

MATERIALS MANAGEMENT PLANNING GUIDE



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Introduction

This implementation resource provides guidelines for preparing a materials management plan for a specific project, based on its project execution plan. It is divided into two sections:

- I. Materials Management and the Project Execution Plan
- II. Preparing the Materials Management Plan
 - A. Personnel and Organization
 - B. Materials Requirements Planning
 - C. Project Acquisition Strategy
 - D. Purchasing
 - E. Subcontracting
 - F. Expediting
 - G. Supplier Quality Management
 - H. Transportation and Logistics
 - I. Site Materials Management
 - J. Materials Management Planning for Operations and Maintenance
 - K. IT Systems.

I. Materials Management and the Project Execution Plan

Elements

The Materials Management Plan must fit within the overall framework of the Project Execution Plan and take into account the following considerations:

- overall project strategies
- limitations
- constraints.

The following are among the general project descriptions and parameters that define the Project Execution Plan:

- project type
- project size
- project location
- facilities to be constructed
- existing facilities.

Following are some of the more significant strategic elements that affect the Materials Management Plan:

- use of existing materials
- approach to procurement of critical equipment
- use of existing owner, engineer, or constructor strategic supplier relationships
- acceptability of international/global supplied materials
- bulk material quantification—take-off/estimate
- approach to procurement of engineered materials
- timing for first bulk materials take-off and subsequent take-offs
- approach to and supply of materials for prefabrication
- schedule implications/expediting support
- responsibility for procurement of bulk materials, both the first buy and the subsequent purchases
- inspection
- shipping terms
- approach to materials shorts, changes, damages, and surplus
- spare parts philosophy, including commonality of equipment with existing plant and other contractors

- responsibility for procurement of materials for temporary facilities
- extent of field warehousing, considering use of available supplier inventory systems
- role of subcontractors in procurement of materials
- use of min-max warehousing versus buying from take-offs
- design/procurement freezes
- just-in-time (JIT)
- interfaces: EDI, Internet, and communications
- logistics/materials staging/distribution
- construction plan (subcontract versus direct-hire labor).

Responsibilities

It is important to realize that the owner and contractor on a project must participate in the activities that make up the materials management cycle. A major effort of project materials management planning is the establishment of specific responsibilities for materials and equipment. Owners must determine these responsibilities in the front end planning phase, in conjunction with project priorities, goals, and contract strategies.

According to previous research, successful construction contracts are characterized by thorough preparation by the owner before the contract is let. All elements of the owner's organization that have an impact on a project should be represented. Responsibilities that should be brought to owners' attention include the following:

- Contractually determine and define the scope of materials-related services for each contractor.
- Ensure that materials management is recognized as a critical project management function by both their organizations and by the engineering and construction contractors they hire.

Responsibilities for all materials management activities should be defined during the planning effort. All participants should be consulted, including the following:

- owner
- prime contractor or managing contractor
- engineering contractor
- construction contractor
- shop fabricators
- suppliers
- field subcontractors.

A responsibility matrix should be developed to consider the following project materials:

- process equipment and engineered items
- bulk materials
- prefabricated materials
- construction infrastructure (including temporary facilities).

Specific attention should be given to the roles of the construction contractor and the subcontractors in the “gray area” between direct materials and construction consumables. Project participants’ responsibilities should be well defined for these gray areas. These responsibilities include the following:

- developing specifications
- materials take-off
- inquiries
- purchasing
- inspection
- expediting
- shipping
- invoicing
- close-out.

Developing a detailed matrix that is based on input from all participants can have a significant impact on the success of the project. The benefits this matrix provides for the project include the following:

- All participants understand their respective materials management responsibilities.
- Effective communication is easier, since all participants understand their respective roles.

Organizational Structure

The responsibility and position of all key personnel for each project participant is best illustrated on organizational charts developed for the specific project. These charts promote a better understanding of the different organizational groups participating in the work. They also allow a clearer understanding of the authority of key personnel, including the line of command.

Material Types

To appropriately manage materials acquisition activities, project materials are categorized into three groups: engineered materials, bulk materials, and prefabricated materials.

Engineered Materials

Broadly defined as items with uniquely assigned numbers, or tags, that permit identification and location throughout the entire life of the project, this group is often further divided into two subcategories:

- major equipment, such as tanks, heat exchangers, and pumps
- minor equipment, such as control valves, instrumentation, and specialty items.

Bulk Materials

Bulk items are materials that are manufactured to industry standards and purchased in quantity. These materials include such items as pipe, fittings, wiring, and cable.

Prefabricated Materials

Prefabricated items are typically engineered and fabricated according to engineered specifications at a fabrication shop/site that is separate, sometimes distant, from the construction site.

II. Preparing the Materials Management Plan

A. Personnel and Organization

The appropriate selection of materials management personnel and the formation of them into an effective organization are fundamental to the success of any construction project. Basic considerations affecting both skills selection and organizational configuration are the following:

- project size
- contracting strategy and schedule
- type and volume of materials
- site location
- availability of advanced material management IT systems.

B. Materials Requirements Planning

Within the project environment, the materials requirements planning function includes the activities associated with the definition and quantification of all project materials. The function encompasses both owner and contractor organizational groups. The materials requirements process includes the following activities:

- defining and selecting materials based on constructability, availability, and economics; best accomplished by the combined efforts of engineering and construction
- planning for and managing toward schedule requirements for all projects materials
- controlling and managing toward minimum materials surpluses, while meeting project schedule requirements
- procuring and distributing strategies that, because they are highly interdependent, must be considered in the planning phase.

Planning for Engineered Materials

The basic objective of planning for engineered materials is to ensure that they are acquired and delivered to meet the overall construction schedule. Planning for engineering materials includes the following activities:

- determining needed items
- developing specifications
- establishing the relationship of the materials to the project schedule
- planning for initiating the acquisition of the materials.

The first step in planning for engineered items is a determination of the engineered items required for the project. Although equipment specifications may not be completed until the detailed engineering phase, it is important that planning for these items begin during conceptual engineering, since these items will drive the entire project schedule. During the conceptual engineering phase, a major equipment list should be developed to which lead times for supplier data, fabrication, and delivery should be added. This list can be used as input to the development of the engineering schedule so that long lead items can be specified early, and the overall project schedule can be optimized.

Another item that must be accomplished early on is the development of the actions required in the acquisition cycle of engineered items. Establishing these in the most precise terms possible is important to meeting project needs and should be a joint effort between the owner and contractor. A method of monitoring and reporting against these milestones must also be planned.

During planning for acquisition of major equipment, the team should consider the acquisition of the materials related to the basic equipment. Such ancillary materials acquisition involves special considerations, including the following:

- Spare parts – Is there a need to acquire start-up and/or operational spare parts?
- Supplier assistance – Is supplier assistance needed for installation, start-up, or training?
- Warranty/guarantee – What operational or functional guarantees are required?
- Supplier data – What supplier documents are required?
- Inspection – What is the approach to inspection, testing, or other quality assurance methods?
- Transportation – Will cost of shipment be covered by the buyer or the supplier?
- Commercial terms – What are requirements for retainage and payment schedule?
- Master manifest – What will the receivables be and how will they be billed?
- Preventive maintenance – Will the requirements be defined prior to shipment?
- Early involvement – Is there a process in place for early involvement with suppliers of equipment critical to the success of the project?

All of these items will become specific at inquiry and purchase order time. However, contractual arrangements between owner and contractor should establish the ground rules for many of them, and the overall philosophy should be set during the planning stage. As specific items reach the inquiry stage, specific terms and conditions should be selected with inputs from the owner and contractor.