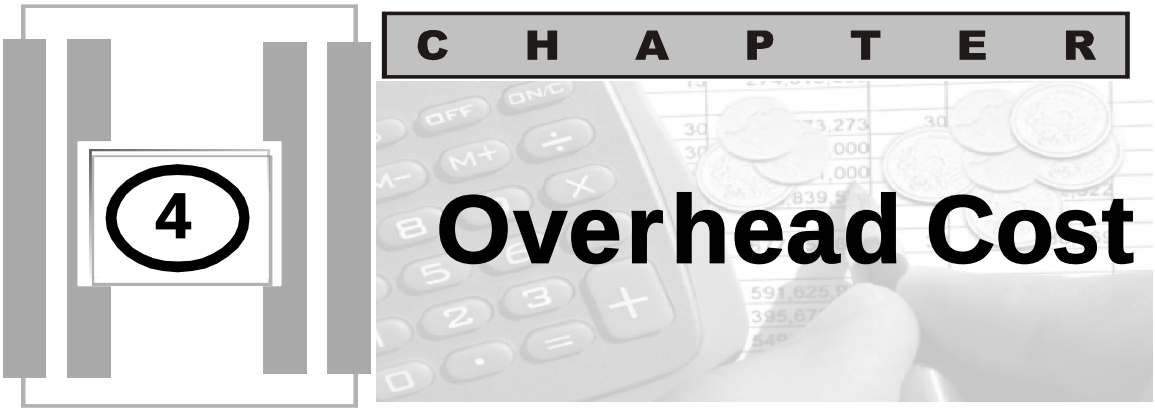


DEFINITION OF OVERHEAD

Cost is defined as the amount of expenditure, actual or notional, incurred on or attributable to given item. Cost represents the resources that have been or must be sacrificed to attain a particular objective.

Direct costs are those costs that can be specifically and exclusively identified with a particular cost object. Indirect costs cannot be identified specifically and exclusively with a given cost object. Direct costs can be accurately traced because they can be physically identified with a particular object whereas indirect costs cannot.

Prime cost refers to the direct cost of the product and consists of direct labor cost plus direct materials and direct expenses.

Overheads are the indirect costs that cannot be allocated to any specific job or process as they are not capable of being identified with any specific job or process. It includes cost of indirect materials, Indirect labor and indirect expenses that cannot be conveniently charged to any job or process. The CIMA defines overhead cost as "the total cost of indirect materials, labor and indirect expenses. In short, it is the cost of materials, labor and expenses that cannot be economically identified with specific saleable cost unit.

The cost attributable to a cost center or cost unit can be classified into two categories — direct and indirect. The cost which can be directly identified with a cost unit or cost center is called as Direct/ Prime Cost. The aggregate of indirect cost such as material cost, indirect wages and indirect expenses is called overhead. In other words, any expenditure over and above prime cost is known as overhead.

CLASSIFICATION OF OVERHEAD COSTS

The basic principles to be considered while treating an item as OH are as follows.

- The aggregate of indirect material costs, indirect wages and indirect expenses is OH. Thus, it comprises of all indirect costs. Therefore, the relationship of the items of cost to products, jobs, etc., must be traced.

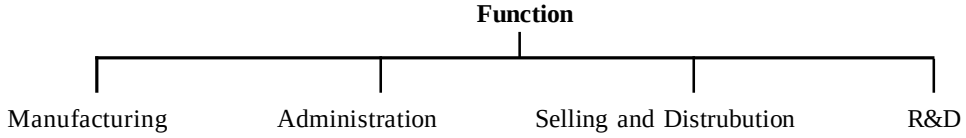
- Direct costs are also treated as OH in cases where efforts involved in identifying and accounting are disproportionately large costs incurred for item like nuts, bolts, etc., if very small, can be apportioned as OH over the jobs or products.
- The OH can be apportioned to a cost center in accordance with the principles of benefit and/or responsibilities. The benefit principle implies that if cost center occupies a certain proportion of a large unit of space for which standing charges are accurately ascertained, it should be charged with a corresponding proportion of such costs. The responsibility principle implies that as the departmental head has no control over the amount of rent and rates paid, his department should not bear any brunt of allocation of such costs.
- Capital expenditure should be excluded from costs and should not be treated as OH.
- Expenditure that does not relate to costs should not be treated as OH. Payment like donations, subscriptions, etc., cannot be treated as OH.

The process of grouping costs according to their common characteristics is called cost classification. It involves two steps: (i) the determination of the class or groups into which the overhead costs are subdivided; (ii) the actual process of classification of the various expenses. The classification of overhead costs depends on the type and size of business, nature of product or services rendered and the management policy. The various types of classifications are:

1. Functional classification,
2. Classification with regards to behavior of the expenditure,
3. Element-wise classification,
4. Classification according to the nature of expenditure.

Functional Classification of Overheads

Classification of overhead expenses with reference to major activity centers of a concern is called functional classification. As per this classification the overhead expenses can be classified as follows.



Manufacturing or Production or Works Overhead

All the indirect expenses incurred by the operations of the manufacturing divisions of a concern are classified as manufacturing overhead. Examples of such expenses are depreciation, insurance charges on fixed assets like plant and machinery, stores, repairs and maintenance of fixed assets, electricity charges, fuel charges, factory rent, etc.

Administration Overhead

All the expenses incurred towards the control and administration of an undertaking are called Administration Overhead. Examples, office rent, salaries and wages of clerks, secretaries and accountants, postage, telephone, general administration expenses, depreciation and repairs of office building, etc.

Selling and Distribution Overhead

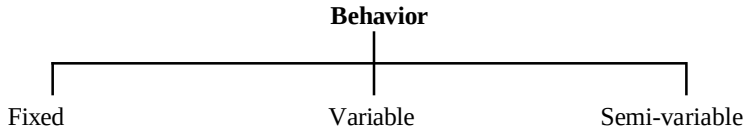
The cost incurred towards marketing, distribution and sales is called selling and distribution overhead. It includes sales, office expenses, salesmen's salaries and commission, showroom expenses, advertisement charges, samples and free gifts, warehouse rent, packaging expenses, transportation cost, etc.

Research and Development Expenses

The costs incurred for researching on new and improved products, new application of materials or improved methods is called research costs. Development costs are incurred towards commercial application of the discoveries made.

Classification with Regard to Behavior of Expenditure

Based on the behavior, the overheads can be classified into (a) Fixed overhead, (b) Variable overhead, and (c) Semi-variable overhead.



Fixed Overhead

Those costs remain constant regardless of the changes in the volume of activity Examples, rent, depreciation, etc.

Variable Overhead

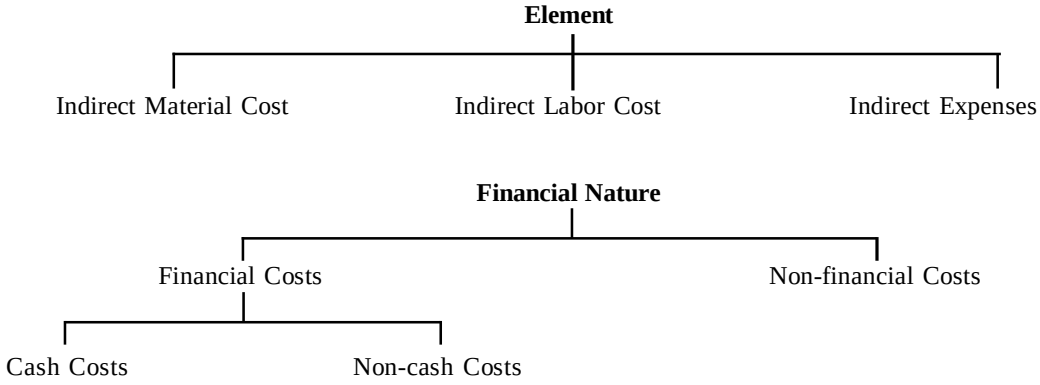
Variable overhead cost varies with changes in volume of activity. Examples, material cost, labor cost, etc.

Semi-variable Overhead

Semi-variable overhead remains fixed up to a certain activity level, but once that level is exceeded, they vary with the volume. Examples, salary of an employee (fixed amount plus overtime depending on the overtime hours), telephone charges, etc.

ELEMENT-WISE CLASSIFICATION

Based on the elements, overheads can be classified as indirect material cost, indirect labor cost and indirect expenses.



The costs incurred in materials used to further the manufacturing process, that is necessarily built into the product are called indirect materials. For example, cutting oil used in cutting surface, threads and buttons used in stitching clothes, etc., are considered as indirect materials.

Indirect labor consists of all salaries and wages paid to the staff for the purpose of carrying tasks incidental to goods or services, which will not form part of salaries and wages paid while working directly upon the product.

Indirect expenses are those that are incurred by the organization while carrying out their total business activities and cannot be conveniently allocated to job, process cost unit or cost centre.

Step in Overhead Accounting

The total cost is ascertained by adding the overhead to the prime cost. The apportionment of overheads that cannot be specifically related to cost units, or cost centers is done by the following procedure.

1. First, the overhead is collected from different source documents, for different items of overhead expenses, the documents which are used for the collection, allocation and apportionment of overheads are standing order numbers, departmental distribution summary, journal, invoice and payroll.

A factory is administratively divided into various subdivisions known as departments such as repairs department, power department, stores department, etc., the following factors must be considered while organizing a concern into a number of departments.

(i) Every manufacturing process is to be divided into its natural divisions in order to maintain natural flow of raw materials from time of its purchase till its conversion into finished goods and sales.

(ii) For ensuring smooth flow of production, the sequence of operations is taken into consideration, while determining the location of various departments and layout of production facilities.

(iii) For physical control on production and maintaining efficiency of the concern, division of labor, authority and responsibility must be taken into consideration with organization departments.

Types of Department

The main department of manufacturing concern are:

(a) Production Departments: The process of manufacturing is carried on in these departments.

(b) Service Departments: Service departments render a particular type of service to the other departments. For example, repairs and maintenance electricity, etc.

(c) Partly Producing Departments: A department may normally be service department, but some times does some productive work, so it becomes partly producing department. For example, a carpentry shop which is mainly responsible for the repairs.

2. The next step is primary distribution of overheads, this is the allocation and apportionment of expenses to cost centers.

Tracing and assigning accumulated cost to one or more cost centers or cost units is called *cost allocation*. For example, the cost of repairs and maintenance of a particular machine is charged to that particular department wherein such machine is located.

Certain costs cannot be traced to a particular cost unit or cost center. The proportionate allotment of costs (which cannot be identified wholly with a particular department) over two or more cost centers or units is called *cost apportionment*.

The main difference between cost allocation and cost apportionment is that while the allocation involves tracing of the whole of a cost to a cost over the cost units or cost centers on some suitable basis.

Allocating costs to different projects or services is necessary for the allocating certainment of the actual cost involved in each project or service. The costs that are assigned to cost objects can be divided into direct costs and indirect costs. Direct costs can be accurately traced to cost objects because they can be specifically and exclusively traced to a particular cost object whereas indirect costs cannot be traced directly to a cost object because they are usually common to several cost objects. Hence, the concept of cost allocation comes into picture.

Cost allocation is the process of assigning costs in a situation wherein a direct measure does not exist for the quantity of resources consumed by a particular cost object. Cost allocations involve the use of surrogate rather than direct measures. The basis that is used to allocate cost to cost object is called an allocation base or cost driver.

Cost allocation is direct, but cost apportionment needs a suitable basis.

Bases of Apportionment

Apportionment of overhead costs to production and service departments and then reapportionment of service department costs to other service and production departments should be done on some suitable equitable basis. There should be proper correlation between the expenses and the basis of cost apportionment. The process of apportionment of overhead is known as Primary Distribution.

The following are the main bases of overhead apportionment used in manufacturing concerns.

(i) Direct Allocation: Overheads are directly allocated to various departments on the basis of expenses incurred for each department respectively. Examples are overtime premium of workers engaged in a particular department, power when separate meters are available, jobbing, repairs, etc.

(ii) Direct Labor Hours: Under this basis the overhead expenses are distributed to various departments in the ratio of total number of labor hours worked in each department. For example, administrative salaries and particularly salaries of supervisors are apportioned on the basis of labor hours worked. This is so because time is an element of cost in these cases.

(iii) Direct Wages: According to this basis, expenses are distributed amongst the departments in the ratio of direct wage bills of various departments.

(iv) Number of Workers: The total number of worker working in each departments form the basis for the apportioning overhead expenses among departments.

(v) Relative Areas of Departments: The area occupied by different departments form the basis for the apportionment of certain expenses like lighting and heating, rent, rates, taxes on building, air consitioning, etc.

(vi) Capital Values: In this method, the capital values of certain assets like machinery and building are used as basis for the apportionment of certain expenses. Examples are rates, taxes, depreciation, insurance charges of the building, etc.

(vii) Light Points: This is used for apportioning lighting expenses.

(viii) Kilowatt Hours: This basis is used for the apportionment of power expenses.

(ix) Technical Estimates: This basis of apportionment is used for the apportionment of those expenses for which it is difficult to find out any other basis of apportionment. An assessment of the equitable proportion is carried out by technical experts. This is used for distributing works manager's salary, internal transport, steam, water, etc., when these are used for processes.

Principle of Apportionment of Overhead Cost

The following are the principles for the determination of a suitable basis for cost apportionment:

1. **Service or Use or Benefit Drived:** If the service rendered by a particular item of expense to different departments can be measured, overheads can be apportioned on that basis. For example, rent charges can be distributed according to the floor space occupied by each department.
2. **Ability to pay Method:** Under this method, overhead is distributed in proportion to the sales, income or profitability of the departments, territories or products, etc.
3. **Efficiency Methods:** Under this method, the apportionment of expenses is made on the basis of production targets.
4. **Survey Methods:** Under this method, a survey is made of the various factors involved and the share of overhead costs to be borne by each cost center is determined.

3. Reapportionment of Service Department Costs to Production Departments. The reapportionment of service department costs to the production departments or the cost centers is know as Secondary Distribution.

Service Department Cost	Basis of Apportionment
1. Maintenance department	Hours worked for each department
2. Payroll or timekeeping	Total labor or machine hours or number of employees in each department
3. Employment or personnel department	Rate of labor turnover or number of employees in each department
4. Storekeeping department	No. of requisitions or value of materials of each department
5. Purchase department	No. of purchase orders or value of materials for each department
6. Welfare, ambulance, canteen service, recreation room expenses	No. of employees in each department
7. Building service department	Relative area in each department
8. Internal transport service or overhead crane service	Weight, value-graded product handled, weight and distance traveled
9. Transport department	Crane hours, truck hours, truck mileage, truck tonnage, truck tonne-hours, tonnage handled, number of packages
10. Power House (Electric power cost)	Wattage, horse power, horse power machine hours, number of electric points, etc.

Methods of Reapportionment or Redistribution

The following are the methods of redistribution of service department costs to production departments:

(i) Direct Redistribution

(ii) Step Method

(iii) Reciprocal Service Method.

Direct Redistribution

Under this method, the costs of service departments are directly apportioned to production departments without taking into account any service rendered by one service department to another service department. Thus, proper apportionment cannot be made and the production department may either be overcharged or undercharged. As budgeted overhead for each department cannot be prepared thoroughly, the department overhead rates cannot be ascertained correctly.

Illustration 1

The particulars of cost incurred in the production departments and service departments of cost incurred in the production departments and service departments of a manufacturing concern are as follows. Cost of service department D is to be apportioned in the ratio of 5:4:4 and E in the ratio of 4:3:2.

Figures in `

Production Departments			Service Departments	
A	**B**	**C**	**D**	**E**
1,00,000	1,50,000	1,25,000	75,000	60,000

Calculate the costs allocated to each production department.

Solution

Statement of reapportionment of service department costs

	Production Departments			Service Deprtments	
	A	**B**	**C**	**D**	**E**
Total Expenses	1,00,000	1,50,000	1,25,000	75,000	60,000
Department D (5:4:4)	28,846	23,077	23,077	**75,000**	
Department E (4:3:2)	26,667	20,000	13,333		**60,000**
Total	1,55,513	1,93,077	1,61,410		

Working Notes:

1. Apportionment of services Dept. D expenses

   Total expenses = ` 75,000

   Ratio of Apportionment = 5:4:4 (as given)

   Apportionment of Dept.A = 75,000 × 5/13 = 28,846

   Dept. B = 75,000 × 4/13 = 23,077

   Dpet. C = 75,000 × 4/13 = 23,077

2. Apportionment of service Dept.E expenses:

Total Expense = 60,000

Ratio of Apportionment = 4:3:2 (as given)

Apportionment to Dept A = 60,000 × 4/9 = 26,667

B = 60,000 × 3/9 = 20,000

C = 60,000 × 2/9 = 13,333

Illustration 2

In a light engineering factory, the following particulars have been collected for the quarter ended 31st December, 2012. The department summary showed the following expenses:

Production Departments			Service Departments	
P_1 `	P_2 `	P_3 `	S_1 `	S_2 `
8000	7000	6000	4000	6000

From the given data you are required to reapportion the service departments costs to production departments using direct redistribution method. Apportion the expenses of service department S_2 in the ratio of 4:4:3 and those of service department S_1 in the ratio of 3:3:4 to the production departments P_1,P_2 and P_3 respectively.

Solution

Production Overheads Distribution Summary for the quarter ending 31st December, 2012.

	Production Departments			Service Departments	
	P_1 `	P_2 `	P_3 `	S_1 `	S_2 `
Total expenses as per summary	8,000	7,000	6,000	4,000	6,000
Dept. S_2 (4:4:2)	2,400	2,400	1,200	—	(6,000)
Dept. S_1 (3:3:4)	1,200	1,200	1,600	(4,000)	—
Total	11,600	10,600	8,800	—	—

Step Method

Under this method the sequence of distribution starts first with the service department that provides greatest services, as measured by costs, to the greatest number of other service departments and the last service department that distributes its cost will be the one that provides least amount of services to the least number of other service departments, just like the direct method, under this method also if a service department costs are distributed to other service departments, other service departments do not allocate their costs back to it. Thus, the cost of last service department is apportioned only to the production departments.

Illustration 3

A manufacturing company has two Production Departments P and Q and three Service Departments – Timekeeping, Stores and Maintenance. The Departmental summary showed the following expenses for July, 2012.

Production Departments		Service Departments (in order of their importance)		
P	Q	X (Timekeeping)	Y (Stores)	Z (Maintenance)
15,000	10,000	5,000	6,000	4,000

The order information relating to the above departments is as follows

	Service Departments			Production Departments	
	X (Timekeeping)	Y (Stores)	Z (Maintenance)	P	Q
No. of Employees	—	10	5	20	15
No. of Stores Requisitions	—	—	6	24	20
Machine Hours	—	—	—	1200	800

Apportion the expenses of service departments.

Solution:

Department	As per Primary Distribution Summary	Secondary Distribution			
		From X to Y, Z, P & Q	From Y to Z, P & Q	From Z to P & Q	
	`	`			
X (Timekeeping)	5,000	(–) 5,000			
Y (Stores)	6,000	1,000	(–) 7,000		
	4,000				
Z (Maintenance)		500	840	(–) 5,340	
	15,000				
P		2,000	3,360	3,204	23,564
	10,000				
Q		1,500	2,800	2,136	16,436
	40,000				40,000

Note: Basis of apportionment

(a) Timekeeping: No. of employees (i.e., 2:1:4:3)

(b) Store: Number of store requisition (i.e., 3:12:10)

Reciprocal Service Method

This method recognizes the fact that every department should be charged for the services rendered to it. If two service departments provide service to each other, each department should be charged for the cost of services rendered by the other. Simultaneous Equation Method, Repeated Distribution Methods, Trial and Error Method are used to deal with inter-service department transfers.

Advantages of Departmentalization of Overhead

1. It facilitates control of overhead expenses by means of predetermined budgets.
2. It helps in controlling the uses made of the services rendered to the respective departments.
3. "Correct" cost can be determined as the actual overhead costs of the respective departments are taken into consideration in determining the overhead rates.
4. The reasons for variance can be known by the analysis of under or overabsorption of overhead. It helps in taking remedial measures.
5. It helps in arriving at the cost of work-in-progress correctly.

Statement Showing the Apportionment of Overheads

Items of Overheads Apportioned	*Basis of Apportionment*	*Production Departments*		*Service Department*	
		P_1 `	P_2 `	S_1 `	S_2 `
Fixed Power Generation Cost	Normal Capacity	.....	.....	.....	.....
Variable Power Generation Cost	Actual Power Consumption (kwh)	.....	.....	.....	.....
Lighting	No. of Light Points	.....	.....	.....	.....
Depreciation	Asset Value	....	.....	.....	.....
Insurance	Asset Value	.....	.....	.....	.....
Rent, Rates & Taxes	Floor Area	.....	.....	.....	.....
Repairs	Floor Area	.....	.....	.....	.....
Stores Overheads	Direct Material	.....	.....	.....	.....
Employee's Insurance Charges	Direct Wages	.....	.....	.....	.....
Staff Welfare Expenses	No. of Workers	.....	.....	.....	.....
Supervision Expenses	No. of Workers	.....	.....	.....	.....
Total Overheads Apportioned		.....	.....	.....	.....

Illustration 4

T Ltd. has two production departments and two service departments and provides you the following data:

	Production Departments		**Service Departments**	
	P_1	**P_2**	**S_1**	**S_2**
Direct Materials	40,000	30,000	20,000	10,000
Direct Wages	15,000	20.000	5,000	10,000
Floor Area (sq. feet)	5,000	4,000	3,000	2,000
Value of Plant & Machinery	50,000	60,000	20,000	10,000
Value of Stock	35,000	25,000	5,000	5,000

No. of workers	100	50	25	25
No of light points	200	50	25	25
Horse power of machines	50	25	15	10

The indirect expenses for the period were:

Factory Rent, Rates, Taxes & Repairs	` 14,000
Depreciation. Insurances & Repairs of machinery	` 28,000
Insurance of stock	` 700
Supervision & Staff welfare expenses	` 2,000
Stores Overheads	` 1,000
Lighting & Heating	` 3,000
Power	` 1,000

Required: Prepare the Statement showing the apportionment of overheads.

Solution:

Items of Overheads	Basis of Apportionment	Total	Production Departments		Service Department	
		`	P_1 `	P_2 `	S_1 `	S_2 `
1. Factory Rent, Rates, Taxes & Repairs	Floor Area	14,000	5,000	4,000	3,000	2,000
2. Depreciation Insurance Repair of Machinery	Value of Plant & & Machinery	28,000	10,000	12,000	4,000	2,000
3. Insurance of stock	Value of stock	700	350	250	50	50
4. Supervision &	No. of workers	2,000	1,000	500	250	250
5. Stores overhead	Value of Materials	1,000	400	300	200	100
6. Lighting & Heating	No. of light points	3,000	2,000	500	250	250
7. Power	H.P. of Machinery	1,000	500	250	150	100
		49,700	19,250	17,800	7,900	4,750

Basis of Apportionment of Overheads of Service Departments

The following table suggests the basis of apportionment of some common items of overheads of service departments:

Service Department	Basis
1. Purchase Department	Number of Purchase Orders or Number of Purchase Requisitions or Value of Materials Purchased.
2. Stores Department	Number of Material Requistions or Value of Materials Issused.
3. Time-keepling Department	Number of Employees or Total Labour Hours or Machine Hours. pay-roll Department

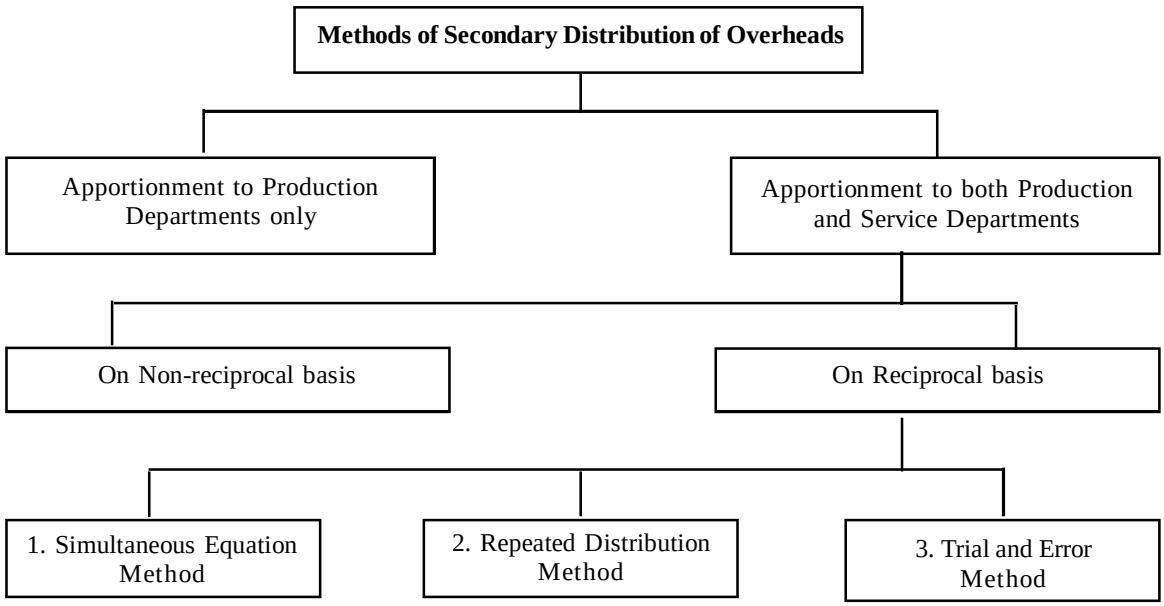
4. Personnel Department Canteen, Welfare, Medical, Recreation Department	Number of Employees or Total Wages.
5. Repairs and Maintenance	Number of Hours worked in each department.
6. Power House	Meter reading or H.P. Hour for powers.
	Meter reading or floor space for lighting, heat consumed.
7. Inspection	Inspection Hours or Value of Items Inspected.
8. Drawing Office	Number of Drawings made or Man-hours worked.
9. Accounts Department	Number of Workers in each department or Time devoted
10. Tool Room	Direct Labour Hours or Machine Hours or Wages

SECONDARY DISTRIBUTION OF OVERHEADS

Meaning of Secondary Distribution of Overheads

Secondary distribution of overheads means the apportionment of overheads of service departments among the production departments on some suitable basis.

Methods of Secondary Distribution of Overheads



Apportionment to Production Departments Only

Under this method, the costs of service departments are directly apportioned to production department only, ignoring the service rendered by one service departmentto another service department.

Illustration 5

CAS Ltd., has three production departments and four service departments. The expenses for departments as per Primary Distribution Summary are as follows:

Production Department:	`	`
A	60,000	
B	52,000	
C	48.000	1,60,000
Service Department:	`	`
Stores	8,000	
Time-keeping and Accounts	6,000	
Power	3,200	
Canteen	2.000	19,200

The following information is also available in respect of the production departments:

	Dept. A	Dept. B	Dept. C
Horsepower of Machine	300	300	200
Number of workers	20	15	15
Value of stores requisition in (`)	2,500	1,500	1,000

Required: Apportion the costs of service departments over the production departments.

Solution:

Statement showing the Secondary Distribution of Overheads

Item of Cost	Basis of Apportionment	Total	Production Departments		
		`	A `	B `	C `
Cost as per Primary Distribution Summary		1,60,000	60,000	52,000	48,000
Stores	Value of Stores requisition (5:3:2)	8,000	4,000	2,400	1,600
Time-keeping and Accounts	No. of workers (4:3:3)	6,000	2,400	1,800	1,800
Power	H.P. of Machine (3:3:2)	3,200	1,200	1,200	800
Canteen	No. of workers (4:3:3)	2,000	800	600	600
		1,79,200	68,400	58,000	52,800

Apportionment to Both Production and Service Departments

Under this method the costs of a service department are apportioned to both production departments and other service departments on some equitable basis. This may be done on reciprocal basis or non-reciprocal basis.

Apportionment on Non-reciprocal basis/Step Ladder Method

This method involves the following three steps:

Practical Steps Invoved in the Step Ladder Method	
Step1:	Apportion the cost of first service department which serves the largest number of departments to production departments and other service departments.
Step 2:	Apportion the cost of second service department which serves the next largest number of departments.
Step 3:	Continue this process till the cost of last service department is apportioned. Thus, the cost of last service department is apportioned only to the production departments.

Tutorial Note: Some authors are of the view that the cost of service department with largest amount of cost should be distributed first.

Illustration 6

BT Ltd. has two production departments P_1 and P_2 and three service departments S_1, S_2 and S_3. The overheads of various departments for a period are given below:

P_1 ` 53,000, $P_2$ ` 7,000, S_1 ` 17,000, $S_2$ ` 30,000, S_3 ` 13,000

The costs of service departments are to be apportioned as follows.

		P_1	P_2	S_1	S_2 S_3
	S_1	50%	30%	—	— 20%
	S_2	30%	50%	10%	— 10%
	S_3	401%	60%	—	— —

Required: Prepare Overhead Distribution Statement according to Step Ladder Method.

Solution:

Overheads Distribution Statement

Particulars	P_1 `	P_2 `	S_1 `	S_2 `	S_3 `
Overheads as given	53,000	7,000	17,000	30,000	13,000
Apportionment of S2's costs to P1, P2, S1 & S3 in ratio of 3 : 5 : 1 : 1	9,000	15,000	3,000	(30,000)	3,000
Apportionment of S1's cost to P1, P2 & S3 in ratio of 5 : 3 : 2	10,000	6,000	(20,000)	—	4,000
Apportionment of S3's costs to P1 and P2 in the ratio of 2 : 3	8,000	12,000	—	—	(20,000)
	80,000	40,000	—	—	—

Apportionment on Reciprocal basis: This method recognises the fact that where two or more service departments render services to each other, each department receiving such services should be charged for the cost of services rendered by the other. The reciprocal service methods are conceptually preferable. Any one of following three methods may be followed for inter-service distribution:

(i) Simultaneous Equation Method

(ii) Repeated Distribution Method

(iii) Trial and Error Method

Let us discuss these methods one by one.

(i) Simultaneous Equation Method

This method involves the following steps:

Practical Steps Involved in the Simultaneous Equation Method
Step 1 - Calculate the Total Costs of each service department by forming and solving simultaneous equations.
Step 2 - Re-apportion the total costs of each service department only to Production Department on the basis of given percentages.

Illustration 7

TT Ltd. has two production departments P_1 and P_2 and two service departments S_1 and S_2 Expenses of these departments are as follows:

P_1 – ` 51,837, $P_2$ – ` 12,163, S_1 – ` 40,000, $S_2$ – ` 16,000

The expenses of service departments are to be apportioned are as follows:

	P_1	P_2	S_1	S_2
S_1	50%	40%	—	10%
S_2	30%	50%	20%	—

Required: Apportion the cost of service departments by using Simultaneous Equation Method.

Solution:

Step 1 - Formation of simuitaneous equations

Let X = Total expenses of S_1, Let Y = Total expenses of S_2

X = ` 40,000 + 20% of Y

Y = 16,000 + 10% of X

Step 2 - Solving simultaneous equations

X = 40,000 + .20Y

Y = 16,000 + .10X

Putting the value of X in equation II

Y = 16000 + .10(40,000 + .20Y)

= 16000 + 4000 + .02Y

Y – .01Y = 20,000

Y = 20,000/.98 = ` 20,408

Putting value of Y is equation I

X = 40,000 + .20 × 20,408

X = 44,082

Step 3 - Overheads Distribution Summary

Item	Production Departments	
	P_1 (`)	P_2 (`)
As per primary distribution summary	51,837	12,163
90% of costs of S1, apportioned to P1 & P2 in the ratio of 5:4	22,041	17,633
80% of costs of S2 apportioned to P1 & P2 in the ratio of 3 : 5	6,122,	10,204
Total overheads of Production Department	80,000	40,000

(ii) Repeated Distribution Method

This method involves the following steps:

Practical Steps involved in the Repeated Distribution Method
Step 1- Apportion the costs of first service department (say S_1) over other service departments and production departments on agreed percentages.
Step 2 - Apportion the costs of second service department (Say S_2) plus the share received from S_1 over other departments on agreed percentages.
Step 3 - Apportion the costs of third service department (Say S_3) plus the share received from S_1 and S_2 over other departments on agreed percentages.
Step 4 - Repeat this process of distribution again beginning with S_1 until the total costs of the service departments are exhausted or reduced to too small figure. The small figure should be apportioned over production departments and not over other service departments.

Illustration 8

Taking the same figure of Illustration 7, apportion the expenses of service departments using Repeated Distribution Method.

Solution:

Overheads Distribution Statement

Item	Production Departments		Service Departments	
	P_1 (`)	P_2 (`)	S_1 (`)	S_2 (`)
Overheads as per Primary Distribution	51,837	12,163	40,000	16,000
Cycle I				
Cost of S_1 apportioned in the ratio (5 : 4 : 1)	20,000	16,000	(40,000)	4,000
Cost of S_2 apportioned in the ratio (3 : 5 : 2)	6,000	10,000	4,000	(20,000)
Cycle II				
Cost of S_1 apportioned in the ratio (5 : 4 : 1)	2,000	1,600	(4,000)	400
Cost of S_2 apportioned in the ratio (3 : 5 : 2)	120	200	80	(400)
Cycle III				
Cost of S_1 apportioned in the ratio (5 : 4 : 1)	40	32	(80)	8
Cost of S_2 apportioned in the ratio (3 : 5)	3	5	—	(8)
Total Overheads	80,000	40,000	—	—

Illustration 9

A company has three production departments A, B and C and two service departments the boiler house and the pumproom. The boiler house has to depend upon the pumproom for its supply of water and the pumproom, in its turn, is dependent on the boiler house for its supply of steam power for driving the pump. The expenses incurred by the production department are:

(CS, Modified)

A ` 4,00,000
B ` 3,50,000
C ` 2,50,000

The expenses for the boiler house are ` 1,17,000 and for the pumproom ` 1,50000.

The expenses of the boiler house and the pumproom are apportioned to the production departments ton the following basis:

Particulars	A (%)	B (%)	C (%)	Boiler House (%)	Pump Room (%)
Expenses ol the Boiler House	20	40	30	-	10
Expenses or the Pump Room	40	20	20	20	-

Show clearly as to how the expenses of the boiler house and the pumproom would be apportioned to A, B and C departments?

Solution:

Note: Alternatively, this sum can also be solved using the Repeated Distribution Method

Simultaneous Equation Method

Let X be the total overheads of the Boiler House

Let Y be the total overheads of the Pump Room

Then; X = ` 1,17,000 + 20 of Y

Y = ` 1.50,000 + 10% of X

X = 1,17,000 + 0.2Y

Y = 1,50.000 + 0.1X

By Multiplying by 10; we get

$10X = 11,70,000 + 2Y$

$10Y = 15,00,000 + 1X$

$10X - 2Y = 11,70,000$ (Equation 1)

$-1X + 10Y = 15,00,000$ (Equation 2)

By Multiplying Equation (1) by – 1 and Equation (2) by 10; we get;

$-10X + 2Y = -11,70,000$

$-10X + 100Y = 1,50,00,000$

\+ – –

$$-98Y = -1,61,70,000$$

$$98\,Y = 1,61,70,000$$

$$Y = \frac{1,61,70,000}{98}$$

Pump Room **Y = 1,65,000**

Substituting Y = 1,65,000 in Equation (1); we get

$$10X - 2Y = 11,70,000$$

$$10X - (2 \times 1,65,000) = 11,70,000$$

$$10X - 3,30,000 = 11,70,000$$

$$10X = 11,70,000 + 3,30,000$$

$$10X = 15,00,000$$

$$X = \frac{15,00,000}{10}$$

Boiler house **X = ` 1,50,000**

Apportionment of Overheads

Items	Total (`)	Production Departments		
		A (`)	B (`)	C (`)
Opening Expenses	10,00,000	4,00,000	3,50,000	2,50,000
Boiler House (1,50,000 – 10% for pump room) (Working Note 1)	1,35,000	30,000	60,000	45,000
Pump Room (1,65,000 – 20% for Boiler house) (Working Note 2)	1,32,000	66,000	33,000	33,000
Total	12,67,000	4,96,000	4,43,000	3,28,000

Working Notes:

(1) Boiler house expenses

A $1,35,000 \times \frac{20}{90} = 30,000$

B $1,35,000 \times \frac{40}{90} = 60,000$

C $1,35,000 \times \frac{30}{90} = 45,000$

(2) Pump room expenses

A $1,32,000 \times \frac{40}{80} = 66,000$

B $1,32,000 \times \frac{20}{80} = 33,000$

C $1,32,000 \times \frac{20}{80} = 33,000$

Illustration 10 ***(CA Modified)***

In a factory, there are three production departments and two service departments. In December, 2012, the departmental expenses were:

Production Departments (`)		Service Departments (`)	
P_1	1,30,000	S_1	24,000
P_2	1,20,000	S_2	20,000
P_3	1,00,000	–	–

The service department expenses are allocated on a percentage basis as follows:

Particulars	P_1	P_2	P_3	S_1	S_2
S_1	30	40	15	–	15
S_2	40	30	25	5	–

Prepare a statement showing the distribution of service department expenses to the production department by using the repeated distribution method.

Solution:

Repeated Distribution Method:

Distribution of the Service Department Expenses (using Repeated Distribution Method)

Items	Production Department			Service Department	
	P_1 (`)	P_2 (`)	P_3 (`)	S_1 (`)	S_2 (`)
Opening Expenses	1,30,000	1,20,000	1,00,000	24,000	20,000
S_1 (W.N.2)	7,200	9,600	3,600	(24,000)	3,600
				Nil	23,600
S_2 (W.N.3)	9,440	7,080	5,900	1,180	(23,600)
				1,180	Nil
S_3 (W.N.4)	354	472	177	(1,180)	177
				Nil	177
S_4 (W.N.5)	70.80	53.10	44.25	8.85	(177)
				8.85	Nil
S_5 (W.N.6)	2.655	3.54	1.3275	(8.85)	1.3275
				Nil	1.3275
S_6 (W.N.7)	0.53	0.39	0.33	0.06	(1.3275)
Total	1,47,067.98	1,37,209.03	1,09,722.90	—	Nil

Working Notes:

(1)

Particulars	P_1	P_2	P_3	S_1	S_2	Total
S_1	30	40	15	–	15	100
S_2	40	30	25	5	–	100

(2)

P_1	$24,000 \times \frac{30}{100}$	$= 7,200$
P_2	$24,000 \times \frac{40}{100}$	$= 9,600$
P_3 and S_2	$24,000 \times \frac{15}{100}$	$= 3,600$

(3)

P_1	$23,600 \times \frac{40}{100}$	$= 9,440$
P_2	$23,600 \times \frac{30}{100}$	$= 7,080$
P_3	$23,600 \times \frac{25}{100}$	$= 5,900$
S_1	$23,600 \text{ x } \frac{5}{100}$	$= 1,180$

(4)

P_1	$1,180 \times \frac{30}{100}$	$= 354$
P_2	$1,180 \times \frac{40}{100}$	$= 472$
P_3 and S_2	$1,180 \times \frac{15}{100}$	$= 177$

(5)

P_1	$177 \times \frac{40}{100}$	$= 70.80$
P_2	$177 \times \frac{30}{100}$	$= 53.10$
P_3	$177 \times \frac{25}{100}$	$= 44.25$
S_1	$177 \times \frac{5}{100}$	$= 8.85$

(6)			
	P_1	$8.85 \times \frac{30}{100}$	$= 2.655$
	P_2	$8.85 \times \frac{40}{100}$	$= 3.54$
	P_3 and S_2	$8.85 \times \frac{15}{100}$	$= 1.3275$

(7)			
	P_1	$1.3275 \times \frac{40}{100}$	$= 0.531$
	P_2	$1.3275 \times \frac{30}{100}$	$= 0.39825$
	P_3	$1.3275 \times \frac{25}{100}$	$= 0.331875$
	S_1	$1.3275 \times \frac{5}{100}$	$= 0.066375$

Note: Alternatively, this sum can also be solved by the Simultaneous Equation Method.

Illustration 11

Calculate the overheads that can be allocated to the production departments A and B. There are also two service departments X and Y. X renders service worth ` 12,000 to Y and the balance to A and B at 3:2 Y renders service to A and B in the ratio 9:1. ***(CA Modified)***

Particulars	A	B	X	Y
Floor area (Sq. Feet)	5,000	4,000	1,000	2,000
Assets (Rs. lakhs)	10	5	3	1
Horsepower of Machines	1,000	500	400	100
Number of the Workers	100	50	50	25
Light Points	50	30	20	20

The expenses includes:

Particulars	`
Depreciation	1,90,000
Rent, Rates, etc.	36,000
Insurance	15,200
Power	20,000
Canteen expenses	10,800
Electricity	4,800

Solution:

Overhead Distribution Summary

Items	Basis	Total (`)	Production Department Department		Service	
			A (`)	B (`)	X (`)	Y (`)
Electricity (W.N.2)	Light Points	4,800	2,000	1,200	800	800
Depreciation (W.N.3)	Asset Value	1,90,000	1,00,000	50,000	30,000	10,000
Canteen Ezpenses (W.N.4)	No. of Workers	10,800	4,800	2,400	2,400	1,200
Rent, Rates, etc. (W. N. 5)	Floor Area	36,000	15,000	12,000	3,000	6,000
Power (W.N.6)	Horse Power of Machines	20,000	10,000	5,000	4,000	1,000
Power (W.N.7)	Asset Value	15,200	8,000	4,000	2,400	800
Total –		2,76,800	1,39,800	74,600	42,600	19,800
Department X	(W. N.8)	–	18,360	12,240	(42,600)	12,000
					Nil	31,800
Department Y	(W. N. 9)	–	28,620	3,180	–	(31,800)
Total	–	2,76,800	1,66,780	90,020	Nil	Nil

Workings:

(1)

Items	A	B	X	Y	Total
Floor Area	5,000	4,000	1,000	2,000	12,000
Assets	10	5	3	1	19
Horsepower of Machines	1,000	500	400	100	2,000
Number of the Workers	100	50	50	25	225
Light Points	50	30	20	20	120

(2) Electricity (Light Points)

A	$4,800 \times \frac{50}{120}$	= 2,000
B	$4,800 \times \frac{30}{120}$	= 1,200
X	$4,800 \times \frac{20}{120}$	= 800
Y	$4,800 \times \frac{20}{120}$	= 800

(3) Depreciation (Asset Value)

A	$1,90,000 \times \frac{10}{19}$	= 1,00,000
B	$1,90,000 \times \frac{5}{19}$	= 50,000
X	$1,90,000 \times \frac{3}{19}$	= 30,000
Y	$1,90,000 \times \frac{1}{19}$	= 10,000

(4) Canteen Expenses (No. of Workers)

A	$10,800 \times \frac{100}{225}$	= 4,800
B	$10,800 \times \frac{50}{225}$	= 2,400
X	$10,800 \times \frac{50}{225}$	= 2,400
Y	$10,800 \times \frac{25}{225}$	= 1,200

(5) Rent, Rates, etc. (Floor Area)

A	$36,000 \times \frac{5,000}{12,000}$	= 15,000
B	$36,000 \times \frac{4,000}{12,000}$	= 12,000
X	$36,000 \times \frac{1,000}{12,000}$	= 3,000
Y	$36,000 \times \frac{2,000}{12,000}$	= 6,000

(6) Power (Horspower of Machines)

A	$20,000 \times \frac{1,000}{2,000}$	= 10,000
B	$20,000 \times \frac{500}{2,000}$	= 5,000

X	$20,000 \times \frac{400}{2,000}$	= 4,000
Y	$20,000 \times \frac{100}{2,000}$	= 1,000

(7) Insurance (Asset Value)

A	$15,200 \times \frac{10}{19}$	= 8,000
B	$15,200 \times \frac{5}{19}$	= 4,000
X	$15,200 \times \frac{3}{19}$	= 2,400
Y	$15,200 \times \frac{1}{19}$	= 800

(8) Department X Expenses:

A	$30,600 \times \frac{3}{5}$	= 18,360
B	$30,600 \times \frac{2}{5}$	= 12,240
Y	Given	= 12,000
		= 42,600

(9) Departmet Y Expenses:

A	$31,800 \times \frac{9}{10}$	= 28,620
B	$31,800 \times \frac{1}{10}$	= 3,180

Illustration 12

(CS Modified)

ZED Ltd., a manufacturing unit, has three production departments A, B and C and two service departments X and Y. The following estimates of expenses are available for a period:

Particulars	
Rent and Rates	3,20,000
Power	4,40,000
Staff Welfare Expenses	3,00,000
Insurance on Building	1,60,000
Insurance on Machinery	6,00,000
Staff canteen Expenses	1,00,000

The other technical details about the departments are as under:

Particulars	Total	A	B	C	X	Y
Floor area ('000 Sq. Ft.)	80	10	20	30	10	10
Number of Workers	50	10	15	15	5	5
H. P. of Machines	100	30	20	25	15	10
Cost of Machines (` lakhs)	10	6	2	1	1	0

The costs of service departments are distributed as under:

Particulars	A	B	C	X	Y
Department X	40%	30%	20%	–	10%
Department Y	20%	40%	20%	20%	–

Required: Show the PRIMARY and SECONDARY DISTRIBUTION of overhead expenses and the resulting total costs of the production departments.

Solution:

Item	Base	Total	Production Departments			Service Departments	
			A	B	C	X	Y
Rent and Rates	Floor Area	3,20,000	40,000	80,000	1,20,000	40,000	40,000
Power	H.P. M/c.	4,40,000	1,32,000	88,000	1,10,000	66,000	44,000
SWE	No. of Workers	3,00,000	60,000	90,000	90,000	30,000	30,000
Ins. Bldg.	Floor area	1,60,000	20,000	40,000	60,000	20,000	20,000
Ins. M/c	Cost M/c	6,00,000	3,60,000	1,20,000	60,000	60,000	–
Staff Canteen Expenses	No. of workers	1,00,000	20,000	30,000	30,000	10,000	10,000
Primary Distribution		19,20,000	6,32,000	4,48,000	4,70,000	2,26,000	1,44,000
X:	2,60,000		1,04,000	78,000	52,000	(2,60,000)	26,000
Y:	1,70,000		34,000,	68,000	34,000	34,000	(1,70,000)
Secondary Distribution		19,20,000	7,70,000	5,94,000	5,56,000	Nil	Nil

(1) Rent and Rates:

A	10	40,000
B	20	80,000
C	30	1,20,000
X	10	40,000
Y	10	40,000
	80	3,20,000

(2) Power

A	30	1,32,000
B	20	88,000
C	25	1,10,000
X	15	66,000
Y	10	44,000
	100	4,40,000

(3) SWE

A	10	60,000
B	15	90,000
C	15	90,000
X	5	30,000
Y	5	30,000
	50	3,00,000

(4) Insurance Building

A	10	20,000
B	20	40,000
C	30	60,000
X	10	20,000
Y	10	20,000
	80	1,60,000

(5) Insurance Machinery

A	6	3,60,000
B	2	1,20,000
C	1	60,000
X	1	60,000
Y	–	–
	10	6,00,000

(6) Canteen

A	10	20,000
B	15	30,000
C	15	30,000
X	5	10,000
Y	5	10,000
	50	1,00,000

X = 2,26,000 + 0.20Y

Y = 1,44,000 + 0.10X

$$
\begin{aligned}
X - 0.20Y &= 2{,}26{,}000 \\
-X + 10Y &= 14{,}40{,}000 \text{ x by } 10 \\
X - 0.20Y &= 2{,}26{,}000 \\
-X + 10Y &= 14{,}40{,}000 \\
9.8Y &= 16{,}66{,}000 \\
Y &= 1{,}70{,}000 \\
X &= 2{,}60{,}000
\end{aligned}
$$

The following factors should be taken into consideration for determining the basis for applying overheads to products:

1. **Adequacy:** The overhead rate should be such that equitable apportionment can be made to the cost centers or cost units. The amount of overhead recovered should be equivalent to the amount of overheads incurred.
2. **Convenience:** The overhead rate should be simple, easy to understand and convenient in application.
3. **Time Factor:** Overhead rate should have some relation to the time taken by various jobs for completion.
4. **Manual or Machine Work:** Different overhead rates should be applied for manual and machine work.
5. **Different Overhead Rates:** When the nature of work done by various departments is not the same, different overhead rates should be ascertained.
6. **Information:** The availability affects the selection of the overhead rates. For example, labor hour rate can be applied where labor time cards are maintained.

UNDERABSORPTION AND OVERABSORPTION OF OVERHEADS

Overhead costs are fully recovered from production, if actual rate method of absorption is adopted. But if a predetermined rate is used, the actual expense may be different from the charged or budgeted overhead expenses. If the overheads absorbed are less than the overheads incurred, it is underabsorption of overheads. On the other hand, if the amount of overhead absorbed is more than the actual overheads incurred it is overabsorption of overheads.

Causes of Under or Overabsorption of Overheads

The following are the cause of under or overabsorption of overheads:

1. Error in estimating the overheads may lead to over or underabsorption of overheads.
2. The anticipated output may be different from the actual output
3. The hours anticipated may be more or less than the actual hours worked.
4. Due to fluctuations in the prices of material or wage rates, the basis upon which the factory overhead is recovered from production may not be correct.
5. If overhead are not charged to work-in-progress proportionately.
6. Non-recurring expenditure incurred due to unexpected changes in the methods of production.
7. Seasonal fluctuations in the overhead expenses.

Accounting for Under and Overbsorption of Overhead

The disposal of under/overheads depends on the extent of such under/overabsorption and the circumstances index which it arise. The main methods of disposal of under/overabsorption of overheads are as follows:

Use of Supplementary Rates

Supplementary rates are used to carry out adjustment for the difference between overhead absorbed and overhead incurred. This rate can be calculated by dividing under/overabsorbed overheads by the actual base.

Advantages

If facilitates the absorption of actual overhead incurred for incurred for production. Correction of costs through supplementary rates is necessary for maintain data for comparison.

Disadvantages

These rates can be determined only after the end of the accounting period. It requires a lot of clerical work.

WRITING OFF TO COSTING PROFIT AND LOSS ACCOUNT

Insignificant amount of overabsorption and underabsorption may be written off to costing profit and loss account. Underabsorption due to idle facilities should be written off to costing profit and loss account. Under or overabsorption which arises due to abnormal cause such as strikes, lockouts, breakdowns, etc., then such expenses should be carried over to next year and is considered while fixing the rate for that period.

The value of stock is distorted under this method as the over or underabsorption of overheads is not allocated to the stock of work-in-progress and finished goods.

ABSORPTION IN THE ACCOUNTS OF SUBSEQUENT YEARS

The over or underabsorption of overheads can be carried over as deferred charge to the next accounting period by transferring it to a suspense or overhead reserve account. This method is suitable in case of new projects and when the normal business period is more than one year. Criticism levied against this method is that it distorts the cost for the purpose of comparison, as the over or underabsorbed costs are carried forward.

ACCOUNTING AND CONTROL OF MANUFACTURING EXPENSES

Manufacturing overhead control account opened in the cost ledger is debited by indirect material, indirect labor and indirect expense incurred by passing the following journal entry:

Manufacturing Overhead Control a/c Dr.
To Stores Ledger Control a/c
To Wage Control a/c
To General Ledger Adjustment a/c

The debit side of this account represents the total manufacturing expenses incurred. The recovery of such expenses is made by passing the following entry.

Work-in-progress a/c Dr.
To Manufacturing Overhead Control a/c

The balance in the manufacturing overhead control account represents the amount of under or overabsorption of overheads.

Control of manufacturing Overheads

- Nature of overheads
- Budgeting of overheads
- Comparison of actual and budgeted overheads
- Actual amount per functional unit
- Standard costing

For better control of the manufacturing overheads, the manufacturing expenses can be classified into fixed, variable and semi-variable expenses. The management of the organization should concentrate on the controllable costs that will be incurred. One way of reducing the overhead cost is through increasing the production level, i.e., by following the concept of economies of scale.

The service requirement of each department can be estimated by referring the budgeted output of each production department. There should be adequate care to identify the variability of each item while determining the budgeted amount.

The control of manufacturing overheads can also be done by comparing the actual and budgeted overheads.

Also, the actual amount per functional unit can be compared with the appropriate budgeted amount..

Finally, control can also be done by use of standard costing method. Here, the actual overheads should be compared with the standard overheads, and the variations, if any, should be analyzed and reported to the management for taking appropriate actions.

QUESTIONS FOR SELF-PRACTICE

(I) Theory Questions

(1) Explain the basis of apportionment of overheads.

(2) Explain primary distrubution of overheads.

(3) What do you mean by secondary distrubution of overheads? Explain the various methods of secondary distrubution of overheads?

(4) Short notes on:

(1) Overheads

(2) Overheads v/s Costs

(II) Theory Questions

(1) Break-up the cost into Fixed Cost and Variable Cost using the method of Least Squares:

Units	Repairs and Maintenance Cost (`)
200	5,600
220	5,900
260	6,500
280	6,900

(Ans.: Y = 16X + 2.385)

(2) Break-up the cost into fixed cost using the technique of least square Method

Units	Factory overheads (`)
18	416
16	378
17	386
19	424
15	335

(Ans.: Y = 2.16X + 351.08)

(3) A Ltd. has 3 manufaturing deprtments - A, B, C and a deparment - S. the following figures are available for one month of 25 days 8 hrs. each day. All the departments work for all the working days and with full attendance.

Expenditure	Total	Departments			
		S	A	B	C
Power and lighting	1100	240	200	300	360
Supervisors Salary	2000	-	-	-	
Rent	500				
Welfare	600				
Others	1200	200	200	400	400
Total	5400				
Supervisors Salary		20%	30%	30%	20%
No.of Workers		10	30	40	20
Floor Areas (sq.ft)		500	600	800	600
Service rendered by service department			50%	30%	20%

(4) From the following particulars you are required to calculate the department overhead retes for each of the production department and service departments on appropriate basis.

Particulars	Production Departments			Service Departments	
	A	B	C	D	E
Direct wages (`)	8000	12,000	16,000	4,000	8,000
Direct material	4,000	8,000	8,000	6,000	6,000
No.of workers	100	150	150	50	50
Electricity (units)	4,000	3,000	2,000	1,000	1,000

No.of light points	10	16	4	6	4
Value of Assets (`)	1,00,000	70,000	50,000	20,000	1,00,000
Area(sq,ft)	150	250	50	50	50

The expenses incurred are as undre:

Power ` 2,200, Lighting ` 400, Stores overheads ` 1,920, Incenives to workers ` 6,000, Depreciation ` 15,000, Repairs and maintanance work of machine ` 10,000 General overheads ` 24,000, Rent and Rates ` 1,100.

You are required to show a statement of distrubution of overheads asuuming that the stores and general overheads are distrubuted in propotion of direct wages.

(5) A company has three production deprtments and two service departments. For the period ending 31 December, 2007 the departmental distrubution summery has the following totals:

Production departments	**(`)**
P_1	1,600
P_2	1,400
P_3	1,000
Service Deparment	**(`)**
S_1	4,400
S_2	600
Total	5,000

The service department costs are proposed to be charged on a percentage basis as given below:

Particulers	**p_1**	**p_2**	**p_3**	**s_1**	**s_2**
S_1	20%	40%	30%	—	10%
S_2	40%	20%	20%	20%	—

You are required to show the appointamnet of service departments's overheads by the following methods (i) simultaneous equation and (ii) repeated distribution.

(6) Nerul Ltd. has production departments A. B, and C and two service departments S_1 and S_2. Monthly expences (`) include; rent (5,000); indirect wages (1,500); depreciation (10,000); lighting (600); power 1,500; and sundries 10,000.

Additional Informaation:

Particulars	**Total**	**Production Dept.**			**Service Dept.**	
		A	**B**	**C**	**S1**	**S2**
Floor Space (sq. feet)	10,000	2,000	2,500	3,000	2,000	500
Light points	90	15	10	35	15	15
Wages (`)	10,000	3,000	2,000	3,000	1,500	500
Horse power of the machines	150	60	30	50	10	—
Value of machines	2,50,000	60,000	80,000	1,00,000	5,000	5,000
Working hours	—	6,226	4,028	4,066	—	—

The expences of S_1 and S_2 are allocated as follows (in percentage):

Particulers	A	B	C	S_1	S_2
S_1	20	30	40	—	10
S_2	40	20	30	10	—

Calculate the overhead charges recovery per hour.

(7) A factory has two productiuon departments A and B two service department C and D. Following figures have been extracted from the books of the respective departments.

Particular	Production Departments		Service Departments	
	A	B	C	D
Wages (`)	8,000	6,000	3,000	3,500
Area (m2)	1,500	1,100	900	500
No. of employees	40	30	20	10
Value of plant and machinery (`)	16,000	12,000	8,000	4,000
Value of Stock (`)	25,000	15,000	—	—
Lighting units	5,000	3,000	1,500	500

The followings figures of actual costs were taken from the financial books.

Paricular	`
Supervision	3,000
Repairs to plant and machinery	1,200
Light	1,000
Employer's contribution to employees state insurance	200
Rent	800
Depreciation of plant and machinery	2,000
Insurance (Stock)	1,200
Power	4,000
Canteen expences	1,200

Apportion the above costs to the various depatments on most equitable bases and draw an overhead analysis sheet.

(8) A company is divided into four departments A, B, C are production departments and D is service department. The actual costs for a period are as follows:

Particular	`
Rent	10,000
Repairs to plant	6,000
Depreciation of plant	4,500
Supervision	15,000
Power	9,000
Light	1,000
Employer's liability insurance	2,000

The following details are available in respect of the four deparments:

Particular	A	B	C	D
Area (Sq. feet)	1,500	1,100	900	500
No. of employees 40	40	30	20	30
Horsepower of machines	800	500	200	—
Total wages (`)	60,000	40,000	30,000	20,000
Value of plant (`)	2,40,000	1,80,000	1,20,000	60,000
Value of stock (`)	1,50,000	90,000	60,000	—
Light points (`)	40	30	20	10

Appropriate the costs of the various departments.

(9) Calculate the overheads allocable to production departments A and B. There are also two services X and Y.

X renders services worth (`) 12,000 to Y and the balance to A and B at 3 : 2; Y renders services to A and B at 9:1.

Particulars	A	B	X	Y
Floor space (sq.feet)	5,000	4,000	1,000	2,000
Assets (` lakhs)	10	5	3	1
Horsepower of machines	1,000	500	400	100
No. of workers	100	50	50	25
Light and fan points	50	30	20	20

Expenses and charges are:

Particulars	(`)
Depreciation	2,10,000
Rent, rates and taxes	36,000
Insurance	15,200
Power	20,000
Canteen expenses	24,000
Electricity	5,000

(10) In Real Chemicals Ltd., there are two service departments, P and Q and three production departmenmts A, B and C. In may, 2008 the departmental expences were:

Particular	(`)
A	1,30,000
B	1,20,000
C	1,00,000
P	24,000
Q	20,000

Service department expenses are allocated on the following (in percentage):

Particulars	A	B	C	P	Q
P	30	40	15	—	15
Q	40	30	25	5	—

Prepare a statement showing the distribution of the service departments expenses of threee production departments under the simultaneous equation method.

(11) In a light engeering factory, the following particulars have been collected for the three month period ending on 31 December, compute the departmental overhead rates for each of the production departments assuming the overheads are recovered as percentage of direct wages.

Particulars	Production Department			Service Department	
	A (`)	B (`)	C (`)	D (`)	E (`)
Direct wages (`)	2,000	3,000	1,000	1,500	1,500
Direct materials (`)	1,000	2,000	2,000	1,500	1,500
Staff (Nos.)	100	150	150	50	50
Electricity (kWh)	4,000	3,000	2,000	1,000	1,000
Light points (Nos)	10	16	4	6	4
Asset value (`)	60,000	40,000	30,000	1,00,000	10,000
Area occupied (sq. yds)	150	250	50	50	50

The expenses for the period were:

Particulars	`
Motive power	550
Lighting power	100
Stores overhead	400
Amenities to staff	1,500
Depericiation	5,000
Repairs and maintenance	3,000
General overhead	6,000
Rent and taxes	275

Apportion the expenses of the service depatment expenses in proportion to direct wages and that of the sevice department D in the ratio of 5:3:2 to department A, B, and C respectively.

(ICWA)

(12) ABC Ltd. has three production departments P_1 P_2 and P_3 and two service department S_1 and S_2. The following data are extracted from the records of the company for the month of October 2007.

Particulars	(`)
Rent & rates	62,500
General lighting	7,500
Indirect wages	18,750
Power	25,000
Depreciation on machinery	50,000
Insurance of machinery	20,000

Other Information:

Particulars	P_1	P_2	P3	S_1	S_2
Direct Wages (`)	37,500	25,000	37,500	18,750	6,250
Horsepower of Machines used	60	30	50	10	—
Cost of Machinery (`)	3,00,000	4,00,000	5,00,000	25,000	25,000
Floor space (sq. ft)	2,000	2,500	3,000	2,000	500
Number of ligth points	10	15	20	10	5
Production hours worked	6,225	4,050	4,100	—	—

Expenses of the departments S_1 and S_2 are reapportioned as below:

Particulars	P_2	P_2	P_3	S_1	S_2
S_1	20%	30%	40%	—	10%
S_2	40%	20%	30%	10%	—

Required:

(i) Compute overhead absorption rate per production hour of each production department.

(ii) Determine the total cost of product X which is processed for manufacture in department P_1, P_2 and P_3 for 5 hours 3 hours and 4 hours respectively, given that its dirct material cost is ` 625 and direct labour cost is ` 375.

(CA, December 2007)

(13) You are given the following data about at a factory and costs of prodiction over the past 5 months.

Particulars	Output (Units)	Semi Variable Overhead (`)
June	4,200	17,600
July	4,000	17,000
August	4,300	17,900
September	3,800	16,400
October	2,700	13,100

There is a high degree of correlation between output and costs and so it is decided to calculate fixed costs and the variable cost per unit of output using the least squares method.

Required:

(a) Calculate a formula to determine the expected level of costs, for any given volume of output.

(b) Determine the total costs if output is 4,500 units.

(14) ZED Ltd., a manufacturing unit, has three production departments A, B, and C and two service departments X and Y. the following estimates of expenses are availble for a period.

Particular	(`)
Rent & rates	3,20,000
Power	4,40,000
Staff Welfare Expenses	3,00,000

Insurance on Building	1,60,000
Insurance on Machinery	6,00,000
Staff canteen Expenses	1,00,000

The other technical details about the departments are as under:

Particular	Total	A	B	C	X	Y
Floor area ('000 sq. ft.)	80	10	20	30	10	10
Number of Workers	50	10	15	15	5	5
H.P. of machines	100	30	20	25	15	10
Cost of Machines (` Lakhs) 10	10	6	2	1	1	0

The cost of service departments are distributed as under:

Particulars	A	B	C	X	Y
Department X	40%	30%	20%	—	10%
Department Y	20%	40%	20%	20%	—

Required:

Show the Primary and Secondary Distribution of overhead expenses and the resulting total costs of the production departments.

[III] Objective Questions

I. State Whether the Following Statements are True or False.

(1) Overhead absorption is the allotment of overheads to cost units.

(2) Overhead absorption rates for fixed overheads are based on normal plant capacity.

(3) Under-absorption of overheads means that actual overheads are more than absorbed overheads.

(4) Under-absorption of overheads decreases profit in costing books.

(5) When actual overheads are more than absorbed overheads, it is known as over-absorption

(6) Administrative overheads are usually absorbed as a percentage of prime cost.

(7) Departmentalisation of overheads facilitates control objective accounting.

(8) Linking overheads to cost unit is known as overhead absorption.

(9) Variable overhead cost is a period cost.

[Ans. True : (1, 2, 3, 7, 8). False : (4, 5,6, 9)]

II. Match the Following.

Group A	Group B
(1) Rent	(i) No. of light points
(2) Lighting and Heating	(ii) Time spent on machine
(3) Supervision	(iii) Cost of each machine
(4) Insurance	(iv) Actual depreciation
(5) Depreciation	(v) Requisition Slip
	(vi) Floor area occupied by each machine

[Ans. (1 - vi), (2 - i), (3 - ii), (4 - iii), (5 - iv)]

III. Multiple Choice Questions. Select the Right Answer.

(1) The process by which cost items are charged direct to a cost unit is called
   (i) Absorption
   (ii) Apportionment
   (iii) Allocation
   (iv) Allotment

(2) A common absorption rate used through out the following for all jobs and units of output irrespective of the department in which they were produced is called
   (i) Machine hour rate
   (ii) Department absorption rate
   (iii) Overall absorption rate
   (iv) Blanket absorption rate

(3) When allocating service department costs to production departments, the method that does not consider different cost behaviour pattern is the
   (i) Step method
   (ii) Reciprocal method
   (iii) Simple rate method
   (iv) Dual rate method

(4) Machine hour rate is followed when
   (i) Most of the work is done by machine
   (ii) Most of the work is done by labour
   (iii) One operator uses several machines

(5) Labour hour rate is followed when most of the work is done by
   (i) Labour
   (ii) Machines
   (iii) Different groups of machines

[Ans. (1 - iii), (2 - i), (3 - iii), (4 - iii), (5 - i)]

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