# Process Costing

## Chapter 5

## JOB-ORDER COSTING

- Furniture manufacturing;
- Special-order printing;
- Ship-building
- Service organizations
- …

***Many different jobs/products worked on each period***

## PROCESS COSTING

- Bricks;
- Soda;
- Paper;
- Gas, water, electricity
- …

***Raw materials converted into homogeneous (i.e. uniform) products***

# Similarities Between Job-Order and Process Costing

- Both systems assign material, labor, and overhead costs to products and they provide a mechanism for computing unit product costs.
- Both systems use the same manufacturing accounts, including Manufacturing Overhead, Raw Materials, Work in Process, and Finished Goods.
- The flow of costs through the manufacturing accounts is basically the same in both systems.

# Differences Between Job-Order and Process Costing: Job-Order Costing Characteristics

Job-Order costing:

1. Many different jobs are worked on during each period, with each job having unique production requirements.
2. Costs are accumulated by individual job.
3. Unit costs are computed *by job* on the job cost sheet.

# Differences Between Job-Order and Process Costing: Process Costing Characteristics

Process costing:

1. A single product is produced either on a continuous basis or for long periods of time. All units of product are identical.
2. Costs are accumulated by department.
3. Unit costs are computed *by department*.

# Concept Check 1

Process costing is used for products that are:

a. Different and produced continuously.

b. Similar and produced continuously.

c. Individual units produced to customer specifications.

d. Purchased from vendors.

# Concept Check 1a

Process costing is used for products that are:

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b. Similar and produced continuously.

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d. Purchased from vendors.

# Processing Departments

Any unit in an organization where work is performed and materials, labor, or overhead are added to the product.

The activities performed in a processing department are *performed uniformly* on all units of production.

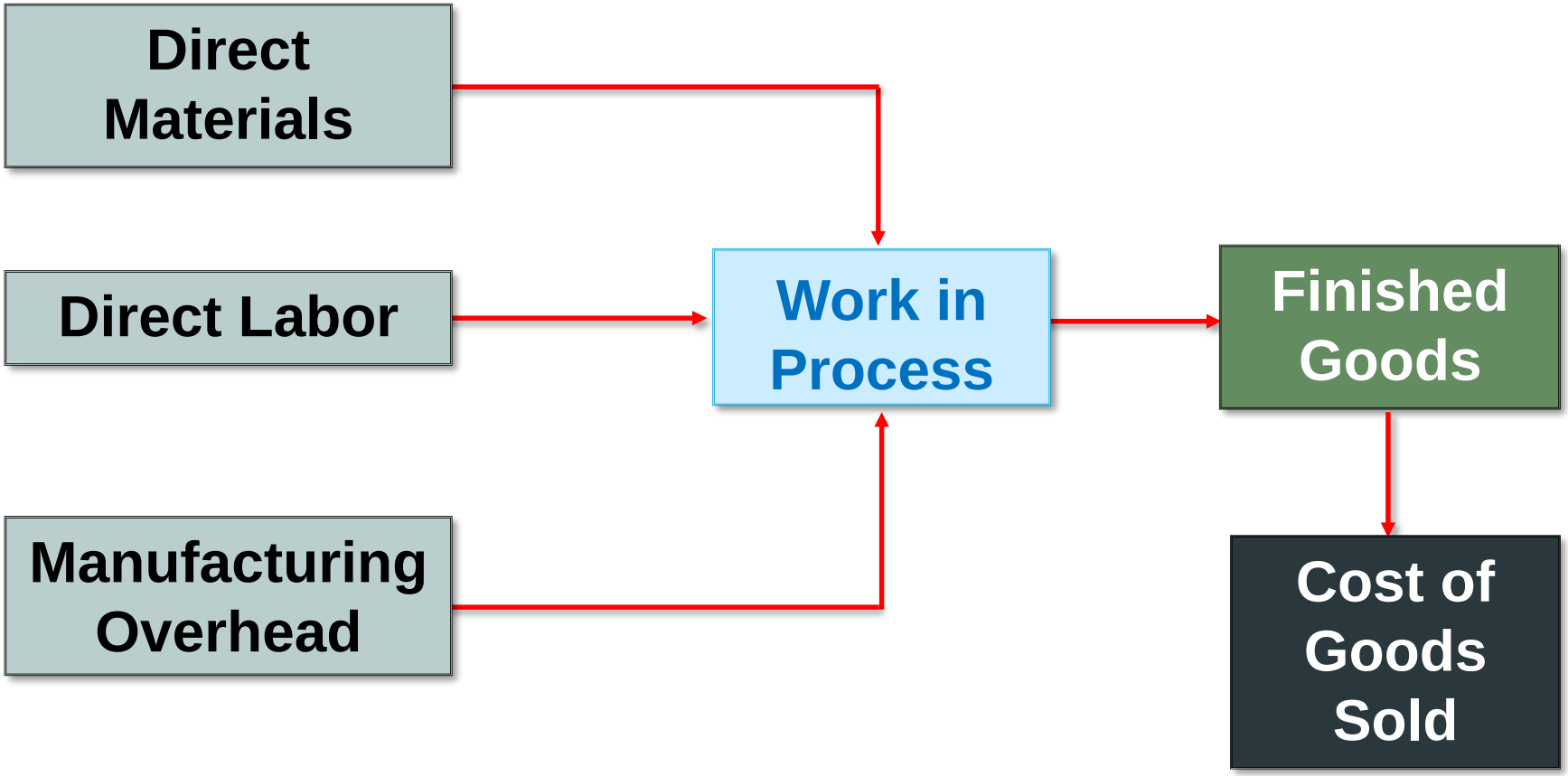
Furthermore, the output of a processing department must be *homogeneous*.

Products in a process costing environment typically *flow in a sequence* from one department to another.

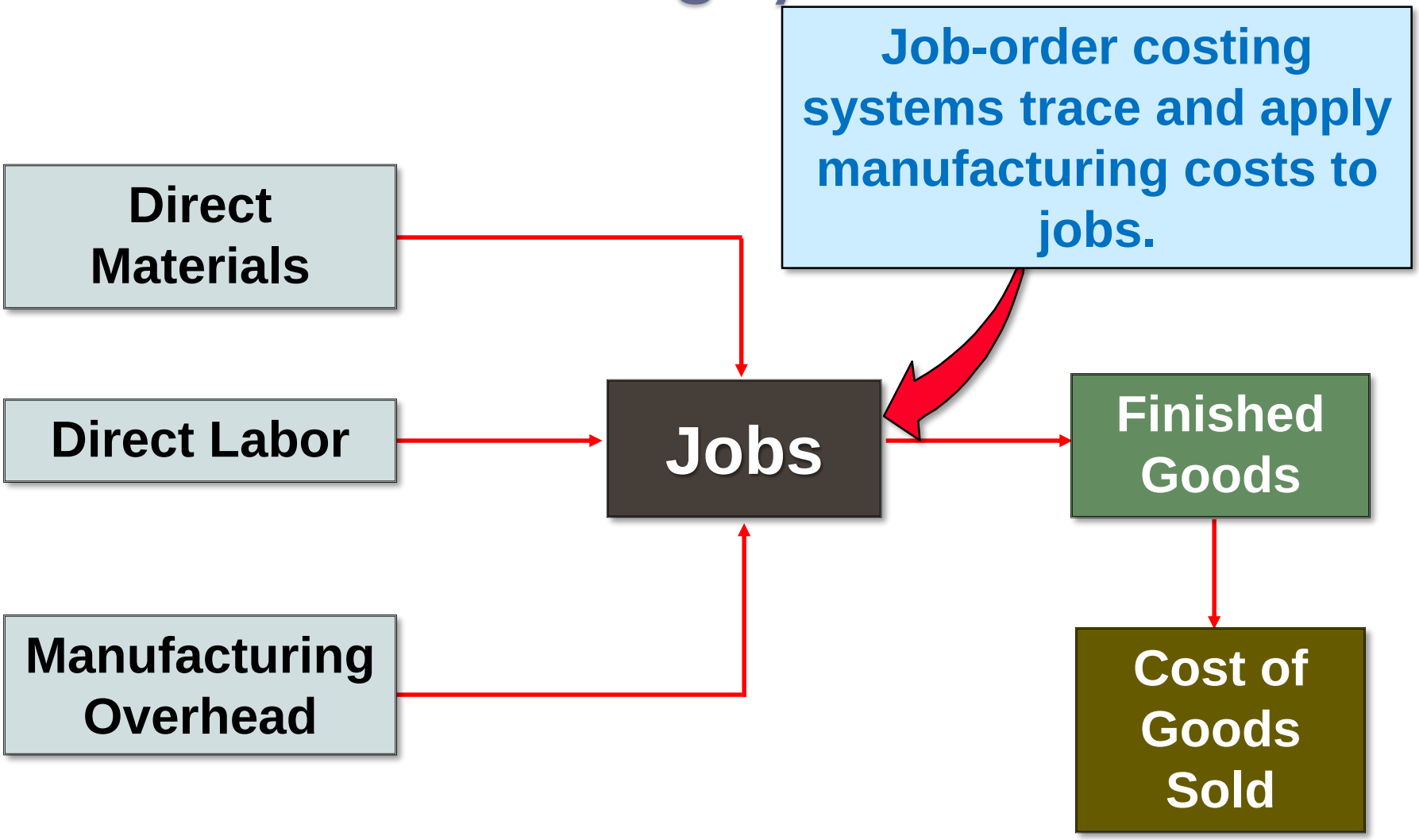
# Learning Objective 1

**Record the flow of materials, labor, and overhead through a process costing system.**

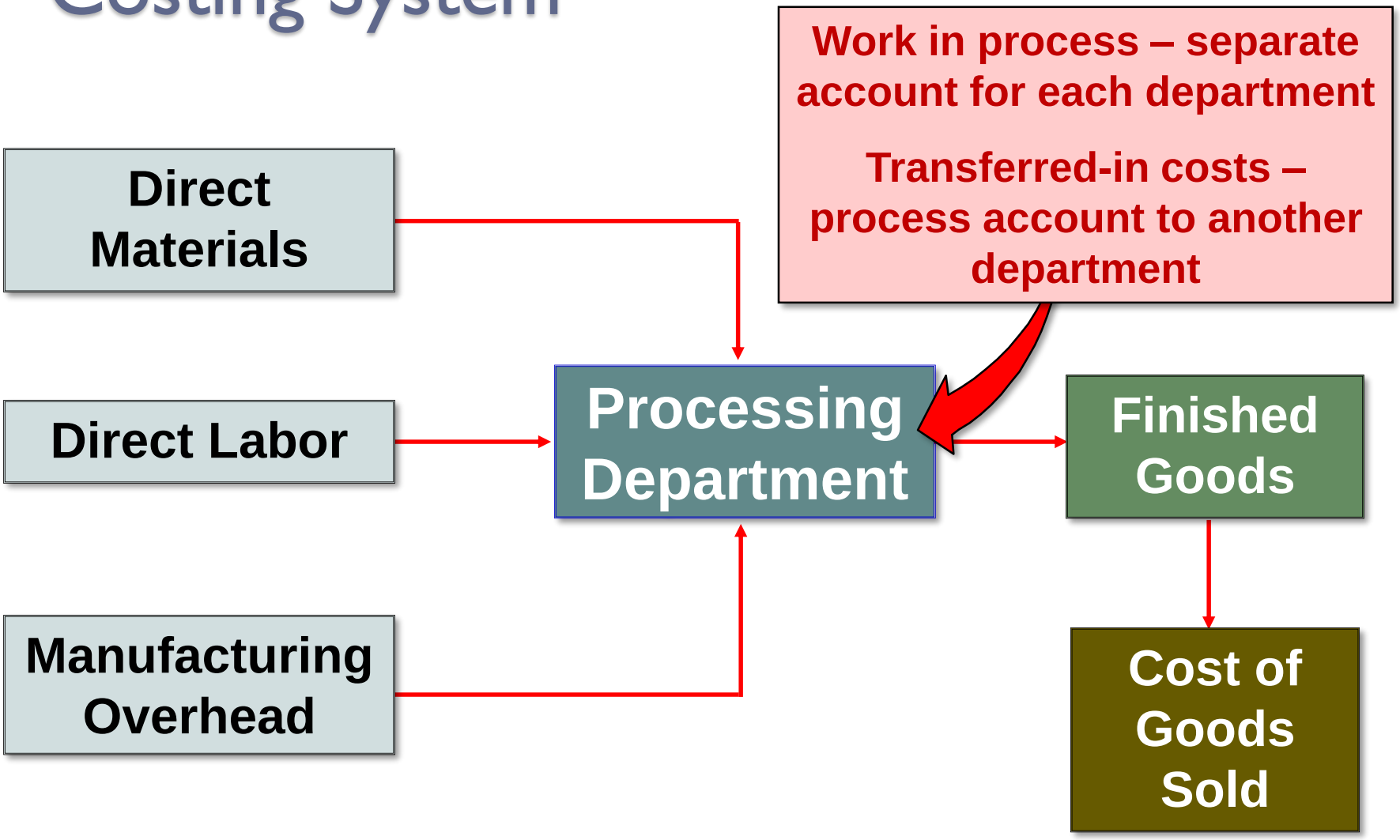
# The Flow of Costs in Job-Order and Process Costing - Similarities



# The Flow of Costs in a Job-Order Costing System



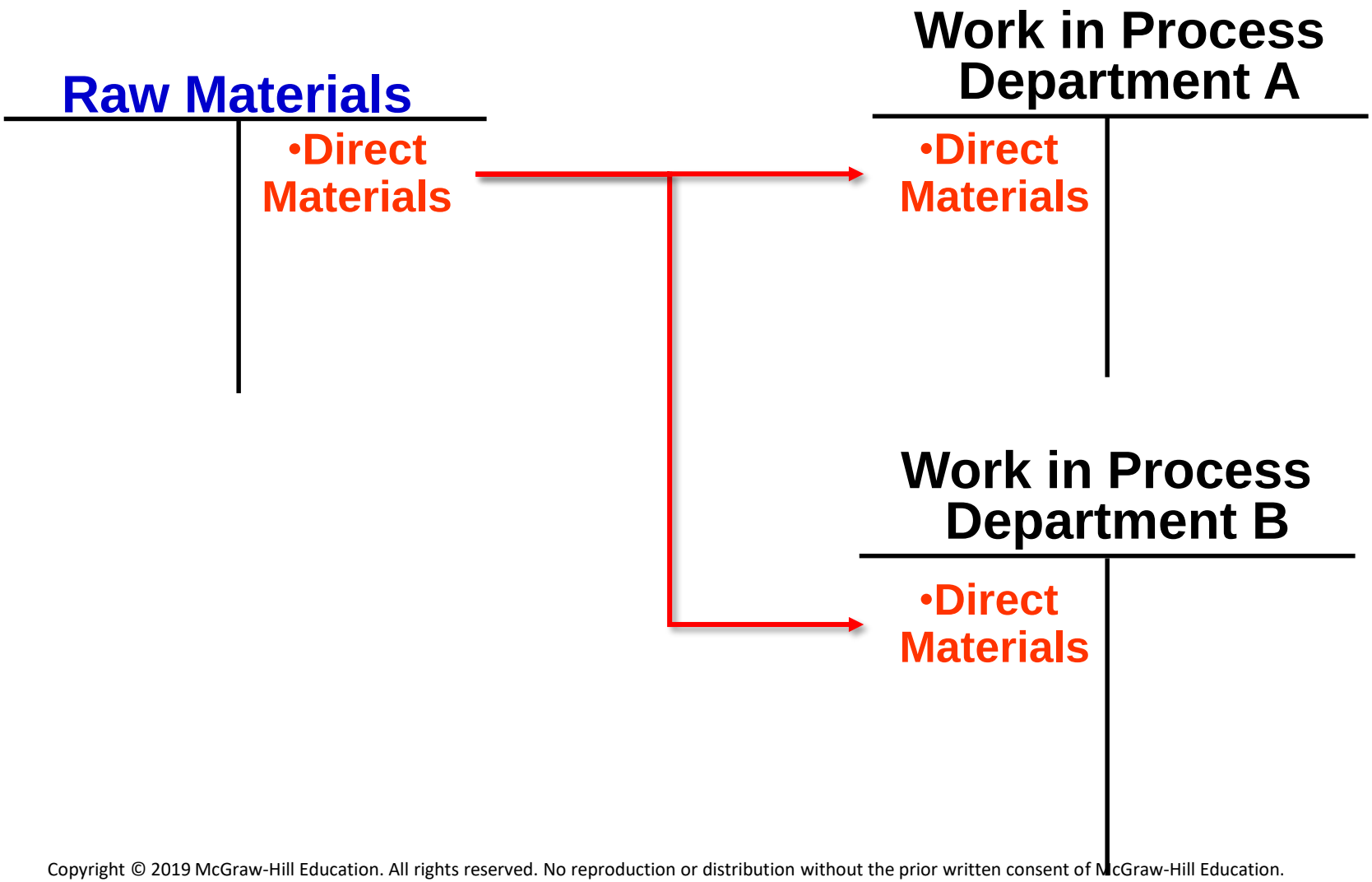
# The Flow of Costs in a Processing Costing System



# Flow of Raw Material Costs

For purposes of this example, assume there are two processing departments – Departments A and B.
We will use T-accounts and journal entries.

# Flow of Raw Material Costs: T-Account Form

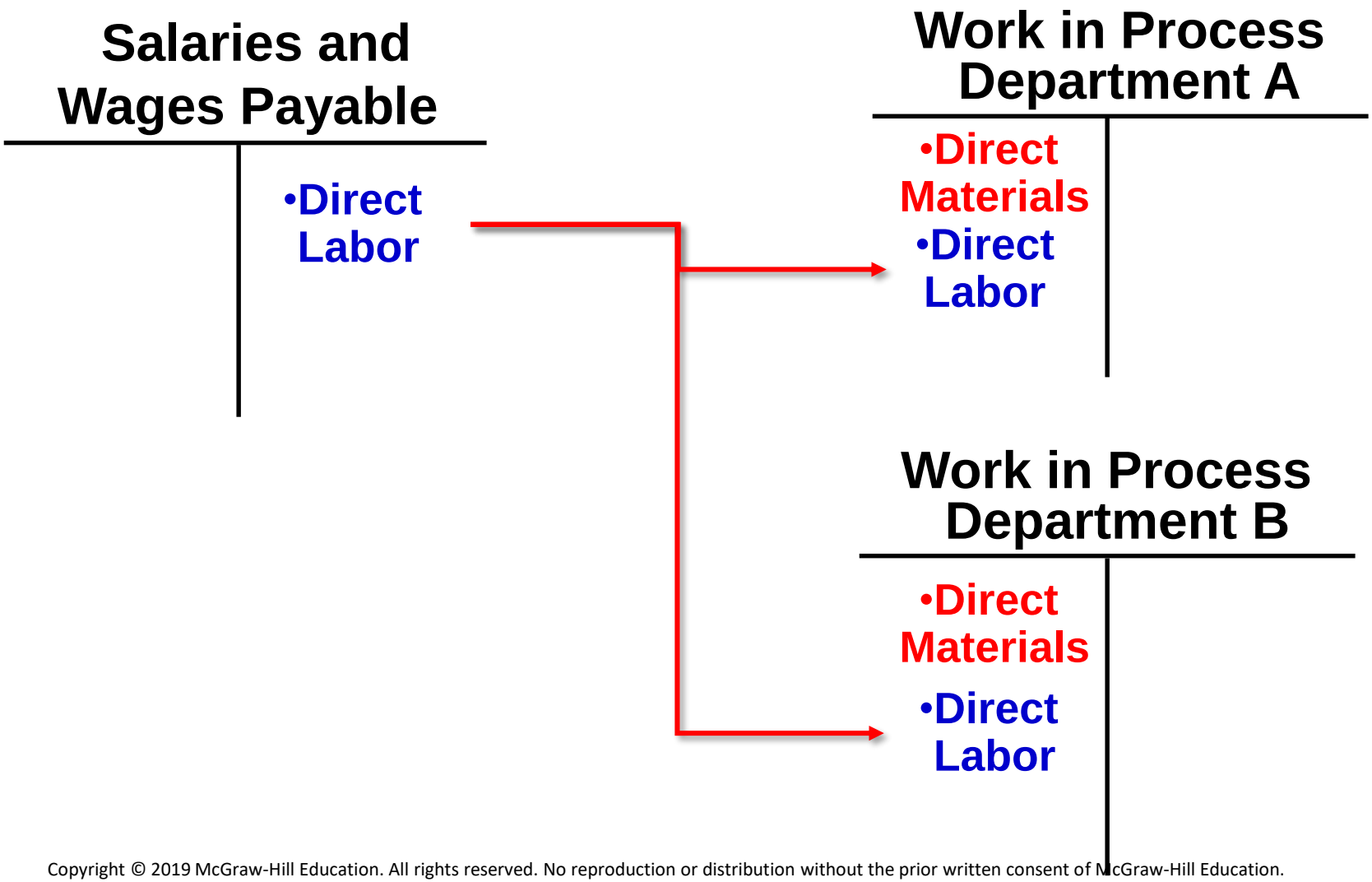


# Flow of Raw Material Costs: Journal Entry Form

As in job-order costing, materials are drawn from the storeroom using a materials requisition form. Materials can be added in any processing department. Here is the journal entry to issue raw materials to Processing Department A and Department B.

| | | |
|---|---|---|
| **Work in Process - Department A** | **XXXXX** | |
| **Work in Process - Department B** | **XXXXX** | |
| **Raw Materials** | | **XXXXX** |

# The Flow of Labor Costs: T-Account Form

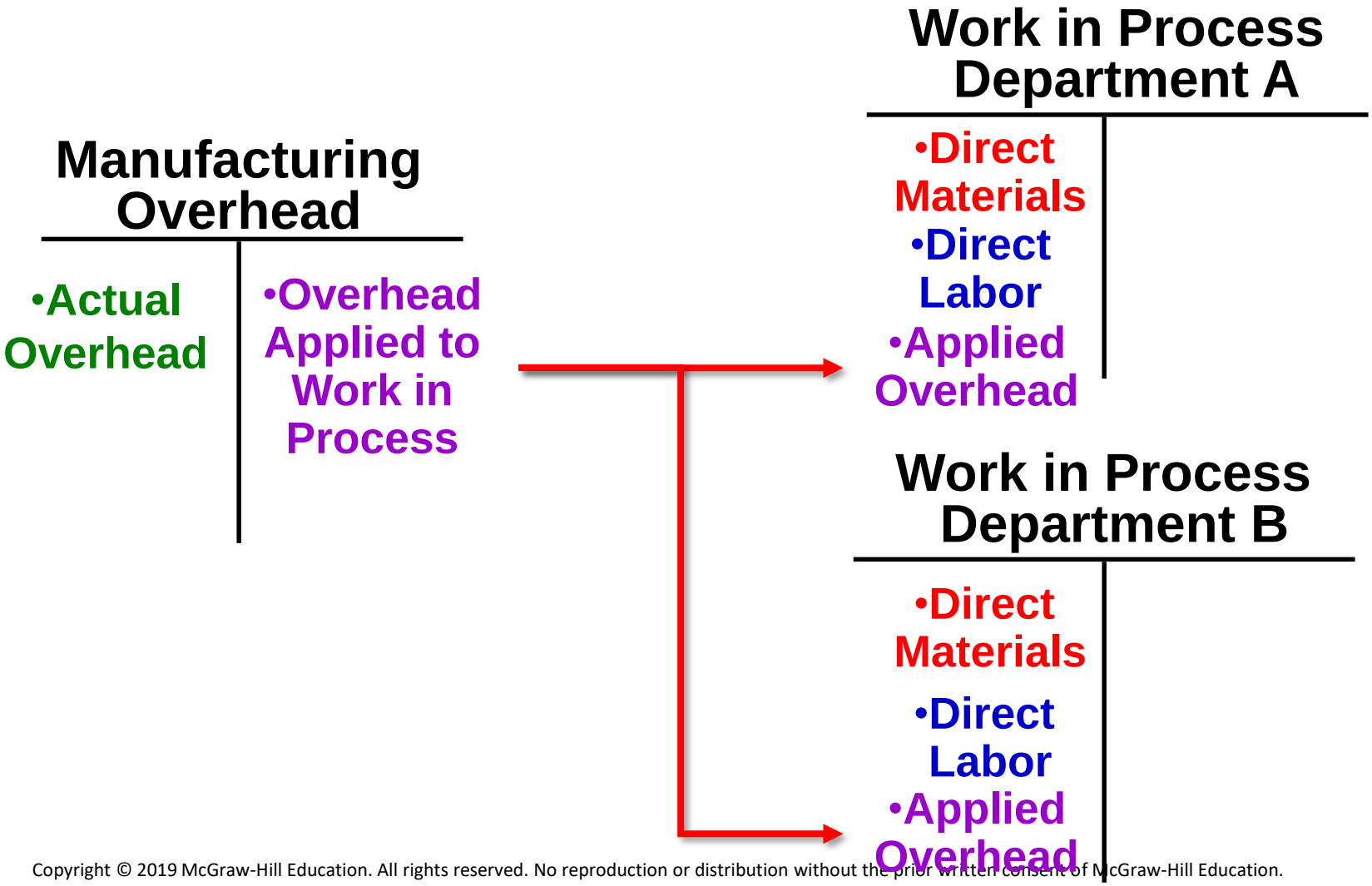


# The Flow of Labor Costs: Journal Entry Form

In process costing, labor costs are traced to departments – not to individual jobs. The following journal entry records the labor costs recorded to Department A and Department B.

| | | |
|---|---|---|
| **Work in Process - Department A** | **XXXXX** | |
| **Work in Process - Department B** | **XXXXX** | |
| **Salaries and Wages Payable** | | **XXXXX** |

# The Flow of Manufacturing Overhead Costs: in T-Account Form

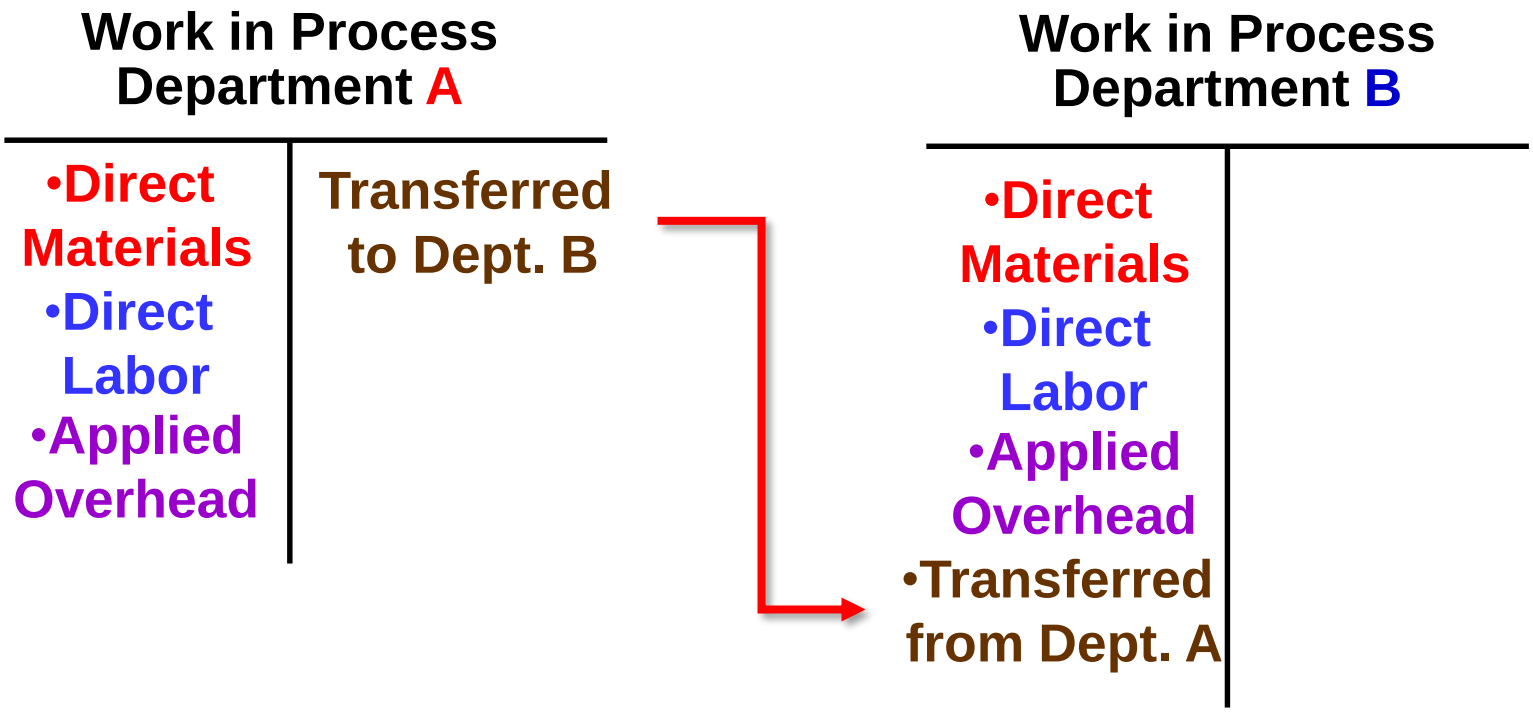


# The Flow of Manufacturing Overhead Costs: Journal Entry Form

In process costing, as in job-order costing, predetermined overhead rates are usually used. Manufacturing overhead cost is applied according to the amount of the allocation base that is incurred in the department. The following journal entry records the overhead cost applied to Department A and Department B.

| | | |
|---|---|---|
| Work in Process - Department A | XXXXX | |
| Work in Process - Department B | XXXXX | |
| Manufacturing Overhead | | XXXXX |

# Transfers from Work In Process – Dept. A to Work in Process – Dept. B: T-Account Form

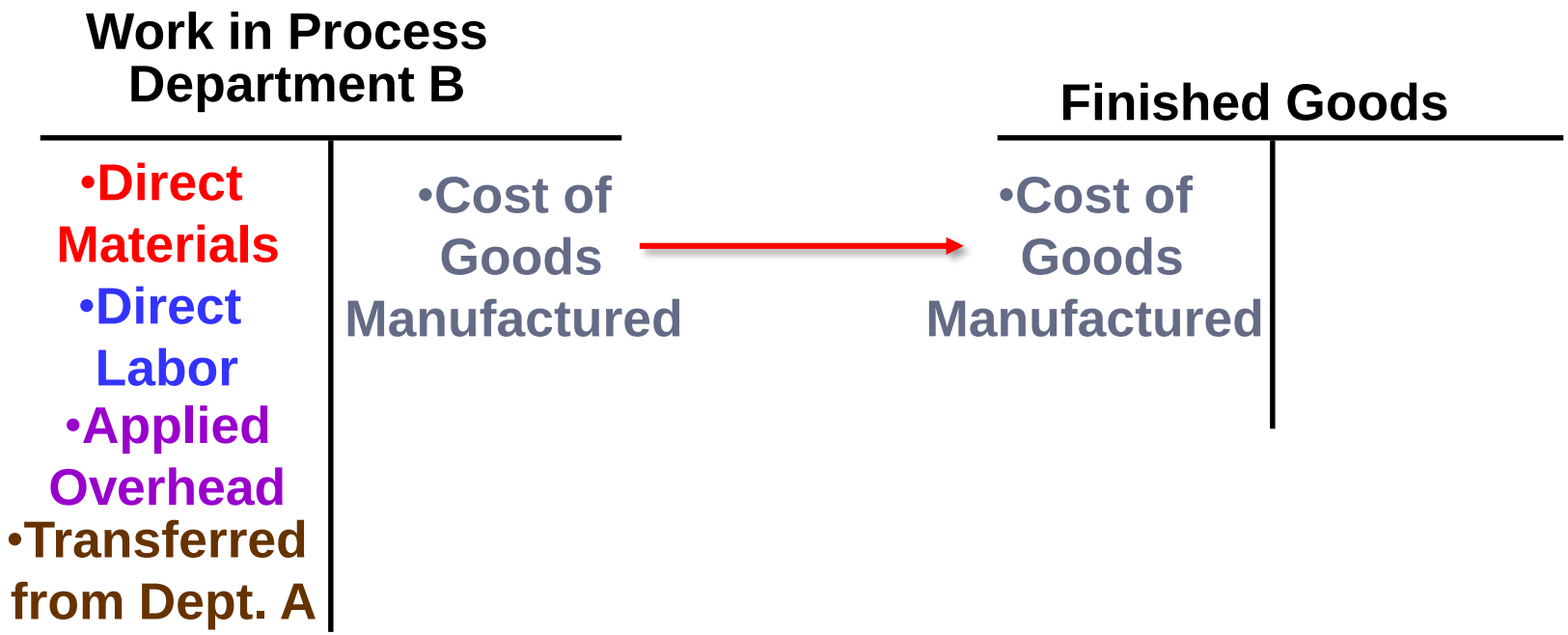


# Transfers from Work In Process – Dept. A to Work in Process – Dept. B: Journal Entry Form

Once processing has been completed in a department, the units are transferred to the next department for further processing.

| | | |
|---|---|---|
| Work in Process - Department B | XXXXX | |
| Work in Process - Department A | | XXXXX |
| | | |

# Transfers from Work In Process – Dept. B to Finished Goods: T-Account Form

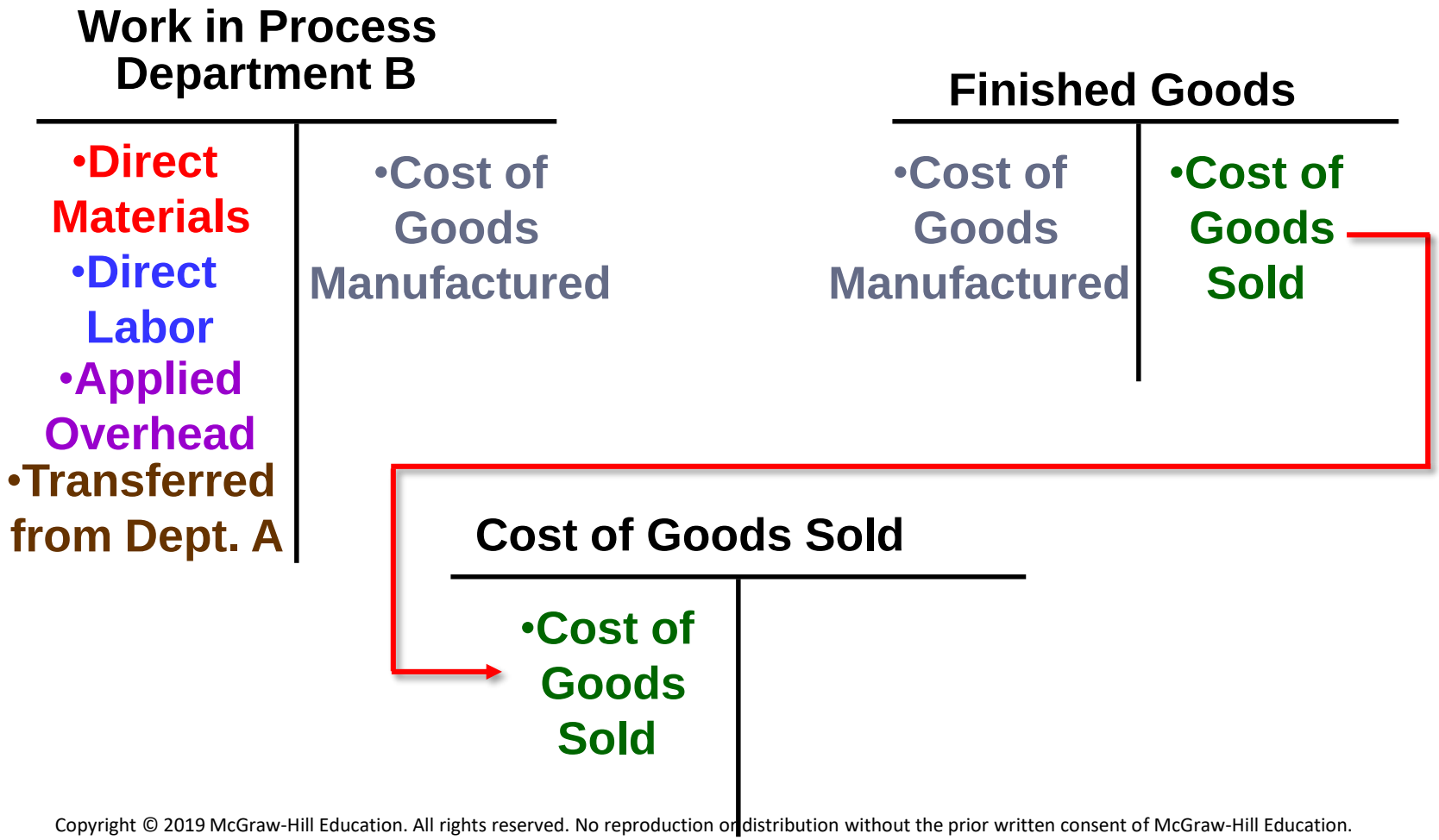


# Transfers from Work In Process – Dept. B to Finished Goods: Journal Entry Form

After processing has been finished in Department B, the costs of the completed units are transferred to the Finished Goods inventory account:

| | | |
|---|---|---|
| **Finished Goods** | **XXXXX** | |
| **Work in Process - Department B** | | **XXXXX** |
| | | |

# Transfers from Finished Goods Inventory to Cost of Goods Sold: T-Account Form



# Transfers from Finished Goods to Cost of Goods Sold: Journal Entry Form

Finally, when a customer's order is filled and units are sold, the cost of the units is transferred to Cost of Goods Sold:

| | | |
|---|---|---|
| Cost of Goods Sold | XXXXX | |
| Finished Goods | | XXXXX |
| | | |

# Process Costing Computations: Three Key Concepts – Overview

In process costing, each department needs to calculate **two numbers** for financial reporting purposes—the cost of its ending work in process inventory and the cost of its completed units that were transferred to the next stage of the production process. The key to deriving these two numbers is calculating *unit costs* within each department.

# Process Costing Computations: Three Key Concepts – Part 1

**Key Concept #1:** There are two methods for performing the computations of departmental unit costs: the *weighted-average method* and the *FIFO method*.

The **weighted-average method** of process costing calculates unit costs by combining costs and outputs from the current and prior periods.

The **FIFO method** of process costing, which will be covered in *Chapter 5 Supplement*, calculates unit costs based solely on the costs and outputs from the current period.

# Process Costing Computations: Three Key Concepts – Part 2

Characteristics of the weighted-average method:

a) This method makes no distinction between work done in the prior and current periods. It blends together units and costs from the prior and current periods.

b) The equivalent units of production for a department are the number of units transferred to the next department (or finished goods) plus the equivalent units in the department's ending work in process inventory.

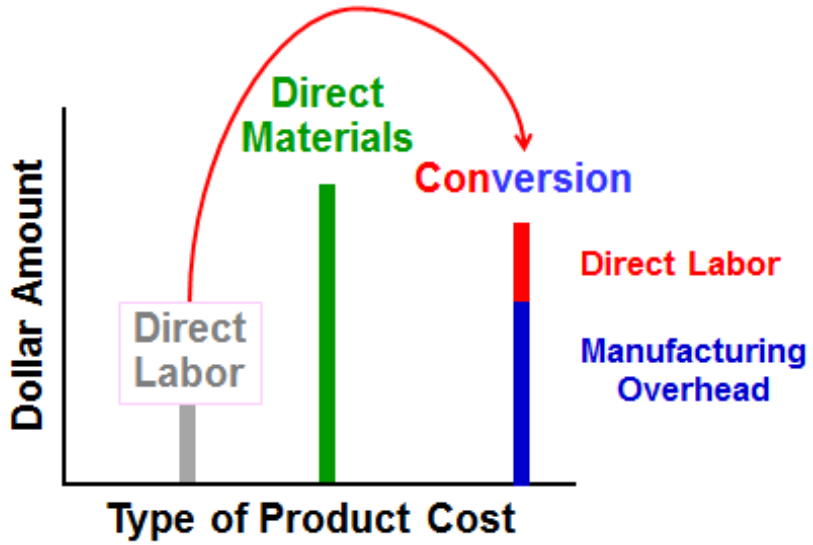
# Process Costing Computations: Three Key Concepts – Part 3

**Key Concept #2: Conversion Costs: direct labor plus manufacturing overhead.**

- Direct labor costs are often small in comparison to the other product costs in process cost systems.

# Process Costing Computations: Three Key Concepts – Part 4

- Therefore, direct labor and manufacturing overhead are often combined into one classification of product cost called conversion costs. The example combines these costs:



# Process Costing Computations: Three Key Concepts – Part 5

## Key Concept #3: Equivalent Units

Equivalent units are the product of the number of partially completed units and the percentage completion of those units.

Equivalent units need to be calculated because a department usually has some partially completed units in its beginning and ending inventories. These partially completed units complicate the determination of a department's output for a given period, and the unit cost that should be assigned to that output.

# Calculating Equivalent Units

**Equivalent units = Number of partially completed units x Percentage completion.**

**Equivalent units is the product of the number of partially completed units and the percentage completion of those units with respect to the processing in the department.**

**The equivalent units is the number of complete units that could have been obtained from the materials and effort that went into the partially complete units.**

# Calculating Equivalent Units: Examples

**Assume Department A has 500 units in its ending work in process inventory that are 60% complete with respect to processing in the department.**

**These 500 partially complete units are equivalent to 300 fully complete units (500 × 60% = 300).**

**Department A's ending work in process inventory would contain 300 equivalent units for the period.**

# Concept Check 2

For the current period, Jones started 15,000 units and completed 10,000 units, leaving 5,000 units in process 30 percent complete. How many equivalent units of production did Jones have for the period?

a. 10,000

b. 11,500

c. 13,500

d. 15,000

# Concept Check 2a

For the current period, Jones started 15,000 units and completed 10,000 units, leaving 5,000 units in process 30 percent complete. How many equivalent units of production did Jones have for the period?

a. 10,000
b. 11,500
c. 13,500
d. 15,000

**10,000 units + (5,000 units × 0.30) = 11,500 equivalent units**

# The weighted-average method: an example

3 steps:

1. Compute the equivalent units of production;
2. Compute the cost per equivalent unit;
3. Assign costs to unit;

# Learning Objective 2

**Compute the equivalent units of production using the weighted-average method.**

# Compute the equivalent units of production

Equivalent units of production: is the *denominator in unit cost calculations*. Each processing department calculates the equivalent units of production for each of its manufacturing cost categories. In *the weighted-average method*, the equivalent units of production for a department is *the number of completed units transferred to the next department (or to finished goods) plus the equivalent units in the department's ending work in process inventory.*

Weighted-average method: a separate calculation is made for each cost category in each processing department.

**Equivalent units of production= Units transferred to the next department or to finished goods + Equivalent units in ending work in process inventory**

# Step 1: Compute the Equivalent Units of Production – Part 1

Smith Company reported the following activity in the Assembly Department for the month of June:

| | | Percent Completed | |
|---|---|---|---|
| | Units | Materials | Conversion |
| Work in process, June 1 | 300 | 40% | 20% |
| Units started into production in June | 6,000 | | |
| Units completed and transferred out of Department A during June | 5,400 | | |
| Work in process, June 30 | 900 | 60% | 30% |

# Step 1: Compute the Equivalent Units of Production – Part 2

Begin by calculating the equivalent units completed and transferred out of the Assembly Department in June (5,400 units).

| | Materials | Conversion |
|---|---|---|
| **Units completed and transferred out of the Department in June** | **5,400** | **5,400** |

# Step 1: Compute the Equivalent Units of Production – Part 3

Next, identify the *equivalent units* of production in *ending work in process* with respect to *materials* for the month (540 units) and adding this to the 5,400 units from step one.

| | Materials | Conversion |
|---|---|---|
| **Units completed and transferred out of the Department in June** | **5,400** | **5,400** |
| **Work in process, June 30:** | | |
| **900 units × 60%** | **540** | |
| **Equivalent units of Production in the Department during June** | **5,940** | |

# Step 1: Compute the Equivalent Units of Production – Part 4

Finally, identify the *equivalent units* of production in *ending work in process* with respect to *conversion* for the month (270 units) and adding this to the 5,400 units.

| | Materials | Conversion |
|---|---|---|
| **Units completed and transferred out of the Department in June** | **5,400** | **5,400** |
| **Work in process, June 30:** | | |
| **900 units × 60%** | **540** | |
| **900 units × 30%** | | **270** |
| **Equivalent units of Production in the Department during June** | **5,940** | **5,670** |

# Step 1: Compute the Equivalent Units of Production – Part 5

**Equivalent units of production *always* equals:**
**Units completed and transferred**
**+ Equivalent units remaining in work in process**

| | Materials | Conversion |
|---|---|---|
| Units completed and transferred out of the Department in June | 5,400 | 5,400 |
| Work in process, June 30: | | |
| 900 units × 60% | 540 | |
| 900 units × 30% | | 270 |
| Equivalent units of Production in the Department during June | 5,940 | 5,670 |

# Learning Objective 3

**Compute the cost per equivalent unit using the weighted-average method.**

# Step 2: Compute the Cost per Equivalent Unit – Part 1: Beginning Work in Process

**Beginning Work in Process Inventory: 300 units**
- **Materials: 40% complete $ 6,119**
- **Conversion: 20% complete $ 3,920**

**Production started during June 6,000 units**
**Production completed during June 5,400 units**

**Costs added to production in June**
- **Materials cost $ 118,621**
- **Conversion cost $ 81,130**

**Ending Work in Process Inventory: 900 units**
- **Materials: 60% complete**
- **Conversion: 30% complete**

# Step 2: Compute the Cost per Equivalent Unit – Part 2

The formula for computing the cost per equivalent unit is:

*Weighted-Average Method (a separate calculation is made for each cost category in each processing department)*

$$\text{Cost per equivalent unit} = \frac{\text{Cost of beginning Work in Process Inventory} + \text{Cost added during the period}}{\text{Equivalent units of production}}$$

# Step 2: Compute the Cost per Equivalent Unit – Part 3

Here is a schedule with the cost and equivalent unit information.

| | Total Cost | Materials | Conversion |
|---|---|---|---|
| **Cost to be accounted for:** | | | |
| Work in process, June 1 | $ 10,039 | $ 6,119 | $ 3,920 |
| Cost added in Assembly | 199,751 | 118,621 | 81,130 |
| Total cost | $ 209,790 | $ 124,740 | $ 85,050 |
| **Equivalent units** | | 5,940 | 5,670 |

# Step 2: Compute the Cost per Equivalent Unit – Part 4: Basic Information

Here is a schedule with the cost and equivalent unit information.

$124,740 ÷ 5,940 units = $21.00

$85,050 ÷ 5,670 units = $15.00

| | Total Cost | Materials | Conversion |
|---|---|---|---|
| **Cost to be accounted for:** | | | |
| Work in process, June 1 | $ 10,039 | $ 6,119 | $ 3,920 |
| Cost added in Assembly | 199,751 | 118,621 | 81,130 |
| Total cost | $ 209,790 | $ 124,740 | $ 85,050 |
| Equivalent units | | 5,940 | 5,670 |
| Cost per equivalent unit | | $ 21.00 | $ 15.00 |

Cost per equivalent unit = $21.00 + $15.00 = $36.00

# Learning Objective 4

**Assign costs to units using the weighted-average method.**

# Step 3: Assign Costs to Units – Part 1

| Assembly Department<br>Cost of Ending WIP Inventory and Units Transferred Out | | | |
|---|---|---|---|
| | Materials | Conversion | Total |
| **Ending WIP inventory:** | | | |
| **Equivalent units** | **540** | **270** | |

# Step 3: Assign Costs to Units – Part 2

| Assembly Department<br>Cost of Ending WIP Inventory and Units Transferred Out | | | | | |
|---|---|---|---|---|---|
| | Materials | | Conversion | | Total |
| Ending WIP inventory: | | | | | |
| Equivalent units | | 540 | | 270 | |
| Cost per equivalent unit | $ | 21.00 | $ | 15.00 | |

# Step 3: Assign Costs to Units – Part 3

| Assembly Department<br>Cost of Ending WIP Inventory and Units Transferred Out | | | |
|---|---|---|---|
| | Materials | Conversion | Total |
| Ending WIP inventory: | | | |
| Equivalent units | 540 | 270 | |
| Cost per equivalent unit | $ 21.00 | $ 15.00 | |
| Cost of Ending WIP inventory | $ 11,340 | $ 4,050 | $ 15,390 |

# Step 3: Compute Cost of Units Transferred Out

| Assembly Department<br>Cost of Ending WIP Inventory and Units Transferred Out | | | | | |
|---|---|---|---|---|---|
| | Materials | | Conversion | | Total |
| Ending WIP inventory: | | | | | |
| Equivalent units | 540 | | 270 | | |
| Cost per equivalent unit | $ 21.00 | | $ 15.00 | | |
| Cost of Ending WIP inventory | $ 11,340 | | $ 4,050 | | $ 15,390 |
| Units completed and transferred out: | | | | | |
| Units transferred | 5,400 | | 5,400 | | |

# Step 3: Assign Costs to Units – Part 4

| Assembly Department<br>Cost of Ending WIP Inventory and Units Transferred Out | | | | | |
|---|---|---|---|---|---|
| | Materials | | Conversion | | Total |
| Ending WIP inventory: | | | | | |
| Equivalent units | 540 | | 270 | | |
| Cost per equivalent unit | $ 21.00 | | $ 15.00 | | |
| Cost of Ending WIP inventory | $ 11,340 | | $ 4,050 | | $ 15,390 |
| Units completed and transferred out: | | | | | |
| Units transferred | 5,400 | | 5,400 | | |
| Cost per equivalent unit | $ 21.00 | | $ 15.00 | | |

# Step 3: Assign Costs to Units – Part 5

| Assembly Department<br>Cost of Ending WIP Inventory and Units Transferred Out | | | |
|---|---|---|---|
| | Materials | Conversion | Total |
| Ending WIP inventory: | | | |
| Equivalent units | 540 | 270 | |
| Cost per equivalent unit | $ 21.00 | $ 15.00 | |
| Cost of Ending WIP inventory | $ 11,340 | $ 4,050 | $ 15,390 |
| Units completed and transferred out: | | | |
| Units transferred | 5,400 | 5,400 | |
| Cost per equivalent unit | $ 21.00 | $ 15.00 | |
| Cost of units transferred out | $ 113,400 | $ 81,000 | $ 194,400 |

# End of Chapter 5

## EX.01

Duntroon Company uses the weighted-average method in its process costing system. It processes used tires for various manufacturers of basketball courts. Data relating to tons of tires processed during November are provided below:

| | | Percent Completed | |
|---|---|---|---|
| | Tons | Materials | Labor and Overhead |
| Work in process, November 1 | 18,000 | 80% | 60% |
| Work in process, November 30 | 37,000 | 40% | 50% |
| Started into production during November | 225,000 | | |

***Required***:

1. Compute the number of tons of tires completed and transferred out during November.
2. Compute the equivalent units of production for materials and for labor and overhead for November.

**Requirement 1:** Compute the number of tons of tires completed and transferred out during November.

| | Tons |
|---|---|
| Work in process, November 1 | 18,000 |
| Started into production during the month | 225,000 |
| Total tons in process | 243,000 |
| Deduct work in process, November 30 | 37,000 |
| Completed and transferred out during the month | 206,000 |

**Requirement 2:** Compute the equivalent units of production for materials and for labor and overhead for November.

| | Equivalent Units | |
|---|---|---|
| | Materials | Labor & Overhead |
| Units transferred out | 206,000 | 206,000 |
| Work in process, ending: | | |
| 37,000 units × 40% | 14,800 | |
| 37,000 units × 50% | | 18,500 |
| Equivalent units of production | 220,800 | 224,500 |

# Cost per equivalent unit-w.a.m.

**EX.02**

Superior Micro Products uses the weighted average method in its processes costing system. Data for the Assembly Department for May appear below:

| | Materials | Labor | Overhead |
|---|---|---|---|
| Work in process, May 1 | $18,000 | $5,500 | $27,500 |
| Cost added during May | $238,900 | $80,300 | $401,500 |
| Equivalent units of production | 35,000 | 33,000 | 33,000 |

***Required**:*

1. Compute the cost per equivalent unit for materials, labor, overhead and in total.

***Requirement***: Compute the cost per equivalent unit for materials, labor, overhead and in total

| | Materials | Labor | Overhead |
|---|---|---|---|
| Cost of beginning work in process inventory | $ 18,000 | $ 5,500 | $ 27,500 |
| Cost added during the period | 238,900 | 80,300 | 401,500 |
| Total cost (a) | $256,900 | $85,800 | $429,000 |
| Equivalent units of production (b) | 35,000 | 33,000 | 33,000 |
| Cost per equivalent unit (a) ÷ (b) | $7.34 | $2.60 | $13.00 |

| | Total |
|---|---|
| Materials | $ 7.34 |
| Labor | 2.60 |
| Overhead | 13.00 |
| Total cost per equivalent unit | $22.94 |

# Equivalent units of Production-w.a.m.

**EX.03**

Highlands Company uses the weighted average method in its process costing system. It processes wood pulp for various manufacturers of paper products. Data relating to tons of pulp processed during June are provided below:

| | | Percent Completed | |
|---|---|---|---|
| | Tons of Pulp | Materials | Labor and Overhead |
| Work in process, June 1 . . . . . | 20,000 | 90% | 80% |
| Work in process, June 30 . . . . . | 30,000 | 60% | 40% |
| Started into production during June . . . | 190,000 | | |

***Required***:

1. Compute the number of tons of pulp completed and transferred out during June;
2. Compute the equivalent units of production for materials and for labor and overhead for June.

**Requirement 1:** Compute the number of tons of pulp completed and transferred out during June;

| | Tons of Pulp |
|---|---|
| Work in process, June 1 | 20,000 |
| Started into production during the month | 190,000 |
| Total tons in process | 210,000 |
| Deduct work in process, June 30 | 30,000 |
| Completed and transferred out during the month | 180,000 |

***Requirement 2:*** Compute the equivalent units of production for materials and for labor and overhead for June.

| | *Equivalent Units of Production* | |
|---|---|---|
| | Materials | Labor and Overhead |
| Units transferred out | 180,000 | 180,000 |
| Equivalent units in ending work in process inventory: | | |
| Materials: 30,000 tons × 60% complete | 18,000 | |
| Labor and overhead: 30,000 tons × 40% complete | _____ | 12,000 |
| Equivalent units of production | 198,000 | 192,000 |