Chapter 5 : The Job Order Cost Accounting System

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

1. Explain how to design a job order cost accounting system (JOCAS).

2. Illustrate the cost flows and prepare journal entries for a normal JOCAS.

3. Demonstrate how to account for scrap, reworked units, and spoilage in a normal JOCAS.

4. Describe how an integrated computer-based information system (ICBIS) can support a JOCAS.

5. Discuss how costs are estimated for construction projects and how work item software is used.

6. Prepare a list of attributes needed in a relational database to prepare job cost reports in an REA environment.

INTRODUCTION

A **job** is an individual product, a small and unique batch of products, a project, a case, or a client. Its distinguishing characteristic is that materials and labor can be directly traced to it, along with the basis for applying over-head. The basic purpose of a job order cost accounting system (JOCAS) is to provide information about the cost of a job.

But a world-class JOCAS is much more than that. It is designed and used to provide vital information to management for planning and estimating, monitoring and controlling daily shop floor operations, and evaluating performance. After demonstrating how to design and implement a JOCAS, this chapter explores how the system can aid management in ways other than just costing products or services.

DESIGNING THE JOB ORDER COST ACCOUNTING SYSTEM

A traditional JOCAS has three main informational inputs:

• Materials requisitions
• Time tickets
• Information on the volume of the predetermined overhead rate's basis (machine hours, direct labor hours or cost, and so forth)

Notice that the third informational input means that this will be a normal JOCAS, not an actual or standard cost system. Designing a standard JOCAS will be discussed in Chapter 8.

The key record that details the costs of each job is the job cost sheet. A **job cost sheet** (also called a **job order cost record)** is used to accumulate and summarize all direct materials, direct labor, and applied overhead costs for each job order. The *only* difference between the basic CAS in Chapter 4 and a JOCAS is in the subsidiary ledger accounts of WIP. Instead of having one subsidiary ledger account for the cost of the product ("WIP-Product Cost"), each job has its own subsidiary account.

SETTING UP THE WIP GENERAL LEDGER AND SUBSIDIARY ACCOUNTS

Exhibit 5-1 illustrates the WIP inventory subsidiary ledger system for a JOCAS. The WIP general ledger account remains a control account, as in any basic CAS. Because it is the control account for all production costs, its balance equals the sum of all actual manufacturing costs incurred. These costs are subtotaled by jobs and overhead. In other words, each job and overhead are accounted for as separate WIP subsidiary ledger accounts. The sum of their ending balances equals the balance in WIP.

In Exhibit 5-1, each job performed by the Earnest and Oldham accounting firm represents one of their clients. Manufacturers and construction companies maintain the same kind of accounts. In manufacturing firms, individual products or small batches of unique products are treated as jobs. In construction companies, projects such as an office building, mini-mall, house, or bridge are jobs. For the accounting firm, job 1572 is an audit of Clarksdale's financial accounting system. Job 1644 is an activity-based overhead allocation system for Mercy Hospital (covered in detail in Chapter 10). Job 1711 is the implementation of an ICBIS and EDI for Taylor Manufacturing.

The WIP inventory subsidiary ledger accounts are periodically reconciled to the WIP inventory control account in the general ledger. This reconciliation provides an internal control feature for the JOCAS by helping to ensure the proper recording of costs.

SETTING UP AND USING JOB COST SHEETS

As Exhibit 5-2 illustrates, each job order is assigned a unique job number to keep track of jobs and their costs as they progress toward completion. The top portion of the job cost sheet used at Milacron Company includes a job order number, contract price, customer name and address, description of job, and schedule. The rest of the record contains cost data. The bottom of the record summarizes the total manufacturing costs assigned to the job, marketing and administrative expenses directly traceable to the job, its contract price, and profit (or loss).

Exhibit 5-1 Cost Flows and Journal Entries for a Normal JOCAS
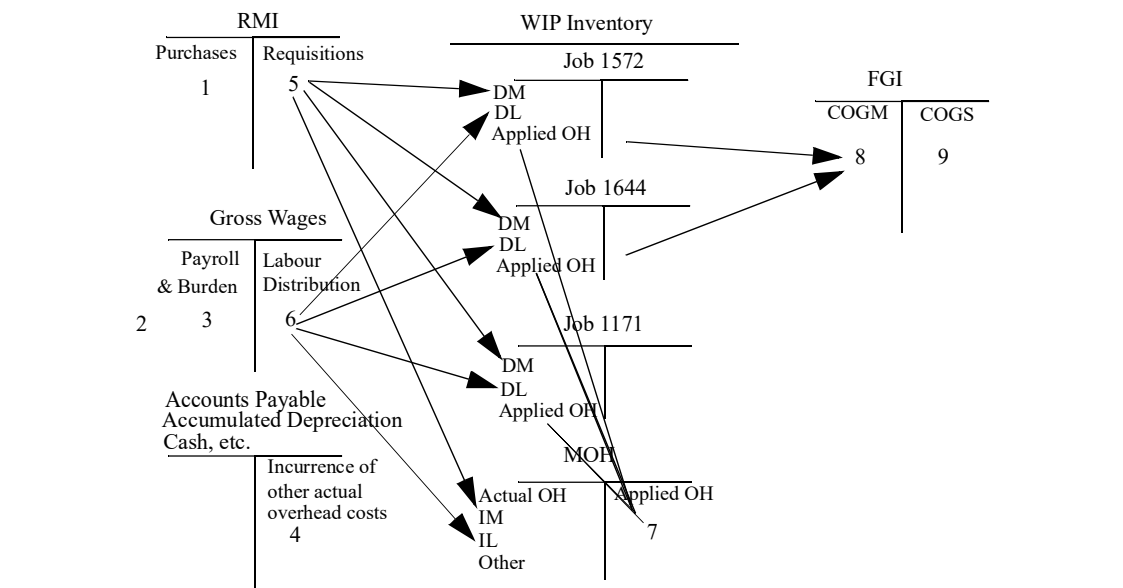
The job cost sheet for job 897 shows a contract price of $18,000 for the manufacture of five 24-inch sluice valves for Deephole Mining. Direct materials and direct labor costs are assigned to the job as work is performed. Data about direct materials are gathered from materials requisitions. Data on direct labor costs are obtained from time tickets. Overhead costs are applied to the job using a POR based on machine hours. The management accountant at Milacron also includes applicable marketing and administrative costs associated with each job. These costs are not charged to WIP because they are not costs of *making the job.* They are costs of selling it and all aspects of its administration. Marketing and administrative costs are treated as expenses for financial and tax reporting. To help in identifying which nonmanufacturing costs are directly traceable to jobs, modern CASs include subsidiary ledger systems by job for related engineering, research and development, purchasing, marketing, and administrative activities.

Exhibit 5-2 Job Cost Sheet for Milacron Company's Job Number 897

Milacron Company		Job Order Number	897
1200 Industrial Drive		Contract Price	$ 18,000.00
Reno, NV 89557			
For:	Deephole Mining	Date ordered:	02/05/x5
Product:	24-inch Sluice valves	Date promised:	02/26/x5
Specification:	Beveled flanges	Date started:	02/06/x5
Quantity:	5	Date completed:	02/23/x5
Direct Materials			
Date	Requisition Number	Cost	Total
02/06	612	$ 3,450.00	
02/15	643	1,200.00	

Date	Hours	Cost	Total
02/18	651	400.00	
			$ 5,050.00

Direct Labour			
Date	Hours	Cost	Total
02/06	10	$ 100.00	
02/13	60	600.00	
02/18	40	400.00	
02/23	30	300.00	
	140		$ 1,400

Applied Overhead			
Date	For	Cost	Total
02/23	$ 12.00 x 500 machine hours	$ 6,000.00	$ 6,000.00

| Direct Materials	$ 5,050.00	Contract price		$ 18,000
Direct Labour	1,400	Manufacturing cost	$ 12,450.00	
Applied Overhead	6,000	Marketing cost	1,400	
Total Manufacturing cost	$ 12,450.00	Administrative cost	800	<14,650,00
		Profit		$ 3,350,00
Unit Cost	($ 12,450/5) =	$ 2,490.00/unit		

The job cost sheet serves as the source record for the WIP subsidiary ledger accounts. In many manual JOCASs, it is the subsidiary ledger sheet. In computerized JOCASs, it is the report, or status screen display, from a job file or record in the database.

When a job is completed, costs posted to the job cost sheet are totalled to determine the total manufactured cost of the job (the cost of goods manufactured). This amount is used to credit the appropriate WIP subsidiary ledger account and to debit finished goods inventory when the job is completed and leaves the factory. If the job's product is directly shipped or sold to the customer upon completion, there is no FGI, and the debit is directly to COGS.

HOW DO DATA FLOW IN A JOCAS?

The flow of the inputs, documents, and records is summarized in Exhibit 5-3. This flow diagram provides a visual summary of the overall operations in a normal JOCAS. In a manual JOCAS, completed job cost sheets are transferred to a FGI subsidiary ledger file and then, when sold, to a permanent COGS file for long-term storage. These job cost sheets are useful for planning and control purposes as well as for bidding on future jobs. If a particular job was very profitable, management may decide to pursue similar jobs in the future. If a job was unprofitable, the job cost sheet may provide the reasons why. In some instances, management may decide to produce some products that have not yet been ordered. If these products are not sold fairly quickly, management may decide to reduce prices or offer discounts. Having ready access to cost records for such products provides management with guidance as to how much prices can be reduced and still make a profit.

Exhibit 5-3 Document flow in a JOCAS
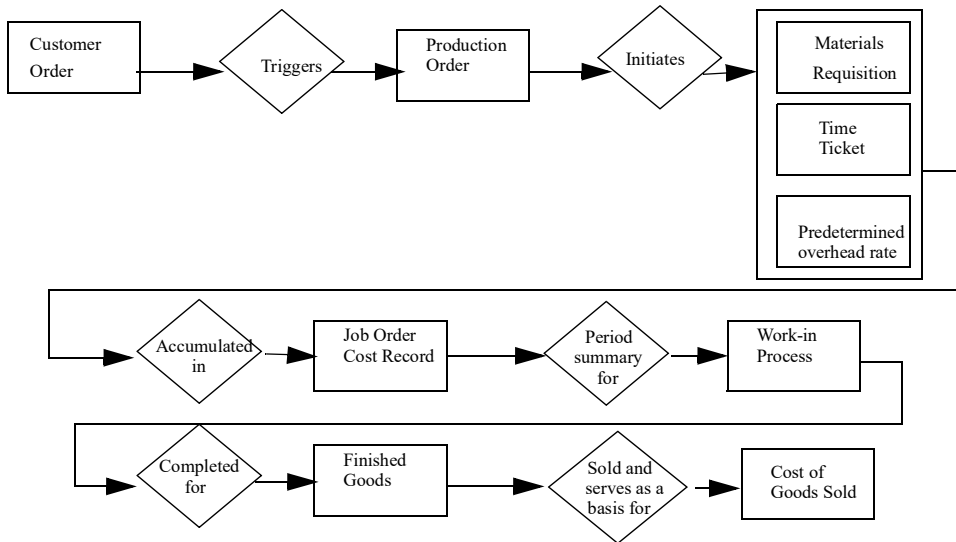
JOURNAL ENTRIES FOR A NORMAL JOCAS

Thus far, the discussion has established the general outline of a JOCAS. This section describes the flow of production costs through the JOCAS and shows the journal entries that account for these costs. The following presentation records a single month's activity (May) for Oilwell Compressors, Inc., a company that manufactures a variety of air compressors and oil pumps used in producing and refining crude oil. The journal entries will be presented in order of the cost elements (DM, DL, and OH) instead of in journal entry number order to facilitate linking topics to Chapter 4.

On May 1, there was one unfinished production job, job 11, which was started in April. During April, $71,000 was charged to job 11 for direct materials ($50,000), direct labor ($20,000), and applied overhead ($1,000). This is labelled as its beginning balance in the exhibits that follow.

ACCOUNTING FOR MATERIALS COSTS

The beginning balance in RMI is $10,000. During May, Oilwell Compressors, Inc., purchased $100,000 of materials, including $80,000 for direct materials and $20,000 for indirect materials. The purchase is recorded as in any basic CAS (journal entry 1 for the basic CAS in Exhibit 4-4 in Chapter 4):

JOURNAL ENTRY 1: Purchase of Raw Materials

Raw Materials Inventory	$100,000	
Accounts Payable		$100,000

During May, the factory floor requisitioned $70,000 in raw materials from the storeroom for use in production. Direct materials equaled $60,000 and indirect materials, $10,000. In a basic CAS, the requisition of materials to production is recorded in journal entry 5:

BASIC CAS JOURNAL ENTRY 5: Requisition of Raw Materials

|		
WIP-Product Cost (DM)	$60,000	
WIP-Manufacturing Overhead (IM)	$10,000	
Raw Materials Inventory		$70,000

The breakdown of direct materials by job from the material requisitions is presented in Exhibit 5-4. In a JOCAS, the "WIP-Product Cost" subsidiary account is replaced with individual subsidiary accounts for each job. This changes journal entry 5 to:

JOCAS JOURNAL ENTRY 5: Requisition of Raw Materials

WIP-Job 11 (DM)	$45,000	
WIP-Job 12 (DM)	$15,000	
WIP-Manufacturing Overhead (IM)	$10,000	
Raw Materials Inventory		$70,000

In Exhibit 5-4, $10,000 of raw materials issued to production was not directly traceable

Exhibit 5-4 Materials cost flows
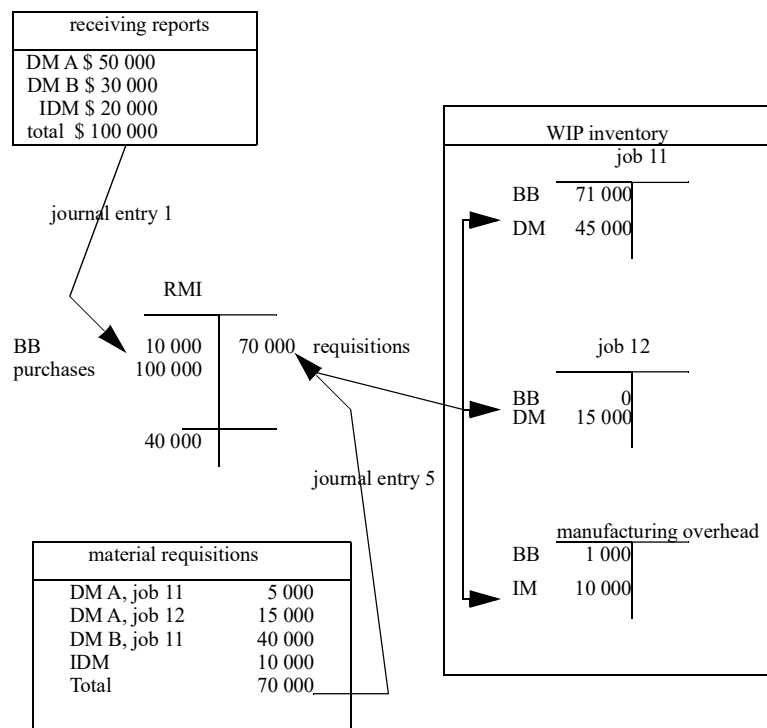
to any specific job and was charged to overhead as indirect materials. These costs remain in the overhead account until applied to the individual job cost sheets by use of a POR. At the end of May, $40,000 of raw materials remained in RMI and is reported as a current asset on Oilwell Compressors' May 31 balance sheet.

ACCOUNTING FOR LABOR COSTS

As work is performed, time tickets are generated daily. These tickets are used to trace labor costs directly to specific jobs (assume $40,000) and to identify indirect labor costs

going to the overhead subsidiary account ($20,000). In a basic CAS, the labor distribu-tion journal entry is:

**BASIC CAS JOURNAL ENTRY 6: Distributing Gross Wages**

WIP-Product Cost (DL)	$40,000	
WIP-Manufacturing Overhead (IL)	$20,000	
Gross Wages		$60,000

The amount charged to WIP-Product Cost represents the direct labor costs of specific jobs. The JOCASs' payroll system provides a summary of the direct labor by job for journal entry 6. Using the Exhibit 5-5 information, the labor distribution journal entry becomes:

JOCAS JOURNAL ENTRY 6: Distributing Gross Wages

WIP-Job 11 (DL)	$30,000	
WIP-Job 12 (DL)	$10,000	
WIP-Manufacturing Overhead (IL)	$20,000	
Gross Wages		$60,000

Exhibit 5-5 Labour Cost Flows
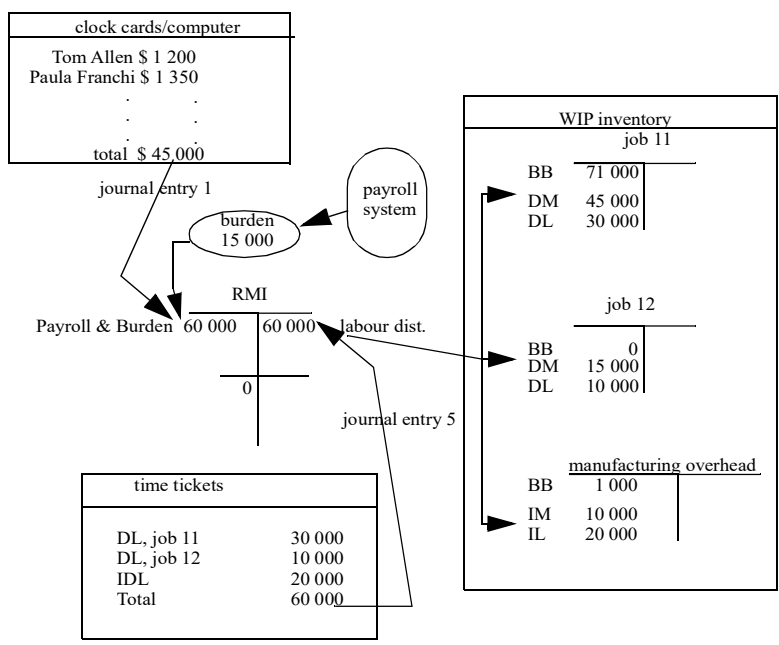
The labor costs charged to the overhead subsidiary account represent the indirect labor costs for May. Such costs include janitorial work, security guards, and maintenance. As in the case of indirect materials, the indirect labor costs charged to overhead will remain there until applied to the jobs through the use of a POR. Finally notice that, like material purchases (journal entry 1), the "purchase" of labor-related costs (journal entry 2 for payroll and journal entry 3 for the employer's burden) is the same as in any basic CAS.

ACCOUNTING FOR ACTUAL OVERHEAD COSTS

As actual overhead costs are incurred, they are charged to WIP-Manufacturing Overhead in the same way as in any basic CAS. To illustrate, assume Oilwell Compressors incurred two cash overhead costs during the month of May, rent on the factory building of $10,000 and factory utilities of $2,000. Oilwell Compressors also recognized $25,000 in depreciation on factory equipment, $17,000 in accrued property taxes on factory buildings, and $6,000 of prepaid insurance expired on factory buildings and equipment.

In both a basic CAS and a JOCAS, journal entry 4 records these items as follows:

JOURNAL ENTRY 4: Incurring Other Overhead Costs

WIP-Manufacturing Overhead (Rent)	$10,000	
WIP-Manufacturing Overhead (Utilities)	$ 2,000	
WIP-Manufacturing Overhead (Depreciation)	$25,000	
WIP-Manufacturing Overhead (Taxes)	$17,000	
WIP-Manufacturing Overhead (Insurance)	$ 6,000	
Cash		$12,000
Accumulated Depreciation-Equipment		$25,000
Property Taxes Payable		$17,000
Prepaid Insurance		$ 6,000

All actual overhead costs are recorded directly into the overhead account as they are incurred throughout the period. Thus, there are really a series of different journal entries, originating from different databases, at different times throughout May. This is illustrated in Exhibit 5-6.

ACCOUNTING FOR APPLIED OVERHEAD

At the beginning of the year, Oilwell Compressors budgeted a POR of $10 per machine hour. During May, 5,400 machine hours (Mhr) were worked on job 11, and 4,000 Mhr were worked on job 12. Therefore, $54,000 ($10/Mhr X 5,400 Mhr) of overhead is applied to job 11 and $40,000 ($10/Mhr X 4,000 Mhr) to job 12. Journal entry 7 records the applied overhead of $94,000 ($54,000 + $40,000) transferred from the overhead account to the jobs:

JOCAS JOURNAL ENTRY 7: Applying Overhead

WIP-Job 11 (Applied OH)	$54,000	
WIP-Job 12 (Applied OH)	$40,000	
WIP-Manufacturing Overhead		$94,000

Compare this to the basic CAS overhead application journal entry:

BASIC CAS JOURNAL ENTRY 7: Applying Overhead

WIP-Product Cost (Applied OH)	$94,000	
WIP-Manufacturing Overhead		$94,000

As Exhibit 5-6 shows, overhead is applied to each job's subsidiary account, rather than to the single subsidiary account for all products created in the basic CAS of Chapter 4. Before preceding any farther, review usage journal entries (JEs 5-7). These are the only journal entries that have changed from the basic CAS presented in Chapter 4. But the only change is that the subsidiary account titled "Product Cost" is replaced by subsidiary accounts for each job. The journal entries recording the acquisition of manufacturing cost elements have not changed.

The last issue to consider in overhead application is when to make journal entry 7. In this illustration, Oilwell Compressors uses a machine hour basis for its POR. Usually, the

Exhibit 5-6 Overhead Cost Flows
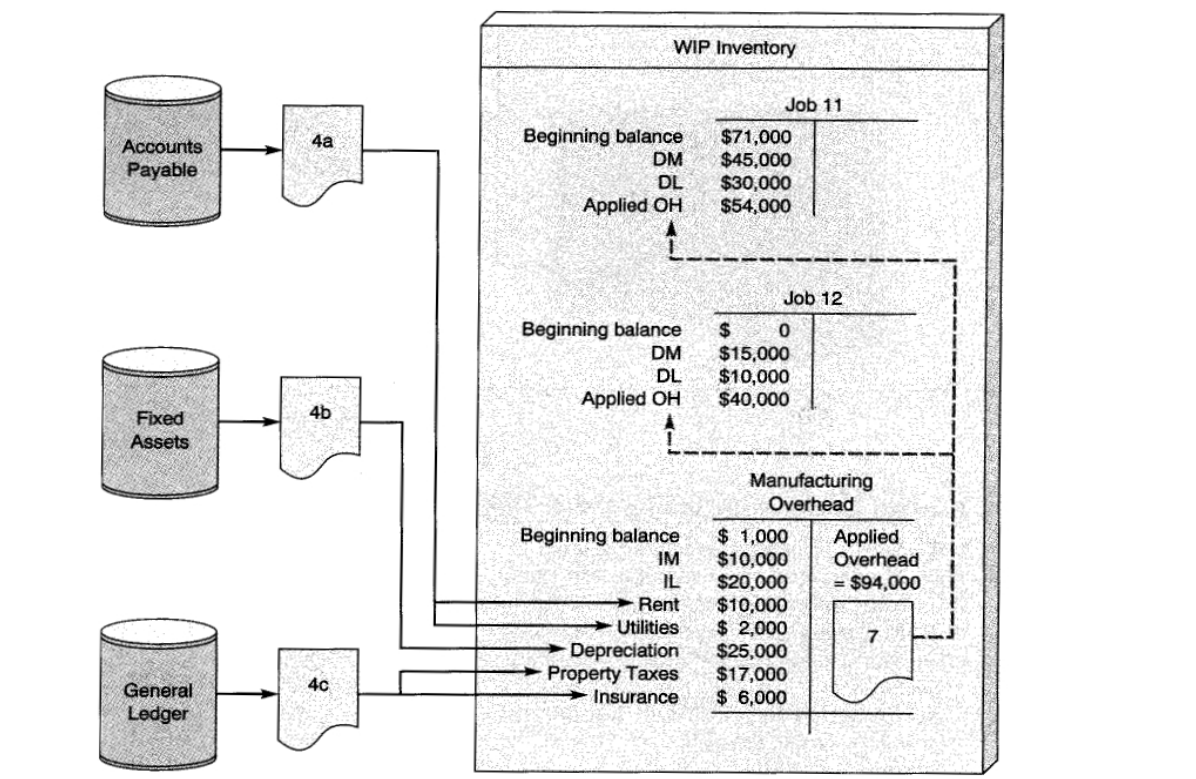
information on machine hours worked per job is accumulated throughout the month, and a summary month end adjusting journal entry is made to apply overhead. This information can be summarized and a journal entry made at any time, though, including in real-time, based on bar code scanning, for an ICBIS JOCAS. If a job is completed before the end of the posting period (e.g., the month), journal entry 7 should be made upon job completion. For example, assume job 11 was completed on May 20. Then the overhead application journal entry would be prepared at that time when the management accountant obtains the machine usage information.

With a different application base this journal entry may be made at another time. What if the POR basis is direct labor hours or cost? If the factory workers are paid weekly, then journal entry 7 can be prepared along with the labor-related journal entries (journal entry 2 for the paycheques and journal entry 3 for the employer's burden).

ACCOUNTING FOR COST OF GOODS MANUFACTURED AND SOLD

Oilwell Compressors, Inc., completed job 11 during May. Job 12 was still in process. The cost flows and ending WIP subsidiary account balances for May are shown in Exhibit 5-7. The total costs charged to job 11 are as follows:

Journal entry 8 transfers job 11 costs from the factory to finished goods:

When job 11 is sold, journal entry 9 records the removal of this job from FGI:

Beginning balance, May 1	$ 71,000
Direct materials added in May	45,000
Direct labor added in May	30,000
Applied overhead in May	54,000
Total costs incurred on job 11	$200,000

:JOURNAL ENTRY 8: Cost of Goods Manufactured and Transferred to Finished Goods

Finished Goods Inventory-Job 11	$200,000	
WIP-Job 11		$200,000

JOURNAL ENTRY 9: Cost of Goods Sold

Cost of Goods Sold-Job 11	$200,000	
Finished Goods Inventory-Job 11		$200,000

Notice that in both journal entries, FGI and COGS have subsidiary accounts to track which jobs have been completed and sold. Not all JOCASs track transfers to finished goods and sales by job. Consider a machining shop that makes batches of screws, bolts, nails, and the like. When transferred to FGI and when sold, all size 4 screws may be stored together in a bin, regardless of whether they were produced in May as job 11 or in July as job 45. Tracking FGI and COGS by job may not be possible in this situation.

Exhibit 5-7 Completed Job Cost Flows and Ending Work-In-Process Balances

WIP Inventory

Job 11		FGI	
Beginning balance	$71,000	COGM = $200,000	COGS
DM	$45,000		
DL	$30,000 / Completed		
Applied OH	$54,0000 / &Transferred = $200,000		
	0		

Job 12	
Beginning balance	$ 0
DM	$15,000
DL	$10,000
Applied OH	$40,000
	$65,000

Manufacturing Overhead	
Beginning balance	$ 1,000
IM	$10,000
IL	$20,000
Rent	$10,000
Utilities	$ 2,000
Depreciation	$25,000
Property Taxes	$17,000 / Applied Overhead
Insurance	$ 6,000 / = $94,000
	$3,000

ACCOUNTING FOR NONMANUFACTURING COSTS

In addition to incurring property taxes, rent, utilities, supervisor salaries, insurance, and so forth, as part of the operations of its plant, Oilwell Compressors also incurred similar costs generated by administrative and sales office activities. The costs of these nonmanu-

facturing activities are not charged to overhead, however, because they are not related to the manufacture of products. Only the costs of making a product go into WIP. These nonmanufacturing costs are expenses reported on the income statement.[1]

Because these administrative and sales costs go directly into expense accounts, they have no effect on the costing of Oilwell's *production* for May, even though they may be directly traceable to the jobs. A growing number of management accountants believe that all costs of the enterprise should be assigned to the product, including administrative, sales, distribution, and research and development costs. As in the earlier example of the job cost sheet (Exhibit 5-2), administrative and selling costs are added to manufacturing costs to determine the *total* costs to make, sell, and deliver the job.

Exhibit 5-8 JOCAS Journal Entries for Oilwell Compressors, Inc.

SPREADSHEET PROGRAM TO RECORD WELL COMPRESSORS, INC.JOURNAL ENTRIES

For May 1993

General Ledger Account Titles	dr's	cr's
PURCHASE (ACQUISITION) OF RAW MATERIALS:		
1: Raw Materials Inventory	$100,000	
Accounts Payable'		$100,000
PREPARING (RECORDING) PAYCHECKS:		
2: Gross Wages	$45,000	
FICA Payable		?
FIT Payable		?
Wages Payable		?
EMPLOYER'S PAYROLL TAXES & BENEFITS (BURDEN):		
3: Gross Wages	$15,000	
FICA Payable		?
FUTA Payable		?
SUTA Payable		
OTHER OVERHEAD COSTS INCURRED:		
4: WIP-Manufacturing OH (Rent)	$10,000	
WIP-Manufacturing OH (Utilities)	$2,000	
WIP-Manufacturing OH (Depreciation)	$25,000	
WIP-Manufacturing OH (Property Taxes)	$17,000	
WIP-Manufacturing OH (Insurance)	$6,000	
Cash		$12,000
Accumulated Depreciation		$25,000
Accrued Property Taxes Payable		$17,000
Prepaid Insurance		$6,000
REQUISITION OF RAW MATERIALS INTO THE FACTORY:		
5: WIP-Job 11 (DM)	$45,000	
WIP-Job 12 (DM)	$15,000	
WIP-Manufacturing OH (IM)	$10,000	

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1. Traditionally, management accountants have called expenses "Period costs" to differentiate them from "product cost" elements (DM, DL, OH). This distinction can be misused by management, though, in that direct costs of distribution (logistics), advertising, and sales for a particular job may never be associated with the total cost of making, selling, and delivering the job. As a result job's profitability may be understated by traditional CASs.

Raw Materials Inventory		$70,000
DISTRIBUTING GROSS WAGES TO JOBS:		
6: WIP-Job 11 (DL)	$30,000	
WIP-Job 12 (DL)	$10,000	
WIP-Manufacturing OH (IL)	$20,000	
Gross Wages		$60,000
OVERHEAD ALLOCATION TO JOBS:		
7: WIP-Job 11 (Applied OH)	$54,000	
WIP-Job 12 (Applied OH)	$40,000	
WIP-Manufacturing OH		$94,000
JOBS COMPLETED:		
8: Finished Goods Inventory-Job 11	$200,000	
WIP-Job 11		$200,000
JOBS SOLD (INVENTORY RELIEF JOURNAL ENTRY ONLY):		
9: Cost of Goods Sold-Job 11	$200,000	
Finished Goods Inventory-Job-11		$200,000

SPREADSHEET APPLICATIONS IN THE JOCAS

Spreadsheet software has two common uses in JOCASs. As for any basic CAS, spreadsheet programs can be created for journal entries. The May journal entries for Oilwell Compressors, Inc., are presented in Exhibit 5-8. These should be compared with the basic CAS journal entries in Exhibit 4-4 and Demonstration Problem 1 in Chapter 4. Again, verify that the only journal entries that are different are the usage journal entries (JEs 5-7).

A second common application of spreadsheet software is in creating WIP summary reports showing the costs incurred on each job. The report program designed by Oilwell Compressors' management accountant is linked to the journal entry program. It is illustrated in Exhibit 5-9. The beginning and ending balances in the report can be verified by comparing them to the T-account balances shown in Exhibit 5-7.

Exhibit 5-9 Oilwell Compressors, Inc. Job Cost Report for May

OILWELL COMPRESSORS, INC.

WIP INVENTORY AND JOB COSTS SUMMARY

For the Month of May 1993

COSTS	JOB 11	JOB 12	MFG OH	TOTALS
Direct Materials: Beginning Balance	$50,000	$0		$50,000
Direct Materials: Added	45,000	15,000		60,000
Subtotal	$95,000	$15,000		$110,000
Direct Labor: Beginning Balance	20,000	0		20,000
Direct Labor: Added	30,000	10,000		40,000
Subtotal	$50,000	$10,000		$60,000
Applied OH-Beginning Balance	1,000	0		1,000
Applied OH-Added	54,000	40,000	<$94,000>	0
Subtotal	$55,000	$40,000		$95,000
Overhead-Beginning Balance			1,000	
Indirect Materials			10,000	
Indirect Labor			20,000	
Rent			10,000	

Utilities			2,000	
Depreciation			25,000	
Property Taxes			17,000	
Insurance			6,000	
Actual OH-Added			91,000	
TOTAL JOB COSTS:	$200,000	$65,000	<$3,000>	$262,000
Less: Completed Jobs	<200,000>			<200,000>
WIP INVENTORY BALANCE	$0	565,000	<$3,000>	$62,000

Note: Individual columns add (sum) *across* into the Totals column. The totals for each cost element ($110,000, $60,000, and $95,000) are not meant to add *down* into the Total Job Costs ($262,000). This is why each cost element's total is double-underlined.

SCRAP AND JOCAS

Scrap refers to fragments of material removed during the production or construction process. Metal fragments, odd pieces of lumber, cloth remnants, and meat trimmings are examples of scrap. Scrap is sometimes collected, inventoried, and either reused or sold to scrap dealers.

When the quantity and value of scrap are relatively high, it should be stored in a designated place (such as RMI) under the supervision of a storekeeper. A typical entry removes the market value less any disposal costs (the net realizable value or NRV) from the job's cost in WIP:

SCRAP METHOD 1: Inventory at NRV

RMI-Scrap Material	debit	
WIP-Job 102		credit

When the scrap is sold, the entry would be:

SCRAP METHOD 1: Sale of Scrap

Cash (or accounts receivable)	debit	
RMI-Scrap Material		credit

To minimize accounting for scrap, often no entry is made until the scrap is actually sold. At that time, the entry would be:

SCRAP METHOD 2: Only Records Sale

Cash (or accounts receivable)	debit	
Scrap Sales		credit

The second method is expedient and reasonable when scrap value is small. The amount accumulated in the scrap sales account may be closed directly to income summary and included on the income statement as other income. It is also advantageous because the cost of scrap remains in the job's cost. Those who support this method argue that since the job causes the scrap (i.e., without the job, there would be no scrap), this scrap should be budgeted as part of the cost of the job. JIT proponents argue that scrap is a nonvalue-added cost and that the production process should be changed to eliminate it. By including scrap in the cost of every job where it is created, management will be better aware of

its costs. If scrap is taken out of the job's cost, as in the first method, set up in inventory, and then resold, management may not be motivated to eliminate it (or so the argument goes).

Proponents of the first method argue that if the scrap can be resold, its net realizable value should be removed from the cost of the job. Leaving it there overstates the job's cost and understates its profitability. Besides, they argue, the reasons for scrap are long run: as yet, there are no suppliers available who can deliver materials cut to size (so that there is no scrap from material use), or changing the direct technology cost elements (machines that cause scrap through cutting operations and the like) is not currently feasible. Whether scrap is included or excluded from the job's cost will not change management's motivation to eliminate it.

Obviously, the management accountant is faced with a choice in accounting methods for scrap. As long as the amounts of scrap are relatively small, accounting entries are not a major consideration. However, many manufacturers are discovering that scrap is a growing and serious problem. In dealing with scrap accounting, the management accountant should remember that what is important is an effective scrap performance measurement system that keeps scrap to a minimum, eliminates it entirely, or converts it to a profitable product. Timely scrap reports and performance measurements are the key to reducing scrap and managing its costs.

REWORKED UNITS AND THE TRADITIONAL JOCAS

Reworked units are defective products that are fixed so that they can be sold as acceptable finished units through regular marketing channels. Rework should be done only if incremental revenue is expected to exceed incremental costs. Otherwise, if possible, the defective units should be sold as irregulars without the reworking.

• Defective units occur for several reasons including:
• Low-quality raw materials
• Faulty and poorly maintained machinery
• Poor workmanship
• Inadequate training and poor supervision
• Outdated methods and processes

World-class manufacturers work diligently to eliminate these problems, so the modern management accountant needs to provide information on rework costs within the CAS.

TRADITIONAL ACCOUNTING FOR NORMAL REWORK

In traditional manufacturing firms, management expects some level of rework within all the jobs. If rework is common to all the jobs, each job should bear a fair share of the rework costs. However, solely due to random fluctuations, some jobs will incur more or less rework than others. Consequently, rework costs should not be directly charged to the jobs, but should instead be included in budgeted overhead and the POR. By allocating rework to all jobs through the POR, these costs will be more equitably spread across all production.

For example, assume that a clothing manufacturer receives an order for 1,000 men's suits. The POR includes a budgeted amount for reworking defective units. One hundred suits are defective and reworked at a total cost of $280 for direct materials, $790 for

direct labor, and 100 machine hours of overhead applied at $4 per machine hour. The following entry records the rework:

Journal Entry For Normal Rework

WIP-Manufacturing Overhead (Rework)	$1,470	
RMI		$280
Gross Wages		$790
WIP-Manufacturing Overhead		$400

Note that all the source documents (material requisitions, time tickets, machine hour reports) must identify the cost elements used on rework. If the source documents do not clearly identify that this is rework, the costs could easily be charged into the job.

It may seem strange that overhead is both debited and credited. In effect, the CAS is applying overhead to itself. This occurs because the POR includes an allowance for rework, and it creates credits in the overhead account when used to apply overhead to jobs. Then, when rework is done, its actual costs have to be debited to overhead where the credits are, so that the debits and credits are matched in the same account. This creates yet another problem, however. Unquestionably, the rework used overhead, so some overhead should be included in its cost. But how much? $4 per machine hour? The $4/Mhr POR includes an allowance for spreading rework over all good suits made in the various jobs worked on during the year. Should these reworked suits be charged with even more rework cost through the POR? Probably not. In other words, the POR should be reduced by the amount of rework cost included in it when it is used to apply overhead to reworked suits! This means that two PORs are needed, one for normal work and one for rework.

This accounting method also creates another, potentially more serious problem. When rework is included in the overhead budget and not in the cost of the jobs, it may effectively be "buried" with all the other overhead items (indirect materials and labor, rent, utilities, depreciation, insurance, taxes, janitorial services, repairs and maintenance, and so forth). The WCM advocate argues that rework, like scrap, is a nonvalue-added activity that should be identified, "brought out into the open," and analyzed, so that it can be prevented in the future. Is an accounting method available that will do this and also be simple to implement and explain? Some modern management accountants believe so. Because this method treats rework and spoilage in the same way, it is discussed later in the section dealing with spoilage.

TRADITIONAL ACCOUNTING FOR REWORKED UNITS FOR A SPECIAL JOB OR UNUSUAL CONDITIONS

The same clothing manufacturer receives *a special* order for 1,000 suits, with the agreement that any rework costs are chargeable to the job and billable to the customer. During production, 100 suits need to be reworked. In requisitioning additional materials, workers charge them to the job, as is done with any direct materials in journal entry 5. Workers charge their direct labor time to the job, and overhead is applied to it based on the total machine hours worked.

The problem, though, is that the POR of $4/Mhr has to be reduced by the amount included in it for rework. Since this rework is not debited to overhead, the regular

amount of applied overhead representing normal rework should not be credited from the overhead account and charged to this job. The rework costs are already included in the job's cost. Thus, this method includes rework costs directly in the job's cost. It is used when the customer agrees to pay for the rework costs, or when the rework is a result of special circumstances unique to the job. In other words, this method is used for rework costs that are not considered common to all jobs or expected because of the condition of the equipment, raw materials, and/or work force.

SPOILAGE AND THE TRADITIONAL JOCAS

Spoilage refers to a rejected job or specific units within a job. A spoiled job or unit is so defective that it is not reworked to bring it up to specifications. In a JOCAS, the treatment of spoilage is basically the same as for rework.

Preparing a Spoilage Report

Exhibit 5-10 illustrates a spoilage report, which is prepared when defective products are removed from production. For cost management purposes, spoilage reports should be prepared and reported daily. In highly automated environments, these spoilage reports are made continuously.

NORMAL SPOILAGE ATTRIBUTABLE TO ALL JOBS

Normal spoilage, like normal rework, is expected under present conditions. Since this spoilage is expected on all jobs, the budgeted overhead includes an amount for normal spoilage, just as it does for normal rework. The POR spreads normal spoilage costs over all jobs through the overhead application journal entry. This means that, as with normal rework costs, when normal spoilage occurs, the costs of these products have to be debited to overhead.

Based on the *Insights & Applications* on the next page, the following entry is made to account for the actual normal spoilage cost incurred on these two jobs:

SPOILAGE JOURNAL ENTRY: Normal Loss

WIP-Manufacturing Overhead (Spoilage)	$1,286	
WIP-Job 101		$ 66
WIP-Job 106		$1,220

NORMAL SPOILAGE CAUSED BY A SPECIFIC JOB

If spoilage is not expected but is occasionally experienced on specific jobs, its estimated cost should *not* be included in calculating the POR. Why? In this case, the spoilage is caused by the extraordinary specifications of a particular job instead of being associated with standard conditions and specifications that affect all jobs. Chances are, this type of

spoilage cannot be estimated at the beginning of the year. Majordomo, for example, does not know exactly what kinds of catering jobs it will have and, thus, the peculiar spoilage that might be associated with any one job. For the wedding (job 106), the total cost of the mountain lilies was $4,000. This normal spoilage cost, which is solely attributable to the wedding, remains with this job's cost. It is treated as just another direct material cost element.

Exhibit 5-10 A Spoilage Report

Spoilage Report			
Number		Date	
Part number:		Part name:	
Quantity spoiled:		Last completed operation number:	
Description of defect:			
Cause of defect Operator Vendor Material Machine Other		Operation number responsible for defect:	
		Inspector's signature:	
	Direct materials	Direct labor	Overhead
Unit standard cost			
Total standard cost			

Exhibit 5-11 Majordomo Job Number 106 Cost Sheet

Job Order Cost Report

Job number: 106   Date: MM/DD/YY
Job name: Deeppockets Wedding   Location: Happy Valley Church

Direct materials	$200,000.00
Direct labor ($10.00 x 5,000 DLhr)	50,000.00
Overhead ($5.40 x 5,000 DLhr)	27,000.00
Total cost	$277,000.00

Normal spoilage associated with all jobs:

20 pounds of shrimp	$ 100.00
30 pounds of steak	120.00
Breakage	1,000.00
Total actual spoilage cost	$ 1,220.00

(The shrimp and steak were spoiled before the cooking process began. Breakage was determined after the wedding. The costs for this spoilage represent costs accumulated to the point of inspection.)

Normal spoilage caused by this job:

Mountain lilies	$4,000.00

(The lilies were spoiled after the wedding. They are valueless but require no disposal cost. The cost accumulated to this point for lilies is $4,000.00.)

Exhibit 5-12 Majordomo Job Number 101 Cost Sheet

```
                        Job Order Cost Report

Job number: 101                    Date:      MM/DD/YY
Job name:   Foghorn Political Rally Location: Marquis Hotel

       Direct materials                    $10,000
       Direct labor ($10.00 x 120 DLhr)      1,200
       Overhead ($5.40 x 120 DLhr)            648
           Total cost                       11,848

       Normal spoilage:
           1 turkey                        $30.00
           1 ham                            36.00
       Total actual normal spoilage cost   $66.00

(The turkey and ham were discovered to be spoiled before the cooking
process began. Total cost accumulated to this point was $66.00)
```

ACCOUNTING FOR ABNORMAL SPOILAGE IN TRADITIONAL JOCASS

Abnormal spoilage is the amount of spoilage in excess of the expected level of spoilage. Abnormal spoilage should be written off as a loss (expense) of the time period. For example, Majordomo catered a banquet (job 310) that incurred normal spoilage expected of all jobs of $2,000 and abnormal spoilage of $10,000 due to faulty refrigeration. The entry for this situation is:

SPOILAGE JOURNAL ENTRY: Abnormal Loss

WIP-Manufacturing Overhead (Spoilage)	$ 2,000	
Loss from Abnormal Spoilage	$10,000	
WIP-Job 310		$12,000

ACCOUNTING FOR REWORK AND SPOILAGE IN WORLD-CLASS JOCASS

To summarize the traditional CAS accounting for rework and spoilage:

> If rework and spoilage are "normal" occurrences, expected across all jobs due to the condition of the production process and the nature of the products, these costs should be budgeted for and included in the POR. When these costs occur, they should be debited to overhead. When overhead is applied to the jobs, the POR puts these costs back into the jobs, spreading the costs evenly throughout the year to all jobs.
>
> If unique rework and spoilage are attributable to a specific job, and not to the general operating conditions of the enterprise, these costs should remain within the job. If the company budgets for normal rework and spoilage, including them in the POR, then these amounts must be removed from the POR when overhead is applied to the rework and the job.
>
> Abnormal, unexpected spoilage costs should not be charged to the job. These costs should be written off (debited) to a loss account.

- WCM managers ask, "Why bury the costs of rework and spoilage in overhead or in a completely separate, isolated expense account?" These are nonvalue-added costs that need to be measured, and their activities need to be identified in accordance with the Japanese philosophy that a defect is a gem to be understood so it can be prevented in the future. The JOCAS, then, should specifically measure, identify, and report the cost of all rework and spoilage.

Exhibit 5-13 Viking Boat Company's ICBIS JOCAS
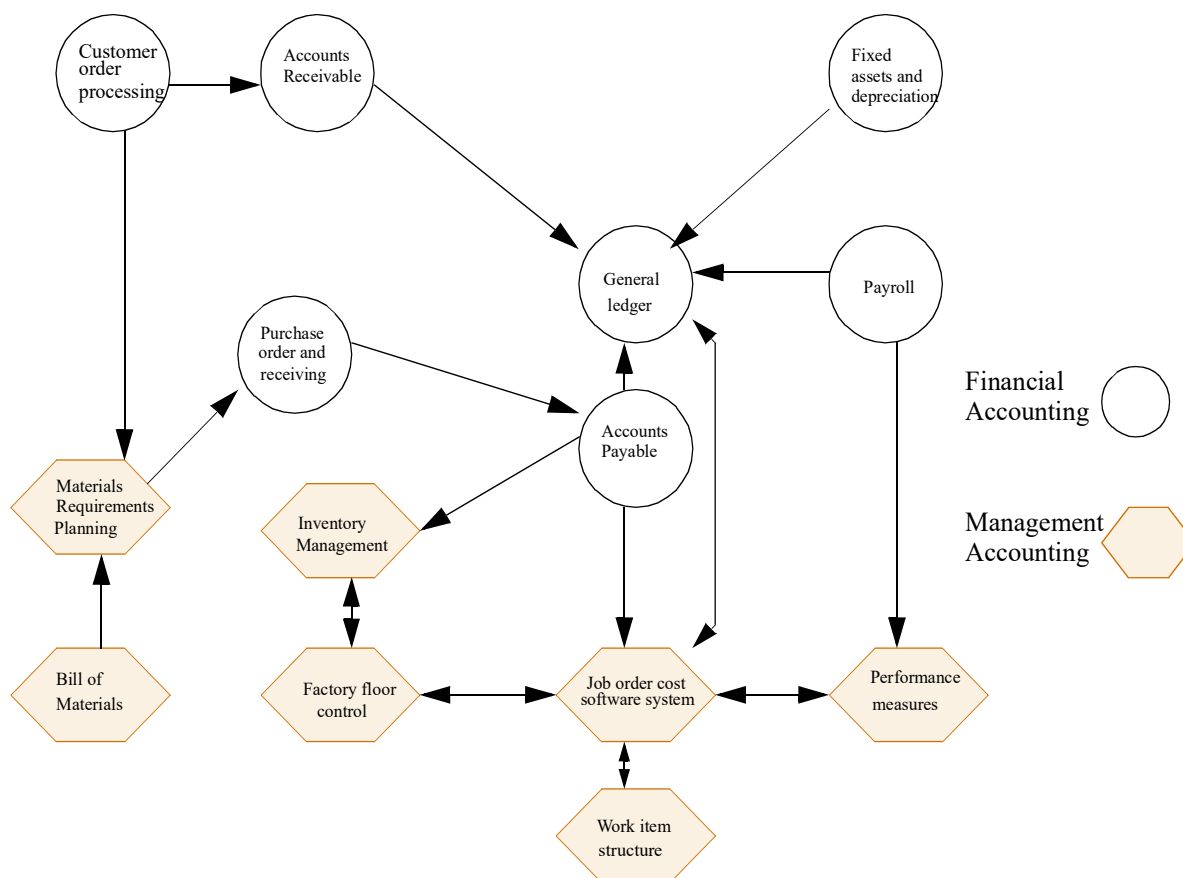
Thus, modern job cost reports for WCMs are expanded to include budget and cost variance information about the job. This is illustrated in the last two sections of the chapter (see Exhibits 5-15 and 5-22). If all rework and spoilage costs are left within the job's cost, the job cost report can specifically identify them, and their causes, for management's attention. Further, through the use of an ICBIS, this information can be immediately available for daily operations control.

What are the accounting effects of leaving rework and spoilage costs within the job? First, the job cost report has to include budget and variance information to help measure the significance of these costs. For example, in a traditional CAS, normal rework and spoilage have to be budgeted for anyway. Rather than putting them in overhead, though, why not just budget for them within the jobs directly? If a job results in abnormal rework or spoilage, it will not have been budgeted for and will show up as a cost overrun (unfavorable cost variance) on the job cost report. If normal rework and spoilage costs are not included in overhead, the special journal entries described above do not have to be made. This actually simplifies the CAS and at the same time provides better information for management control.

Secondly, there is a potential effect on net income. When normal rework and spoilage are included in overhead and the POR, job costs are "smoothed." All jobs are charged equally, regardless of random fluctuations between them (some have more or less rework and spoilage than others). Smoothing job costs smooths COGS and net income. But, if all rework and spoilage are left in individual jobs, this smoothing effect will not happen. Net income will be subject to the random fluctuations between jobs. In other words, instead of moving the fluctuations to overhead, they remain in the jobs and affect net income when the jobs are sold.

Traditional CAS theory argues that it is more important to smooth earnings because this gives a truer picture of the firm's profitability. Attaching these costs to specific jobs is not appropriate because the costs were caused by overall operating conditions, not by the individual jobs. The WCM management accountant counters this argument by pointing out that if the fluctuations are truly random and normal across all jobs, then the effect of not smoothing cannot be significant. The fluctuations will, for the most part, be relatively small (these costs will be fairly even across jobs). When a fluctuation is significant because a job results in an unusually high rework or spoilage cost, this job should be singled out for special attention. Only by keeping these nonvalue-added costs within the jobs will management be able to identify and eliminate them.

What about abnormal rework and spoilage? Under traditional CAS methods, these are expensed against net income in the time period they occur (within the month). If these costs remain in the job, and the job is sold, they will still "hit the income statement," not as an expense, but as a cost of the job (COGS). The net income effect is the same. But what if the job was not finished this month? The traditional approach would still expense these costs this month. The WCM approach would keep the costs in the job until it is completed and sold, thus matching the revenues from the job against all of its costs.

What's the "bottom line"? With increasing global competition, the WCM firm needs information on all nonvalue-added costs. The firm must measure these costs, identify the jobs where they were created, and ascertain the underlying causes. Whether these costs are added to every job through a POR, or specifically budgeted for within each job, they end up in the job's cost. Is it better to identify these costs through an overhead cost analysis or through a job cost analysis? Scrap, rework, and spoilage have become extremely serious problems for many traditional manufacturers. The modern management accountant must address the issue of how best to account for these costs in designing a world-class JOCAS.

INSTALLING AN ICBIS FOR A JOCAS

LEARNING OBJECTIVE 4

Describe how an integrated computer-based information system (ICBIS) can support a JOCAS.

Many companies now apply computer technology to support their JOCASs. For example, the *Insights & Applications* feature on the following page introduces how Viking Boat Company uses an ICBIS to support its JOCAS.

NECESSARY FEATURES OF JOCAS SOFTWARE

Different software packages have different features and are customized for different situations. The key to acquiring the best software is to match the needs of the enterprise with

the capabilities of the software package. The following list of common features can serve as a guide for comparing the capabilities of different software packages:

• *User-friendly.* The software package should provide online help, menus, and tutorials. The system should be simple enough that it will not overwhelm the average user. *Internal controls.* The package

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INSIGHTS & APPLICATIONS

Viking Boat Company's New ICBIS

The Viking Boat Company is located in West Palm Beach, Florida. Viking takes in about 100 boat construction jobs per month. Some are huge projects, lasting up to six months and producing revenue up to $500,000. Viking also has a large service area that performs a substantial number of repair jobs. Both of these areas, construction and service, fit into the categories for a JOCAS.

Viking's management accountant has acquired a JOCAS software package that will track, bill, and charge costs to construction and repair jobs. It is integrated into the financial accounting software, as shown in Exhibit5-13. The advantage of this ICBIS is that transactions entered into one module simultaneously update a specific job as well as other accounting files. For example, when employee time tickets are entered into the payroll module, the hours spent on each job are automatically posted to the job cost sheet. The worker's paycheck is also calculated and prepared. In another example, when a part is taken from materials inventory, the cost is charged to the job cost sheet and WIP, and RMI is automatically reduced.

---

should have internal controls, such as input, processing, output, and database controls.

• *Flexibility.* The software should permit each job to be set up according to the work ordered by the customer.
• *Break down by work areas.* The software should have the ability to break down a job into departments, workcenters, or cells to measure work performed and costs for each work area.
• *Integration.* The software should be easily integrated with other accounting tasks. For example: integration with payroll for entering labor costs and determining labor performance; integration with inventory for entering material costs and updating quantity on hand; integration with accounts payable and with purchasing for ordering materials and other items; integration with accounts receivable for producing customer invoices and recording receipts; and integration with the general ledger for preparing journals and monthly financial statements.
• *WIP reporting. WIP* reports keep management abreast of progress on various jobs and also can show at a very early date when costs (such as scrap, rework, and spoilage) are getting out of control.
• *Pre-billing data.* Management should be provided with a pre-billing worksheet to review before customer invoices are prepared and mailed.
• *Job scheduling.* This feature produces information including start and due dates, percent completion, and a list of open and closed jobs.
• *Job profitability.* This feature computes costs incurred and profit margin for each job.
• *New job estimating.* This feature provides cost information that aids management in bidding for new jobs.

THE TECHNOLOGY PLATFORM FOR VIKING'S ICBIS

The network backbone and computer hardware platform for Viking's ICBIS are presented in Exhibit 5-14. The network transmission medium is fiber optic and the fiber distributed data interface (FDDI) standard supported by the American National Standards Institute (ANSI). Fiber optic's main advantage to Viking is its resistance to electrical interference from production equipment and lightning from thunderstorms, which are prevalent in Florida.

A computerized JOCAS is more than simply a historical record of what happens at Viking. It is a major tool in the whole management process. Moreover, it increases the efficiency and effectiveness of operations. The above *Insights & Applications* describes how Viking's new JOCAS software system aids management.

Exhibit 5-14 The Technology Platform for Viking's ICBIS JOCAS

* FDDI stands for fiber distributed data interface
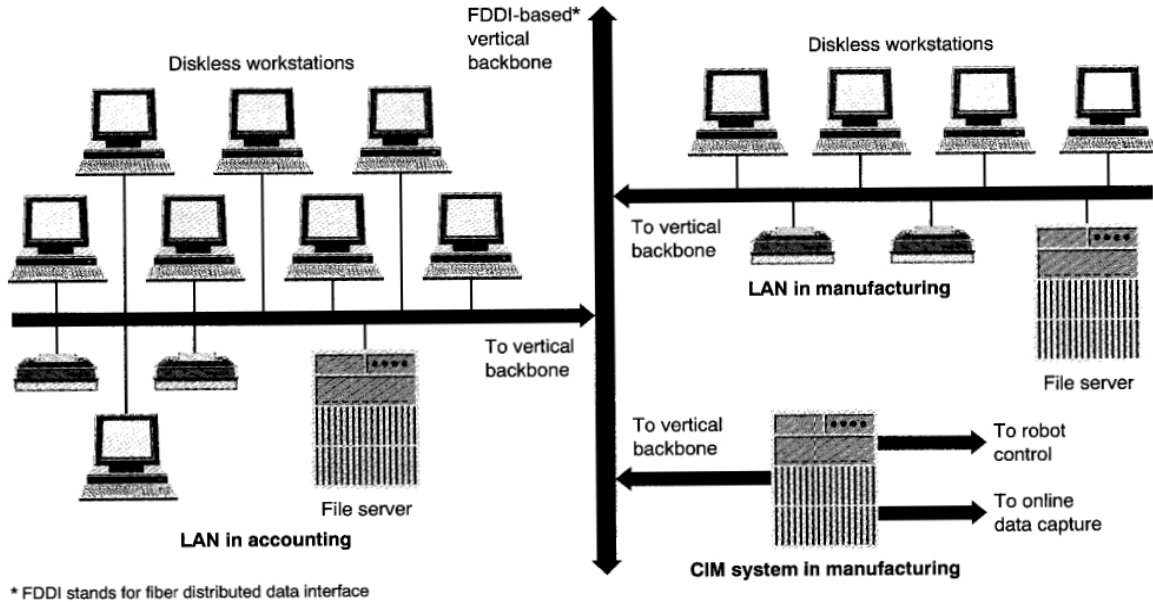
Exhibit 5-15

Closed Job Order Report			
Job Order Number:	147F	Work Centre	4
Customer:	Water Sports	Quantity Ordered:	28' Neptune Ski Pkg.
Contract Number:	19743M	Date Ordered:	9/1/X5
Contract Price:	$ 30 000.00	Date Promised:	10/12/X5
		Date Started:	9/3/X5
		Date Completed:	10/13/X5

Cost Inputs	Estimated ($)	Actual ($)	Under/<Over>
Materials			
Purchased Parts	6 500.00	7 000.00	<500.00>
Manufactured Stock	3 000.00	3 000.00	0.00
Total	9 500.00	10 000.00	<500.00>
Direct Labour			
Production	2 600.00	2 500.00	100.00
Setup	200.00	500.00	<300.00>
Rework	400.00	1 000.00	<600.00>
total	3 200.00	4 000.00	<800.00>
Applied Overhead			
Fixed	4 200.00	4 000.00	200.00
Variable	1 600.00	2 000.00	<400.00>

Total	5 800.00	6 000.00	<200.00>
Total Manufacturing Costs	18 500.00	20 000.00	<1 500.00>

|			
Memo:	Contract Price		$ 30 000.00
	Cost charged to job	$ 20 000.00	
	Administrative Cost	2 000.00	
	Selling Cost	3 000.00	
	Total cost to make and sell		<25 000.00>
	Profit		$ 5 000.00

INSIGHTS & APPLICATIONS

Viking Boat Company's New JOCAS as a Management Tool

John Silver, CEO of Viking said, "One of the advantages of our new computerized system is that it gives me work-in-progress on all jobs, both construction and service, any time I want this information. I can see exactly what we have in a job; that is, in materials, labor, overhead, and any subcontracted work, by simply entering job numbers via my workstation. I also like the job order reports that I get upon completion of a job. (See Exhibit 5-15 for an example of the job 147F report.) I use these reports to help analyze performance, to bid on future jobs, and to determine product line profitability." Teri Crusoe, marketing manager, said, "We have also improved customer relations. We're customer-oriented, and we have fewer billing disputes. We can send interim bills on major jobs so the customer knows how work is progressing. We also disclose a lot more detail in the bills to explain precisely what was done." Marcy Gulliver, financial accountant, said, "On the productivity side, it has streamlined the work flow in our office by cutting the time we spend on billing almost in half. We also get customer revenues much faster, which has almost eliminated our need to obtain short-term loans. Moreover, the integration feature eliminates all the manual entries we used to make for each account. This feature not only increases productivity but reduces data-entry errors." Homer Dreyfus, yard foreman, said, "I really like the system's flexibility in specifying the precise work the customer wants. I meet with the customer and enter the instructions in detail via my workstation.

The tasks are grouped to departments, such as yard, electrical, mechanical, paint shop, and so forth. The exact assignment is keyed into the system. When the customer receives a bill, he sees what he told me to do and exactly what he is being charged for. Another feature I like is the graphics that give me performance and utilization information at a glance. I particularly like the trend of performance measures, such as labor utilization, machine utilization, and units rejected. I can use this information to analyze performance over one or more jobs, which might otherwise be obscured by the complexities of various job orders." Sylvia Torrence, service and repair foreman, said, "The new system simplifies service work and repair jobs. We are able to assign the right parts to the right customer. This used to be a nightmare. Now, we know exactly what parts were used on each job. Since there is a tie to inventory, we can tell if we have the parts on hand before we start a job. We can track a job from the time a customer walks in the door until she leaves with a paid receipt. The work to be performed is entered on the keyboard, and a job cost sheet is set up and printed. Then, a mechanic takes the proper copy and begins the job. Parts are charged to the job cost sheet by the inventory clerk, and labor is entered from the mechanic's time clock tickets. We used to spend hours totaling up the parts and labor for each job. Now, we can hand the customer a computer-generated bill as soon as the job is completed."

ATTRIBUTES NEEDED FOR A JOB COST REPORT

Assuming you are in a company with a relational database driven accounting system, [and the accountants in the company actually realize it] what attributes do you need to add to the basic database tables in order to produce the Job Cost reports? Using the generic REA template in Exhibit 5-22 to work on your answer. Include both the attribute and the table it would be from.

Exhibit 5-16 REA Standard Template
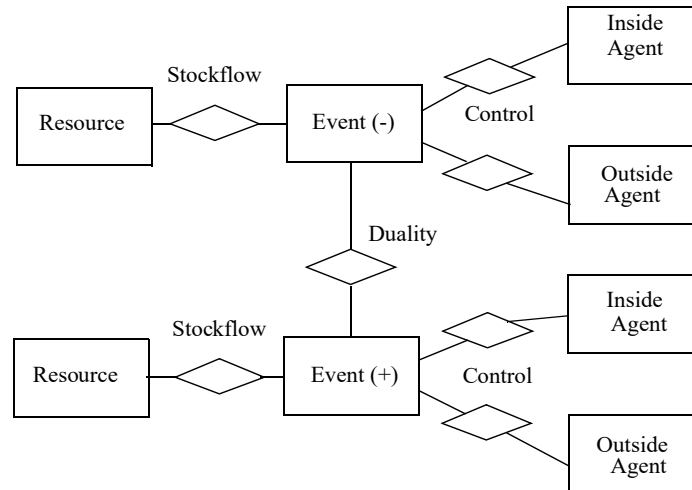
SUMMARY OF LEARNING OBJECTIVES

The major goals of this chapter were to enable you to achieve five learning objectives:

Learning objective 1. Explain how to design a job order cost accounting system (JOCAS).

A JOCAS has three main informational inputs:

• Materials requisitions
• Time tickets
• Information on the volume of the predetermined overhead rate's basis

Costs accumulated from these inputs are charged to the job, project, or case by posting costs to its job cost sheet. Direct materials are assigned to each job through materials requisitions. Direct labor is traced

through time tickets. Overhead is applied to each job using a POR.

Job cost sheets serve as WIP subsidiary ledger accounts. Completed job cost records for jobs not yet delivered to customers are transferred to FGI subsidiary ledger accounts. When jobs are sold, the appropriate costs are transferred from the finished goods account to the cost of goods sold account. Corresponding FGI subsidiary ledger accounts are closed. Completed job cost sheets are maintained in a database for management analysis and to serve as a guide for bidding on future jobs.

Learning objective 2. Illustrate the cost flows and prepare journal entries for a normal JOCAS.

The cost flows and journal entries are identical to those for any basic CAS, presented in Chapter 4, except that the three journal entries for cost element usage debit specific jobs rather than the WIP subsidiary account called "Product Cost." The "Product Cost" subsidiary account is replaced by separate subsidiary accounts for each job. Thus, when

journal entries 5-7 record the usage of direct materials, direct labor, and applied over-head, the debits are to individual job cost sheets.

To review the cost flows, first cost elements are purchased. When raw materials, factory labor, and indirect manufacturing costs are obtained, their costs are debited (charged) to temporary holding accounts in the JOCAS (journal entries 1-4). These are RMI, gross wages, and overhead, respectively.

When raw materials and factory labor are used in the production process, their costs are removed (credited) from their holding accounts and charged (debited) to the jobs and overhead account as described above (journal entries 5-6). In a normal JOCAS, over-head is applied using a POR in journal entry 7. The journal entry is made when the job is completed, or more frequently, depending on how long it takes to complete the job and the basis used for the POR.

When jobs are completed and all their costs accumulated in their subsidiary WIP accounts, the jobs are transferred to FGI and, when sold, to COGS. Journal entries 8 and 9, recording COGM and COGS, may show subsidiary ledger accounts by job for FGI and COGS. This depends on whether individual jobs are tracked through FGI and sold separately. The journal entry formats are illustrated in Demonstration Problem 1.

Learning objective 3. Demonstrate how to account for scrap, reworked units, and spoilage in a normal JOCAS.

Scrap and spoilage reports should be given to management in a timely fashion. Scrap also should be returned to the storeroom to be held for sale or for reuse. Typically, scrap is not assigned any cost. When it is sold, the proceeds are recorded as miscellaneous income. Sometimes, the net realizable value (NRV) is significant. In that case, the scrap is inventoried, with the NRV credited from the job's cost. Then, when the scrap is sold, no miscellaneous income is recognized.

When rework and spoilage are expected ("normal") and attributable to the overall condition of the production process, rather than caused by specific jobs, traditional CAS methods require that the budgeted costs for rework and spoilage be included in budgeted overhead and the POR. This allows these costs to be spread more evenly over all jobs, smoothing job costs and net income. The cost to rework defective units or the cost of rejected products (spoilage) is then charged to overhead.

If, on the other hand, rework and rejects are caused by extraordinary specifications or unusual conditions of a particular job, or the customer agrees to pay for these costs, the rework should be charged to the job. Abnormal spoilage, though, is written off to a loss (expense) account under traditional methods. In any case, the vast majority of rework and reject costs are not associated with specific jobs in a traditional CAS.

WCM managers, though, may prefer a different accounting for rework and spoilage. They argue that the costs should remain in the jobs where the rework and spoilage occurred. This eliminates the need to make special journal entries removing the costs from the jobs and "burying" them in the overhead account along with many other indi-rect cost elements. If these costs are truly random and common to all jobs, COGS and net income should not be materially affected. More importantly, if the job cost sheets

include budget and cost variance data (as in Exhibits 5-15 and 5-22), the JOCAS can provide valuable information that will help managers deal with these problems.

Learning objective 4. Describe how an integrated computer-based information system (ICBIS) can support a JOCAS.

More and more companies are installing computerized information networks that integrate data collection and information reporting throughout the firm. These ICBISs contain job order costing software as well as a host of other software, such as materials requirements planning, work item modules, performance measures, and inventory control. These modules are integrated with financial accounting modules to form an ICBIS.

Integrating the modules increases the effectiveness and efficiency of operations. Specifically, timely information is available for controlling operations from online, realtime access to job cost sheets via workstation terminals. Expanding the job cost sheet to include budget and cost variance information will provide better accountability for performance evaluation. Finally, this type of information is critical to budgeting similar projects in the future.

With or without ICBISs, spreadsheet software has become a common tool for reporting and analyzing job costs as well as for preparing budgets for jobs. Spreadsheet programs can be linked together, further increasing efficiency in processing information in modern JOCASs.

Learning objective 5. Discuss how costs are estimated for construction projects and how work item software is used.

For any given project, the cost estimator and the management accountant must work together to estimate the direct costs for materials, labor, and equipment with reasonable accuracy. The bid price can then be determined by adding the costs for subcontract work, overhead, contingencies, insurance and bonds, and a target profit. The bid price of a project should be high enough to allow the contractor to complete the project with a reasonable profit, yet low enough to be competitive.

Cost estimates can be divided into:

• Preliminary cost estimates
• Detailed cost estimates

All cost estimates based on previous cost data should be adjusted for:

• Time
• Location
• Size

A work item software program is a special tool that management accountants can add to their JOCAS. It provides a systematic way for firms to bid on jobs. If a job is awarded, the management accountant can also use the work item software for other purposes:

• To accumulate actual costs
• To report variances
• As input to electronic spreadsheets for financial analysis m As a basis for bidding on future similar jobs.

Learning objective 6. Prepare a list of attributes needed in a relational database to prepare job cost reports in an REA environment.

Developing a Job Order Cost Accounting System in a relational database involves adding a number of attributes to the basic tables and writing the JOCAS reports. These should be seen as extensions of the basic model.

IMPORTANT TERMS

Abnormal spoilage Spoilage that is unexpected and in excess of normal spoilage.

Bid price The amount of money the owner must pay the general contractor to build a project.

Detailed cost estimate (final or **definitive cost estimate)** A forecast of direct materials, direct labor, equipment, subcontractor work, overhead, contingencies, insurance and bonds, and profit, for a project based on a complete set of contract documents, technical specifications, drawings, and site visits.

Job A job is an individual product, a small batch of unique products, a client, or case, or any other project that materials, labor, and the POR's basis can be directly traced to.

Job cost sheet (job order cost record) A record set up for each job started into production, which serves as a means for accumulating the direct materials, direct labor, and overhead costs chargeable to the job. It is used as a means for computing unit costs. Job cost sheets are often the subsidiary ledger accounts in WIP for product costs.

Normal spoilage Rejected products that are expected, and budgeted for, under present conditions.

Preliminary cost estimate (conceptual, approximate, or budget estimate) A ballpark estimate of what costs could be to build a project, including the target profit.

Reworked units Defective products that are fixed and sold as acceptable finished units.

Scrap Fragments of material removed during the production or construction process.

Spoilage A rejected job or products within a job. Spoiled jobs or units are discarded and are sometimes sold for disposal value.

DEMONSTRATION PROBLEMS

DEMONSTRATION PROBLEM 1 *Journal entries for a normal JOCAS.*

Using the annual information below for Topper, Inc., prepare the journal entries for each event using a normal JOCAS. (Note: this is the same problem as Demonstration Problem 1 in Chapter 4. It is repeated to facilitate comparisons between journal entries in a basic CAS and in a JOCAS.)

1. Raw materials beginning balance is zero, and the ending balance is $20,000. Purchases made on account are $100,000.

2. There is a $200,000 factory payroll for the year, with the following withholding rates: federal income taxes 10%, state income taxes 5%, Social Security taxes 7.5%, pension plan 2%, health insurance 1.5%.

3. Topper's payroll tax burden and fringe benefits rates are as follows: federal unemployment tax rate = 0.8% and the state's = 5.4%; fringe benefits include vacation pay (2

weeks when 50 weeks are worked in a year), Topper's contribution to a pension plan of 5.0%, and its contribution to the health insurance plan of 3.3%.

4. Other actual overhead costs, paid on account, are $88,000. Factory equipment depreciation equals $200,000.

5. Direct materials requisitioned equal $75,000.

6. $175,000 of factory labor costs represents direct labor.

7. Overhead allocation assuming a POR of 200% of direct labor cost.

New information:

8. The direct materials were for two jobs: job 31 = $50,000 and job 42 = $25,000. (See item 5 above)

9. Job 31 had $100,000 of direct labor, and job 42 had $75,000. (See item 6 above) \

10. Job 31 had a beginning balance of $650,000. It was the only job completed and sold.

11. FGI and COGS accounts do not have subsidiary accounts for each job.

Study note: Verify that the only journal entries that have changed from the Chapter 4 solution are the three cost element usage journal entries (JEs 5-7), and that COGS has changed to $1,000,000 due to the sale of job 31.

Solution To Demonstration Problem 1

Ref General Ledger Account Titles	dr's	cr's	Notes:
PURCHASE (ACQUISITION) OF RAW MATERIALS:			
1: Raw Materials	$100,000		given
Inventory Accounts Payable		$100,000	all RMI purchases are charge d
PREPARING (RECORDING) PAYCHECKS:			
2: Gross Wages	$200,000		**given**
FIT Withholdings Payable		$20,000	+$GROSS WAGES*0.1
SIT Withholdings Payable		$10,000	+$GROSS WAGES*0.05
FICA Taxes Payable		$15,000	+$GROSS WAGES*0.075
Pension Plan Payable		$4,000	+$GROSS WAGES*0.02
Health Insurance Payable		$3,000	+$GROSS WAGES*0.015
Wages Payable		$148,000	GROSS WAGES - WITHHOLDINGS
EMPLOYER'S PAYROLL TAXES & BENEFITS (BURDEN):			
3: Gross Wages	$52,000		SUM (EMPLOYER BURDEN)
FICA Taxes Payable		$15,000	= withheld from paycheques
FUTA Taxes Payable		$1,600	+$GROSS WAGES*0.008
SUTA Taxes Payable		$10,800	+$GROSS WAGES*0.054
Pension Plan Payable		$10,000	+$GROSS WAGES*0.05
Health Insurance Payable		$6,600	+$GROSS WAGES*0.033
Vacation Payable		$8,000	+$GROSS WAGES*0.04
OTHER OVERHEAD COSTS INCURRED:			
4: WIP-Manufacturing Overhead (Other OH costs)	$88,000		amounts given
WIP-Manufacturing Overhead (Depreciation)	$200,000		
Accounts Payable		$88,000	amounts charged
Accumulated Depreciation-Factory Equipment		$200,000	
REQUISITION OF RM INTO THE FACTORY:			
5: WIP-Job 31 (DM	$50,000		given
WIP-Job 42 (DM)	$25,000		given
WIP-Manufacturing Overhead (IM)	$5,000		"plug" to balance
Raw Materials Inventory		$80,000	calculate from T-account
DISTRIBUTING GROSS WAGES TO PRODUCTS:			
6: WIP-Job 31 (DL)	$100,000		given
WIP-Job 42 (DL)	$75,000		given
WIP-Manufacturing Overhead (IL)	$77,000		"plug" to balance
Gross Wages		$252,000	gross pay + employer burden

OVERHEAD ALLOCATION TO PRODUCTS: 7: WIP-Job 31 (Applied Overhead) WIP-Job 42 (Applied Overhead) WIP-Manufacturing Overhead	$200,000 $150,000	$350,000	POR = 200% of DL$ DL$ = $175,000 (given)
PRODUCTS COMPLETED: 8: Finished Goods Inventory WIP-Job 31	$1,000,000	$1,000,000	COGM calculated within T-account
PRODUCTS SOLD (INVENTORY RELIEF ENTRY ONLY): 9: Cost of Goods Sold Finished Goods Inventory	$1,000,000	$1,000,000	COGS calculated within T-account
JOURNAL ENTRY RECORDING CONVENTIONS: 1. Use a dash to separate a control account from a subsidiary account. 2. Use parentheses for a posting reference within a general ledger account.			

DEMONSTRATION PROBLEM 2 *Accounting for scrap, rework, and spoilage.*
Waste Management Company has a traditional CAS. During the month of April, it incurred some significant scrap, rework, and spoilage costs. As the new management accountant, you have been asked to prepare the journal entries necessary to record these costs. You have found the following information:

Scrap: From the Accounts Receivable Department, receipts issued for the sale of scrap equal $5,000. You check with the shop floor foreman and find that the scrap could not be identified as coming from any particular jobs. Although workers collect scrap after each job and set it aside, no records are kept as to how much came from any job.

Rework: Rework occurred on two jobs during the month. Job 25 rework required $500 in direct materials and $1,000 in direct labor. The shop foreman believed that this was just normal rework that occurs due to the type of production process in place. He did believe, though, that this amount was a bit curious. Job 28 rework costs were due to the special nature of the job. These costs were not significant, however, being only $75 in direct materials and $100 in direct labor.

Spoilage: Forty products made in job 27 were rejected by quality control inspection. From talking to the shop floor foreman, you learn that up to 25 rejects were considered normal for this job. The rest were considered beyond normal expectations. This job was not unique relative to any other job, according to the foreman. From the job cost sheet, the direct materials and direct labor costs per unit on this job were $10 and $12, respectively.

From the JOCAS records, you also found that normal rework and spoilage were included in the overhead budget. The POR is based on budgeted direct labor cost of $600,000 for the year. The budgeted overhead included:

Indirect materials	$ 20,000
Indirect labor	40,000
Depreciation	100,000
Factory utilities	50,000
Normal rework	60,000
Normal spoilage	30,000
Total budgeted overhead	$300,000

Solution To Demonstration Problem 2

SCRAP JOURNAL ENTRY:

Cash	$5,000	
Scrap Sales		$5,000

Comment: Since the scrap could not be identified with specific jobs, those jobs' costs could not be credited (reduced) and the market value set up in a subsidiary RMI account. If this is a significant amount, since workers collect scrap after each job, possibly the JOCAS should be changed to trace scrap directly to jobs.

REWORK JOURNAL ENTRY:

WIP-Manufacturing Overhead (Rework)	$1,900	
RMI		$ 500
Gross Wages		$1,000
WIP-Manufacturing Overhead		$ 400

Comment: The regular POR is 50% of direct labor cost (total budgeted overhead of $300,000 divided by budgeted direct labor cost of $600,000). However, this POR cannot be used in allocating overhead to the reworked products because it includes an allowance for rework. Normal rework is included in the overhead budget to spread its costs over the good products made. Therefore, the amount of the normal rework in the POR has to be deducted from it to yield a "rework allowance-free" POR. Since normal rework is 10% of direct labor cost ($60,000 - $600,000), the adjusted POR should be 40% of direct labor cost, and the applied overhead should be $400.

Should there be a special journal entry for the abnormal rework on job 28? This is not clear in the problem. Since direct material and direct labor are incurred on the job, whether for regular production or for abnormal rework, these costs are debited to the job. Assuming that this happened in the normal course of recording material requisitions and time tickets, no new journal entry is needed. However, if no special journal entry was separately made for the abnormal rework, it is likely that the regular 50% POR was used in applying overhead to the job. Therefore, the applied overhead is overstated. The correct POR to use on the rework direct labor costs is 40%, not 50%, so the following journal entry may be necessary:

ADJUSTING JOURNAL ENTRY: To Correct Applied OH

WIP-Manufacturing Overhead	$10	
WIP-Job 28 (Applied Overhead)		$10

The overhead applied to the $100 of direct labor cost for the rework should not have been $50 (using the 50% POR), but rather $40 (based on the 40% POR).

If the abnormal rework was separately tracked in the JOCAS and a separate journal entry was made for these costs, it would be:

REWORK JOURNAL ENTRY: Abnormal Rework

WIP-Job 28 (Abnormal Rework)	$215	
RMI		$ 75
Gross Wages		$100
WIP Manufacturing Overhead		S 40

SPOILAGE JOURNAL ENTRY:

WIP-Manufacturing Overhead (Spoilage)	$700	
Loss from abnormal spoilage	$420	
WIP-Job 27		$1,120

The calculations for normal (charged to overhead) and abnormal spoilage (written off to a loss account) are:

Cost Element	Normal	Abnormal
Direct materials	$250	$150
Direct labor	300	180
Applied overhead	150	90
Totals	$700	$420

Also notice that in applying overhead to all units worked on in the jobs, spoiled and rejected as well as good products, the normal 50% of direct labor cost POR is used. Does it make sense to allocate spoilage to spoiled units? Should some type of adjustment to the spoilage costs be made? These issues are considered in Think-Tank Problem 5.57.

DEMONSTRATION PROBLEM 3 *Estimating the cost of hauling lumber to a job.* Lumber is usually loaded by laborers directly onto flatbed trucks, hauled to the job, and stacked according to size. A laborer is able to load lumber at an average rate of 3,000 feet board measure (FBM) per hour. The laborer unloads the truck at the same average rate. A truck will transport lumber at 2,000 FBM per load. The job site is 2 miles from the lumberyard, and the truck will travel at an average speed of 20 miles per hour.

The truck driver (who is also a laborer) and a laborer will be used to load, transport, and unload the lumber. The costs are:

Truck @ $10.58 per hour
Truck driver @ $8.10 per hour Laborer @ $7.50 per hour
The job calls for the transportation of 40,000 FBM of lumber.

 Required:

a. Calculate the total time for the job.
b. Calculate the total cost for the job and the cost per 1,000 FBM.

Solution To Demonstration Problem 3

a. Rate of loading/unloading truck, 2 X 3,000 =	6,000 FBM/hr.
Time to load truck, 2,000 / 6,000 =	0.33 hr.
Time to unload truck, 2,000 / 6,000 =	0.33 hr.
Travel time, round trip, 4 miles / 20 MPH =	0.20 hr.
Total time per load =	0.86 hr.
Number of trips per hour, 1 _ 0.86 =	1.16
Quantity hauled, 1.16 X 2,000 =	2,320 FBM/hr.
Total time for the job, 40,000 - 2;320 =	17.2 hr.

An alternative approach to calculating the total time for the job:

Number of truckloads required, 40,000 / 2,000 =	20
Round-trip time per load, 0.86 hours	
Total time for the job, 20 x 0.86 =	17.2 hr.

b. Total cost for the job is:

Truck, 17.2 hours @ $10.58 =	129.00
Truck driver, 17.2 hours @ $8.10 =	181.98
Laborer, 17.2 hours @ $7.50 =	139.32
Total cost	$450.30
Cost per 1,000 FBM, $450.30 / 40 =	$11.26

REVIEW QUESTIONS

5.1 List and briefly describe the three main informational inputs to the normal JOCAS. Why is this information important and how is it used?

5.2 What is the purpose of the job cost sheet?

5.3 What information does the job cost sheet contain, and how does management use these records?

5.4 Outline the format of the job cost sheet and explain the purpose of each of its elements.

5.5 Although marketing and administrative costs are not normally charged to jobs, explain why such costs may be included in the job cost sheet.

5.6 Describe the flow of data in a JOCAS.

5.7 Which basic CAS journal entries change in a normal JOCAS?

5.8 Which basic CAS journal entries do not change in a normal JOCAS?

5.9 Why do some journal entries change, but others do not?

5.10 Which general ledger account titles change from a basic CAS? Why?

5.11 Explain why JOCASs are equally applicable to manufacturing, service, and construction organizations. Describe the types of manufacturing organizations in which JOCASs are not applicable.

5.12 What is scrap?

5.13 How is scrap accounted for in a traditional JOCAS?

5.14 How is scrap accounted for in a world-class JOCAS?

5.15 What are reworked units?

5.16 How are reworked units accounted for if rework is considered a normal result of the overall production system?

5.17 How is rework accounted for when it is a unique result of special jobs?

5.18 What adjustment has to be made to the regular POR when allocating overhead costs to special rework unique to a particular job?

5.19 How is rework accounted for in a world-class JOCAS?

5.20 Distinguish between normal and abnormal spoilage.

5.21 Describe the accounting procedure for normal spoilage in a traditional JOCAS.

5.22 What is the traditional JOCAS accounting procedure for abnormal spoilage?

5.23 How are the traditional procedures for spoilage accounting changed in a worldclass JOCAS?

5.24 Describe how computers are used for cost estimating and cost management.

5.25 Explain the purpose of work item software and describe how it is used.

5.26 Explain why construction companies often add direct equipment as a fourth cost element. Do you recommend that highly automated manufacturers do the same? Explain why or why not.

5.27 Explain how service organizations can also use work item software.

5.28 Explain how work item software aids management in monitoring and controlling

jobs.

5.29 List and briefly describe the necessary features of a JOCAS software system.

5.30 List and briefly describe the three main elements applicable to estimating construction costs.

5.31 Explain why cost estimating is the lifeblood of the construction industry.

5.32 Explain the purpose of a preliminary cost estimate.

5.33 Explain why it is helpful in cost estimating to reduce the project to its basic parameters.

5.34 Explain how costs of previous projects are adjusted so that they can be used in cost estimating.

5.35 What is the purpose of a detailed cost estimate? Distinguish a detailed cost estimate from a preliminary cost estimate.

5.36 List and briefly describe the steps for preparing a detailed cost estimate.

5.37 Briefly describe the two methods used to organize work items for preparing the cost estimate and computing a bid price.

CHAPTER-SPECIFIC PROBLEMS

These problems require responses based directly on concepts and techniques presented in the text.

5.38 *Making the appropriate journal entry.* Freeflow Company manufactures pipe and uses a normal JOCAS. During May, the following jobs were started (no other jobs were in process), and the following costs were incurred:

	Job X	Job Y	Job Z	Totals
Materials requisitioned	$10,000	$20,000	$15,000	$45,000
Direct labor	5,000	4,000	2,500	11,500
	$15,000	$24,000	$17,500	$56,500

In addition, estimated overhead of $600,000 and direct labor costs of $150,000 were budgeted for the year. Overhead is applied on the basis of direct labor cost.

Required: Make the appropriate journal entries to record the initiation of all jobs. [CIA adapted]

5.39 *Normal JOCAS journal entries.* Using the information from the previous problem, and the additional information below, make the remaining journal entries for Freeflow's normal JOCAS.

• Raw materials purchases were $45,000 and requisitions were $50,000.
• There was a $20,000 factory payroll for May, with the following withholding rates: federal income taxes 10%, state income taxes 5%, Social Security taxes 7.5%, pension plan 2%, health insurance 1.5%.
• Freeflow's payroll tax burden and fringe benefits rates are as follows: federal unemployment tax rate = 0.8% and the state's = 5.4%; fringe benefits include vacation pay (2 weeks when 50 weeks are worked in a year), Freeflow's contribution into a pension plan of 5.0%, and to their health insurance plan of 3.3%.
• Overhead costs include $4,000 in an accrual of utilities owed and factory equipment depreciation of $20,000. At the end of April, there was a $3,000 under-applied overhead account balance.
• Jobs X and Y were started in April, incurring direct materials costs of $20,000 and $5,000 respectively that month. They also incurred direct labor costs in April of $6,000 and $4,000 respectively. Jobs X and

Z were completed in May. Job X was sold. Both FGI and COGS contain subsidiary accounts for jobs.

5.40 *Job cost reports.* Using the information from the preceding problem, manually prepare a May WIP inventory and job cost report for Freeflow Company. Use the format in Exhibit 5-9.

5.41 *Calculating direct materials costs charged to a job.* For the month of April, the following debits (credits) appeared in the general ledger WIP inventory control account:

APRIL

1	Balance	$ 24,000
30	Direct materials	80,000
30	Direct labor	60,000
30	Factory overhead	54,000
30	To finished goods	<200,000>

The JOCAS applies overhead to production using a POR of 90% of direct labor cost. Job 100, the only job still in process at the end of April, has been charged with factory overhead of $4,500.

Required: Calculate the amount of direct materials charged to job 100. [AICPA adapted]

5.42 *Journal entries in a normal JOCAS.* The following information for Abram's Jeans, Inc., a manufacturer based in San Jose, California, has been obtained from the various databases in its ICBIS JOCAS during the month of August:

1. Raw materials purchases made on account are $50,000.
2. There is a $100,000 factory payroll for the year, with the following withholding rates: federal income taxes 15%, state income taxes 3%, Social Security taxes 7.5%, pension plan 1%, health insurance 1.5%.
3. Abram's payroll tax burden and fringe benefits rates are as follows: federal unemployment tax rate = 0.6% and the state's = 4.7%; fringe benefits include vacation pay (3 weeks when 49 weeks are worked in a year), Abram's contribution to a pension plan of 2.0%, and its contribution to the health insurance plan of 3.0%. Round all amounts to whole dollars.
4. Other actual overhead costs, paid on account, are $36,000. Factory equipment depreciation equals $70,000.
5. Raw materials requisitioned equal $80,000. Direct materials for job 14 are $50,000; and for job 26, $25,000.
6. Job 14 incurred $40,000 of direct labor costs, while job 26 incurred $20,000.
7. Overhead is allocated using a POR of $100 per machine hour. Job 14 used 1,000 Mhr in August, while job 26 used 750 Mhr. The beginning overhead account balance = $4,000 (underapplied).
8. Job 26 was completed and sold during August. It had a beginning balance in its job cost sheet of $5,000 in direct materials, $10,000 in direct labor, and 200 Mhr.

Required: Prepare all the journal entries to record August activity.

5.43 *Job cost reports.* Using the information from the preceding problem, manually prepare an August WIP inventory and job cost report for Abram's Jeans. Use the format in Exhibit 5-9.

5.44 *Calculating cost of goods manufactured and overhead.* [AICPA adapted] The Hamilton Company uses a JOCAS. Factory overhead is applied to production at a predetermined rate of 150% of direct labor cost. Any over- or underapplied factory overhead is

closed to the cost of goods sold account at the end of each month. Additional information is available as follows:

Job 101 was the only job in process at January 31, with accumulated costs as follows:

Direct materials	$4,000
Direct labor	2,000
Applied factory overhead	3,000
	$9,000

Jobs 102, 103, and 104 were started during February. Direct materials requisitions for February totaled $26,000. Direct labor cost of $20,000 was incurred for February. Actual factory overhead for February was $32,000.

The only job still in process on February 28 was job 104, with costs of $2,800 for direct materials and $1,800 for direct labor.

Required:

a. What was the cost of goods manufactured for February?
b. What was the amount of over- or underapplied overhead closed to the cost of goods sold account at Feb. 28?

5.45 Calculating the total manufacturing costs of a job. [AICPA adapted] Tillman Corporation uses a JOCAS and has two production departments, M and A. Budgeted manufacturing costs for the year are as follows:

	M	A
Direct materials	$700,000	$100,000
Direct labor	200,000	800,000
Manufacturing overhead	600,000	400,000

The actual direct materials and direct labor costs charged to job 432 during the year were as follows:

Direct materials		$25,000
Direct labor: Department M	$ 8,000	
Department A	12,000	20,000

Tillman applies overhead to production orders on the basis of direct labor cost, using separate departmental PORs determined at the beginning of the year based on the annual budget. Thus, there are two overhead application journal entries.

Required: Calculate the total production costs associated with job 432.

5.46 Journal entries *for spoilage.* The D. Hayes Cramer Company manufactures product C, which has costs per unit of $1 for materials, $2 for labor, and $3 for overhead. During the month of May, 1,000 units of product C were spoiled. These units could be sold for scrap at $.60 each. The 1,000 units all came from job 1236.

The accountant said that any one of the following entries could be made for these 1,000 lost or spoiled units:

Required:

1. Spoiled goods	$600	
WIP-Materials		$100
WIP-Labor		$200
WIP-Overhead		$300
2. Spoiled goods	$ 600	
Manufacturing expenses	$5,400	
WIP-Materials		$1,000
WIP-Labor		$2,000
WIP-Overhead		$3,000
3. Spoiled goods	$ 600	
Loss on spoiled goods	$5,400	
WIP-Materials		$1,000
WIP-Labor		$2,000
WIP-Overhead		$3,000
4. Spoiled goods	$ 600	
Receivable	$5,400	
WIP-Materials		$1,000
WIP-Labor		$2,000
WIP-Overhead		$3,000

a. Indicate the circumstances under which each of these four solutions would be appropriate.

b. Discuss any problems you see in the account titles used. Recommend correct account titles.

c. Recommend the appropriate journal entries if a world-class JOCAS were used.
   [AICPA adapted]

5.47 Estimating cost of equipment. The ideal output of a backhoe is 180 cubic yards per hour. On a particular job, the average volume of a 1-cubic yard bucket is .8 cubic yards, with the bucket actually operating only 45 minutes per hour. The total cost of the backhoe, including the operator, is $100 per hour. The job calls for the excavation of 10,800 cubic yards.

Required: Calculate the number of hours and the total cost to do the job.

5.48 Estimating labor costs. An ironworker works 10 hours per day, 6 days per week. A base wage of $15.80 per hour is paid for all straight-time work, 8 hours per day, 5 days per week. An overtime rate of time and one-half is paid for all hours over 8 hours per day, Monday through Friday, and double time is paid for all Saturday work. The Social Security tax is 7.51%, and the unemployment tax is 3% of actual wages. The rate for worker's compensation insurance is $5.50 per $100.00 of base wages, and the public liability and property damage insurance rate is $3.25 per $100.00 of base wages. Fringe benefits are $1.27 per hour.

Required:

a. Calculate the average hourly cost to hire an ironworker.

b. If there are five ironworkers in a crew and the crew can place 6,500 pounds of reinforcing steel per day, calculate the labor cost per pound.

5.49 Estimating the cost of excavating a trench. A proposed job calls for excavating a trench 3 feet wide, 6 feet deep, and 2,940 feet long in ordinary earth. A ladder-type trenching machine will be used, and there will be no obstructions to retard the progress of the trenching machine.

The average speed of the trenching machine is 40 feet per hour. The cost to transport the trenching machine to and from the job is $1,260.00. The trenching machine costs $86.25 per hour. The following additional resources will be required to perform the job:

Utility truck @ $12.50 per hour Machine operator @ $16.50 per hour Truck driver @ $5.10 per hour. Two laborers @ $6.90 per hour each Foreman @ $17.30 per hour

Required: Estimate the total cost and the cost per linear foot for excavating the trench.

5.50 Estimating the cost of handling bricks. Upon arrival at the job, 60,480 bricks are to be unloaded. This stockpile of bricks will be loaded on a tractor that transports the bricks around the perimeter of the structure where the bricks will be laid. The tractor can transport 1,600 bricks per hour. At the perimeter, laborers, using brick tongs, can carry an average of 8 bricks per load to the brick masons for laying. The average time for a trip is 45 seconds. The costs are as follows:

Tractor $19.00 per hour
Operator $9.50 per hour
Laborers $7.50 per hour

 Required: Calculate the cost per brick for handling 60,480 bricks.

5.51 omitted

5.52 omitted

THINK-TANK PROBLEMS

Although these problems are based on chapter material, reading extra material, reviewing previous chapters, and using creativity may be required to develop workable solutions.

5.53 Calculation of dollar balances and application of overhead. [CMA adapted] Constructo, Inc., is a manufacturer of furnishings for infants and children. The company uses a normal job order costing system. Constructo's WIP inventory at April 30, 20x4, consisted of the following jobs:

Job Number	Items	Units	Accumulated Cost
CBS102	Cribs	20,000	$ 900,000
PLP086	Playpens	15,000	420,000
DRS 114	Dressers	25,000	250,000
			$1,570,000

The company's finished goods inventory, using the FIFO method, consisted of five items:

Item	Quantity And Unit Cost		Accumulated Cost
Cribs	7,500 units @	$64 each	$ 480,000
Strollers	13,000 units @	$23 each	299,000
Carriages	11,200 units @	$102 each	1,142,400
Dressers	21,000 units @	$55 each	1,155,000
Playpens	19,400 units @	$35 each	679,000
			$3,755,400

Constructo applies factory overhead on the basis of direct labor hours. The company's factory overhead budget for the fiscal year ending May 31, 20x4, totals $4,500,000, and the company plans to expend 600,000 direct labor hours during this period. Through the first 11 months of the year, a total of 555,000 direct labor hours were worked, and total factory overhead amounted to $4,273,500.

At the end of April, the balance in Constructo's RMI account, which includes both raw materials and purchased parts, was $668,000. Additions to and requisitions from RMI during the month of May included the following:

	Raw Materials	Purchased parts
Additions	$242,000	$396,000
Requisitions:Job CBS 102	51,000	104,000
Job PLP086	3,000	10,800
Job DRS 114	124,000	87,000
Job STR077 (10,000 strollers)	62,000	81,000
Job CRG098 (5,000 carriages)	65,000	187,000

During the month of May, Constructo's factory payroll consisted of the following:

ACCOUNT	Hours	Cost
CBS102	12,000	$122,400
PLP086	4,400	43,200
DRS 114	19,500	200,500
STR077	3,500	30,000
CRG098	14,000	138,000
Indirect	3,000	29,400
Supervision		57,600
		$621,100

The following are the jobs that were completed and the unit sales for the month of May:

Job Number	Items	Quantity Complete
CBS102	Cribs	20,000
PLP086	Playpens	15,000
STR077	Strollers	10,000
CRG098	Carriages	5,000

Items	Quantity Shipped
Cribs	17,500
Playpens	21,000
Strollers	14,000
Dressers	18,000
Carriages	6,000

Required:

a. Describe when it is appropriate for a company to use a job order cost system.

b. Calculate the dollar balance in Constructo's WIP inventory account as of May 31, 20x4.

c. Calculate the dollar amount related to the playpens in Constructo's FGI as of May 31, 20x4.

d. Explain the proper accounting treatment for over- or underapplied overhead balances when using a job order cost system.

5.54 *Application of overhead and cost of goods manufactured.* [CMA adapted] Valpor Company employs a normal JOCAS. Manufacturing overhead is applied on the basis of machine hours using estimated manufacturing overhead costs of $1,200,000 and an estimated activity level of 80,000 Mhr. Valport's policy is to close the over/under application of manufacturing overhead to cost of goods sold.

Operations for the year ended November 30, 20x5, have been completed, and all of the accounting entries have been made for the year except the application of manufacturing overhead to the jobs worked on during November, the transfer of costs from WIP to finished goods for the jobs completed in November, and the transfer of costs from finished goods to cost of goods sold for the jobs sold during November. Jobs N11-007, N11-013, and N11-015 were completed during November 20x5. All completed jobs except job N11-013 had been turned over to customers by the close of business on November 30, 20x5.

Summarized data that have been accumulated from the accounting records as of October 31, 20x5, and for November 20x5, are as follows:

	Work-in-process	November 20x5 Activity		
Job Number	Balance 10/31/x5	Direct Materials	Direct labor	Machine Hours
NII-007	$ 87,000	$ 1,500	$ 4,500	300
N11-013	55,000	4,000	12,000	1,000
N1l-015	-0-	25,600	26,700	1,400
D12-002	-0-	37,900	20,000	2,500
D12-003	-0-	26,000	16,800	800
Totals	$142,000	$95,000	$80,000	6,000

Operating Activity	Activity through 10/31/x5	November 20x5 Activity
Manufacturing overhead incurred		
Indirect materials	$ 125,000	$ 9,000
Indirect labor	345,000	30,000
Utilities	245,000	22,000
Depreciation	385,000	35,000
Total incurred overhead	$1,100,000	$96,000
Other items		
Material purchases*	$965,000	$98,000
Direct labor costs	$845,000	$80,000
Machine hours	73,000	6,000

Required:

Account Balances At Beginning Of Fiscal Year	12/01/x4
Materials inventory*	$105,000
Work-in-process inventory	60,000
Finished goods inventory	125,000

* Material purchases and materials inventory consist of both direct and indirect materials. The balance of the materials inventory account as of November 30, 20x5, is $85,000.

a. Valport Company uses a predetermined overhead rate to apply manufacturing overhead to its jobs. When overhead is accounted for in this manner, there may be over- or underapplied overhead.

1. Explain why a business uses a predetermined overhead rate to apply manufacturing overhead to its jobs.
2. How much manufacturing overhead would Valport have applied to jobs through October 31, 20x5?
3. How much manufacturing overhead would Valport apply to jobs during November 20x5?
4. Determine the amount by which the manufacturing overhead is over- or underapplied as of November 30, 20x5. Be sure to indicate whether the overhead is over- or underapplied.
5. Over- or underapplied overhead must be eliminated at the end of the accounting period. Explain why Valport's method of closing over- or under- applied overhead to the cost of goods sold is acceptable in this case.

b. Determine the balance in Valport Company's finished goods inventory at November 30, 20x5.

c. Prepare a Schedule of Cost of Goods Manufactured for Valport Company for the year ended November 30, 20x5.

5.55 Calculating and applying overhead in a JOCAS. [CMA adapted] Baehr Company's fiscal year runs from July 1 to June 30. The company uses a normal job order costing system for its production costs. A predetermined overhead rate based upon direct labor hours is used to apply overhead to individual jobs. A flexible budget of overhead costs was prepared for the fiscal year as follows:

	Direct Labor Hours		
	100,000	120,000	140,000
Variable overhead costs	$325,000	$390,000	$455,000
Fixed overhead costs	216,000	216,000	216,000
Total overhead	$541,000	$606,000	$671,000

Although the annual ideal capacity is 150,000 direct labor hours, company officials have determined 120,000 direct labor hours to be normal capacity for the year.

The following information is for November. Job 87-50 was completed and sold during November. During October, job 87-50 incurred $20,850 in direct materials and 3,000 direct labor hours.

Required:

a. What is the predetermined overhead rate to use in applying overhead to specific jobs during the fiscal year?
b. Prepare all possible journal entries for the JOCAS.

Inventories, November 1:Raw materials and supplies	$ 10,500
WIP (job 87-50)	54,000
Finished goods	112,500
Purchases of raw materials and supplies: Raw materials	$135,000
Supplies	15,000
	$150,000
Materials and supplies requisitioned for production: Job 87-50	$ 45,000
Job 87-51	37,500
Job 87-52	25,500
Supplies	12,000
	$120,000
Factory direct labor hours: Job 87-50	3,500
Job 87-51	3,000
Job 87-52	2,000
	8,500
Labor costs: Direct labor wages	$ 51,000
Indirect labor wages (4,000 hours)	15,000
Supervisory salaries	6,000
	$ 72,000
Building occupancy costs (heat, light, depreciation, etc.):Factory facilities	$ 6,500
Sales offices	1,500
Administrative offices	1,000
	$ 9,000
Factory equipment costs: Power	$ 4,000
Repairs and maintenance	1,500
Depreciation	1,500
Other	1,000
	$ 8,000

c. Manually prepare a WIP inventory and job cost report for November using the format in Exhibit 5-9.

d. Without prejudice to your answer to Requirement (a), assume the POR is $4.50 per direct labor hour.

1. What is the total cost of job 87-50?

2. What was the applied overhead cost to job 87-52 during November?

3. What were the total amounts of overhead costs applied to jobs during November?

4. What were the actual overhead costs incurred during November?

5.56 Analyzing cost flows and inventories with a JOCAS. [CMA adapted] Targon Inc., manufactures lawn equipment. A job order costing system is used because the products are produced in batches rather than on a continuous basis. The balances in selected general ledger accounts for the 11-month period ended November 30, 20x5, were as follows:

Materials inventory	$ 32,000
WIP inventory	1,200,000
Finished goods inventory	2,785,000
Overhead control	2,260,000
Cost of goods sold	14,200,000

The following additional information is also available:

1. The Wip Inventory At November 30 Consisted Of Two Jobs:

Job Number	Units	Items	Total Cost November 30
105	50,000	Estate sprinklers	$ 700,000
106	40,000	Economy sprinklers	500,000
			$1,200,000

2. The finished goods inventory at November 30 consisted of five separate items in stock:

Items	Quantity And Unit Cost		Total Cost
Estate sprinklers	5,000 units @	$22 each	$ 110,000
Deluxe sprinklers	115,000 units @	$17 each	1,955,000
Brass nozzles	10,000 gross @	$14 per gross	140,000
Rainmaker nozzles	5,000 gross @	$16 per gross	80,000
Connectors	100,000 gross @	$5 per gross	500,000
			$2,785,000

3. Manufacturing overhead cost is applied to jobs on a basis of direct labor hours. For 20x5, management estimated that the company would work 400,000 direct labor hours and incur $2,400,000 in manufacturing overhead cost.

4. A total of 367,000 direct labor hours were worked during the first 11 months of the year (through November 30). Items (5) through (10) below summarize the activity that took place in the company during December 20x5.

5. A total of $708,000 in raw materials was purchased during the month.

6. Raw materials were drawn from inventory and charged as follows:

Job Number	Quantity And Items	Material charged
105	See above	$210,000
106	See above	6,000
201	30,000 gross rainmaker nozzles	181,000
202	10,000 deluxe sprinklers	92,000
203	50,000 ring sprinklers	163,000
-	Indirect materials	20,000
		$672,000

7. The payroll during December was as follows:

Job Number	Hours	Total Cost
105	6,000	$ 62,000
106	2,500	26,000
201	18,000	182,000
202	500	5,000
203	5,000	52,000
Indirect labor	8,000	84,000
Sales and administration	-	120,000
		$531,000

8. Other costs incurred in the factory during December were:

9. Jobs completed during December and the number of good units transferred to the finished goods warehouse were as follows:

COST AND MANAGEMENT ACCOUNTING

Depreciation	$62,500	
Utilities	15,000	
Insurance	1,000	
Property taxes	3,500	
Maintenance	5,000	
	$87,000	

Job Number	Quantity	Items
105	50,000 units	Estate sprinklers
106	40,000 units	Economy sprinklers
201	30,000 gross	Rainmaker nozzles
203	50,000 units	Ring sprinklers

10. Finished products were shipped to customers during December as follows:

Items	Quantity
Estate sprinklers	16,000 units
Deluxe sprinklers	32,000 units
Economy sprinklers	20,000 units
Ring sprinklers	22,000 units
Brass nozzles	5,000 gross
Rainmaker nozzles	10,000 gross
Connectors	26,000 gross

Required:

a. Determine the amount of under- or overapplied overhead for the year 20x5.

b. What is the appropriate accounting treatment for this under- or overapplied overhead balance? Explain your answer.

c. Determine the dollar balance in the WIP inventory account as of December 31, 20x5. Show all computations in good form.

d. For the estate sprinklers only, determine the dollar balance in the finished goods inventory account as of December 31, 20x5. Assume a FIFO flow of units. Show all computations in good form.

5.57 Accounting for scrap, rework, and spoilage. Recommend a new scrap, rework, and spoilage policy for Waste Management's JOCAS in Demonstration Problem 2. Discuss how the raw data will be obtained to administer the new method. Using the information from April, prepare all journal entries required by your new plan. Consider job 28. Is it wrong to use the lower POR on all rework if some of it must have been normal? How about rework? Should the POR include any allowances for scrap, rework, or spoilage?

5.58 Design considerations *for a world-class JOCAS.* Consider the characteristics of quality information and WCMs discussed in the first two chapters. What implications do these characteristics have for the design of a JOCAS?

5.59 Spreadsheet programs for JOCASs. Create a spreadsheet program for JOCAS reporting using the format in Exhibit 5-9. Use the information from Demonstration Problem 1 to create a job order cost report for Topper, Inc. Job 31 incurred $150,000 in direct labor last year.

5.60 Spreadsheet programs for JOCASs. Using the spreadsheet program created in Problem 5.59, input the data for Freeflow's May transactions in Problems 5.38 and 5.39, and print a monthly report.

5.61 Spreadsheet programs for JOCASs. Using the spreadsheet program created in Problem 5.59, input the data for Abram's Jeans' August transactions in Problem 5.42 and print a monthly report.