

COURSE NAME: INDUSTRIAL PIPING SYSTEM

**LECTURE X-WEEK X: COST ESTIMATION FOR PIPING
SYSTEM INSTALLATION**

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OBJECTIVES

By the end of this session the learner/student will be able to:

- ✓ Elaborate piping system project materials cost
- ✓ Elaborate piping system project labour cost
- ✓ Elaborate piping system project Subcontractors and Equipment
- ✓ Elaborate piping system project indirect cost.

X.1. Introduction

Cost estimation for piping system installation refers to the process of determining the projected expenses associated with installing a piping system in a construction or industrial project.

It involves assessing the various elements required for the installation, such as materials, labour, subcontractor services, equipment, indirect costs, and potential markup or profit.

Introduction Cont'd

The purpose of cost estimation is to provide an estimate of the overall financial investment needed to complete the piping system installation. It helps project stakeholders, such as contractors, engineers, and clients, to plan and budget effectively, make informed decisions, and assess the feasibility and competitiveness of the project.

Introduction Cont'd

The cost estimation process typically involves the following:

Analysing project specifications, reviewing design drawings, determining material quantities, considering labour requirements, evaluating subcontractor and equipment needs, accounting for indirect costs (e.g., engineering, permits, contingencies), and applying appropriate markups or profit margins.

The estimation is presented as a breakdown of costs, providing transparency and facilitating decision-making.

Introduction Cont'd

The accuracy of the cost estimation relies on the availability of project details, industry expertise, knowledge of current market rates for materials and services, and consideration of any unique project requirements or constraints.

It is important to regularly review and update the cost estimation as the project progresses and more precise information becomes available.

X.2. Steps to do steps cost estimation

a. Gather project information:

Collect all the necessary details about the piping system installation project, including design drawings, specifications, and any specific requirements or constraints.

Steps to do steps cost estimation Cont'd

b. Define scope of work:

Clearly define the scope of work for the piping system installation, including the extent of the system, materials to be used, and any additional components or services required (e.g., insulation, supports, valves).

Steps to do steps cost estimation Cont'd

c. Material take-off:

Create a detailed list of all the materials needed for the project, including pipes, fittings, valves, supports, insulation, fasteners, and any specialty items.

Consult suppliers or catalogues to obtain current pricing information for each item.

Steps to do steps cost estimation Cont'd

d. Labour estimation:

Determine the labour requirements for the installation, considering factors such as the complexity of the system, pipe size, welding or joining methods, and any special considerations like working at heights or in hazardous conditions.

Estimate the number of hours required for each task and multiply it by the appropriate labor rate.

Steps to do steps cost estimation Cont'd

e. Subcontractors and equipment:

If specific tasks require subcontractors or specialized equipment, obtain quotes from subcontractors or rental companies for their services or equipment costs.

This may include activities such as welding, hydrostatic testing, or excavation.

Steps to do steps cost estimation Cont'd

f. Indirect costs:

Consider indirect costs associated with the project, such as project management, supervision, engineering, permits, mobilization or demobilization, insurance, and contingencies.

These costs are typically a percentage of the direct costs or estimated separately.

Steps to do steps cost estimation Cont'd

g. Markup and profit:

Add an appropriate markup or profit margin to the total estimated cost to cover overhead expenses and generate profit for the contractor or organization. This means the additional amount added to the cost of goods or services to cover expenses and generate profit.

Steps to do steps cost estimation Cont'd

h. Summarize and present the estimate

Prepare a detailed breakdown of the estimated costs, including labour, materials, subcontractors, equipment, indirect costs, and profit margin.

Present the estimate in a clear and organized manner, specifying any assumptions or exclusions made during the estimation process.

It's important to note that cost estimation can vary depending on the specific project, location, market conditions, and other factors. Additionally, consulting with experienced estimators or industry professionals, as well as referring to industry cost estimation guides or software, can provide valuable insights and improve the accuracy of your estimates.

X.3. Cost estimation

a. Scope of the Work

No	Items	Description
1	Purpose of the project	Installation of a new piping system as per the project specifications and requirements
2	Piping material	Specification of the type of material, e.g., carbon steel, stainless steel, PVC
3	Pipe size	Specify the size and schedule of the pipes, e.g., 4 inches, SCH 40
4	System components	Specify the required components, such as valves, fittings, supports, insulation, etc

b. Materials cost

Material costs in piping system installation refer to the expenses associated with the materials required for the project, including pipes, fittings, valves, supports, insulation, gaskets, flanges, and other components.

Example of material cost estimation

No	Material	Estimated Cost
1	Pipes	3500\$
2	Valves	300\$
3	Fittings	250\$
4	Supports and hangers	200\$
5	Insulation	100\$
6	Miscellaneous material	180\$
Total material cost		4530\$

c. Labour cost

Labour cost in piping system installation refers to the expenses associated with the manpower required to complete the installation process. It includes the wages or salaries of the workers involved in tasks such as pipefitting, welding, installation, testing, and inspection. Calculating labour costs for piping system installation typically involves different steps which are to be discussed in the next slides.

Labour cost Cont'd

i. Determine Labour Hours:

Estimate the number of hours required for each specific task involved in the installation process. This estimation is usually based on industry standards, project specifications, and the expertise of professionals or project managers familiar with similar projects.

Labour cost Cont'd

ii. Define Labour Rates:

Determine the hourly labour rate for each type of labour involved in the installation. Labour rates can vary based on factors such as skill level, experience, location, and market conditions. Consider both direct labour (pipefitters, welders, etc.) and indirect labour (supervisors, project managers, etc.) when setting labour rates.

Labour cost Cont'd

iii. Calculate Labour Costs:

Multiply the labour hours for each specific task by the corresponding labour rate to determine the labour cost for that task. Repeat this process for all tasks involved in the piping system installation. Sum up the individual task costs to obtain the total labour cost.

Labour cost Cont'd

It's important to note that labour costs can vary depending on project complexity, labour productivity, work schedules, and other factors specific to the project.

Regularly reviewing and updating labour estimates as the project progresses and obtaining input from experienced professionals can help ensure accurate labour cost calculations.

Labour cost Cont'd

Additionally, it's recommended to consider other labour-related expenses, such as payroll taxes, benefits, insurance, and any applicable labour-related overhead costs, to obtain a comprehensive understanding of the overall labour cost for the piping system installation.

Example

No	Activity	Cost/Unit time(Hour)	Total cost in life span
1	Pipefitting and welding	5\$	3500\$
2	Insulation installation	2\$	1000\$
3	Supervisor and project management	3\$	2500\$
Labour total cost		10\$	7000\$

d. Subcontractors and Equipment

Subcontractors in piping system installation are specialized contractors or companies hired to perform specific tasks or provide certain services that are beyond the scope or capabilities of the primary contractor. In the context of piping system installation, subcontractors may be involved in activities such as excavation, trenching, equipment rental, specialized welding, insulation installation, or testing.

Subcontractors and Equipment

Equipment in piping system installation refers to the machinery, tools, and devices used during the installation process. This can include equipment such as excavators, backhoes, trenchers, welding machines, pipe threading machines, lifting equipment, and other specialized tools or instruments required for the installation and assembly of the piping system.

Example of Subcontractors and Equipment calculation

No	Activity	Cost/Unit time(Hour)	Total cost in life span
1	Excavation	100\$	10000\$
2	Trenching	20\$	1000\$
3	Equipment rental	120\$	15000\$
Total cost			26000\$

e. Indirect costs

Indirect costs in piping system installation refer to the expenses that are not directly associated with the physical labour or materials of the installation process but are necessary for the overall project execution. These costs typically include engineering and design fees, permits and licenses, project management, insurance, and contingency funds.

Example of indirect cost calculation

No	Activity	Cost
1	Engineering and design:	1000\$
2	Permits and fees	500\$
3	Contingency	400\$
4	Insurance	1200\$
Total cost		3100\$

Summary of cost estimation

The summary of cost estimation highlights all the cost elements, including material costs, labour costs, subcontractor and equipment costs, indirect costs, and markup, into a comprehensive cost breakdown. It is the estimation in a clear and organized manner, providing a detailed breakdown of costs and any assumptions made during the estimation process.

Summary of cost estimation

No	Item	Cost
1	Total material cost	7,000\$
2	Total labour cost	4,530\$
3	Total subcontractor and equipment cost	26,000\$
4	Total indirect cost	3,100\$
5	Total markup and profit	1,500\$
Grand Total		42,130\$

Conclusion

Please note that this cost estimation is based on the information provided, and actual costs may vary depending on site conditions, project specifications, and any changes during the execution phase. Be aware that dummy data were used in this presentation in order to facilitate for the easy understanding. In case you are working on piping system project you put real data you have on spot.

Reference

1. National Research Council. (2009). Assessing and managing the ecological impacts of paved roads. National Academies Press.
2. Chee, R., Lansley, K., & Chee, E. (2018). Estimation of water pipe installation construction costs. *Journal of Pipeline Systems Engineering and Practice*, 9(3), [04018008]. Available at [https://doi.org/10.1061/\(ASCE\)PS.1949-1204.0000323](https://doi.org/10.1061/(ASCE)PS.1949-1204.0000323).
3. Rifka Aisyah (2021), How To Estimate Capital Cost of Pipeline Project, accessed on 10th May 20203, Available at <https://missrifka.com/pipeline/how-to-estimate-capital-cost-of-pipeline-project.html>.
4. Ray Hardee (2014), Calculate the Costs of Piping System Elements, accessed on 10th May 20203, Available at <https://www.pumpsandsystems.com/calculate-costs-piping-system-elements>.