LEARNING OBJECTIVES
After studying this chapter, you should be able to:
1. Recognize the two basic aspects of materials control.
2. Specify internal control procedures for materials.
3. Account for materials and relate materials accounting to the general ledger.
4. Account for scrap materials, spoiled goods, and defective work.
5. Account for inventories in a just-in-time system.

The total inventory cost of a finished product consists of the expenditures made for raw materials, direct labor, and its fair share of factory overhead. The principles and procedures for controlling and accounting for these cost elements are discussed in Chapters 2, 3, and 4. Each chapter examines the accounting procedures and controls that apply to each cost element. However, certain procedures and controls pertain to all cost control systems. The major function of a cost control system is to keep expenditures within the limits of a preconceived plan. The control system should also encourage cost reductions by eliminating waste and operational inefficiencies. An effective system of cost control is designed to control the people responsible for the expenditures because people control costs. Costs do not control themselves.

An effective cost control system should include the following:
1. A specific assignment of duties and responsibilities.
2. A list of individuals who are authorized to approve expenditures.
3. An established plan of objectives and goals.
4. Regular reports showing the differences between goals and actual performance.
5. A plan of corrective action designed to prevent unfavorable differences from recurring.
6. Follow-up procedures for corrective measures.

Responsibility accounting is an integral part of a cost control system because it focuses attention on specific individuals who have been designated to achieve the established goals. Of the three major objectives of cost accounting—cost control, product costing, and inventory pricing—cost control is often the most difficult to achieve. A weakness in cost control can often be overcome by placing more emphasis on responsibility accounting. This makes the people who incur costs accountable for those costs.

## Materials Control

The two basic aspects of materials control are (1) the physical control or safeguarding of materials and (2) control of the investment in materials. Physical control protects materials from misuse or misappropriation. Controlling the investment in materials maintains appropriate quantities of materials in inventory.

### Physical Control of Materials

Every business requires a system of internal control that includes procedures for the safeguarding of assets. Because highly liquid assets, such as cash and marketable securities, are particularly susceptible to misappropriation, the protection provided for such assets is usually more than adequate. However, other assets, including inventories, must also be protected from unauthorized use or theft.

Because inventories usually represent a significant portion of a manufacturer’s current assets, a business must control its materials from the time they are ordered until the time they are shipped to customers in the form of finished goods. In general, to effectively control materials, a business must maintain: (1) limited access, (2) segregation of duties, and (3) accuracy in recording.

### McDonald’s

Manufacturers are not the only ones who have direct materials. Although McDonald’s, for example, is considered a service business, it has direct materials such as ground beef and potatoes that are used in the preparation of its burgers and fries.

### Limited Access.

Only authorized personnel should have access to materials storage areas. Raw materials should be issued for use in production only if requisitions are properly documented and approved. Finished goods should also be safeguarded in limited access storage areas and not released for shipment in the absence of appropriate documentation and authorization. Procedures should be established within each production area for safeguarding work in process.
Segregation of Duties. A basic principle of internal control is the segregation of employee duties to minimize opportunities for misappropriation of assets. With respect to materials control, the following functions should be segregated: purchasing, receiving, storage, use, and recording. The independence of personnel assigned to these functions does not eliminate the danger of misappropriation or misuse because the possibility of collusion still exists. However, the appropriate segregation of duties limits an individual employee’s opportunities for misappropriation and concealment. In smaller organizations, it is frequently not possible to achieve optimum segregation due to limited resources and personnel. Small businesses must therefore rely on specially designed control procedures to compensate for the lack of independence of assigned functions.

Accuracy in Recording. An effective materials control system requires the accurate recording of the purchase and issuance of materials. Inventory records should document the inventory quantities on hand, and cost records should provide the data needed to assign a cost to inventories for the preparation of financial statements. Periodically, recorded inventories should be compared with a physical inventory count, and any significant discrepancies should be investigated. Differences may be due to recording errors or may result from inventory losses through theft or spoilage. Once the cause has been determined, appropriate corrective action should be taken.

CONTROLLING THE INVESTMENT IN MATERIALS

Maintaining an appropriate level of raw materials inventory is one of the most important objectives of materials control. An inventory of sufficient size and diversity for efficient operations must be maintained, but the size should not be excessive in relation to scheduled production needs.

Because funds invested in inventories are unavailable for other uses, management should consider other working capital needs in determining inventory levels. In addition to the alternative uses of funds that otherwise would be invested in inventories, management should consider the materials costs of handling, storage, personal property taxes, and casualty insurance. Also, higher than needed inventory levels may increase the possibility of loss from damage, deterioration, and obsolescence. The planning and control of the materials investment requires that all of these factors be carefully studied to determine (1) when orders should be placed and (2) how many units should be ordered.

Order Point. A minimum level of inventory should be determined for each type of raw material, and inventory records should indicate how much of each type is on hand. A subsidiary ledger, in which a separate account is maintained for each material, is needed.

The point at which an item should be ordered, called the order point, occurs when the predetermined minimum level of inventory on hand is reached. Calculating the order point is based on the following data:
1. **Usage**—the anticipated rate at which the material will be used.
2. **Lead time**—the estimated time interval between the placement of an order and the receipt of the material.
3. **Safety stock**—the estimated minimum level of inventory needed to protect against **stockouts** (running out of stock). Stockouts may occur due to inaccurate estimates of usage or lead time or various other unforeseen events, such as the receipt of damaged or inferior materials from a supplier or a work stoppage at a supplier’s plant.

Assume that a company’s expected daily usage of an item of material is 100 lbs., the anticipated lead time is 5 days, and the estimated safety stock is 1,000 lbs. The following calculation shows that the order point is reached when the inventory on hand reaches 1,500 lbs.:

\[
\begin{align*}
100 \text{ lbs. (daily usage)} \times 5 \text{ days (lead time)} & = 500 \text{ lbs.} \\
\text{Safety stock required} & = 1,000 \text{ lbs.} \\
\text{Order point} & = 1,500 \text{ lbs.}
\end{align*}
\]

If estimates of usage and lead time are accurate, the level of inventory when the new order is received would be equal to the safety stock of 1,000 lbs. If, however, the new order is delivered three days late, the company would need to issue 300 lbs. of material from its safety stock to maintain the production level during the delay.

**Economic Order Quantity (EOQ)**. The order point establishes the time when an order should be placed, but it does not indicate the most economical number of units to be ordered. To determine the quantity to be ordered, the cost of placing an order and the cost of carrying inventory in stock must be considered. **Order costs** generally include several items:

1. Salaries and wages of employees engaged in purchasing, receiving, and inspecting materials.
2. Communications costs associated with ordering, such as telephone (including fax) charges, software for electronic ordering, and postage and stationery.

A variety of factors must be considered in determining **carrying costs**:

1. Materials storage and handling costs.
2. Interest, insurance, and property taxes on the inventory investment.
3. Loss due to theft, deterioration, or obsolescence.
4. Records and supplies associated with carrying inventories.

Order costs and carrying costs move in opposite directions—annual order costs decrease when the order size increases, while annual carrying costs increase when the order size increases. The optimal quantity to order at one time, called the **economic order quantity**, is the order size that minimizes the total order and carrying costs over a period of time, such as one year.

The factors to be considered in determining order and carrying costs for a particular company vary with the nature of operations and the organizational struc-
ture. Special analyses are usually required to identify relevant costs, because these data are not normally accumulated in an accounting system. Care must be exercised in determining which costs are relevant. For example, a company may have adequate warehouse space to carry a large additional quantity of inventory. If the space cannot be used for some other profitable purpose, the cost of the space is not a relevant factor in determining carrying costs. If, however, the space in the company warehouse could be used for a more profitable purpose or if additional warehouse space must be leased or rented to accommodate increased inventories, the costs associated with the additional space are relevant in determining carrying costs.

The interest cost associated with carrying an inventory in stock should be considered whether or not funds are borrowed to purchase the inventory. If these funds were not used for inventory, they could have been profitably applied to some alternate use. The rate of interest to be used in the calculations will vary depending on the cost of borrowing or the rate that could be earned by the funds if they were used for some other purpose.

Quantitative models or formulas have been developed for calculating the economic order quantity. One formula that can be used is the following:

\[
EOQ = \sqrt{\frac{2CN}{K}}
\]

where

- \(EOQ\) = economic order quantity
- \(C\) = cost of placing an order
- \(N\) = number of units required annually
- \(K\) = carrying cost per unit of inventory

To illustrate this formula, assume that the following data have been determined by analyzing the factors relevant to materials inventory for Carson Chemical Company:

- Number of gallons of material required annually: 10,000
- Cost of placing an order: $10.00
- Annual carrying cost per gal. of inventory: $0.80

Using the EOQ formula:

\[
EOQ = \sqrt{\frac{2 \times \text{cost of order} \times \text{number of units required annually}}{\text{carrying cost per unit}}}
\]

\[
= \sqrt{\frac{2 \times \$10 \times 10,000}{\$0.80}}
\]

\[
= \sqrt{250,000}
\]

\[
= 500 \text{ gals.}
\]

The EOQ can also be determined by constructing a table using a range of order sizes. A tabular presentation of the data from the previous example, assuming no safety stock, follows:
The data presented in Figure 2-1 show the total annual order cost decreasing as the order size increases. Meanwhile, the total annual carrying cost increases as the order size increases because of the necessity to maintain a large quantity of inventory in stock. At the 500-gallon level, the combined carrying and order costs are at their minimum point. This is the point at which the total carrying charges equal the total order costs, as demonstrated in the figure, when no safety stock is provided for. Assume in the preceding example that the company desires a safety stock of 400 gallons. The average number of gallons in inventory would be calculated as follows:

\[
\text{Average number of gallons in inventory} = \frac{1}{2} \times \text{EOQ} + \text{Safety stock} \\
= \frac{1}{2} \times 500 + 400 \\
= 650 \text{ gals.}
\]

The total carrying cost then would be

\[
\text{Carrying cost} = \text{Average inventory} \times \text{Carrying cost per unit} \\
= 650 \times 0.80 \\
= 520
\]

Note that the order cost of $200, which doesn’t change in this example, is significantly less than the carrying cost of $520 when safety stock is present.

**Limitations of Order Point and EOQ Calculations.** The techniques illustrated for determining when to order (order point) and how much to order (EOQ) may give a false impression of exactness. However, because these calculations are based on estimates of factors such as production volume, lead time, and order and carrying costs, they are really approximations that serve as a guide to planning and controlling the investment in materials.
In addition, other factors may influence the time for ordering or the quantity ordered. Such factors include the availability of materials from suppliers, the proximity of suppliers, fluctuations in the purchase price of materials, and trade (volume) discounts offered by suppliers.

**Automotive and Electronics Industries**

Companies often increase safety stock due to strong expected demand. In recent years, both the automotive and electronics industries have experienced occasional shortages of parts due to such increased demand and/or work slowdowns or strikes at certain plants. The cost of such stockouts may include the lost revenue from the current sale, as well as a permanent loss of customers due to the ill will created.

**Materials Control Procedures**

Specific internal control procedures for materials should be tailored to a company’s needs. However, materials control procedures generally relate to the following functions: (1) purchase and receipt of materials, (2) storage of materials, and (3) requisition and consumption of materials.
**Materials Control Personnel**

Although actual job titles and duties may vary from one company to another, the personnel involved in materials control usually include: (1) purchasing agent, (2) receiving clerk, (3) storeroom keeper, and (4) production department supervisor.

**Purchasing Agent.** The responsibility for buying the materials needed by a manufacturer should rest on the shoulders of one person. In a small plant, the employee who does the buying may also perform other duties, while in a large plant the purchasing agent may head a department established to perform buying activities. Regardless of the size of an organization, it is important that ultimately one individual be responsible for the purchasing function. The duties of a purchasing agent and staff may include the following:

1. Working with the production manager to prevent delays caused by the lack of materials.
2. Compiling and maintaining information that identifies where the desired materials can be obtained at the most economical price.
3. Placing purchase orders.
4. Supervising the order process until the materials are received.
5. Verifying purchase invoices and approving them for payments.

**Receiving Clerk.** The receiving clerk is responsible for supervising the receipt of incoming shipments. All incoming materials must be checked as to quantity and quality and sometimes as to price.

**Storeroom Keeper.** The storeroom keeper, who has charge of the materials after they have been received, must see that the materials are properly stored and maintained. The materials must be placed in stock and issued only on properly authorized requisitions. The purchasing agent should be informed of the quantities on hand as a guide to the purchasing of additional materials.

**Production Department Supervisor.** Each production department has a person who is responsible for supervising the operational functions within the department. This individual may be given the title of production department supervisor or another similar designation. One of the assigned duties of a department supervisor is to prepare or approve the requisitions designating the quantities and kinds of material needed for the work to be done in the department.

**Control During Procurement**

Materials are ordered to maintain the adequate levels of inventory necessary to meet scheduled production needs. The storeroom keeper is responsible for monitoring quantities of materials on hand. When the order point is reached for a particular material, the procurement process is initiated. In many companies, computers store data pertaining to inventories on hand, predetermined order points, and economic order quantities. When properly programmed, computers can simplify the task of maintaining appropriate inventory levels.
Supporting documents are essential to maintaining control during the procurement process. In general, the documents should be prenumbered and protected from unauthorized use. The documents commonly used in procuring materials include: (1) purchase requisitions, (2) purchase orders, (3) vendor’s invoices, (4) receiving reports, and (5) debit-credit memoranda. Increasingly, the supporting documents are in the form of computer records, which will be discussed at the appropriate points in the following narrative.

**Purchase Requisitions.** The form used to notify the purchasing agent that additional materials are needed is known as a *purchase requisition*. It is an important part of the materials control process because it authorizes the agent to buy. Purchase requisitions should originate with the storeroom keeper or some other individual with similar authority and responsibility.

Purchase requisitions should be prenumbered serially to help detect the loss or misuse of any of these forms. They are generally prepared in duplicate. The first copy goes to the purchasing agent, and the storeroom keeper retains the second copy. Figure 2-2 shows a purchase requisition.

**Purchase Order.** The purchase requisition gives the purchasing agent authority to order the materials described in the requisition. The purchasing agent should maintain or have access to an up-to-date list of vendors, which includes prices, available discounts, estimated delivery time, and any other relevant information. From this list, the purchasing agent selects a vendor from whom high-quality materials can be obtained when needed at a competitive cost. If this information is not available from the list for a particular type of material, the purchasing agent may communicate with several prospective vendors and request quotations on the materials needed.

The purchasing agent then completes a *purchase order*, as shown in Figure 2-3 on page 59, and addresses it to the chosen vendor, describing the materials wanted, stating price and terms, and fixing the date and method of delivery. This purchase order should be prenumbered serially and prepared in quadruplicate. The first copy goes to the vendor, one copy goes to the accounting department, one copy goes to the receiving clerk, and the purchasing agent retains a copy. The purchasing agent’s copy of the order should be placed in an unfilled orders file. Before the order is filed, the purchase requisition on which it is based should be attached to it. This last important step begins the assembly of a complete set of all the forms pertaining to the purchase transaction. To identify each document relating to a transaction with all others of the same set, the purchase order number should be shown on each of the documents. The sets can then be compiled according to the respective purchase order numbers.

A computerized purchasing system greatly simplifies the process previously described. The necessary computer files include an inventory file, a supplier file, and an open purchase order file. The storeroom keeper would initiate the process by transmitting a purchase requisition electronically to the purchasing agent. The purchasing agent would then browse the supplier file to choose the most appropriate supplier for the material requested. The purchase order would be prepared electronically and the open purchase order file would be updated. The transmission of
The electronic purchase order to the supplier’s computer is an example of Electronic Data Interchange (EDI), which is the process of business-to-business electronic communication for the purpose of expediting commerce and eliminating paperwork. The example on page 60, The Big E-Payback, describes how the internet can be used to facilitate a company’s purchasing function.

**Vendor’s Invoice.** The company should receive a vendor’s invoice before the materials arrive at the factory. As soon as they are received, the vendor’s invoice goes to the purchasing agent, who compares it with the purchase order, noting particularly that the description of the materials is the same, that the price and the

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>20,000 Gal.</td>
<td>Adhesive Compound—Grade A102</td>
</tr>
</tbody>
</table>
terms agree, and that the method of shipment and the date of delivery conform to the instructions on the purchase order. When satisfied that the invoice is correct, the purchasing agent initials or stamps the invoice indicating that it has been reviewed and agrees with the purchase order. The invoice is then filed together with the purchase order and the purchase requisition in the unfilled orders file until the materials arrive.

Receiving Report. As noted previously, a copy of the purchase order goes to the receiving clerk to give advance notice of the arrival of the materials ordered.
This is done to facilitate planning and to provide space for the incoming materials. The receiving clerk is in charge of the receiving department where all incoming materials are received, opened, counted or weighed, and tested for conformity with the order. If the materials received are of too technical a nature to be tested by the receiving clerk, an engineer from the production manager’s office may perform the inspection, or the materials may be sent to the plant laboratory for testing.

The receiving clerk counts and identifies the materials received and prepares a receiving report similar to the one in Figure 2-4. Each report is numbered serially and shows the vendor, when the materials were received, what the shipment contained, and the number of the purchase order that identifies the shipment. The report should be prepared in quadruplicate. Two copies go to the purchasing agent, one copy goes with the materials or supplies to the storeroom keeper to ensure that all of the materials that come to the receiving department are put into the

THE BIG E-PAYBACK

. . . Instead of wading through an alphabet soup of paper P.O.s and P.R.s (purchase orders and purchase requisitions) that can take days or weeks to process, employees will go to their computers and use a Web-based procurement system to summon a virtual shopping cart and order items they need right away. In fact, Web-based procurement systems actually transform employees into strategic buyers by granting them control over a subset of preapproved and budgeted items. No longer will they have to ask permission to order something. Based on the amount of purchasing power the company grants them, they can order at will and be alerted if their purchase isn’t allowed or if they’ve reached their spending limit.

. . . Further, the labor-intensive process of handling purchase orders can cost corporations up to $200 per transaction. And with large companies generating hundreds of thousands of purchase orders each year, processing costs can be overwhelming. Not to mention that while waiting days or weeks for approval, employees often grow frustrated that corporate service levels don’t match their need for delivery of materials.

. . . But Web-based technology can provide the easy answers missing from many other solutions. For one, employees make their purchases within a familiar interactive medium. Using a shopping cart-style browser, employees examine items closely with full-color pictures and descriptions and select the goods and services they need. The Web-interface offers a virtual glimpse at the product being purchased—not just a product number or a line item.

. . . Best of all, the Web is a real-time interface, so with one click of a mouse or push of a button, the transaction is made—and the appropriate monies are transferred.

. . . Another advantage: Companies improve and reduce their inventory levels when they consolidate their supply base and shorten requisition and order fulfillment cycles.

. . . Because it creates operational efficiencies using Internet and intranet technologies, e-procurement drives unnecessary costs out of simple transactions and frees up employees to focus on more strategic issues than completing an order.

storeroom, and the receiving clerk retains one copy. In some plants, the receiving clerk is given a copy of the purchase order with the quantity ordered omitted, thus ensuring that the items received will be counted.

The purchasing agent compares the receiving report with the vendor’s invoice and the purchase order to determine that the materials received are those ordered and billed. If the documents agree, the purchasing agent initials or stamps the two copies of the receiving report. One copy is then attached to the other forms already in the file, and the entire set of forms is sent to the accounting department where the purchase of merchandise on account is recorded. The other copy of the receiving report is sent to the person in the accounting department who maintains
inventory records. The procedures for recording materials purchases are discussed later in this chapter.

In the previously mentioned computerized purchasing system, the receiving clerk would enter the quantity of the materials counted into the system. The system would then compare the items in the open purchase order file with the items received and generate a receiving report as well as update the inventory file, supplier file, and open purchase order file.

**Debit-Credit Memorandum.** Occasionally, a shipment of materials does not match the order and the invoice. The purchasing agent will discover this discrepancy when comparing the receiving report with the purchase order and the invoice. Whatever the cause, the difference will lead to correspondence with the vendor, and copies of the letters should be added to the file of forms relating to the transaction. If a larger quantity has been received than has been ordered and the excess is to be kept for future use, a credit memorandum is prepared notifying the vendor of the amount of the increase in the invoice.

If, on the other hand, the shipment is short, one of two courses of action may be taken. If the materials received can be used, they may be retained and a debit memorandum prepared notifying the vendor of the amount of the shortage. If the materials received cannot be used, a return shipping order is prepared and the materials are returned.

Figure 2-5 shows one form of debit-credit memorandum. This memo shows that the vendor has delivered materials that do not meet the buyer’s specifications. The purchasing agent will prepare a return shipping order and return the materials to the vendor. In our computerized purchasing system example, the receiving clerk would enter the purchase order number of the returned items into the system, and the computer would generate a credit or debit memorandum and a return shipping order, if necessary.

**Control During Storage and Issuance**

The preceding discussion outlined ways to maintain the control of materials during the procurement process. The procedures and forms described are necessary for control of the ordering and receiving functions and the transfer of incoming materials to the storeroom. The next step to be considered is the storage and issuance of materials and supplies.

**Materials Requisition.** As discussed earlier, materials should be protected from unauthorized use. To lessen the chance of theft, carelessness, or misuse, no materials should be issued from the storeroom except on written authorization. The form used to provide this control is known as the materials requisition or stores requisition (Figure 2-6, page 64) and is prepared by factory personnel authorized to withdraw materials from the storeroom. The personnel authorized to perform this function may differ from company to company, but such authority must be given to someone of responsibility. The most satisfactory arrangement would be to have the production manager prepare all materials requisitions, but this is usually not feasible. Another arrangement requires that the department su-
Supervisors approve (sign) all materials requisitions for their respective departments. When the storeroom keeper receives a properly signed requisition, the requisitioned materials are released. Both the storeroom keeper and the employee to whom materials are issued should be required to sign the requisition. (Note that in a computerized system signatures are replaced with passwords and other security codes.)

In a paper-based system, the materials requisition is usually prepared in quadruplicate. Two copies go to the accounting department for recording; one copy goes to the storeroom keeper and serves as authorization for issuing the materials; and the production manager or department supervisor who prepared it retains one copy.

---

**Figure 2-5** Debit-Credit Memorandum. (Discrepancy between order, shipment, and vendor invoice. Price adjustment shown on debit-credit memo.)

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 boxes</td>
<td>Brass machine screws, 8/32” x 1” flat head</td>
<td>$27.50</td>
<td>$137.50</td>
</tr>
</tbody>
</table>

Date: January 3, 2002

To: Hurricane Machine Company
Miami, FL 33178

We have today debited your account for the following:

**Explanation**

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Brass machine screws, 8/32” x 1” flat head</td>
<td>$27.50</td>
<td>$137.50</td>
</tr>
</tbody>
</table>

Purchase order no. 1029
Your invoice date December 27, 2001

By A. Lauren
Purchasing Agent
Identification is an important factor in the control of materials. For this reason, the materials requisition should indicate the job number (job order costing) or department (process costing) for which the materials are issued. When indirect materials are issued, such as cleaning materials, lubricants, and paint, the requisition will indicate the name or number of the factory overhead account to be charged.

**Returned Materials Report.** After materials are requisitioned, occasionally some or all of the materials must be returned to the storeroom. Perhaps more materials were requested than were needed or the wrong type of materials were issued. Whatever the reason, a written report, called a returned materials report,
describing the materials and the reason for the return, must accompany the materials to the storeroom.

You should now be able to work the following: Questions 1–15; Exercise 2-1; Problem 2-1.

ACCOUNTING FOR MATERIALS

A company’s inventory records should show (1) the quantity of each kind of material on hand and (2) its cost. The most desirable method of achieving this result is to integrate the materials accounting system with the general ledger accounts. All purchases of materials are recorded as a debit to Materials in the general ledger (the corresponding credit is to Accounts Payable). Materials is a control account supported by a subsidiary stores or materials ledger that contains an individual account for each type of material carried in stock. Periodically, the balance of the control account and the total of the subsidiary ledger accounts are compared, and any significant variation between the two is investigated.

Each of the individual materials accounts in the subsidiary stores ledger shows (1) the quantity on hand and (2) the cost of the materials. To keep this information current, it is necessary to record in each individual account the quantity and the cost of materials received, issued, and on hand. The stores ledger accounts are usually maintained on cards or computer files similar in design to the one shown in Figure 2-7.

Copies of the purchase order and receiving report are approved by the purchasing agent and sent to the accounting department. Upon receiving the purchase order, the stores ledger accountant enters the date, purchase order number, and quantity in the “On Order” columns of the appropriate stores ledger card. When materials arrive, the accounting department’s copy of the receiving report serves as the basis for posting the receipt of the materials to the stores ledger card. The posting shows the date of receipt, the number of the receiving report, the quantity of materials received, and their unit and total cost.

When materials are issued, two copies of the materials requisition go to the accounting department. One copy is used in posting the cost of requisitioned materials to the appropriate accounts in the job cost ledger and factory overhead ledger. Direct materials are charged to the job to which they were issued and indirect materials are charged to the appropriate factory overhead account. The other copy of the requisition goes to the stores ledger accountant and becomes the basis for posting to the stores ledger account. The posting shows the date of issue, the number of the requisition, the quantity of materials issued, and their unit and total cost.

When materials are returned to the storeroom, a copy of the returned materials report goes to the accounting department. The cost of the returned materials is entered on the report and posted to the appropriate stores ledger card. The cost

Learning Objective 3

Account for materials and relate materials accounting to the general ledger.
### Figure 2-7  Stores Ledger Card

**Description**  Adhesive Compound—Grade A102  
**Location in Storeroom**  Bin 8  
**Maximum**  30,000 gal.  
**Minimum**  15,000 gal.  
**Stores Ledger Acct. No.**  1411

<table>
<thead>
<tr>
<th>Date</th>
<th>ON ORDER</th>
<th>RECEIVED</th>
<th>ISSUED</th>
<th>BALANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Purchase Order No.</td>
<td>Quantity</td>
<td>Receiving Report No./Returned Shipping Order No.</td>
<td>Quantity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Materials Requisition/Returned Materials Report No.</td>
</tr>
</tbody>
</table>

---

Principles of Cost Accounting
assigned to the returned materials should be the same as that recorded when the materials were issued to the factory.

The copy of the returned materials report is then routed to the cost accountant in charge of the job cost and factory overhead ledgers. Direct materials returned are credited to the job or department, and indirect materials returned are credited to the appropriate factory overhead account.

After each receipt and issue of materials is posted to the stores ledger cards, the balance is extended. These extensions could be made at the end of the accounting period, when ending inventories are to be determined for financial reporting purposes. However, to wait until that time would defeat one of the advantages of this method of materials control because it would not be possible to determine from the stores ledger when stock is falling below the minimum requirements. Also, most companies now have automated inventory systems that utilize online information processing, such as bar coding and optical scanning technology to update the inventory records which are stored on magnetic disk, thus allowing current balances to be available in a timely and cost-efficient manner.

**Determining the Cost of Materials Issued**

An important area of materials accounting is the costing of materials requisitioned from the storeroom for factory use. The unit cost of incoming materials is known at the time of purchase. The date of each purchase is also known, but the materials on hand typically include items purchased on different dates and at different prices. Items that look alike usually are commingled in the storeroom. As a result, it may be difficult or impossible to identify an issue of materials with a specific purchase when determining what unit cost should be assigned to the materials being issued.

Several practical methods of solving this problem are available. In selecting the method to be employed, the accounting policies of the firm and the federal and state income tax regulations must be considered. As the methods are discussed, it is important to remember that the flow of materials does not dictate the flow of costs. The flow of materials is the order in which materials are actually issued for use in the factory. The flow of costs is the order in which unit costs are assigned to materials issued. The following examples assume the use of a perpetual inventory system where the materials ledger cards are updated each time materials are received or issued. FIFO and LIFO may also be used with a periodic inventory system where the inventory is counted and costed at the end of the period. In a periodic inventory system, the moving average method is replaced by the weighted or month-end average method.

**First-In, First-Out Method.** The first-in, first-out (FIFO) method of costing has the advantage of simplicity. The FIFO method assumes that materials issued are taken from the oldest materials in stock. Therefore, the materials are costed at the prices paid for the oldest materials. In many companies, the flow of costs using FIFO closely parallels the physical flow of materials. For example, if materials have a tendency to deteriorate in storage, the oldest materials would be issued first. However, as noted previously, the flow of costs does not have to be
determined on the basis of the flow of materials. As a result, any organization may use FIFO.

The FIFO method can be illustrated using the following data:

Dec. 1  Balance, 1,000 lbs. @ $20.
10    Issued 500 lbs.
15    Purchased 1,000 lbs. @ $24.
20    Issued 250 lbs.
26    Issued 500 lbs.
28    Purchased 500 lbs. @ $26.
30    Issued 500 lbs.
31    Balance, 750 lbs.

Using FIFO, costs would be assigned to materials issued during the month and to materials on hand at the end of the month as follows (Figure 2-8):

Dec. 10  Issued from the December 1 balance: 500 lbs. @ $20, total cost, $10,000.
20    Issued from the December 1 balance: 250 lbs. @ $20, total cost, $5,000.
26    Issued from the December 1 balance: 250 lbs. @ $20, total cost, $5,000.
     Issued from the December 15 purchase: 250 lbs. @ $24, total cost, $6,000.
     Total cost of materials issued: $5,000 + $6,000 = $11,000.
30    Issued from the December 15 purchase: 500 lbs. @ $24, total cost, $12,000.
31    The ending inventory of materials, 750 lbs., consists of the following:

<table>
<thead>
<tr>
<th>Date of Purchase</th>
<th>Lbs.</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 15</td>
<td>250</td>
<td>24</td>
<td>6,000</td>
</tr>
<tr>
<td>December 28</td>
<td>500</td>
<td>26</td>
<td>13,000</td>
</tr>
<tr>
<td></td>
<td>750</td>
<td></td>
<td>19,000</td>
</tr>
</tbody>
</table>

Figure 2-8  Comparison of Inventory Valuation Methods
As illustrated in the example, ending inventories using FIFO are costed at the prices paid for the most recent purchases. Thus, 500 lbs. on hand are assigned a unit cost of $26, the unit cost of the December 28 purchase. The remaining 250 lbs. on hand are costed at $24 per lb., reflecting the unit cost of the next most recent purchase on December 15.

**Last-In, First-Out Method.** The *last-in, first-out* (LIFO) method of costing materials, as the name implies, assumes that materials issued for manufacturing are the most recently purchased materials. Thus, materials issued are costed at the most recent purchase prices, and inventories on hand at the end of the period are

<table>
<thead>
<tr>
<th>Received</th>
<th>Issued</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Quantity</td>
<td>Unit Price</td>
</tr>
<tr>
<td>Dec. 1</td>
<td>1,000</td>
<td>24 00</td>
</tr>
<tr>
<td>10</td>
<td>500</td>
<td>20 00</td>
</tr>
<tr>
<td>15</td>
<td>1,000</td>
<td>24 00</td>
</tr>
<tr>
<td>20</td>
<td>250</td>
<td>24 00</td>
</tr>
<tr>
<td>26</td>
<td>500</td>
<td>24 00</td>
</tr>
<tr>
<td>28</td>
<td>500</td>
<td>26 00</td>
</tr>
<tr>
<td>30</td>
<td>500</td>
<td>26 00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Received</th>
<th>Issued</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Quantity</td>
<td>Unit Price</td>
</tr>
<tr>
<td>Dec. 1</td>
<td>1,000</td>
<td>20 00</td>
</tr>
<tr>
<td>10</td>
<td>500</td>
<td>20 00</td>
</tr>
<tr>
<td>15</td>
<td>1,000</td>
<td>22 66/3</td>
</tr>
<tr>
<td>20</td>
<td>250</td>
<td>22 66/3</td>
</tr>
<tr>
<td>26</td>
<td>500</td>
<td>22 66/3</td>
</tr>
<tr>
<td>28</td>
<td>500</td>
<td>26 00</td>
</tr>
<tr>
<td>30</td>
<td>500</td>
<td>24 00</td>
</tr>
</tbody>
</table>
Principles of Cost Accounting

costed at prices paid for the earliest purchases. The LIFO method of costing closely approximates the physical flow of materials in some industries. For example, in the smelting of iron ore, the raw material is stored in mountainous piles. As ore is needed for production, it is drawn from the pile in such a way that the material being used is the last ore to have been received. As emphasized previously, however, physical flow does not have to determine the costing method used.

Using the same data given to illustrate the FIFO method, costs under the LIFO method would be determined as follows (Figure 2-8):

\[
\begin{array}{cccc}
\text{Dec. 10} & \text{Issued from the December 1 balance: 500 lbs. @ $20, total cost, $10,000.} \\
20 & \text{Issued from the December 15 purchase: 250 lbs. @ $24, total cost, $6,000.} \\
26 & \text{Issued from the December 15 purchase: 500 lbs. @ $24, total cost, $12,000.} \\
30 & \text{Issued from the December 28 purchase: 500 lbs. @ $26, total cost, $13,000.} \\
31 & \text{The ending inventory of materials, 750 lbs., consists of the following:} \\
\hline
\text{Date of Purchase} & \text{Lbs.} & \text{Unit Cost} & \text{Total Cost} \\
\text{Balance, December 1} & 500 & 20 & 10,000 \\
\text{December 15} & 250 & 24 & 6,000 \\
\text{December 28} & 500 & 26 & 13,000 \\
\hline
750 & $16,000 \\
\end{array}
\]

Moving Average Method. The moving average method assumes that the materials issued at any time are simply withdrawn from a mixed group of like materials in the storeroom and that no attempt is made to identify the materials as being from the earliest or the latest purchases. This method has the disadvantage of requiring more frequent computations than the other methods. However, the use of computers has overcome this disadvantage, and many firms are adopting this method. A basic requirement of the moving average method is that an average unit price must be computed every time a new lot of materials is received, and this average unit price must be used to cost all issues of materials until another lot is purchased. Thus, the issues in the illustration would be computed as follows (Figure 2-8):

\[
\begin{array}{cccc}
\text{Dec. 10} & \text{Issued from the December 1 balance: 500 lbs. @ $20, total cost, $10,000.} \\
15 & \text{The balance of materials on hand on December 15 consists of 500 lbs. from December 1 and 1,000 lbs. acquired on December 15, for a total of 1,500 lbs. That cost $34,000. The average cost is $22.66 2/3 per lbs. ($34,000/1,500).} \\
20 & \text{Issued 250 lbs. @ $22.66 2/3, total cost, $5,666.67.} \\
26 & \text{Issued 500 lbs. @ $22.66 2/3, total cost, $11,333.33.} \\
28 & \text{The balance of materials on hand on December 28 consists of 750 lbs. costing $17,000 (purchased prior to December 28) and 500 lbs. @ $26 (purchased on December 28) costing $13,000. The total cost is $30,000 for 1,250 lbs., representing an average cost of $24 per lbs. ($30,000/1,250).} \\
30 & \text{Issued 500 lbs. @ $24, total cost, $12,000.} \\
31 & \text{The ending inventory of materials is $18,000, consisting of 750 lbs. at $24 per lbs.} \\
\end{array}
\]

Analysis of FIFO, LIFO, and Moving Average. FIFO, LIFO, and moving average are the most commonly used methods of inventory costing. Any of these methods may be adopted to maintain the stores ledger.
Because no one method best suits all manufacturing situations, the method chosen should be the one that most accurately reflects the income for the period in terms of the current economic conditions. One factor to consider is the effect the costing method has on reported net income. Overstating net income will subject a firm to higher taxes than those of a competitor who is using a different costing method.

In an inflationary environment, LIFO is sometimes adopted so that the higher prices of the most recently purchased materials may be charged against the increasingly higher sales revenue. The resulting lower gross margin is assumed to reflect a more accurate picture of earnings because the firm will have to replace its inventory at the new higher costs. Also, the lower gross margin, brought about by the use of the LIFO method, results in a smaller tax liability for the firm. This LIFO benefit, however, does not mean that all companies should adopt LIFO.

To illustrate the effects that the different costing methods have on profit determination, assume that A, B, and C are competing companies that use FIFO, moving average, and LIFO, respectively. The companies have no beginning inventories, and they purchase identical materials at the same time, as follows (assume also that each purchase is for one unit):

<table>
<thead>
<tr>
<th>Purchase No.</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$0.10</td>
</tr>
<tr>
<td>2</td>
<td>$0.50</td>
</tr>
<tr>
<td>3</td>
<td>$0.90</td>
</tr>
</tbody>
</table>

Assume that one unit of materials is used and sold at a price of $1.00 after the last purchase has been made. The net income is calculated as follows:

<table>
<thead>
<tr>
<th>Co. A FIFO (Per Unit)</th>
<th>Co. B Moving Avg. (Per Unit)</th>
<th>Co. C LIFO (Per Unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net sales . . . . . . .</td>
<td>$1.00</td>
<td>$1.00</td>
</tr>
<tr>
<td>Less cost of goods sold</td>
<td>0.10</td>
<td>0.50*</td>
</tr>
<tr>
<td>Gross margin on sales .</td>
<td>$0.90</td>
<td>$0.50</td>
</tr>
<tr>
<td>Operating expenses . . .</td>
<td>0.08</td>
<td>0.08</td>
</tr>
<tr>
<td>Income before income taxes</td>
<td>$0.82</td>
<td>$0.42</td>
</tr>
<tr>
<td>Less income taxes (50%)</td>
<td>0.41</td>
<td>0.21</td>
</tr>
<tr>
<td>Net income . . . . . .</td>
<td>$0.41</td>
<td>$0.21</td>
</tr>
</tbody>
</table>

*0.10 + 0.50 + 0.90 = $1.50/3 units = $0.50 per unit.

As shown in the example, LIFO costing has a definite tax advantage when prices are rapidly rising. Notice that Company C pays $0.01 per unit for taxes, while Companies A and B pay taxes per unit of $0.41 and $0.21, respectively. Thus, Company C has $0.99 ($1.00 – $0.01) of each sales dollar to pay for replacement merchandise, operating expenses, and dividends, while Company A has only $0.59 ($1.00 – $0.41) and Company B has only $0.79 ($1.00 – $0.21) available.

As previously mentioned, each unit of material currently costs $0.90 (Purchase No. 3). Therefore, Company A requires additional funding of $0.31 ($0.90 – $0.59) and Company B requires additional funding of $0.11 ($0.90 – $0.79) to replace a
unit of material. Only Company C can replace materials, pay operating expenses and taxes, and retain its profit per unit. The companies, using their respective costing methods, have the following ending materials inventory balances:

- **Company A (FIFO)**: $1.40 ($0.50 + $0.90)
- **Company B (moving average)**: $1.00 ($0.50 + $0.50)
- **Company C (LIFO)**: $0.60 ($0.10 + $0.50)

Company C has the most conservatively valued inventory at $0.60, and Company A shows the highest inventory value at $1.40. The Company A inventory value also may be detrimental because inventory often is subject to state and local property taxes that are based on the inventory valuation chosen by the company. It is important to realize that differences between the three methods usually will not be as extreme as they were in this example. Companies that turn their inventory over very rapidly will not be as concerned with the choice of methods as will companies who hold their inventory for a longer time.

Many companies have adopted the LIFO method to match current materials costs with current revenue as well as to minimize the effect of income taxes in periods of rising prices. Companies considering the adoption of the LIFO method, however, should carefully analyze economic conditions and examine the tax regulations that pertain to LIFO. If there should be a downward trend of prices, these companies would probably desire to change to the FIFO method to have the same competitive advantages that were gained by using LIFO when prices were rising. However, the LIFO election cannot be rescinded unless authorized or required by the Internal Revenue Service.

**Accounting Procedures**

The purpose of materials accounting is to provide a summary from the general ledger of the total cost of materials purchased and used in manufacturing. The forms commonly used in assembling the required data have already been discussed. The purchase invoices provide the information needed to prepare the entry in the purchases journal or to prepare the vouchers, which are then recorded in a voucher register, if a voucher system is in use. Note that for illustrative purposes in this text, all entries are recorded in general journal format. At the end of the month, the total materials purchased during the month is posted by debiting Materials and crediting Accounts Payable. The materials account in the general ledger serves as a control account for the stores ledger.

All materials issued during the month and materials returned to stock are recorded on a summary of materials issued and returned form (Figure 2-9). When the summary is completed at the end of the month, the total cost of direct materials requisitioned is recorded by debiting Work in Process and crediting Materials. The total of indirect materials requisitioned is recorded by debiting the appropriate factory overhead account and crediting Materials. The work in process account in the general ledger serves as a control account for the job cost ledger.
### SUMMARY OF MATERIALS ISSUED AND RETURNED

<table>
<thead>
<tr>
<th>Date</th>
<th>Req. No.</th>
<th>Job</th>
<th>Direct Materials</th>
<th>Indirect Materials</th>
<th>Overhead Acct. No.</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar. 5</td>
<td>825</td>
<td>315</td>
<td>$2,150.00</td>
<td></td>
<td>3121</td>
<td>$440.00</td>
</tr>
<tr>
<td></td>
<td>826</td>
<td>316</td>
<td>3,210.00</td>
<td>3121</td>
<td>132.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>827</td>
<td>317</td>
<td>280.00</td>
<td>3121</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>828</td>
<td>317</td>
<td>415.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>829</td>
<td>316</td>
<td>340.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>830</td>
<td>317</td>
<td>820.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>831</td>
<td>318</td>
<td>290.00</td>
<td>3121</td>
<td>135.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>832</td>
<td>319</td>
<td>224.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>833</td>
<td>319</td>
<td>975.90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>834</td>
<td>320</td>
<td>4,350.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>835</td>
<td>321</td>
<td>6,500.00</td>
<td>3121</td>
<td>432.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>836</td>
<td>322</td>
<td>550.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>837</td>
<td>321</td>
<td>785.40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>838</td>
<td>320</td>
<td>870.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Report No.</th>
<th>Job</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3121</td>
<td>$12.50</td>
</tr>
<tr>
<td></td>
<td>3121</td>
<td>15.00</td>
</tr>
<tr>
<td></td>
<td>3121</td>
<td>12.10</td>
</tr>
<tr>
<td></td>
<td>3121</td>
<td>448.90</td>
</tr>
<tr>
<td></td>
<td>3121</td>
<td>318.20</td>
</tr>
</tbody>
</table>

**Summary:**
- **Materials Issued:** $21,760.50
- **Materials Returned to Storeroom:** $1,139.50
- **Overhead Acct. No.:**
  - $779.20
  - $27.50
Any undamaged materials returned to the storeroom should also be recorded on the summary of materials issued and returned so that the totals may be recorded at the end of the month. The entries required to record undamaged materials returned are the reverse of the entries required to record materials requisitioned. Thus, the total cost of direct materials returned to the storeroom should be debited to Materials and credited to Work in Process, while the total cost of indirect materials returned should be debited to Materials and credited to the proper factory overhead account.

Any materials returned to the original vendors should be debited to Accounts Payable and credited to Materials. Unless a special journal is provided for recording such returns, the entries may be made in the general journal. All transactions relating to materials should be recorded so that the balance of the materials account in the general ledger will represent the cost of materials on hand at the end of a period. The balance of the materials account in the general ledger may be proved by listing the stores ledger account balances.

A summary of the procedures involved in accounting for materials is shown in Figure 2-10, which presents the recordings required for the more typical materials transactions, both at the time of the transaction and at the end of the period. At the time of the transaction, the recordings to be made affect the subsidiary ledgers, such as the stores ledger and the job cost ledger. At the end of the period, the recordings to be made affect the control accounts for materials, work in process, and factory overhead in the general ledger.

**Inventory Verification.** The stores ledger contains an account for each material used in the manufacturing process. Each account shows the number of units on hand and their cost. In other words, the stores ledger provides a perpetual inventory of the individual items of material in the storeroom. From the information in the stores ledger, the necessary materials inventory data can be obtained for preparing a balance sheet, an income statement, and a manufacturing statement.

Errors in recording receipts or issues of materials in the stores ledger may affect the reliability of the inventory totals. To guard against error, the materials on hand should be checked periodically against the individual stores ledger accounts. The usual practice is to count one lot of materials at a time, spacing the time of the counts so that a complete check of all inventories in the storeroom can be made within a fixed period of time, such as three months. These periodic checks have the advantage of eliminating the costly and time-consuming task of counting all the materials at one time. To guard against carelessness or dishonesty, the count should be made by someone other than the storeroom keeper or the stores ledger clerk.

The person making the count should prepare an inventory report similar to the one shown in Figure 2-11 (page 76). If the total indicated in the report differs from the balance in the stores ledger account, an immediate correcting entry should be made in the proper stores ledger account. The entries in the general ledger accounts may be made in total at the end of the month. If the materials on hand exceed the balance in the control account, the control account balance should be increased by the entry shown on page 76.
### Figure 2-10 Summary of Materials Transactions

<table>
<thead>
<tr>
<th>Transaction</th>
<th>Entry at Time of Transaction</th>
<th>Entry at End of Accounting Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Source of Data</td>
<td>Book of Original Entry</td>
</tr>
<tr>
<td>Purchase of materials</td>
<td>Vendor's Invoice</td>
<td>Purchases</td>
</tr>
<tr>
<td>Materials returned to vendor</td>
<td>Receiving Report</td>
<td>Journal</td>
</tr>
<tr>
<td>Payment of invoices</td>
<td>Return Shipping</td>
<td>General</td>
</tr>
<tr>
<td></td>
<td>Order</td>
<td>Journal</td>
</tr>
<tr>
<td></td>
<td>Approved Voucher</td>
<td>Cash</td>
</tr>
<tr>
<td>Direct materials issued</td>
<td>Materials</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Requisitions</td>
<td>Job Cost Ledger</td>
</tr>
<tr>
<td>Indirect materials issued</td>
<td>Materials</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Requisitions</td>
<td>Factory Overhead Ledger</td>
</tr>
<tr>
<td>Direct materials returned from</td>
<td>Returned Materials</td>
<td>None</td>
</tr>
<tr>
<td>factory to storeroom</td>
<td>Report</td>
<td>Job Cost Ledger</td>
</tr>
<tr>
<td>Indirect materials returned from</td>
<td>Returned Materials</td>
<td>None</td>
</tr>
<tr>
<td>factory to storeroom</td>
<td>Report</td>
<td>Factory Overhead Ledger</td>
</tr>
<tr>
<td>Inventory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>adjustment:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Materials on hand less than</td>
<td>Inventory Report</td>
<td>General</td>
</tr>
<tr>
<td>stores ledger balance</td>
<td></td>
<td>Journal</td>
</tr>
<tr>
<td>(b) Materials on hand more than</td>
<td>Inventory Report</td>
<td>General</td>
</tr>
<tr>
<td>stores ledger balance</td>
<td></td>
<td>Journal</td>
</tr>
</tbody>
</table>
If the amount of materials on hand is less than the control account balance, as was the case in Figure 2-11, the balance should be decreased by the following entry:

```
Factory Overhead (Inventory Short and Over) xxx
Materials xxx
```

Such inventory differences are almost always a shortage and may arise from carelessness in handling materials, shrinkage in goods as a result of handling, or issuing excess quantities of materials to production. Such shortages are consid-

---

**Figure 2-11** Inventory Report. (Compares book inventory and physical inventory quantities.)

---

**SEMINOLE MFG**

**INVENTORY REPORT**

<table>
<thead>
<tr>
<th>Material</th>
<th>Adhesive Compound—Grade A102</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location in storeroom</td>
<td>Bin 8</td>
</tr>
<tr>
<td>Stores ledger acct. no.</td>
<td>1411</td>
</tr>
<tr>
<td>Date of verification</td>
<td>January 27, 2002</td>
</tr>
</tbody>
</table>

| Units in storeroom | 590 gal. |
| Units in receiving department | 300 gal. |
| Total number units on hand | 890 gal. |
| Balance per stores ledger | 910 gal. |
| Difference | 20 gal. |

Counted by __P. Valence__

Supervised by __W. Cox__
Shortages (or overages) are recorded in a factory overhead account, usually entitled Inventory Short and Over, as indicated in the preceding entries.

Visual Aid. For a cost accounting system to function properly, each employee must understand the assigned duties and the purpose of the various forms and records. Figure 2-12 (on page 78) shows the interrelationship of the accounts and how internal control procedures can be established.

You should now be able to work the following: Questions 16–20; Exercises 2-2 to 2-9; Problems 2-2 to 2-7.

Scrap, Spoiled Goods, and Defective Work

Manufacturing operations usually produce some imperfect units that cannot be sold as regular items. The controls over imperfect items and operations that waste materials are important elements of inventory control. Scrap or waste materials may result naturally from the production process, or they may be spoiled or defective units that result from avoidable or unavoidable mistakes during production. Because the sale of imperfect items tends to damage a company’s reputation, most companies introduce quality control techniques that prevent imperfect items from being sold. Since scrap, spoiled goods, and defective work usually have some value, each of their costs is accounted for separately.

Scrap Materials

The expected sales value of the scrap produced by the manufacturing process determines which accounting procedures are used. When the scrap value is small, no entry is made for it until the scrap is sold. Then Cash (or Accounts Receivable) is debited, and an account such as Scrap Revenue is credited. The revenue from scrap sales is usually reported as “Other income” in the income statement.

If revenue from scrap is to be treated as a reduction in manufacturing costs rather than as other income, Work in Process may be credited if the scrap can be readily identified with a specific job. If the scrap cannot be identified with a specific job, Factory Overhead may be credited.

When the value of the scrap is relatively high, an inventory card should be prepared and the scrap transferred to a controlled materials storage area. If both the quantity and the market value of the scrap are known, the following journal entries are recorded:

\[
\begin{align*}
\text{Scrap Materials} & \quad \text{xxx} \\
\text{Scrap Revenue (or Work in Process or Factory Overhead)} & \quad \text{xxx} \\
\text{Transferred scrap to inventory.}
\end{align*}
\]
Cash (or Accounts Receivable) ........................................... xxx

Scrap Materials ................................................................. xxx

Sold scrap.

If the market value of the scrap is not known, no journal entry is made until the scrap is sold. At the time of sale, the following entry is then recorded:
**SPOILED AND DEFECTIVE WORK**

Scrap is an unexpected by-product of the production of the primary product. Spoiled or defective goods are not by-products but imperfect units of the primary product. **Spoiled units** have imperfections that cannot be economically corrected. They are sold as items of inferior quality or “seconds.” **Defective units** have imperfections considered correctable because the increase in market value by correcting the unit exceeds the cost to correct it.

**Spoiled Work.** The loss associated with spoiled goods may be treated as part of the cost of the job or department that produced the spoiled units, or the loss may be charged to Factory Overhead and allocated among all jobs or departments. Generally, Factory Overhead is charged unless the loss results from a special order and the spoilage is due to the type of work required on that particular order. In both cases, the spoiled goods are recorded in Spoiled Goods Inventory at the expected sales price.

To illustrate, assume a garment manufacturer using job order costing completes an order for 1,000 women’s blazers (Job 350) at the following unit costs:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>$20</td>
</tr>
<tr>
<td>Labor</td>
<td>20</td>
</tr>
<tr>
<td>Factory overhead</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total cost per unit</strong></td>
<td><strong>$50</strong></td>
</tr>
</tbody>
</table>

The journal entry to record the costs of production is as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work in Process (Job 350)</td>
<td>50,000</td>
</tr>
<tr>
<td>Materials</td>
<td>20,000</td>
</tr>
<tr>
<td>Payroll</td>
<td>20,000</td>
</tr>
<tr>
<td>Factory Overhead</td>
<td>10,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50,000</strong></td>
</tr>
</tbody>
</table>

Recognized production costs for Job 350.

During the final inspection, 50 blazers are found to be inferior and are classified as irregulars or seconds. They are expected to sell for $10 each. If the unrecovered costs of spoilage are to be charged to Factory Overhead, the following entry is recorded:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spoiled Goods Inventory</td>
<td>500</td>
</tr>
<tr>
<td>Factory Overhead</td>
<td>2,000</td>
</tr>
<tr>
<td>Work in Process (Job 350)</td>
<td>2,500</td>
</tr>
</tbody>
</table>

Recognized spoiled goods at market value (50 blazers @ $10), charged Factory Overhead for loss of $40 per unit, and reduced cost of Job 350 (50 blazers @ $50).
If the loss from spoilage is considered a cost of the specific job, the entry to record the market value is as follows:

\[
\begin{align*}
\text{Spoiled Goods Inventory} & \quad . & \quad 500 \\
\text{Work in Process (Job 350)} & \quad . & \quad 500 \\
\end{align*}
\]

Recognized spoiled goods at market value and reduced the cost of Job 350 by $500 sales price of spoiled goods.

Spoilage costs charged to Factory Overhead are allocated among all jobs in production. When spoilage is attributed to a specific job, however, the entire cost of spoilage is reflected in the cost of that job. In the example, Job 350 will be charged with only a portion of the $2,000 loss from spoilage when Factory Overhead is allocated to the various jobs. When Factory Overhead is not charged for the spoilage costs, however, the entire $2,000 loss is included in the total cost of Job 350.

**Defective Work.** The procedures for recording the cost associated with defective work are similar to those employed in accounting for spoiled work. There are, however, additional costs for correcting the imperfections on defective units. If these costs are incurred on orders that the company regularly produces, they are charged to Factory Overhead. For special orders, the additional costs are charged to the specific job on which the defective work occurs. An inventory account is not established for goods classified as defective because the defects are corrected and the units become first-quality merchandise.

As in the previous illustration, assume that it costs $50 to manufacture each blazer. Upon final inspection of the 1,000 blazers completed, 50 blazers are defective because one sleeve on each jacket is a slightly different shade of blue than the other parts of the blazer. Management decides to recut the sleeves from a bolt of material identical in color to the rest of the blazer. The costs of correcting the defects are $500 for materials; $400 for labor, and $300 for factory overhead, representing a total cost of $1,200.

If the additional costs are charged to Factory Overhead, the cost of correcting defective work is spread over all jobs that go through the production cycle. The journal entry is as follows:

\[
\begin{align*}
\text{Factory Overhead (Costs to Correct Defective Work)} & \quad . & \quad 1,200 \\
\text{Materials} & \quad . & \quad 500 \\
\text{Payroll} & \quad . & \quad 400 \\
\text{Factory Overhead} & \quad . & \quad 300 \\
\end{align*}
\]

Recognized costs of correcting defective units.

If the order for 1,000 blazers was a special order and the defects resulted from the exacting specifications of the order, the additional costs would be charged to the job as follows:

\[
\begin{align*}
\text{Work in Process (Job 350)} & \quad . & \quad 1,200 \\
\text{Materials} & \quad . & \quad 500 \\
\text{Payroll} & \quad . & \quad 400 \\
\text{Factory Overhead} & \quad . & \quad 300 \\
\end{align*}
\]

Charged Job 350 with cost of correcting defective work.
The total cost of Job 350 will be higher because the additional costs to correct the defects were charged to the order rather than to the factory overhead account. The unit cost of each completed blazer is increased from $50 ($50,000/1,000) to $51.20 ($51,200/1,000) because of the additional costs charged to the work in process account.

You should now be able to work the following: Questions 21–22; Exercises 2-10 to 2-12; Problems 2-8 to 2-10.

APPENDIX: JUST-IN-TIME MATERIALS CONTROL

In a just-in-time (JIT) inventory system, materials are delivered to the factory immediately prior to their use in production. A JIT system significantly reduces inventory carrying costs by requiring that the raw materials be delivered just in time to be placed into production. Additionally, work in process inventory is minimized by eliminating inventory buffers between work centers. For example, the work is performed on a unit in Department A only after the department receives the request from Department B for a certain number of the units. This contrasts with traditional manufacturing systems that produce goods for inventory with the hope that the demand for these goods then will be created. For JIT to work successfully, a high degree of coordination and cooperation must exist between the supplier and the manufacturer and among manufacturing work centers.

Just-in-time production techniques first were utilized by Japanese industry, and they have become popular with U.S. manufacturers in recent years. U.S. companies that have adopted the principles of JIT include Harley-Davidson, Hewlett-Packard, IBM, and Dell Computer. It is not unusual in JIT manufacturing for a finished product to be shipped to the customer during the same eight-hour shift that the raw materials used in the product were received from the supplier.

JIT AND COST CONTROL

Reducing inventory levels may increase processing speed, thereby reducing the time it takes for a unit to make it through production. For example, if 10,000 units are produced each day and the average number of units in work in process is 40,000, then the throughput time, or time that it takes a unit to make it through the system, is 40,000/10,000, or four days. If the same daily output can be achieved while reducing the work in process by 50%, the throughput time will be reduced to two days, 20,000/10,000, and the velocity, or speed with which units are produced in the system, will have doubled. If production speed can be increased dramatically, all products may be made to order, thus eliminating the need for finished goods inventory. Also, reducing throughput time can lower costs because there will be fewer nonvalue-added activities—operations that
include costs but do not add value to the product, such as moving, storing, and inspecting the inventories.

If the velocity of production is doubled as in the preceding example, the inventory carrying costs can be reduced. For example, assume an annual inventory carrying cost percentage of 20% and an average work in process of $400,000, resulting in annual carrying costs of $80,000 (20% \times $400,000). Further assume that through the use of JIT production techniques, the velocity of production is doubled without changing the total annual output, thus necessitating only half as much work in process (WIP). The new annual carrying costs would be calculated as follows:

\[
\text{Carrying cost percentage} \times \text{Average WIP} = \frac{20\% \times (1/2 \times \$400,000)}{}
\]

or a $40,000 reduction from the previous level of $80,000.

Another advantage of reduced throughput time is increased customer satisfaction due to quicker delivery. Also, production losses are reduced due to not having great quantities of partially completed units piling up at the next work station before an error in their production is detected.

**JIT AND COST FLOWS**

Figure 2-13 contrasts the journal entries made in a traditional manufacturing cost accounting system with the entries made in a JIT system. **Backflush costing** is the name for the accounting system used with JIT manufacturing. It derives its name from the fact that costs are not “flushed out” of the accounting system and charged to the products until the goods are completed and sold.

<table>
<thead>
<tr>
<th>Transaction</th>
<th>Journal Entries: Traditional System</th>
<th>Journal Entries: Backflush System</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Purchase of raw materials</td>
<td>Materials ................ 50,000</td>
<td>Raw and In-Process ........ 50,000</td>
</tr>
<tr>
<td></td>
<td>Accounts Payable .......... 50,000</td>
<td>Accounts Payable ........ 50,000</td>
</tr>
<tr>
<td>B Raw materials requisitioned to production</td>
<td>Work in Process ........ 50,000</td>
<td>No Entry</td>
</tr>
<tr>
<td></td>
<td>Materials ................. 50,000</td>
<td></td>
</tr>
<tr>
<td>C Direct labor cost distributed</td>
<td>Work in Process .......... 25,000</td>
<td>Conversion Costs .......... 25,000</td>
</tr>
<tr>
<td></td>
<td>Payroll ................ 25,000</td>
<td>Payroll ................ 25,000</td>
</tr>
<tr>
<td>D Manufacturing overhead costs incurred</td>
<td>Factory Overhead ........ 75,000</td>
<td>Conversion Costs .......... 75,000</td>
</tr>
<tr>
<td></td>
<td>Various Credits .......... 75,000</td>
<td>Various Credits .......... 75,000</td>
</tr>
<tr>
<td>E Transfer of factory overhead costs to work in process</td>
<td>Work in Process .......... 75,000</td>
<td>No Entry</td>
</tr>
<tr>
<td></td>
<td>Factory Overhead ...... 75,000</td>
<td></td>
</tr>
<tr>
<td>F Completion of products</td>
<td>Finished Goods ........... 150,000</td>
<td>No Entry</td>
</tr>
<tr>
<td></td>
<td>Work in Process .......... 150,000</td>
<td></td>
</tr>
<tr>
<td>G Sale of products</td>
<td>Cost of Goods Sold ....... 150,000</td>
<td>Cost of Goods Sold ....... 150,000</td>
</tr>
<tr>
<td></td>
<td>Finished Goods .......... 150,000</td>
<td>Raw and In-Process ........ 50,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conversion Costs .......... 100,000</td>
</tr>
</tbody>
</table>
Entries A and B in Figure 2-13 indicate that a single account, Raw and In-Process, is used in backflush costing for both raw materials and work in process inventories. This is done because raw materials are issued to production as soon as they are received from the supplier in a JIT system, thus negating the need for a separate raw materials inventory account. Also, note that a single journal entry, entry A in Figure 2-13, reflects both the purchase and the issuance of materials into production. Entries C, D, and E illustrate that a single account, Conversion Costs, contains both direct labor and factory overhead costs in a backflush system. Direct labor usually is so insignificant in a highly automated JIT setting that it is not cost effective to account for it separately.

Entries F and G illustrate that in a true JIT setting, there is no need for a finished goods account because goods are shipped to customers immediately upon completion. Entry G also illustrates that materials, labor, and overhead costs are not attached to products in a backflush system until they are completed and sold. The rationale for this approach is that products move through the system so rapidly in a JIT environment that it would not be cost effective to track production costs to them while in process.

Note that different companies choose different points in the production process, called trigger points, at which to record journal entries in a backflush system. The points chosen in this example are typical.

You should now be able to work the following: Questions 23–24; Exercises 2-13 and 2-14; Problems 2-11 and 2-12.

**Key Terms**

- Backflush costing, p. 82
- Carrying costs, p. 52
- Credit memorandum, p. 62
- Debit memorandum, p. 62
- Defective units, p. 79
- Economic order quantity, p. 52
- Electronic Data Interchange (EDI), p. 58
- First-in, first-out (FIFO), p. 67
- Flow of costs, p. 67
- Flow of materials, p. 67
- Inventory report, p. 74
- Just-in-time (JIT) inventory system, p. 81
- Last-in, first-out (LIFO), p. 69
- Lead time, p. 52
- Materials control, p. 50
- Materials ledger, p. 65
- Materials requisition, p. 62
- Moving average, p. 70
- Nonvalue-added activities, p. 81
- Order costs, p. 52
- Order point, p. 51
- Production department supervisor, p. 56
- Purchase order, p. 57
- Purchase requisition, p. 57
- Purchasing agent, p. 56
- Receiving clerk, p. 56
- Receiving report, p. 60
- Returned materials report, p. 64
- Return shipping order, p. 62
- Safety stock, p. 52
- Scrap materials, p. 77
- Spoiled units, p. 79
- Stockouts, p. 52
- Storeroom keeper, p. 56
SELF-STUDY PROBLEM

ORDER POINT; ECONOMIC ORDER QUANTITY; ORDERING AND CARRYING COSTS

WONDERBOY SLUGGER COMPANY

The Wonderboy Slugger Company, manufacturer of top-of-the-line baseball bats from Northern white ash, predicts that 8,000 billets of lumber will be used during the year. (A billet is the quantity of rough lumber needed to make one bat.) The expected daily usage is 32 billets. There is an expected lead time of 10 days and a safety stock of 500 billets. The company expects the lumber to cost $4 per billet. It anticipates that it will cost $40 to place each order. The annual carrying cost is $0.25 per billet.

REQUIRED:

1. Calculate the order point.
2. Calculate the most economical order quantity (EOQ).
3. Calculate the total cost of ordering and carrying at the EOQ point.

SOLUTION TO SELF-STUDY PROBLEM

SUGGESTIONS:

Read the entire problem thoroughly, keeping in mind that you are required to calculate (1) order point, (2) EOQ, and (3) total ordering and carrying costs. The specifics in the problem highlight the following facts relevant to computing the order point:

- Expected daily usage is 32 billets.
- Expected lead time is 10 days.
- Required safety stock is 500 billets.

The order point is the inventory level at which an order should be placed. It is determined by adding the estimated number of billets to be used between placement and receipt of the order:

\[
\text{Estimated usage during lead time} = 32 \text{ billets/ day} \times 10 \text{ days} = 320 \text{ billets}
\]

Add the number of units of safety stock (500 in this problem) needed to protect against abnormally high usage and unforeseen delays in receiving good materials from the supplier:

\[
\text{Order Point} = \text{Estimated usage during lead time} + \text{Safety stock} = 320 + 500 = 820 \text{ units}
\]
The specifics in the problem highlight the following facts relevant to computing the EOQ:

- Estimated annual usage of materials: 8,000 billets
- Cost of placing an order: $40
- Annual carrying cost per billet: $0.25

The EOQ is the order size that minimizes total order and carrying costs. It can be calculated by using the EOQ formula:

\[
EOQ = \sqrt{\frac{2 \times \text{order cost} \times \text{annual demand}}{\text{annual carrying cost per unit}}}
\]

\[
= \sqrt{\frac{2 \times $40 \times 8,000}{$0.25}}
\]

\[
= \sqrt{640,000}
\]

\[
= 1,600 \text{ billets}
\]

The specifics in the problem highlight the following facts that are relevant to computing the total ordering and carrying costs at the EOQ point:

- Annual usage: 8,000 billets
- EOQ: 1,600 billets
- Ordering costs: $40 per order
- Carrying cost: $0.25 per billet
- Safety stock: 500 billets

To determine the annual ordering cost, you must first determine the number of orders by dividing the annual usage by the EOQ:

\[
\text{Number of orders} = \frac{\text{annual usage}}{\text{EOQ}}
\]

\[
= \frac{8,000 \text{ billets}}{1,600 \text{ units}}
\]

\[
= 5
\]

The annual order cost is determined by multiplying the number of orders by the cost per order:

\[
5 \text{ orders} \times $40 \text{ per order} = $200
\]

To determine the annual carrying cost, you must first determine the average number of units in inventory:

\[
\text{average inventory} = \frac{1}{2} \times \text{EOQ} + \text{safety stock}
\]

\[
= \frac{1}{2} \times 1,600 + 500 = 1,300 \text{ units}
\]

The average number of billets in inventory would consist of one-half of the amount ordered plus the 500 billets that are kept as a cushion against unforeseen events. The total carrying cost would then be as follows:

\[
\text{Average inventory} \times \text{carrying cost per billet}
\]

\[
1,300 \times $0.25 = $325
\]
Questions

1. What are the two major objectives of materials control?
2. Materials often represent a substantial portion of a company’s assets; therefore, they should be controlled from the time orders are placed to the time finished goods are shipped to the customer. What are the control procedures used for safeguarding materials?
3. What factors should management consider when determining the amount of investment in materials?
4. Maintaining and replenishing the stock of materials used in manufacturing operations is an important aspect of the procurement process. What is the meaning of the term “order point”?
5. What kind of information and data are needed to calculate an order point?
6. How would you define the term “economic order quantity”?
7. What factors should be considered when determining the cost of an order?
8. What are the costs of carrying materials in stock?
9. Briefly, what are the duties of the following employees?
   a. Purchasing agent
   b. Receiving clerk
   c. Storeroom keeper
   d. Production supervisor
10. Proper authorization is required before orders for new materials can be placed. What is the difference between a purchase requisition and a purchase order?
11. Purchasing agents are responsible for contacting vendors from which to purchase materials required by production. Why is the purchasing agent also responsible for reviewing and approving incoming vendors’ invoices?
12. Illustrations of forms for requisitioning, ordering, and accounting for materials are presented in the chapter. Would you expect these forms, as shown, to be used by all manufacturers? Discuss.
13. What internal control procedures should be established for incoming shipments of materials purchased?
14. What is the purpose of a debit-credit memorandum?
15. Who originates each of the following forms?
   a. Purchase requisition
   b. Purchase order
   c. Receiving report
   d. Materials requisition
   e. Debit-credit memorandum
16. Normally, a manufacturer maintains an accounting system that includes a stores ledger and a general ledger account for Materials. What is the relationship between the stores ledger and the materials account?
17. A company may select an inventory costing method from a number of commonly used procedures. Briefly, how would you describe each of the following methods?
   a. First-in, first-out
   b. Last-in, first-out
   c. Moving average
18. Why do companies adopt the LIFO method of inventory costing? Your discussion should include the effects on both the income statement and balance sheet.
19. Which of the forms shown in the chapter is the source for the following entries to subsidiary ledger accounts?
   a. Debits to record materials purchased in stores ledger.
E2-1

Economic order quantity; order cost; carrying cost
Starr Company predicts that it will use 360,000 units of material during the year. The material is expected to cost $5 per unit. Starr anticipates that it will cost $72 to place each order. The annual carrying cost is $4 per unit.

a. Determine the most economical order quantity by using the EOQ formula.
b. Determine the total cost of ordering and carrying at the EOQ point.

E2-2

Journalizing materials requisitions
Louisiana Manufacturing Inc. records the following use of materials during the month of June:

<table>
<thead>
<tr>
<th>Date</th>
<th>Req. No.</th>
<th>Use</th>
<th>Direct</th>
<th>Indirect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Materials</td>
<td>Materials</td>
</tr>
<tr>
<td>1</td>
<td>110</td>
<td>Material A, Job 10</td>
<td>$20,000</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>111</td>
<td>Material B, Job 11</td>
<td>18,000</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>112</td>
<td>Material B, Job 12</td>
<td>16,000</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>113</td>
<td>Factory supplies</td>
<td></td>
<td>$800</td>
</tr>
<tr>
<td>18</td>
<td>114</td>
<td>Material C, Job 10</td>
<td>3,000</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>115</td>
<td>Material D, Job 10</td>
<td>9,000</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>116</td>
<td>Material E, Job 13</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>117</td>
<td>Factory supplies</td>
<td></td>
<td>1,300</td>
</tr>
<tr>
<td>30</td>
<td>118</td>
<td>Factory supplies</td>
<td></td>
<td>1,700</td>
</tr>
</tbody>
</table>

Prepare a summary journal entry for the materials requisitions.

E2-3

Recording materials transactions
Prepare a journal entry to record each of the following materials transactions:

a. Total materials purchased on account during the month amounted to $200,000.
b. Direct materials requisitioned for the month totaled $175,000.
c. Indirect materials requisitioned during the month totaled $12,000.
d. Direct materials returned to the storeroom from the factory amounted to $2,500.
e. Total materials returned to vendor during the month amounted to $800.

f. Payment during the month for materials purchases totaled $160,000.

E2-4
LO 3

FIFO costing

Using first-in, first-out, perpetual inventory costing, and the following information, determine the cost of materials used and the cost of the May 31 inventory:

May 1 Balance on hand, 1,000 yds. (linen, $4 each).
3 Issued 250 yds.
5 Received 500 yds. at $4.50 each.
6 Issued 150 yds.
10 Issued 110 yds.
11 Factory returned 10 yds. to the storeroom that were issued on the 10th.
15 Received 500 yds. at $5.00 each.
20 Returned 300 yds. to vendor from May 15 purchase.
26 Issued 600 yds.

E2-5
LO 3

LIFO costing

Using last-in, first-out, perpetual inventory costing, and the information presented in E2-4, compute the cost of materials used and the cost of the May 31 inventory.

E2-6
LO 3

Moving average costing

Using the moving average method, perpetual inventory costing, and the information presented in E2-4, compute the cost of materials used and the cost of the May 31 inventory. (Round unit prices to four decimal places and amounts to the nearest whole dollar.)

E2-7
LO 3

Comparison of FIFO, LIFO, and moving average methods

In tabular form, compare the total cost transferred to Work in Process and the cost of the ending inventory for each method used in E2-4, E2-5, and E2-6. Discuss the effect that each method will have on profits, depending on whether it is a period of rising prices or a period of falling prices.

E2-8
LO 3

Impact of costing methods on net income

Cindy Lou Company was franchised on January 1, 2002. At the end of its third year of operations, December 31, 2004, management requested a study to determine what effect different materials inventory costing methods would have on its reported net income over the three-year period.

The materials inventory account, using LIFO, FIFO, and moving average, would have had the following ending balances:

<table>
<thead>
<tr>
<th>December 31</th>
<th>LIFO</th>
<th>FIFO</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>$20,000</td>
<td>$22,000</td>
<td>$21,000</td>
</tr>
<tr>
<td>2003</td>
<td>20,000</td>
<td>24,000</td>
<td>23,000</td>
</tr>
<tr>
<td>2004</td>
<td>20,000</td>
<td>30,000</td>
<td>27,667</td>
</tr>
</tbody>
</table>
a. Assuming the same number of units in ending inventory at the end of each year, were material costs rising or falling from 2002 to 2004?
b. Which costing method would show the highest net income for 2002?
c. Which method would show the highest net income for 2004?
d. Which method would show the lowest net income for the three years combined?

E2-9

Recording materials transactions

Titan Manufacturing Company maintains the following accounts in the general ledger: Materials, Work in Process, Factory Overhead, and Accounts Payable. On June 1, the materials account had a debit balance of $5,000. Following is a summary of materials transactions for the month of June:

1. Materials purchased, $23,750.
2. Direct materials requisitioned, $19,250.
3. Direct materials returned to storeroom, $1,200.
4. Indirect materials requisitioned, $2,975.
5. Indirect materials returned to storeroom, $385.

a. Prepare journal entries to record the materials transactions.
b. Post the journal entries to ledger accounts (in T-account form).
c. What is the balance of the materials inventory account at the end of the month?

E2-10

Scrap materials

A machine shop manufactures a stainless steel part that is used in an assembled product. Materials charged to a particular job amounted to $600. At the point of final inspection, it was discovered that the material used was inferior to the specifications required by the engineering department; therefore, all units had to be scrapped.

Record the entries required for scrap under each of the following conditions:

a. The revenue received for scrap is to be treated as a reduction in manufacturing cost but cannot be identified with a specific job. The value of stainless steel scrap is stable. The scrap is sold two months later for $125.
b. Revenue received for scrap is to be treated as a reduction in manufacturing cost but cannot be identified with a specific job. A firm price is not determinable for the scrap until it is sold. It is sold eventually for $75.
c. The production job is a special job and the $85 received for the scrap is to be treated as a reduction in manufacturing cost. (A firm price is not determinable for the scrap until it is sold.)
d. Only $40 was received for the scrap when it was sold in the following fiscal period. (A firm price is not determinable for the scrap until it is sold and the amount to be received for the scrap is to be treated as other income.)

E2-11

Spoiled work

Tiger Inc. manufactures golf clothing. During the month, the company cut and assembled 8,000 sweaters. One hundred of the sweaters did not meet speci-
fications and were considered “seconds.” Seconds are sold for $9.95 per sweater, whereas first-quality sweaters sell for $39.95. During the month, Work in Process was charged $108,000: $36,000 for materials, $48,000 for labor, and $24,000 for factory overhead.

Record the entries to charge production costs for the period and the loss due to spoiled work, under each of the following conditions:

a. The loss due to spoiled work is spread over all jobs in the department.
b. The loss due to spoiled work is charged to this job because it is a special order.

E2-12 Defective work
Gates Mfg. Company manufactures an integrated transistor circuit board for repeat customers but also accepts special orders for the same product. Job No. MS1 incurred the following unit costs for 1,000 circuit boards manufactured:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>$5.00</td>
</tr>
<tr>
<td>Labor</td>
<td>2.00</td>
</tr>
<tr>
<td>Factory overhead</td>
<td>2.00</td>
</tr>
<tr>
<td>Total cost per unit</td>
<td>$9.00</td>
</tr>
</tbody>
</table>

When the completed products were tested, 50 circuit boards were found to be defective. The costs per unit of correcting the defects follow:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>$3.00</td>
</tr>
<tr>
<td>Labor</td>
<td>1.00</td>
</tr>
<tr>
<td>Factory overhead</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Record the journal entry for the costs to correct the defective work:

a. If the cost of the defective work is charged to factory overhead.
b. If the cost of the defective work is charged to the job.

E2-13 JIT and cost control (Appendix)
A-Rod Industries produces 10,000 units each day and the average number of units in work in process is 40,000.

1. Determine the throughput time.
2. If the same daily output can be achieved while reducing the work in process by 60%, determine the new throughput time.

E2-14 Backflush costing (Appendix)
JRJ Company uses backflush costing to account for its manufacturing costs. Prepare journal entries to account for the following:

a. Purchased raw materials, on account, $80,000.
b. Requisitioned raw materials to production, $40,000.
c. Distributed direct labor costs, $10,000.
d. Manufacturing overhead costs incurred, $60,000. (Use Various Credits for the account in the credit part of the entry.)
Chapter 2  Accounting for Materials

PROBLEMS

P2-1  Economic order quantity; ordering and carrying costs. Similar to self-study problem.

Saxson Company predicts that it will use 25,000 units of material during the year. The expected daily usage is 200 units, and there is an expected lead time of five days and a safety stock of 500 units. The material is expected to cost $5 per unit. Saxson anticipates that it will cost $50 to place each order. The annual carrying cost is $0.10 per unit.

**REQUIRED:**

1. Compute the order point.
2. Determine the most economical order quantity by use of the formula.
3. Calculate the total cost of ordering and carrying at the EOQ point.

P2-2  Inventory costing methods

The purchases and issues of rubber gaskets (Stores Ledger #11216) as shown in the records of Jeter Corporation for the month of November follow:

<table>
<thead>
<tr>
<th>Units</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 1</td>
<td>Beginning balance . . . . . . . . . . . . . . . . 30,000 $3.00</td>
</tr>
<tr>
<td>4</td>
<td>Received, Rec. Report No. 112 . . . . . . 10,000 3.10</td>
</tr>
<tr>
<td>5</td>
<td>Issued, Mat. Req. No. 49 . . . . . . . . . . . 30,000</td>
</tr>
<tr>
<td>8</td>
<td>Received, Rec. Report No. 113 . . . . . . 50,000 3.30</td>
</tr>
<tr>
<td>15</td>
<td>Issued, Mat. Req. No. 50 . . . . . . . . . . . 20,000</td>
</tr>
<tr>
<td>22</td>
<td>Received, Rec. Report No. 114 . . . . . . 25,000 3.50</td>
</tr>
<tr>
<td>28</td>
<td>Issued, Mat. Req. No. 51 . . . . . . . . . . . 30,000</td>
</tr>
</tbody>
</table>

**REQUIRED:**

1. Complete a stores ledger card similar to Figure 2-7 (the “on order” columns may be omitted) for each of the following inventory costing methods, using a perpetual inventory system:
   a. FIFO
   b. LIFO
   c. Moving average (carrying unit prices to five decimal places)
2. For each method, prepare a schedule that shows the total cost of materials transferred to Work in Process and cost of the ending inventory.
3. If prices continue to increase, would you favor adopting the FIFO or LIFO method? Explain.
4. When prices continue to rise, what is the effect of FIFO versus LIFO on the inventory balance reported in the balance sheet? Discuss.

P2-3  Inventory costing methods

The following transactions affecting materials occurred in February:
Feb.  1  Balance on hand, 1,200 feet @ $2.76, $3,312.00 (plastic tubing, stores ledger account #906).
      5  Issued 60 ft. on Materials Requisition No. 108.
      14 Received 800 ft., Receiving Report No. 634, price $2.8035 per ft.
      15 Issued 400 ft., Materials Requisition No. 274.
      16 Returned for credit 90 ft. purchased on February 14, which were found to be defective.
      18 Received 1,000 ft., Receiving Report No. 712, price $2.82712 per ft.
      21 Issued 640 ft., Materials Requisition No. 318.

**REQUIRED:**

Record the transactions on stores ledger cards similar to Figure 2-7. (The “on order” columns may be omitted.) Use the following inventory methods, assuming the use of a perpetual inventory system. Carry units prices to five decimal places.
1. FIFO
2. LIFO
3. Moving average

**P2-4 Journalizing materials transactions**

Steinberg Specialty Clothing Inc. uses a job order cost system. A partial list of the accounts being maintained by the company, with their balances as of November 1, follows:

<table>
<thead>
<tr>
<th>Account</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>$82,250</td>
</tr>
<tr>
<td>Materials</td>
<td>29,500</td>
</tr>
<tr>
<td>Work in process</td>
<td>27,000</td>
</tr>
<tr>
<td>Accounts payable (credit)</td>
<td>21,000</td>
</tr>
<tr>
<td>Factory overhead</td>
<td>none</td>
</tr>
</tbody>
</table>

The following transactions were completed during the month of November:

a. Materials purchases during the month, $84,000.
b. Materials requisitioned during the month:
   1. Direct materials, $57,000.
   2. Indirect materials, $11,000.
c. Direct materials returned by factory to storeroom during the month, $1,100.
d. Materials returned to vendors during the month prior to payment, $3,500.
e. Payments to vendors during the month, $63,500.

**REQUIRED:**

1. Prepare general journal entries for each of the transactions.
2. Post the general journal entries to T-accounts.
3. Balance the accounts and report the balances of November 30 for the following:
   a. Cash
   b. Materials
   c. Accounts Payable
Chapter 2  Accounting for Materials

P2-5  Analyzing materials and other transactions

Nicola Manufacturing Company uses a job order cost system. The following accounts have been taken from the books of the company:

<table>
<thead>
<tr>
<th>Materials</th>
<th>Work in Process</th>
<th>Finished Goods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bal. Inventory</td>
<td>7,000</td>
<td>3,600</td>
</tr>
<tr>
<td>a. Purchases for month</td>
<td>22,000</td>
<td>e. To finished goods</td>
</tr>
<tr>
<td>b. Requisitions for month</td>
<td>19,000</td>
<td>47,500</td>
</tr>
<tr>
<td>Work in Process</td>
<td>3,600</td>
<td>c. Direct Labor</td>
</tr>
<tr>
<td>b. Material Requisitions</td>
<td>19,000</td>
<td>17,000</td>
</tr>
<tr>
<td>c. Direct Labor</td>
<td>17,000</td>
<td>d. Factory Overhead</td>
</tr>
<tr>
<td>d. Factory Overhead</td>
<td>12,000</td>
<td></td>
</tr>
<tr>
<td>Finished Goods</td>
<td>11,650</td>
<td>e. Goods Finished</td>
</tr>
<tr>
<td>Bal. Inventory</td>
<td>1,650</td>
<td>47,500</td>
</tr>
<tr>
<td>e. Goods Finished</td>
<td>47,500</td>
<td>f. Cost of Goods Sold</td>
</tr>
<tr>
<td></td>
<td></td>
<td>55,000</td>
</tr>
</tbody>
</table>

REQUIRED:

1. Analyze the accounts and describe in narrative form what transactions took place. (Use the reference letters a. through f. in your explanations.)
2. List the supporting documents or forms required to record each transaction involving the receipt or issuance of materials.

P2-6  Comprehensive analysis of materials accounting procedures

The following decisions and transactions were made by Sarasota Sheet Metal Company in accounting for materials costs for April.

Mar. 31 The factory manager informs the storeroom keeper that for the month of April, 2,000 sheets of aluminum are the forecasted usage. A check of the stock shows 500 aluminum sheets, costing $23 each, on hand. A minimum stock of 300 sheets must be maintained, and the purchasing agent is notified of the need for 1,800 sheets. This quantity will cover the April production requirements and, at the same time, maintain the minimum inventory level.

Apr. 1 After checking with a number of different vendors, the purchasing agent orders the requested number of sheets at $25 each.

6 The shipment of aluminum sheets is received, inspected, and found to be in good condition. However, the order is short 100 sheets, which are back-ordered and expected to be shipped in five days.

6 The invoice from the vendor covering the aluminum sheets is received and approved for payment.

11 The aluminum sheets that were backordered are received and approved.

11 The vendor’s invoice for the backordered shipment is received and approved for payment.

16 The April 6 invoice is paid, less a cash discount of 2%.

30 During the month, 1,900 sheets are issued to the factory. The company uses FIFO costing and a job order cost system.

30 The factory returns 20 unused sheets to stores. The returned sheets have a cost of $25 each.

30 At the end of the day, 398 sheets are on hand.
REQUIRED:

1. In tabular form, answer the following questions pertaining to each of the preceding decisions and transactions:
   a. What forms, if any, were used?
   b. What journal entries, if any, were made?
   c. What books of original entry, if any, were used to record the data?
   d. What subsidiary records were affected?
2. Calculate and show your computations for the following:
   a. The materials inventory balance as of April 30.
   b. The cost of materials used in production during April.

P2-7  Review problem; transactions and statements

Lift-Up Inc. manufactures chain hoists. The raw materials inventories on hand October 1 were as follows:

<table>
<thead>
<tr>
<th>Material</th>
<th>Pounds/Units</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain</td>
<td>12,000</td>
<td>$24,000</td>
</tr>
<tr>
<td>Pulleys</td>
<td>4,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Bolts and taps</td>
<td>10,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Steel plates</td>
<td>4,000</td>
<td>$2,000</td>
</tr>
</tbody>
</table>

The balances in the ledger accounts on October 1 were as follows:

<table>
<thead>
<tr>
<th>Account</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>$12,000</td>
</tr>
<tr>
<td>Work in process</td>
<td>$35,000</td>
</tr>
<tr>
<td>Materials</td>
<td>$51,000</td>
</tr>
<tr>
<td>Prepaid insurance</td>
<td>$3,000</td>
</tr>
<tr>
<td>Machinery</td>
<td>$125,000</td>
</tr>
<tr>
<td>Office equipment</td>
<td>$30,000</td>
</tr>
<tr>
<td>Office furniture</td>
<td>$20,000</td>
</tr>
<tr>
<td>Accounts payable</td>
<td>$30,000</td>
</tr>
<tr>
<td>Capital stock</td>
<td>$200,000</td>
</tr>
<tr>
<td>Retained earnings</td>
<td>$46,000</td>
</tr>
</tbody>
</table>

$276,000  $276,000

Transactions during October were as follows:

a. Payroll recorded during the month: direct labor, $28,000; indirect labor, $3,000.

b. Factory supplies purchased for cash, $1,000. (Use a separate inventory account, Factory Supplies.)

c. Materials purchased on account: chain—4,000 pounds, $8,800; pulleys—2,000 units, $10,200; steel plates—5,000 units, $3,000.

d. Sales on account for the month, $126,375.

e. Accounts receivable collected, $72,500.

f. Materials used during October (FIFO costing): chain, 14,000 pounds; pulleys, 4,400 units; bolts and taps, 4,000 sets; steel plates, 3,800 units.

g. Payroll paid, $31,000.

h. Factory supplies on hand, October 31, $350.
REQUIRED:

1. Set up T-accounts and enter the balances as of October 1.
2. Prepare journal entries to record each of the previous transactions.
3. Post the journal entries to the accounts, setting up any new ledger accounts necessary. Only controlling accounts are to be maintained; however, show the calculation for the cost of materials used.
4. Prepare a statement of cost of goods manufactured for October.
5. Prepare an income statement.
6. Prepare a balance sheet showing the classifications of current assets, plant and equipment, current liabilities, and stockholders’ equity.

P2-8

Materials inventory shortage; returns; scrap; spoiled goods

An examination of Jerry-Ben Corporation’s records reveals the following transactions:

a. On December 31, the physical inventory of raw material was 9,950 gallons. The book quantity, using the moving average method, was 11,000 gals. @ $0.52 per gal.

b. Production returned to stores materials costing $775.

c. Materials valued at $770 were charged to Factory Overhead (Repairs and Maintenance), but should have been charged to Work in Process.

d. Defective material, purchased on account, was returned to the vendor. The material returned cost $234, and the return shipping charges (our cost) of $35 were paid in cash.

e. Goods sold to a customer, on account, for $5,000 (cost $2,500) were returned because of a misunderstanding of the quantity ordered. The customer stated that the goods returned were in excess of the quantity needed.

f. Materials requisitioned totaled $22,300, of which $2,100 represented supplies used.
g. Materials purchased on account totaled $25,500. Freight on the materials purchased was $185.

h. Direct materials returned to stores amounted to $950.

i. Scrap materials sent to the storeroom were valued at an estimated selling price of $685 and treated as a reduction in the cost of all jobs worked on during the period.

j. Spoiled work sent to the storeroom valued at a sales price of $60 had production costs of $200 already charged to it. The cost of the spoilage is to be charged to the specific job worked on during the period.

k. The scrap materials in (i) were sold for $685 cash.

**REQUIRED:**

Record the entries for each transaction. (Round amounts to the nearest whole dollar.)

**P2-9**

Spoiled goods; loss charged to factory overhead; loss charged to job

One of the tennis racquets that Match-Point manufactures is a titanium model (Tiebreaker) that sells for $149. The cost of each Tiebreaker consists of:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>$35</td>
</tr>
<tr>
<td>Labor</td>
<td>15</td>
</tr>
<tr>
<td>Factory overhead</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$70</strong></td>
</tr>
</tbody>
</table>

Job 100 produced 100 Tiebreakers, of which 6 racquets were spoiled and classified as seconds. Seconds are sold to discount stores for $50 each.

**REQUIRED:**

1. Under the assumption that the loss from spoilage will be distributed to all jobs produced during the current period, use general journal entries to (a) record the costs of production, (b) put spoiled goods into inventory, and (c) record the cash sale of spoiled units.

2. Under the assumption that the loss due to spoilage will be charged to Job 100, use general journal entries to (a) record the costs of production, (b) put spoiled goods into inventory, and (c) record the cash sale of spoiled units.

**P2-10**

Spoiled goods and defective work

Steinbrenner Inc. manufactures electrical equipment from specifications received from customers. Job X10 was for 1,000 motors to be used in a specially designed electrical complex. The following costs were determined for each motor:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>$117</td>
</tr>
<tr>
<td>Labor</td>
<td>100</td>
</tr>
<tr>
<td>Factory overhead</td>
<td>83</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$300</strong></td>
</tr>
</tbody>
</table>
At final inspection, Steinbrenner discovered that 33 motors did not meet the exacting specifications established by the customer. An examination indicated that 15 motors were beyond repair and should be sold as spoiled goods for $75 each. The remaining 18 motors, although defective, could be reconditioned as first-quality units by the addition of $1,650 for materials, $1,500 for labor, and $1,200 for factory overhead.

**REQUIRED:**

Prepare the journal entries to record the following:
1. The scrapping of the 15 units, with the income from spoiled goods treated as a reduction in the manufacturing cost of the specific job.
2. The correction of the 18 defective units, with the additional cost charged to the specific job.
3. The additional cost of replacing the 15 spoiled motors with new motors.
4. The sale of the spoiled motors for $75 each.

**P2-11**  
**JIT and cost control (Appendix)**

Fancher Fixtures produces 50,000 units each day and the average number of units in work in process is 200,000. The average annual inventory carrying cost percentage is 20% and the average work in process is $1,000,000.

**REQUIRED:**

1. Determine the throughput time.
2. Compute the annual carrying costs.
3. If the same daily output can be achieved while reducing the work in process by 75%, determine the new throughput time.
4. What has happened to the velocity of production in part 3?
5. Compute the annual carrying costs for part 3.

**P2-12**  
**Backflush costing (Appendix)**

Rupp Company uses backflush costing to account for its manufacturing costs. The trigger points for recording inventory transactions are the purchase of materials and the sale of completed products.

**REQUIRED:**

Prepare journal entries, if needed, to account for the following transactions.

a. Purchased raw materials on account, $150,000.

b. Requisitioned raw materials to production, $150,000.

c. Distributed direct labor costs, $25,000.

d. Manufacturing overhead costs incurred, $100,000. (Use Various Credits for the credit part of the entry.)

e. Cost of products completed, $275,000.

f. Completed products sold for $400,000, on account.