

Topic 6 Section 7

Managing Resources

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Managing Resources

In order to complete any major construction project, a large amount of materials are used. These materials can be grouped into:

- consumables — materials that are used as part of the job (permanent)
- equipment — materials that are used to carry out the work (temporary)

These materials must be managed efficiently so that the job can proceed on schedule and be completed within cost, on time, and according to specification.

Consumables

These materials become a permanent part of the construction of the job and are set down in the schedule of quantities or can be extracted from the drawings. Since the permanent materials will be scheduled or shown on the drawings, net quantities can be accurately estimated but allowance must be made for wastage. In addition to wastage, some items include unmeasured quantities for which allowances should be made, (e.g. in trench excavation or in any form of excavation overbreak will occur). Some examples of consumables could be:

- Gravel
- Concrete
- Reinforcement steel
- Water
- Explosives
- Sand
- Soil

Equipment

Equipment describes temporary materials and stores items that are used in the temporary works or required for particular operations required in constructing the permanent works, e.g. formwork and falsework for concrete works and drills and explosives in winning materials. These materials are frequently not listed in the schedule of quantities and hence a separate schedule may have to be prepared.

Temporary materials are not so readily estimated and the following values have to be considered:

- Salvage value
- Stores items, depreciation of equipment
- Expendable items.

All temporary materials and stores must be estimated as accurately as practicable. This usually necessitates:

- Preliminary designs for formwork and falsework, trench support materials, temporary timbering, etc.
- Preliminary planning to determine drilling and blasting patterns in the use of explosives.
- Preliminary planning of access, temporary tracks, bridges or culverts and the like which would require the use of materials.

The amount of work spent on their preparation will depend largely upon the amount of detail required to obtain essential quantities. The details and hence the quantities will not be as accurate as for permanent works. This is where past experience and knowledge of the costs of similar works carried out will reduce the time involved in the preparation of extensive temporary works designs, if this type of information is used carefully by a competent engineer-estimator. When the quantities have been determined, allowances for wastage and unmeasured items are handled in the same way as permanent materials. Some examples of equipment or temporary materials might be:

- Tools
- Formwork
- Signage
- Temporary fencing
- Barriers
- Site office / facilities

In managing these materials efficiently, there are a number of factors that must be considered. Materials must be of the correct:

- Type
- Quantity
- Quality

Also materials must be delivered to the right place at the right time and must be stored in a safe and secure manner. Special care must be taken when using natural materials (e.g. topsoil) from local sources, to comply with all relevant regulations and laws. Explosives and other dangerous materials must also be handled, stored and used with great care according to the strict guidelines and regulations that apply. These requirements are discussed in more detail below.

Type of Materials

The supervisor must ensure that any materials that are brought onto the construction site are the correct type for the job to be done and that they conform to the contract documents and job specifications. A responsible person must check all incoming materials and only sign for receipt of the goods when satisfied that they are as ordered. If incorrect materials are brought on site and the error is not detected until work is about to start, costly delays to the schedule could result.

Material Quantities

Material quantities will be ordered according to the job plans and specifications and must be calculated or estimated as accurately as possible so that the budget for the work can be maintained. The quantities ordered might include allowances for wastage and loss in some cases but these allowances should be kept to a reasonable and justifiable level.

Material Quality

The quality of the materials that are used on the job are critical to the successful completion of the project. It is impossible to complete a job satisfactorily if the materials used are inferior or of low quality. It is not worth risking the reputation of your company by using inferior materials just to save a few dollars or for the sake of convenience.

Many suppliers have quality control systems in place so that if there is a problem with the quality of goods, then there is a procedure in place to track down the problem and then to rectify it. The supplier is obliged to follow these procedures or else risk losing their quality accreditation. It is a good policy to use suppliers with quality assurance certification, when possible.

Storage

The supervisor should ensure that all materials are stored safely and securely so that they are not misused, stolen or damaged. This is particularly important for smaller, more valuable items such as laptop computers, chainsaws, jackhammers or generators that may be targeted by thieves or vandals. These items should not be left in isolated locations without adequate security.

Similarly, company procedures for the storage and safeguard of larger items such as plant and equipment must be adhered to, as the loss of a major item through damage or theft can cause a major delay to the project. Such equipment may be stored in secure compounds, private property (with the owner's agreement) or in clearly visible locations to reduce the chance of theft or vandalism.

Storage and handling requirements for particular materials are discussed in more detail below.

Pipes

Concrete and plastic pipes must be unloaded and stored carefully. Usually the manufacturer provides recommendations for the conduct of these operations. Reinforced concrete pipes (RCPs) and bundled polyethylene (PE) or polyvinyl chloride (PVC) pipes are usually unloaded by crane.

Pipes must be stored on a secure, level site. On most sites, this should be out of view of road users if possible, to ensure that there is not an ‘open invitation’ to thieves.

Plastic pipes manufactured of either PE or PVC are supplied in lots held together with plastic straps. RCPs need to be placed on dunnage and chocked to prevent rolling.

Note!

Do not stack large RCPs on top of smaller.

Concrete

Bagged concrete must be stored out of sight and out of the weather; a lockable shed is a good choice. Generally, bags should be stacked on a timber pallet or other structure that will keep them above ground. In addition, they should be covered, to avoid spoilage by moisture.

It is also important to use cement that is reasonably fresh. Cement that has been stored for long periods provides less than its design strength when made into concrete, and may no longer meet the requirements stated in the drawings and specifications for the job.

Sand and Gravel

Stockpiles of sand and gravel are often needed to support such on-site operations as pipe-laying and volume batching of small quantities of concrete.

In most cases, the stockpiles are kept in the open. However, unless the stockpile is maintained for a shorter period than a few days, it will need to be protected against contamination by unwanted materials such as leaves, bark, sticks, paper, plastic and cans. This means coverage of the full surface area of the stockpile with a plastic tarpaulin or other, suitable material and weighting the tarpaulin with concrete blocks or rocks.

Topsoil

Topsoil stripped from the works area must be protected so that it can be re-laid, as the job progresses, to allow revegetation of the site. (For notes on revegetation methods, see Section 4 of this topic).

Stockpiled topsoil, unless maintained for brief periods, need to be protected against erosion and contamination. This requires selection of a level site and coverage with weighted tarpaulins, as for sand and gravel stockpiles. A further consideration is location of the stockpile outside the driplines of trees, so that the pile does not become unnecessarily saturated and therefore more susceptible to loss by erosion.

Hazardous Substances

All construction companies must have strict procedures in place for the storage, issue, use, and disposal of hazardous substances and supervisors should be familiar with these procedures so that they can make sure that they are strictly adhered to and that no breaches occur on site. The term hazardous substances may include:

- Pesticides
- Fuels (diesel, petrol etc.)
- Oils, greases and lubricants
- Cleaning agents, disinfectants and detergents
- Other chemicals.

The supplier of the hazardous substance must provide a Material Safety Data Sheet (MSDS) and it will contain information such as:

- Substance ingredients
- Health hazards associated with the substance
- First aid procedures for injuries caused by contact with the substance
- Precautions and procedures for safe handling, storage and disposal of the substance.

An example of a typical MSDS is shown.

Material Safety Data Sheet		Infosafe No. CAS71	Page 1 of 7
Material Safety Data Sheet			
Infosafe No.	CAS71	Issue Date: October 2004	ISSUED by BPAUST
Product Name:	ALLLUBE Diesel Engine Oil		
Not classified as hazardous according to criteria of NOHSC			
1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY			
Product Name			
ALLLUBE Diesel Engine Oil			
Product Use			
Diesel Engine Oil. For specific application advice see appropriate Technical Data Sheet or consult your BP representative			
Company Name			
BP Australia Pty Ltd (ABN 53 004 085 616)			
Address			
Melbourne Central, 360 Elizabeth Street, Melbourne, Victoria 3000 Australia			
Emergency Tel.			
24hr 1800 638 556			
Telephone Number/Fax			
Tel: 61 3 9268 4111 Fax: (03) 9268-3321			
Other Information			
2. COMPOSITION/INFORMATION ON INGREDIENTS			
Information on Composition			
Highly refined mineral oil (IP 346 DMSO extract 3%) Proprietary performance additives. Hazardous Components No component is present at sufficient concentration to require a hazardous classification.			
3. HAZARDS IDENTIFICATION			
This material is not considered to be hazardous but should be handled in accordance with good industrial hygiene and safety practices.			
Product Name : ALLLUBE Diesel Engine Oil			

Explosives

Particular care must be taken in ensuring the safe storage of explosives and other dangerous materials such as fuels and gas cylinders. Only authorised persons who have successfully completed an approved training course should be permitted to handle or work with explosives. The supervisor should ensure that any employee who has to work with dangerous materials should receive adequate training so that they are capable of carrying out their tasks safely.

Ordering Materials

An important part of the management of materials used on site is the need to ensure that materials are ordered, delivered and used in a timely manner. This means that materials must be ordered in good time so that there are no delays to the schedule. On the other hand, materials should not be ordered and delivered too early so that storage and security problems are created or that they can spoil. Avoidance of these problems means attention to both planning and stock control of materials.

Availability of materials from the supplier must be checked at the planning stages of the project. The supplier's ability to manufacture and deliver required quantities to site on time will depend on:

- time taken to manufacture the material
- normal levels of stock held by the manufacturer or distributor (e.g. generally few RCPs are held in stock as they are made 'on demand')
- lead time for delivery
- seasonal variations in demand.

Decisions about quantities held on site will depend on a variety factors, such as:

- anticipated rate of progress of the work
- tendency of the materials to spoil or become unserviceable, and susceptibility to theft
- amount of space needed to stockpile or store materials.

Stock control involves estimating how much of the total order needs to be delivered at a given stage of the project. In most cases, people are mainly concerned with lack of materials; however, the reverse problem is possible. For example, a project supervisor may note that good stocks of RCPs are currently held on site in required diameters. However, several scenarios are possible:

- a good run of weather will lead to rapid depletion of the stock
- continuing rain may delay the work, leaving the pipes unused for an extended period.

Problems may also arise from the original estimates for the job. For example, it is possible (on a job involving 45 km of road) for the specified numbers of pipes to be over or under actual requirements by 10–20 pipes. If they are under, the problem is sourcing pipes at short notice; if they are over, there may be a need to stockpile the excess pipes until the manufacturer retrieves them or they can be removed to another site.

The problem in both examples is to realise that it is possible to run out of materials, or to end up with excess materials, even when apparently good stockpiles appear to be reasonable for the requirements of the job. In such cases, the person who provides the link between personnel on site and the designers of the project has an important role to play.

Section 7 – Assessment Activities

For information on how these assessment activities may be used as part of the learning process, see the section on ‘Assessment’ in the ‘Topic Descriptor’ section at the front of this topic.

Theory Questions

The following questions allow you to assess your progress in understanding the material presented in Section 7. The questions may be of any of the following types:

- multiple choice (identify correct answer or answers)
- multiple choice (identify incorrect answer or answers)
- fill in the gaps in a sentence or statement
- identify a sentence or statement as TRUE or FALSE
- write a few sentences or a short paragraph.

Answers to the question are shown in the separate ‘Answer’ section.

Question 1

A construction job will use equipment and materials that may be described as consumables (a permanent part of construction of the job). Name three items that are typically considered to be consumables.

Question 2

A construction job will use equipment and materials that are a temporary part of construction of the job and are removed from site after the job is complete. Name three items that are typically considered to be temporary equipment.

Question 3

Construction companies must have strict procedures in place for the storage, issue, use and disposal of hazardous substances. List three examples of hazardous substances that may be used on a construction site.

Question 4

Materials used on site often need to be stored in a certain manner for safety or to keep the materials in a useable condition. Discuss things to consider when storing the following materials:

- Pipes

- Concrete

- Topsoil

Question 5

An important part of site management is the need to ensure that materials are ordered, delivered and used in a timely fashion. Discuss three factors that affect the ability of the manufacturer to deliver the required quantities of material to the site on time.

Practical Exercises

Practical Exercise 1

Make a list of the temporary equipment now in use on the construction job you are working on. Discuss the list with your project supervisor. Can you suggest any improvements in handling or storage?

Practical Exercise 2

Make a list of the consumables that will be required to complete the construction job you are working on. Discuss the list with your project supervisor. Can you suggest any improvements in handling or storage? Is there any evidence of spoilage?