1935

Uniform system for determining manufacturing costs

American Pharmaceutical Manufacturers' Association

A UNIFORM SYSTEM
FOR DETERMINING MANUFACTURING COSTS

AMERICAN PHARMACEUTICAL MANUFACTURERS' ASSOCIATION

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INTRODUCTION

For many years, the American Pharmaceutical Manufacturers' Association has studied and discussed the subject of Manufacturing Costs, that is, the cost of producing products and placing them on the shelves in the Finished Stock Department. Each year the President has appointed a committee on Costs and Cost Finding Methods. Members of the committee have, from time to time, presented papers on various phases of this subject. These were usually based on the particular system in use by the member who presented the paper.

Questionnaires were sent out from time to time asking the members to compute the cost of specific products for comparative purposes. Usually the replies were of little value from a comparative standpoint because of the numerous methods employed by the members in arriving at the cost of their products.

Prior to the Association's meeting at Washington, D.C. on December 13, 1934, another questionnaire was sent to the members asking them to compute manufacturing costs on four specific products. The replies to this questionnaire were grouped according to the methods used for calculating Manufacturing Overhead.

As a result, it was determined that those members who calculated Manufacturing Overhead on the Unit Method, which is explained in this Manual, arrived at total costs which were readily comparable and reasonably uniform. Those members who used other methods of calculating Overhead arrived at total costs which were not at all uniform.

Therefore, it was decided by the Association to have a Manual prepared outlining a Uniform System for determining Manufacturing Costs, containing, as one of its major features, the Unit Method of calculating Manufacturing Overhead.

The system presented herewith was designed after considerable study of the problems and requirements of pharmaceutical manufacturers. It is the result of six years work with approximately twenty pharmaceutical manufacturers, representing a good cross section of the average sized houses.

The purpose of this Manual is to present a simple, uniform method of computing manufacturing costs and to act as a guide for those companies desiring to use such a method.

Manufacturing Costs only are dealt with here, that is, the cost of producing products and placing them on the shelf in the finished stock room. Distribution Costs have not been studied sufficiently by the Association to produce results which can be included here.

This Manual is written with the idea that it will be read and used by people who are thoroughly familiar with the processes involved in the manufacture of pharmaceuticals and by members of their organizations who have a working knowledge of accounting, even though they may not be expert cost accountants.

It is prepared with the knowledge that most of the companies in the Association are average sized organizations, who really do not need an elaborate system of cost accounting. Therefore, a simple system is outlined herein requiring very little clerical labor for its maintenance.

The adoption of the methods presented herein by the Association will give the membership reliable manufacturing cost data. In addition, it will make the comparison of costs at Association meetings a more valuable and helpful procedure.

OUTLINE

As presented in this manual, Manufacturing Costs comprise five elements. They are:

1. Crude Materials
2. Manufacturing Labor
3. Containers
4. Finishing Labor
5. Manufacturing Overhead

Each of these elements will be treated as an individual subject and discussed separately.

One of the questions which arises in the development of any system of cost accounting is whether or not it should be tied-in with the general books. The process of "tying-in" is an accounting procedure designed to determine if every dollar of expense is accounted for in the total cost obtained by the cost system.

The additional detailed clerical work required for this purpose makes it necessary for each manufacturer to determine his position as to this refinement. Therefore, it is not considered at this time. A real effort has been made to devise a system which is relatively simple and inexpensive to operate and therefore usable by average sized companies.

Alternate methods are described wherever they are considered feasible. In each case a comment is made stating which method is considered preferable and the reason for the preference.

The methods discussed herein are Manufacturing Cost Finding methods; that is, the determination of the cost of producing individual bottles, jars, or packages of pharmaceuticals up to the point of placing them on the shelves in the Finished Stock Department.

For the purpose of uniformity, the operations performed up to the point of completing the finished packages and placing them on the shelves in the Finished Stock Department are considered as Production or Manufacturing. The cost of the Finished Stock Department and all other expenses from that point on are considered as Distribution Expenses.

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CRUDE MATERIALS

As used herein, Crude Materials are the ingredients used in the manufacture of pharmaceuticals and are distinguished from Containers. They are an actual part of the finished product taken by or administered into the patient. This definition makes capsules Crude Materials and ampuls Containers.

It is possible to account for Crude Materials more accurately in this industry than in many others because each product is manufactured according to a definite formula.

There are two methods of determining Material Costs for individual preparations. Both are as satisfactory from a cost standpoint, and it is only a matter of the rapidity with which market prices fluctuate as to which requires the least clerical work.

Under the first method, a combination formula, material requisition and manufacturing labor record are combined as a job ticket. (See Form No. 1.) The upper portion of this form remains the same for all types of products and is the part we are concerned with here. The lower portion will be discussed under Manufacturing Labor.

A ticket like the one illustrated is issued when a batch of any product is to be manufactured. It shows the name and number of the product, the quantity to be made, the working formula with the quantity of each ingredient to be used, and, where an inventory control system is used, the lot number from which each ingredient is to be taken.

The use of a perpetual inventory system for the control of Crude Materials is recommended in conjunction with the Cost System. It requires very little time for its maintenance and is of great assistance in keeping stocks at proper levels.

The job ticket referred to above is issued by the cost clerk and is sent to the department where the material will be assembled for manufacture. If a central Crude Stock Department is maintained, all job tickets will be sent there for assembly of materials. The ticket will accompany the materials to the first manufacturing department and will follow them to each succeeding department until the product is finished in bulk and sent to the Finishing Department.

If Crude Materials are kept in each manufacturing department, the job ticket will be sent by the cost clerk to the department that will do the first work on the product, including the assembly of materials. From there it will follow the same procedure as outlined above.

When the manufacturing processes have been completed and the product has been sent in bulk to the Finishing Department, the job ticket is returned to the cost clerk. He will then price each of the ingredients shown on the ticket, including any which have been added after the ticket left his hands originally. After making the extensions and totaling the amounts, he will have the total cost of Crude Material used for the manufacture of that particular batch.

A factor to be considered in the calculation of Crude Material Cost is that of waste or loss. There are two points at which loss occur--in the weighing out or assembling of materials for production, and in the actual manufacturing processes.

The latter is covered by dividing the total cost of the ingredients used by the actual yield of each batch. The former can be accounted for by adding a percentage to the cost of ingredients used.

Some companies, wanting to play safe, add 5% to the total cost of all Crude Materials entering into production. Actual tests in a number of cases have shown this loss to average about 2%, so this figure is recommended.

After determining the total cost of Crude Material, it is then reduced to a cost per thousand, per gallon, per pound, etc., depending on the nature of the product, for entry on a Summary Card. (See Form No. 6.)

Under the second method of calculating Crude Material cost, the upper portion of the job ticket referred to above is eliminated and the lower portion only is used as a Manufacturing Labor record.

A loose-leaf columnar book or card record is maintained with a page or a card devoted to each product manufactured. The formula is shown for a normal batch, and the total Crude Material cost of the batch is calculated.

Columns are provided for recalculating these costs when the price of any ingredient changes sufficiently to affect the cost of a standard size package, e.g., a thousand tablets, a gallon of liquid, a pound of ointment, etc.

Under this plan, an index should be maintained of all materials purchased showing the names of the products in which they are used. Then, when the price of a material changes, adjustments can be made more readily on all products affected.

When market prices are fairly steady, this second method requires a little less clerical work than the first method. However, when market prices fluctuate rapidly, it can easily become more burdensome.

Under the first method, when the clerk has priced his materials, he can compare the ticket with the previous ticket issued for the same product. If he finds the quantities and prices to be the same, he need not refigure them but can simply use the total from the previous ticket.

These job tickets should be filed alphabetically according to the name of the product, within departmental sub-divisions, after all necessary information has been taken from them as explained later. This filing arrangement will facilitate such comparison as that referred to above and other comparisons which will be discussed later.

The first method outlined here for calculating Crude Material costs is considered somewhat preferable because it assures a review of the material costs each time a batch is manufactured. It also provides definite space for the recording of additional materials used in any manufacturing process, such as coloring materials for coating tablets.

Such additional materials should, of course, be accounted for under the second method by being approximated from experience and recorded on the Crude Material record. Then it is imperative, if a formula is even slightly modified, for the manufacturing department to notify the cost clerk immediately. Otherwise his figures will be erroneous.

Under both of the methods described above, the total cost of material used to manufacture a batch of pharmaceuticals is divided by the actual yield to determine the cost per thousand, per gallon, per pound, etc., and this figure is transferred to a Summary Card. (Form No. 6.)

MANUFACTURING LABOR

As used herein, Manufacturing Labor and Finishing Labor combined comprise Productive Labor--that part of the total factory payroll which represents the time spent by employees in direct or actual production.

Manufacturing Labor is the time spent in converting the Crude Materials into the finished product in bulk. Finishing Labor is the time spent in placing the bulk products in Containers. The latter will be discussed in a separate section.

Manufacturing Labor is accounted for on the lower portion of job tickets such as Form No. 1. The ticket illustrated is used to record the manufacturing operations for Tablets, Powders, Capsules, Pills, etc. Similar tickets are used for other preparations, with the operations properly designated.

By arranging the ticket so that one form serves for several kinds of products, the number of forms required is kept at a minimum. As stated above, the form illustrated is used for a number of products. One form can cover the operations performed in the manufacture of Liquids, Ointments, Suppositories, etc. A separate form will be needed for Ampuls because of the difference in nature of operations performed.

As explained before, the job ticket follows the product to each department in which work is performed. There it is handled by the department head. He makes the actual entries on the tickets for the work done by those in his department.

Each operator keeps a record of his time for each operation on individual slips of paper. He turns these slips over to the department head at the conclusion of each operation. The department head then enters on the job ticket, the operator's name or initials, the date when the work was done, and the time for the complete operation.

When the product leaves his department, he sends the job ticket along with it, and the next department head follows the same procedure.

It is important that each department head be cautioned, and that he in turn caution each of his subordinates, that the calculation of time taken for each operation should be as accurate as possible. A clock should be available in each department, preferably wall clocks, so that each individual can easily ascertain the time when each operation is started and finished.

Time clocks which can be punched each time an operation is started and stopped are available and very useful under certain circumstances. They are not recommended, however, for the smaller manufacturers. Employees in such organizations usually work on a number of jobs each day and perhaps on several operations of each job. Some operations require spending a few minutes at a time several times during the day. Therefore the punching in and out operation would cause a lot of lost time and would often take more time than the performance of the operation itself.

Man-hours are to be recorded for the time taken in the performance of all operations except compressing, sugar coating, and polishing. For these three operations, the total elapsed time from when the operator starts preparing his machine or pan until the particular job is finished should be recorded. The time required to clean up the machine or pan should be included with the elapsed time for that particular product.

When the job tickets are returned to the cost clerk, he will fill in the rates and extend the labor cost of each operation. He will use man-hour rates except for the three operations just discussed. For these he will use machine-hour rates determined as follows:

For compressing, divide the direct weekly payroll for compressing by the number of hours the compressing machines ordinarily operate in a week. This should be based on actual operating experience over a period of months and checked from time to time.

For example, if there are two people

working full time in a compressing room receiving a total wage of $60.00 per week and analysis showed that they were capable of operating their compressing machines a total of 200 hours per week, including setting up and cleaning, the machine-hour rate for costing their labor would be 30¢ per machine-hour.

The same procedure would be followed for determining the rate to be used in computing the labor of coating and polishing. If there is less than the full time of one person spent in performing any of these operations, a proportionate reduction will have to be made accordingly.

For example, if one man spends half of his time coating and the other half doing other work, then one half of his pay will be divided by his normal number of pan-hours to determine his rate.

When the cost clerk has extended the labor cost for each operation he will, by addition, secure the Total Labor Cost for the batch. He will then divide this total by the yield to determine the cost per thousand, per gallon, per pound, etc. This figure will then be transferred to a Summary Card. (Form No. 6.)

After making his calculations, the cost clerk will compare the ticket with the previous ticket or tickets for the same preparations to see how the total cost compares. If there is a wide difference, which is not explained by remarks on the ticket, he should then take the matter up with the superintendent or the department head in whose department the discrepancy occurred.

If there is a satisfactory reason for the discrepancy, it should be noted on the ticket for future reference. If the difference is due to error or carelessness, it should be corrected and the person responsible warned to be more careful in the future.

Before filing the job ticket, a record of the labor data it contains is made on a Summary of Productive Labor. (Form No. 2.) A Summary like this is prepared for each Productive Department. This Summary is totaled periodically to determine the amount of Productive Labor accounted for as compared with the total Direct Labor paid for during the period.

The difference between the Direct Labor paid for and the Productive Labor accounted for is considered as Non-Productive Labor and charged to Manufacturing Overhead. If Non-Productive Labor is proportionately higher in some departments than in others, the matter should be taken up with the department heads to learn why.

This separation of Direct Labor into Productive and Non-Productive Labor has brought to light many inefficiencies in manufacturing departments and has, in some cases, shown that certain departments had more help than was necessary. Therefore it is considered a valuable part of this system.

In addition to entering the Productive Labor accounted for on the Summary of Productive Labor, the cost clerk will also enter the Assembly Time shown on each job ticket on a Summary of Assembly Time. (Form No. 3.) The entries on this record are to be made in hours and not in money values. At the end of each accounting period, the assembly time for each department is to be totaled and used as a basis for prorating the cost of the Crude Stock Department to the individual productive departments. This is further explained under Manufacturing Overhead.

An alternate method of accounting for Manufacturing Labor is to have the individual operators in each department prepare daily time reports showing the work done during the day.

On such daily time reports they record information similar to that which, under this plan, is entered directly on the job tickets. The daily report is drawn up so as to show the date, operator's name, jobs worked on during the day, operations performed on each job, and the length of time taken for each operation.

This information is then transferred by a cost clerk to job tickets like those described above. There are two reasons why daily time reports are not recommended here.

First, it has been found from experience that where employees are required to account for an entire day's work on one report, they try to account for as much productive time as possible and often overstate the actual time spent on individual operations. As a result we do not get as accurate a picture of non-productive time. This disadvantage is overcome by having the employees record their time separately for each operation and having the department

head make the entries directly on the job ticket. In this way, the department head is in closer touch with the time reported for each operation.

Second, the use of daily time reports means that more records are being kept and therefore more clerical work is necessary. Under the system outlined herein, clerical work is kept at a minimum with the added advantage explained above.

CONTAINERS

As used herein, Containers include bottles, jars, boxes, tubes, ampuls, vials, corks, caps, labels, wrappers, cotton or paper wadding stuffed into bottles, and all other materials used in packaging or "finishing" operations. It does not ordinarily include materials used for shipping such as, corrugated boxes, wooden boxes, wrappings and shipping labels.

Sometimes preparations are "finished" into corrugated boxes or other containers in which they are shipped without further packing. In such cases, the corrugated box or container should be considered a part of Container Cost rather than Shipping Supplies.

The accounting for Containers in the finished cost of a preparation is the simplest part of the entire system. A loose-leaf book or a card record is set up with a page or card devoted to each kind of Container used; French Square bottles, Flint bottles, Amber Blakes, Opal jars, etc.

One or more pages is devoted to each type of Container used. Each size used is listed and the cost per dozen, gross, hundred, etc., shown in the first column. In the next column, the cost of corks or caps is listed and in the third column, the unit cost per container, including one cent added to cover the cost of labels, wrappers, and cotton padding is shown.

The figure of one cent referred to above is a liberal average of the actual cost of these items and saves the work of calculating them, which involves carrying small figures out into several decimal places.

Where additional items are included as part of Containers, such as individual boxes, circulars, or medicine droppers, they must be added to the cost secured above for the individual packages.

Where special types of Containers are used for certain products, such as Specialties, individual pages or cards should be used to calculate the cost of such Containers.

If some preparations are put up in a single unit of a dozen, etc., a special card or page should be used to show the Container cost of the entire unit.

Once Container costs have been figured for each size and style of package used, they need only be refigured when the price of such Containers change. They do not need to be refigured every time they are included in the cost of a product.

In making up a Summary Card (Form No. 6) for each product, the Container cost will be secured from the loose-leaf book or card record described above.

For example, if a thousand tablets are packaged in a 16 oz. French Square bottle, the cost of the complete Container will be secured from the page or card showing the cost of French Square bottles.

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FINISHING LABOR

As used herein, Finishing Labor is the time spent in placing the bulk products in Containers. It is a part of Productive Labor as defined under Manufacturing Labor.

In the majority of pharmaceutical plants, a central Finishing Department is maintained where all products are packaged. In some plants, products are "finished" in the same departments in which they are manufactured. For the average plant, the first method is usually the more efficient and economical.

Finishing Labor is accounted for on a Finishing Ticket (See Form No. 4.) This one form is used for all types of pharmaceutical products. A ticket is made for each batch or part of a batch finished.

When a batch of pharmaceuticals in bulk reaches the Finishing Department, it is turned over to the person in charge of that department. In most cases this person is one of the women in the department who has been with the company for a long time and is thoroughly familiar with all of the finishing operations and is very reliable and trustworthy.

She will ordinarily perform the first operation on the ticket--Preparing. This covers getting the necessary bottles or boxes, corks or caps, labels, etc., ready for the girls who will package the batch. It also includes stamping the labels with control numbers, etc.

In some organizations, bottles and other supplies are stored close to each operator who uses them, and it is not necessary to assemble them for each batch of products to be finished. In such cases, Preparing will include the assembling and stamping of labels and allocating the various jobs to the individual operators.

The next four operations on the Finishing Ticket (Form No. 4) are self-explanatory. Four spaces have been provided for each operation to allow for four sizes in each batch. This will take care of the majority of cases. Where more than four sizes of any one product are put up at one time, two tickets should be used.

The operation, Place in Cartons, is ordinarily performed on only one size of a product, such as, single tubes of ointments put in cartons, or special sizes of tablets like 25's or 40's put in individual cartons. This space would also be used when a dozen small bottles of liquid were placed in a carton, etc.

The next operation, Label Cartons, would be the labeling of such cartons as those referred to above. These two spaces are not intended for the work done in the Shipping Department of packing articles into cartons and labeling those cartons for shipment.

In the first column to the right of Operations is recorded the quantity of each size package put up on this ticket. For example, 25 - 100s, 30 - 500s, 50 - 1000s, etc. These could, of course, be written 25 - D, 30 - C, 50 - M, etc. A separate line is to be used for each size. This information is to be shown in detail for each operation from Filling to Wrapping inclusive.

In the next column is recorded the number or initials of the employee who performed each operation. If one person performs all of the operations for an entire batch, it is only necessary to show the number once.

In the third column is recorded the time taken for performing each operation on each size put up on the ticket. This is very important because we are desirous of securing the cost of Finishing Labor for each size package put up, as explained below.

In the section in the lower left-hand portion of the ticket, Containers Used, the quantity and description of the bottles or boxes used is recorded. For example: 25 - 4 oz. F. S. (for French Square), 30 - 8 oz. A. B. (for Amber Blakes), etc.

When the tickets are completed, they are sent to the cost clerk who will insert the rates and calculate the cost of each operation for each size put up. He

will not price the Containers Used. As explained in the previous section, this information will come from a separate record, and be entered directly on the Summary Card.

After calculating the Total Finishing Labor cost of the batch, he will then break it down by sizes in the lower right-hand portion of the ticket.

One line is to be used for each size, that is, 100s, 500s, etc. Under Divided Costs he will show, for each size, the cost which has been separated as belonging to that size. Using 100s as an illustration, he will add the cost of Filling, Cotton and Capping, Labeling and Wrapping 100s and enter the total as Divided Costs for 100s. This same procedure will be followed for each size put up on this ticket.

After summing up the costs specifically allocated to each size, he will then add the Costs not Divided, which are Preparing and Inspection. These are to be prorated to each size in proportion to the quantity of each put up on this ticket.

Next he will add the Divided Costs and Costs not Divided, for each size, and enter the results under Totals. Then he will enter the number of each size put up under Quantity.

Finally, he will divide the Total for each size by the Quantity and put the resulting Unit Cost in the last column.

The Unit Cost for each size is the figure that will be transferred to the Summary Card as Finishing Labor.

Job tickets rather than daily time reports are recommended here for the same reasons given under Manufacturing Labor.

MANUFACTURING OVERHEAD

Manufacturing Overhead is that part of the total cost of production which does not represent the actual outlay for Crude Materials, Containers and Productive Labor. It has been described as "the cost of being prepared to manufacture."

The term "manufacture" or "manufacturing department" as used here includes all manufacturing and finishing operations. In the calculation of Manufacturing Overhead as outlined here, no separation is made between "manufacturing" or "finishing."

In setting up productive departments, as explained later, the area occupied for "finishing" operations is added to the area used for "manufacturing" operations; the employees who perform "finishing" operations are included with those who perform "manufacturing" operations.

Methods of Applying Overhead

There are many methods which can be used for allocating Manufacturing Overhead to individual preparations. The method used should be determined as a result of careful analysis of the following factors: the manufacturing processes, the kind and amount of machinery used as well as the number of hand operations, the number and kind of products manufactured, the manner in which the products are packaged, the variety and sizes of packages used, as well as numerous other factors.

In some plants, where all or practically all operations are performed by hand and little or no machinery is used and where Manufacturing Expenses are incurred in proportion to the amount expended for labor, it is satisfactory to allocate overhead to the individual products as a percentage of Productive Labor. Under such circumstances, it is only necessary to determine the amount of Overhead Expense chargeable to each department and the amount of Productive Labor accounted for in each department.

Then a ratio of Overhead to Labor is determined and added to each of the items produced in the department.

As companies in the pharmaceutical industry use machinery and equipment in addition to hand labor in the production of practically all products, the method just described is not very satisfactory. There is an occasional department, in certain companies, where this method can be used, but it is not recommended as a general practice.

Another method of allocating Overhead to individual preparations is by the use of a machine-hour rate which combines Productive Labor and Manufacturing Overhead. This method is usable and very satisfactory when production is large enough to sub-divide each manufacturing department into production centers, each center representing a specific type of machine or the performance of a specific operation.

For the average pharmaceutical house, however, such sub-divisions are impractical because in some cases, they would divide single rooms into several divisions and make the allocation of expenses largely guesswork.

In addition, it would involve a great deal of clerical work on the part of Manufacturing Department employees and cost clerks to record the transfers of labor from one production center to another because quite a few employees, in the average pharmaceutical house, perform several operations.

For these reasons, this method is not recommended in this Manual.

There are other methods which could be explained here, but as they would be out of the question for any house in the pharmaceutical business, regardless of size, there is no object in discussing them at this time. The two methods outlined above are practical under certain circumstances in some parts of the pharmaceutical business. However, a very careful study of the circumstances and requirements of a number of pharmaceutical manufacturers, showed that neither one of them

can be applied very satisfactorily as a uniform system for the entire group.

Therefore another method was developed, based on rather extensive experience with pharmaceutical manufacturers. It is called the Unit Method, because all products manufactured in a given department are reduced to comparable units for overhead purposes. This method is simple and requires a minimum of clerical work, but above everything else, it satisfactorily apportions Manufacturing Overhead to individual products.

Manufacturing Overhead is allocated on the basis of the number of Units produced in a department, rather than on the number of tablets, capsules, etc. As explained in the introduction to this Manual, the Association made a test of this method as compared with other methods of allocating Manufacturing Overhead in use by some of its members. As a result of that test, it was decided to recommend for use by its members, the Unit Method of apportioning Manufacturing Overhead.

The Unit Method is described on the following pages, after first describing the items that make up Manufacturing Overhead and the mechanics involved in distributing them to the productive departments in which products are actually produced.

Elements of Expense

The elements of expense which comprise Manufacturing Overhead are set out on the Association's UNIFORM STATEMENT OF INCOME AND EXPENSE as Manufacturing Expenses and include the following items:

Non-Productive Labor (Time not accounted for as Productive Labor by Manufacturing Department Employees)
Salaries and Wages (Supervision, control, stores, porters, etc.)
Carrier Charges-In (Freight, Express, etc., on Purchases)
Depreciation (On machinery, equipment, tools, etc., used in the manufacturing department)
Insurance (Proration of General Insurance)
Light and Power (Proration)
Rent or Occupancy (Proration of Depreciation, Taxes, Insurance, Maintenance, etc., and Interest on Investment in Real Estate used for manufacturing)
Repairs (Direct charges)
Supplies (Paper bags, glassware, small tools, etc.)
Taxes (Except on Real Estate)
Unclassified (Miscellaneous expenses not itemized above and applying to the Manufacturing Department)

A General Ledger account should be set up for each of these elements of expense and charged with the individual items as they occur.

Non-Productive Labor, as explained under Manufacturing Labor, is the difference between total Direct Labor paid for and Productive Labor accounted for on the Manufacturing and Finishing Tickets. The bookkeeping procedure is as follows:

Set up an account called Productive Labor. Charge this account with the total Direct Labor payroll of the Manufacturing Department. At the end of each month, credit this account and charge the Non-Productive Labor Account with the Non-Productive Labor for the month, as determined by the Summary of Productive Labor (Form No. 2).

This will leave the Productive Labor Account with only the Productive Labor; the Non-Productive Labor Account will show the amount of Non-Productive Labor to be included in Manufacturing Overhead.

The account Salaries and Wages should be charged with all salaries and wages except the following: Productive and Non-Productive Labor, Salesmen's Salaries and Commissions and salaries of Executives functioning in a general managerial capacity.

The two former items were discussed previously. The two latter items are considered as part of Distribution Expense and separate accounts should be carried for them.

As explained in the Outline, this Manual covers Production Costs only and does not explain the allocation of Distribution Expenses to individual products. However, a word about Distribution Expenses is in order at this time, because some of the accounts discussed here will contain charges which are partly Manufacturing Expense and partly Distribution Expense. It will be necessary to prorate these accounts between these divisions.

On the Association's UNIFORM STATEMENT OF INCOME AND EXPENSE, Distribution

Expenses are referred to as Operating Expenses and are segregated into four major divisions: Shipping Expenses, Selling Expenses, Research Expenses, and General and Administrative Expenses.

After considerable discussion about the classification of Research Expenses, it was finally decided to include them in this division rather than in Manufacturing Expenses as a charge against all products manufactured.

To refer back to Salaries and Wages account, it should be charged with all salaries and wages except those specifically mentioned as being chargeable to other accounts. The portion applying to the Manufacturing Department will then be included in Manufacturing Overhead.

The account Carrier Charges-In will be charged with all incoming transportation charges on purchases of Crude Materials and Containers.

The Depreciation account will be charged with the depreciation on machinery, furniture and fixtures, tools, etc. It is not to be charged with depreciation on the building. The portion of this account that applies to the equipment used in the Manufacturing Department will be included in Manufacturing Overhead.

The Insurance account is to be charged with all general insurance, such as Fire and Sprinkler Leakage on contents, Workmen's Compensation, Group Insurance, etc. It is not to be charged with any insurance on the building. The portion applying to equipment and employees in the Manufacturing Department will be included in Manufacturing Overhead. The insurance on inventories of Crude Materials, Containers, work in process and finished stock, is also to be included in Manufacturing Overhead.

Light and Power account will be charged with the total electric light bill representing these items. Where separate bills are received for Power, this item should be charged entirely to Manufacturing Overhead. The charge for Light should be prorated between the Manufacturing Department and the various divisions of Distribution Expense, on an area basis. This may not conform exactly to the amount of light used by each department, but generally it is the most practical basis for proration. Where the charge for Power is not made on a separate bill but is included with the Light bill, the entire account should be prorated between departments on an area basis.

The account known as Rent or Occupancy is to be charged with the actual rent paid to a landlord or the items representing rent which a landlord would ordinarily pay. This includes--Depreciation, Taxes, and Insurance on the building, Interest on the investment in real estate used for manufacturing and office purposes, Maintenance and Repairs such as a landlord ordinarily pays when a tenant occupies the building, etc.

A question is sometimes raised about the advisability of charging Interest on investment in real estate to this account. The reason for charging such interest is that under normal conditions a landlord charges a sufficient amount of rent to return him a reasonable amount of Interest on his investment. Therefore it should be included as an Occupancy charge when a company owns its own building.

For the sake of uniformity, a rate of 6% is recommended. If the building is encumbered with a mortgage, the interest paid on the mortgage should be charged to this account, and interest at 6% figured on the equity in real estate instead of on the total cost of the property. Rent or Occupancy is to be prorated to the individual departments on an area basis.

The account Repairs is to be charged with all repairs made to equipment, furniture and fixtures, etc. It is not to be charged with any repairs made to the building which would ordinarily be made by a landlord. The portion of this account representing repairs to equipment used in the Manufacturing Department will be included in Manufacturing Overhead.

An account should be set up for Supplies used in the Manufacturing Department and separate accounts for Supplies used by each of the other departments. The reason for recommending separate accounts here is that the charges to each of them will be numerous. It will be more accurate and require less detailed bookkeeping to carry separate accounts than to make an analysis of one general Supplies account at the end of each accounting period to determine how much belongs to each division of the business.

The account Taxes should be charged with all taxes except real estate taxes and, of course, Federal Income Taxes. Those applying to the Manufacturing Department such as Narcotic Taxes and Special Licenses and Permits, will be included in Manufacturing Overhead.

The account Unclassified is to be charged only with miscellaneous items for which an individual account has not been provided on the Association's UNIFORM STATEMENT OF INCOME AND EXPENSE. Every effort should be made to classify all expenses and charge them to an individual account. Only such items which are too small or occur very infrequently, so that they would not justify individual accounts, should be charged to Unclassified. This would ordinarily include gas, window cleaning, removal of refuse, etc. If any of these items are considered of sufficient importance, individual accounts can be carried for them. The portion of these items referred to here as Unclassified, which represent charges incurred for the Production Department, will be included in Manufacturing Overhead.

Setting Up Productive and Service Departments

At the end of each accounting period a schedule (Form No. 5) is set up for the distribution of Manufacturing Expenses to the individual productive departments and service departments.

The average house manufactures all or most of the following types of products: Tablets, Capsules, Salts, Powders, Liquids, Ointments, Suppositories, and Ampuls.

In addition to these, some companies manufacture other items such as Pills, Lozenges, Arsenicals, and Surgical Dressings.

A productive department or unit is set up for each type of product manufactured. The area occupied for the manufacture and finishing of each of these types of products and the number of people employed in producing them must be accurately determined for the purpose of this distribution.

Three service departments are set up: Crude Stock, Control, and Manufacturing General.

The Crude Stock Department is the one in which Crude Materials and Containers are stored until they are ready for use by the productive departments. It includes the area in which such materials are assembled preparatory to being sent to the productive departments.

In organizations where Materials and Containers are stored in the productive departments where they are to be used and there is actually no Crude Stock Department as such, it will not be necessary to make provision for one in the accounting records. The area occupied by Materials in each department will be included with the balance of the area for that department; the time taken for assembling of Materials will be included as a part of the Productive Labor spent on each job.

Where such a department is operated, however, the area it occupies must be accurately determined. This will include any area in basements or lofts used for the storage of Crude Materials and Containers.

The number of people employed for the purpose of looking after and assembling Materials must also be accurately determined.

The second service department referred to above, Control, is easily accounted for. The area used by chemists for the purpose of checking Crude Materials and manufactured products should be measured. The number of people employed in this work on a full or part-time basis should also be accurately determined.

The third service department, Manufacturing General, is created for accounting purposes only, to provide a place for charging those expenses which cannot or need not be broken down and charged to each department individually. The area which should be considered as Manufacturing General is that occupied by elevator shafts, stairwells, washrooms, general aisles used by all departments, area used for receiving of incoming goods, etc.

It is not to include space which is vacant purely and simply because the company has too large a plant for its present requirements. It is recommended here that such unused space be measured and set up as a unit to be charged with its proportionate share of Rent or Occupancy, Insurance, Taxes, etc., in an account called

Idle Capacity. This account will appear on the company's statement of Income and Expense as a deduction from Net Profit from Operations.

To return to the Manufacturing General Department, it will include the area scattered around the plant which serves the Manufacturing Department in a general way. This would include the offices occupied by the Plant Superintendent and his assistants and those engaged in buying Crude Materials and Containers as well as Machinery, Equipment, etc., for the plant.

The Salaries which are chargeable to this department are those of supervision, buying, receiving, general porter and maintenance work, etc.

After all of the productive and service departments referred to above have been set up, the area occupied by each should be listed and a schedule of percentages prepared, for use in distributing charges to these departments which will be apportioned on an area basis. The number of employees engaged in each department should also be listed and a schedule of percentages prepared, to be used in distributing charges which will be apportioned on the basis of the number of employees in each department.

Distribution of Manufacturing Expenses

For the purpose of determining the total amount of expense chargeable to each productive department, a schedule like Form No. 5 is prepared.

It is recommended that such a schedule be prepared at least twice a year during the first few years that the Cost System is in operation. The first schedule will cover a period of six months and the next will cover an entire year. After the system has been in operation for several years, it will ordinarily be sufficient to make these distributions only once a year unless there are major changes in the Productive Departments. If there should be such changes, it will then be necessary to redistribute expenses accordingly. The information for this schedule is taken directly from the accounting records.

The total amount of expense applying to the Manufacturing Department as a whole for each of the elements of expense listed is entered in the first column, Total, that is Non-Productive Labor, Salaries and Wages, Carrier Charges-In, etc. Then each expense account will be prorated to the individual departments according to the manner in which incurred.

Non-Productive Labor will have been determined for each department on the Summary of Productive Labor (Form No. 2).

Salaries and Wages will be charged to the departments in which they were incurred; that is, the salaries of supervision will be charged to Manufacturing General, the Control Department salaries will be charged to Control, the Crude Stock Department salaries will be charged to Crude Stock, the wages of porters, general laboratory maintenance men, etc., will be charged to Manufacturing General.

Carrier Charges-In will be charged to Manufacturing General.

Depreciation will be charged directly to each department in the manner in which it has been built up, that is the Tablet Department will be charged with the depreciation on its equipment, the Capsule Department will be charged with the depreciation on its equipment, etc.

Insurance will be charged to Manufacturing General.

Light and Power will be charged to Manufacturing General.

Rent or Occupancy will be charged to each department on the basis of the area occupied by each.

Repairs will be charged directly to the departments for which such repairs were made. This will require an analysis of the Repairs Account.

Supplies will be charged to the departments for which they were purchased. Those of a general nature, which are used by a number of departments, will be charged to Manufacturing General.

Taxes, with the exception of narcotic taxes will be charged to Manufacturing General. Narcotic taxes will be charged to the departments producing narcotic preparations in proportion to the approximate quantity of narcotics used in each department.

Unclassified will be charged to Manufacturing General.

When all of the expenses have been distributed to the individual departments

as outlined above, the amounts charged to each department will be totaled. The total expense of the service departments, Crude Stock, Control, and Manufacturing General will then be prorated to the productive departments.

Manufacturing General will be distributed first because part of it will be charged to the other two service departments as well as to the Productive departments. The total Manufacturing General expense will be prorated to all other departments on the basis of a weighted average of area occupied by each department and the number of employees in each department.

The reason for using these weighted averages is that the items charged to Manufacturing General represent charges for area used by all departments, such as light, power, taxes, etc., for which area is a practical basis for proration, and supervision of employees, insurance on employees, areas used by all employees in a general way, etc., for which the number of employees is a practical basis for distribution.

Therefore a weighted average of the area occupied by each department and the number of employees in each department is considered the most practical basis for proration for the average organization. In some of the larger organizations it is possible and practical to make finer divisions of these particular charges, but for the average house it is considered unnecessary to go beyond the break-down suggested here.

The expense of the Control Department will be distributed to the productive departments on the basis of number of assays or control checks made for each department. This information can be secured from the records of the Control Department, showing the work done for each of the manufacturing departments. Work done by the Control Department on Crude Materials should be charged to the Crude Stock Department.

The Crude Stock Department will be distributed to each of the Productive Departments in proportion to the amount of time spent in assembling materials for each department. This information will be secured from the Summary of Assembly Time (Form No. 3).

After the expense of the three service departments has been distributed to the productive departments, a grand total will then be secured for each of the productive departments. This will represent Total Manufacturing Overhead for each of these departments.

Allocation of Overhead to Products

The allocation of the Total Manufacturing Overhead to the products produced in each department is, as previously pointed out, done on the basis of Units produced within these departments.

To arrive at the number of Units produced, it is first necessary to make a very careful analysis of each item produced in each department and grade it for Overhead purposes. This particular job must be done by those who are most thoroughly familiar with the actual manufacturing and finishing operations involved in the manufacture of each product. Therefore it is usually done by the plant superintendent in conjunction with the individual department heads or foremen.

The process of grading can only be briefly described here. The various factors which must be considered in making this classification are:

1. The size of the batch in which the product is ordinarily manufactured.
2. The number of ingredients in the formula.
3. The difficulty of granulation.
4. The necessity of percolating and filtering.
5. Whether a single punch, single rotary or multiple rotary compressing machine is to be used.
6. Size of tablet or capsule.
7. Difficulty of coating.
8. Length of time taken for sterilization of ampuls.
9. How the product is to be packaged.

The above are the major factors which must be considered to determine the proper class for each product. There are some cases in which other factors are of considerable importance, but generally those listed above are the ones which require most consideration. An intimate technical knowledge of the operations performed in each department and the circumstances surrounding each particular case

are necessary to do the actual grading or classifying.

Taking any one department as an example, Class 1 is set up to represent the simplest item produced in the department--that is, the product requiring the fewest and simplest operations to be performed by hand or by machine. Then a sufficient number of Classes is set up for the department, so that each product manufactured in the department can be graded in relation to those considered as Class 1.

For the average department, six Classes will suffice. In some isolated cases it has been necessary to set up Classes equivalent to 20 or 40, even though there were not actually that many individual Classes set up. In those cases there were certain products in certain departments which were considered to absorb twenty to forty times as much overhead as the products in Class 1, although there were no products to be set up in Classes from seven to nineteen inclusive, etc.

Sometimes it has been necessary to set up a Class 1/2 for products which were purchased in bulk and only tested and packaged by the particular company.

In considering what Class each product should be placed in, the elements which comprise Manufacturing Overhead must be borne in mind, because it is as a basis for apportioning Overhead that the Classes are set up. These elements of expense have already been discussed.

After the responsible individuals have classified each product in each department, it is then necessary to accumulate the actual production of products in each Class in each department. This accumulation is sub-totaled frequently and, at the end of each accounting period, a grand total of production in each Class is secured. This grand total of each Class is then multiplied by the Class number, to determine the number of comparable Units produced in the department during the period.

Having determined the amount of expense applying to each production department as Manufacturing Overhead and having determined the number of Units produced in each department, a schedule is then set up listing these two sets of figures by departments. Then for each department the expense is divided by the number of Units, and the result is the Unit Overhead per thousand tablets, per thousand capsules, per gallon of liquid, per pound of ointment, etc.

The Class number is shown on the Summary Card (Form No. 6) which is made up for each product. When the Manufactured Cost of the product is being determined, it is charged with Overhead in accordance with its Class; that is, a tablet in Class 1 will take one unit of Tablet Department Overhead, a tablet in Class 2 will be charged with two units of Tablet Department Overhead, etc.

The reason for this will be obvious if it is clearly understood that each product in each department has been classified by those who are most thoroughly familiar with operations performed in the manufacture of the product and who understand what elements comprise Manufacturing Overhead and who are aware, when making their classification, that the Class numbers are to represent relative difficulties of manufacture in specific reference to Overhead.

THE SUMMARY CARD (Form No. 6)

The Summary Card, as its name indicates, contains a summary of the five elements of Manufacturing Cost discussed in this Manual. It is the one part of the entire Cost System which will be of most interest to the executive.

This record can be made in the form of a card or a loose-leaf book with a page devoted to each product. There are certain obvious advantages and disadvantages to each of the two types of records and it will be left to the personal choice of each managing executive to decide which of the two he prefers. For the sake of simplicity, this record has been referred to throughout as a "card" rather than use the expression "the card or page."

The information to be shown is: the name of the product, the size (that is 1 grain, 2 grain, etc.) and the Class number. On the form illustrated, seven columns have been provided to take care of seven different kinds or sizes of packages of the one item, for example 100s, 500s, 1000s, etc., or 2 oz., 3 oz., 4 oz., etc.

In each column will be shown the cost of Crude Material contained in the individual package, as explained under Crude Materials. Next will be shown the cost of Containers as explained under Containers.

These two items are then totaled for the information of the management so that they will be available when specific quotations are being made or price revisions are being considered.

This figure represents the actual cash outlay required for each package produced, regardless of other elements of cost.

Next is shown, in consecutive order, Manufacturing Labor, Finishing Labor, and Manufacturing Overhead as explained in the sections dealing with these three elements.

The space provided for Assay is used in the case of products sent outside of the company's own laboratory for special assay or for products requiring such an expensive involved assay in the company's own Control Department that it is considered advisable to charge it specifically to the product, and eliminate such cost from the total expense of the Control Department before prorating the cost of that department to the productive departments.

A total is then secured for the second group of items. This second total represents the amount of manufacturing cost chargeable to this particular preparation, which, though it represents actual outlay of cash for labor and expenses, will fluctuate rather directly with the quantities produced in individual batches.

The two sub-totals are then added to determine the total Manufactured Cost of each package. If there are any additional elements of cost such as royalties, they are shown in the blank space provided.

The total cost shown on this summary will then represent the finished cost of each preparation, in each size and type package, set down on the shelf in the finished stock department. This represents the total Manufactured Cost of each package ready to be picked off of the shelf and shipped to customers.

Spaces have been provided on this Summary to show the selling price of each package and the ratio of selling price to total production cost. This information is for the use of the management in determining whether or not the established selling price is in proper ratio to Manufactured Cost to return a satisfactory Net Profit after deducting Distribution Expenses.

This, in the final analysis, is the prime purpose of Cost Accounting.

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TABLETS--POWDERS--CAPSULES (FORM No. 1)

No.________________ Issued ________________

Product ________________ Quantity________________ Completed ________________

Check		Gal.	Pints or Lbs.	Ozs.	Grs.	Lot No.	Price	Amount	

		TOTAL MATERIAL COST			
Assembled by	Date	Time			
Gran. by	"	"	Rate		
" "	"	"	"		
Drying Started		Drying Finished			
Dried by	Date	Time	Rate		
Screened by	"	"	"		
" "	"	"	"		
Bulk Wt. of Gran.	Gran. Left	Gran. Used			
Machine No.	Started	Finished			
Comp. or Filled by	Time		Rate		
No. Finished					
Sugar Coated by	Pan Nos.	Time in Each	Rate		
Polished by	Pan Nos.	Time in Each	"		
Yield	Count Per Oz.	Wt. Per M			
Inspected by	Assayed by				
		TOTAL LABOR COST			
Remarks:					

SUMMARY OF PRODUCTIVE LABOR (FORM No. 2)

Month ________________ Year 19____ Department ________________

Date	Product	Total	J. Smith	W. Jones	T. Edwards	S. Harris		L. Adams

SUMMARY OF ASSEMBLY TIME (FORM No. 3)

Month ____________________ Year 19____

Date	Product	Total	Ampuls	Tablets	Capsules	Salts	Powders	Liquids	Ointments		Suppos.

FINISHING TICKET (FORM No. 4)

No. _____ Date _____

Product _____

Operations	Quant. & Size	Emp.	Time	Rate	Cost
Preparing					
Filling					
Cotton & Cap or Close & Clip					
Labeling Containers					
Wrapping					
Place in Cartons					
Label Cartons					
Inspected By					
	Total Finishing Labor				

Containers Used	Sizes	Divided Costs	Costs Not Divided	Totals	Quant.	Unit Cost

Remarks:

DISTRIBUTION OF MANUFACTURING EXPENSES

(FORM No. 5)

For the_____ Month Ended _____ 19____

Expense Item	Total	Ampuls	Tablets	Capsules	Salts	Powders	Liquids	Ointments		Crude Stock	Control	Mfg. General
Non-Productive Labor												
Salaries and Wages												
Carrier Charges-In												
Depreciation												
Insurance												
Light and Power												
Rent or Occupancy												
Repairs												
Supplies												
Taxes												
Unclassified												
Totals												
Proration of Service Departments												
Mfg. General	-0-											(Total)
Control	-0-										(Total)	
Crude Stock	-0-									(Total)		
Grand Totals												

(FORM No. 6)

Product _____ Class_____ Size_____

Material								
Container								
Total								
Mfg. Labor								
Finish. Labor								
Overhead								
Assay								
Total								
Total Cost								
Selling Price								
Ratio								
Remarks:								

A UNIFORM SYSTEM

FOR DETERMINING MANUFACTURING COSTS

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