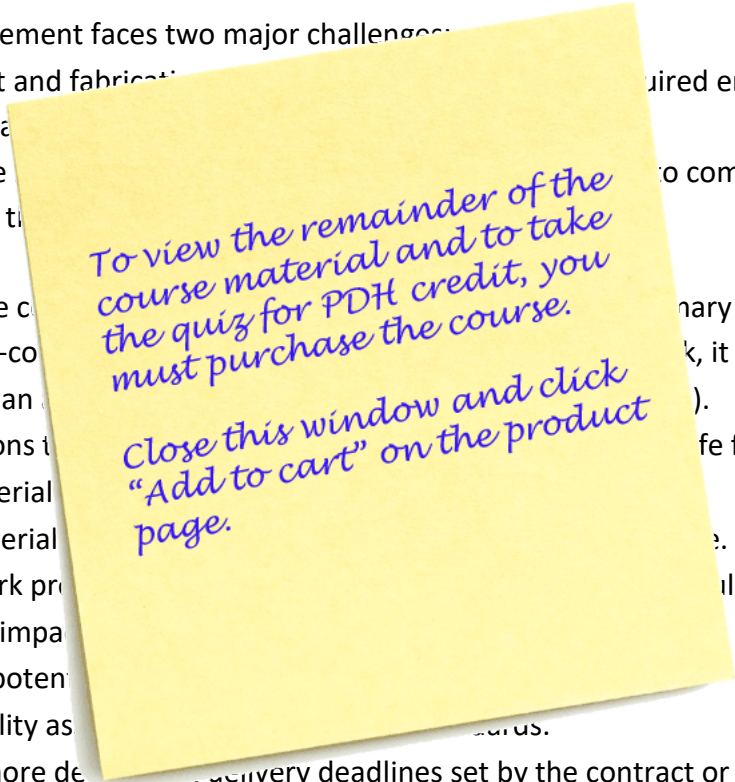
#### 1.4. CHALLENGES

The material management faces two major challenges:

- Procurement and fabrication of materials requires required engineering and quality assurance.
- Deliver those materials to the site, assemble them, and complete the assembly, to the client.

These challenges are complex and require primary and secondary contractors and sub-contractors. To complete the project, it is important to:

- Effectively plan and execute the project.
- Make decisions to optimize the project.
- Procure material and equipment.
- Operate material management systems.
- Measure work progress.
- Manage the impact of changes.
- Reduce the potential for errors.
- Perform quality assurance.
- Meet ever more demanding delivery deadlines set by the contract or client.



#### 1.5. PRIMARY INPUTS FOR PIPING ACTIVITIES

The most crucial part of piping design is to create a layout of the equipment with the end in mind; this is the basis for a good piping design. The following inputs are absolutely necessary for accomplishing the piping design activities:

1. The Fluid Service
2. Process Flow Diagram and Legends
3. Piping and Instrument Diagrams (P&ID's)
4. Line List
5. Equipment Data Sheets (input from mechanical department)