

INVENTORY MANAGEMENT FOR STATE OF VIRGINIA

**REPORT OF THE
COMMISSION FOR ECONOMY IN
GOVERNMENTAL EXPENDITURES**

**To
THE GOVERNOR
And
THE GENERAL ASSEMBLY OF VIRGINIA**



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TO THE GOVERNOR
AND
THE GENERAL ASSEMBLY OF VIRGINIA

November 9, 1959

To:

HIS EXCELLENCY J. LINDSAY ALMOND, JR., *Governor of Virginia*
and

THE GENERAL ASSEMBLY OF VIRGINIA

The Commission for Economy in Governmental Expenditures was created for two years by Chapter 599 of the Acts of Assembly of 1958. This act provided that the Commission should consist of the Joint Auditing Committee of the Senate and the House of Delegates and that the Auditor of Public Accounts should act as executive secretary. The act imposed upon the Commission the duty of making studies for purposes of ascertaining whether services and personnel might be eliminated, or combined, in the interest of economical and efficient administration.

When the Auditing Committee of the General Assembly and the Auditor of Public Accounts studied the purchasing function of the State, they became convinced that there were definite opportunities for improvements and economies in inventory management of the several State agencies. Therefore the Commission undertook as its first objective a comprehensive study of inventory management, including warehousing operations on a state-wide basis.

In the conduct of this study the Commission and its executive secretary had the advice, counsel and assistance of Messrs. Donald T. Ward and Wesley R. Ellms of the firm of Worden & Risberg, management consultants, whom we engaged to assist in our study. Mr. Ellms, who was assigned on a full-time basis during the firm's engagement, had had considerable experience with industrial and other areas of inventory management and warehousing operations and rendered very valuable assistance in this study.

From the study has been prepared the report which follows this communication. The report sets forth our findings and recommendations. It has been reviewed with the Governor, who found himself in agreement with our recommendations, and on November 6, 1959, he issued instructions to the Director of the Department of Purchases and Supply to proceed immediately in putting into effect the recommended program and procedures.

The Commission and its executive secretary, the Auditor of Public Accounts, and the consultants wish to acknowledge the splendid co-operation of the departments, institutions and agencies of the State during the course of the study. The generous assistance of the Department of Purchases and Supply was especially helpful.

Respectfully submitted,

THOMAS H. BLANTON, Chairman
LLOYD C. BIRD,
FRANK P. MONCURE,
GEORGE E. ALLEN, JR.,
W. ROY SMITH

Commission for Economy in Governmental Expenditures

APPROACH

Due to the comprehensive nature of this study and the greatly varied inventory conditions and problems faced by the State's many institutions, a carefully worked out plan of analysis was first developed. The program of study and analysis included the following steps:

1. A detailed questionnaire concerning inventory values, space requirements, manpower requirements, consumption and other factors was prepared and issued to all institutions and agencies of the State. These were completed promptly and carefully by the institutions.
2. The information returned on the questionnaires was consolidated and analyzed.
3. The following institutions were visited, their facilities inspected, their problems reviewed and in many instances a sufficient sample of readings taken of their inventory records to evaluate the effects of their inventory practices:

State Convict Road Force Central Warehouse
State Convict Road Force Camp No. 12
Virginia Penitentiary
Medical College of Virginia
State Highway Central Warehouse—Fulton
State Highway District Warehouse—Staunton
State Highway District Warehouse—Richmond
State Highway Residency Storeroom—Marion
State Highway Residency Storeroom—Petersburg
Central State Hospital
Western State Hospital
Southwestern State Hospital
University of Virginia
Virginia School for the Deaf and the Blind
Woodrow Wilson Rehabilitation Center
DeJarnette Sanatorium
Lime Grinding Plant No. 1
Blue Ridge Sanatorium
Radford College
Bland Correctional Farm
Lynchburg Training School and Hospital
Virginia Polytechnic Institute

4. A number of brokers and distributors were consulted.
5. The central warehousing facilities of the State of Maryland were inspected.
6. A number of producers were interviewed at our request by the Department of Purchases and Supply. We were furnished the information secured through these interviews.
7. A summary of replies to questionnaires on central warehousing, which had been sent out by the State of Kansas to all states, was studied and analyzed.
8. Replies to questionnaires on central warehousing sent out to states and territories by the Commissioner of Mental Hygiene and Hospitals were reviewed through courtesy of the Commissioner.
9. An all day conference was arranged with representatives of most of the institutions. At this conference the recommendations included in this report were explained and discussed. The consensus of the meeting was full agreement with a plan for central warehousing and distribution as well as proposals in respect to inventory management as hereinafter set forth.

FINDINGS

I GENERAL INVENTORY CONDITIONS

A. Storage Space

The total space used for primary storage by the institutions is about 435,000 sq. ft.¹ The census of students, inmates, and patients is about 51,000. Thus the storage space per capita is about 8.5 sq. ft. This compares favorably with standards for comparable operations. In addition to the *primary* storage space there is, of course, a considerable amount of *secondary* storage space employed in the form of ward supply rooms, stationery closets, and so on.

B. Personnel Requirements

The institutions reported a total of about 26,000 paid man-hours used per month for storage and inventory activities.² Of this total, approximately 6,000 paid man-hours per month are used for record keeping. If we assume that the average employee works 1,800 productive hours per year, there would be about 173 persons employed in storage and inventory activities, of which 40 would be employed in record keeping. Assuming the average annual salary of these employees to be \$3,300, the annual salary cost for inventory and storage activities would be about \$570,000. With an annual consumption of stocked items of about \$8,500,000³, it therefore costs about \$.07 for the institutions to handle each \$1 worth of supplies. This cost does not include building maintenance, insurance, and similar overhead expense. Although no standards are available for comparison, it seems obvious that the institutional inventory and storage costs present an area of substantial cost reduction potential.

C. Inventory Values

As of June 30, 1958, Virginia institutions reported inventories having a total value of \$3,805,149.⁴ With a census of about 51,000 patients, inmates, and students, this inventory amounts to about \$75 per capita, comparing favorably with similar standards in other states.

D. The total of the average institutional inventories (for the year ended June 30, 1958) amounted to about \$3,250,000.³ Dividing this \$3,250,000 into the institutional consumption of \$8,500,000 for the same types of supplies shows the average turnover was 2.6 times per year.

E. Inventory Increase

Total institutional inventories increased 9% between June 30, 1957 and June 30, 1958.⁴ The degree to which this increase was affected by increased prices or increased requirements due to larger institutional populations has not been determined. It is believed, however, that the increase is significantly in excess of that which could be accounted for by these factors. Inasmuch as this increase occurred during a period when inventories were being scrutinized for surplus, the conclusion may be drawn that, at least in certain instances, inventories were increased to avoid reversion of funds.

¹ Exhibit I

² Exhibit II

³ Exhibit III

⁴ Exhibit IV

F. General Inventory Status.

It is believed that, in general, inventories are maintained at a level comparing favorably with similar public institutions. On the other hand, there appears to be little doubt that significant reductions could be made in the size of inventories and in the costs of inventory management.

II SPECIFIC INVENTORY CONDITIONS

A. Quarterly Ordering

Early in the study it became apparent that the traditional policy of ordering supplies each quarter was burdening the institutions with many inventory management problems. It appeared that modification of this policy might remove the *cause* of many of these problems and thus make it much easier to tackle the remaining problems of inventory management. In line with this reasoning a detailed analysis was made of the effects of the quarterly ordering policy and of the ways in which it might be most effectively altered.

The principal disadvantages of quarterly ordering were found to be:

1. It is the principal cause of overcrowded stores areas. The supplies which are ordered quarterly occupy the biggest part of the total stores facilities. The influx of such supplies at the beginning of each quarter puts an extreme burden on the storage capacity. Attempts to alleviate this condition by scheduling shipments during the quarter have usually proved ineffective.
2. Institutions are required to make an analysis of their needs for every stock item two and one-half months in advance of each quarter. This requires that for each item the institution must determine its present stock, the stock on order for the *current* quarter (in most instances this will not yet have been delivered), the anticipated usage of the present quarter, anticipated balance at the beginning of the next quarter, and finally, the quantity required which, when added to the anticipated beginning balance of the next quarter, will be adequate to cover anticipated usage. Since this analysis must be applied to hundreds of individual items, it is understandable that the institutions resort to approximations, and excessive safety stocks.
3. Since each item ordered quarterly is offered for bids separately for each institution, an excessive number of vendors deliver supplies to each institution at the beginning of the quarter. This throws a surge of work on receiving and stores personnel. In addition, the large number of vendors makes it almost impossible to assure reliable delivery, thus again tending to force the institution to maintain excessive safety stock.
4. In addition to the above hindrances to good inventory management, it was found that quarterly ordering made efficient cost control very difficult for the institutions. For example, prices of staple foods may vary considerably from quarter to quarter, but since prices for the anticipated quarter are not known until the bids are awarded, the institution is put in the position of planning its menus far into the future without realistic prices to rely upon.
5. The bidding system which is necessary with quarterly ordering does not allow the Department of Purchases and Supply to obtain the lowest prices.
6. Control of quality is ineffective.

B. Surplus Inventories

For purposes of this report, surplus inventories refers to surplus and obsolete materials, supplies and equipment having no apparent use to the institutions and which could be disposed of without inconvenience. We have found these to fall in the three categories discussed below :

Surplus Foodstuffs

Some examples of overstock and resultant spoilage were found. In nearly all instances the foods in question had been received from the Federal government or producing institutions of the State. In all instances the problem was recognized by the institution and should not recur. The over-all value involved is not great and this is not considered a serious problem except for the space required for storage.

Government Surplus Property

There is a considerable supply of materials, parts, and unidentifiable material which has been procured by certain institutions in lots consisting of many items from which they have sifted certain usable items. There is confusion as to what to do with the residue; whether to include it in the inventory records, how to evaluate it, and so on. The over-all current market value is little; probably not over \$20,000 for the entire State.

The problem is that this inventory takes room, confuses records, is unsightly, and a general nuisance. It tends to lessen the sense of responsibility of custodial and stores personnel toward their active inventories. In some instances it is intermixed with active inventory.

Obsolete Materials and Supplies

This category is distinguished in this discussion from slow-moving materials and supplies, as well as government surplus materials and supplies. We refer to such items as are definitely no longer usable, because of obsolescence or deterioration, to serve the purposes for which they were originally acquired.

C. Excessive Inventories

The inventory condition of several institutions was analyzed by detailed examination of their inventory records. Following are the most prevalent departures from good inventory practice:

Unnecessary Safety Stock

If, for example, it takes one week to obtain replenishment of a stock item after ordering, it is nearly always safe to allow stock to reach a two-week supply before reordering. Under such circumstances, however, many instances were found where orders were placed when there was still sufficient stock for one, two, or even more months. This condition applied equally to items which were ordered quarterly, and those which were ordered when stock became depleted.

Ordering Too Large Quantities

A considerable proportion of items was ordered in too large quantities. This was sometimes done to reduce the frequency of

issuing purchase orders; sometimes to gain a price advantage (usually a justifiable reason); and sometimes simply because current requirements were not accurately determined. This condition was found to exist with items ordered quarterly as well as with those ordered when stock became depleted.

Not Anticipating Reduced Usage

There were numerous instances of usage dropping substantially after a large stock replenishment had been received. Although a less common cause of excessive inventory, this condition was considered serious enough to warrant careful attention.

From the analyses of specific institutional inventories, it is believed that correction of the above condition should result in a 20% reduction. Applying this reduction to all inventories, except those contemplated for handling through the proposed central warehouse (canned and staple foods; household, institutional and kitchen supplies) and technical, industrial and laboratory supplies, we have:

Total Inventory Affected*.....	\$1,333,270
Possible Reduction (20%)	\$ 266,654

D. Housekeeping

Great variations were found in the relative housekeeping conditions of the institutions visited. In general, however, the institutions are to be complimented on the improvements which have been made in the last two years. Much surplus material and equipment has been eliminated, stock rooms have been straightened up, layouts improved and stocks more neatly arranged. Nevertheless, there is still room for improvement at many of the institutions. Considerable difficulty is found in the disposition of government surplus material. Clear and simple instructions are lacking and as a consequence the institutions are frustrated in their efforts to free themselves of this burden.

E. Facilities

1. A majority of institutions are operating with crowded storage space. Many are planning to provide for additional space in the near future. It is estimated that several hundred thousand dollars of additional construction is planned for this purpose within the next few years by the various institutions. Most of the crowded space is that used for storing staple foods, household supplies, and institutional supplies. However, some new construction is planned to provide for centralized buildings and grounds supplies storage, as well as centralized receiving.
2. The storage areas range from very poor to very good as regards physical condition, location, layout, atmospheric conditions, and other related factors.
3. Custodial security of stock rooms is generally very good.
4. Receiving and material handling facilities and equipment are in most instances poorer than would be desired for maximum efficiency. In general, however, the institutions are less concerned with this problem than with overcrowded storage areas.

* Exhibit III

F. Record Keeping

Here again excellent progress has been made in many institutions in the last two years. Many previously unrecorded inventories are now set up with perpetual inventory records. However, there are some institutions which still have stocks of building, grounds and technical supplies and materials which are not carried under recorded control.

Establishing comprehensive inventory control over such items presents difficult problems at some of the institutions. At the smaller ones, the value of this type of inventory is frequently too small to justify even modest costs of facilities and personnel necessary to establish inventory control. At the larger institutions, the need for effective inventory control of such stocks is greater, but unfortunately the problem of establishing such control is much more complex. In the first place, there is a great variety of items to control. Secondly, the items may be used commonly by departments which are widely separated and under different supervision. Finally there is usually a long-established practice of the several departments maintaining their own informal stock control which for various reasons they may be reluctant to change.

The larger institutions have tended to assume that such stocks must be controlled completely or not at all. This assumption implies the necessity for constructing a large central stock room with a corresponding complement of personnel. It is believed, however, that the problem can be much reduced if the only items stocked centrally are those which are used in large quantities, have large value, or are used commonly by two or more separate departments. This concept would mean that many items should be stocked solely by the using department, thus reducing the need for central storage space. To assure adequate control of items stocked by the using department, the personnel responsible for an institution's inventory control should also be charged with the responsibility for seeing that the using departments conform to the same inventory control practices and procedures as are followed in the central stock room.

Some institutions have installed detailed inventory controls where the importance of the inventory does not seem to warrant the expense involved. For example, one institution maintains detailed perpetual inventory records on candy bars and similar items sold in a small canteen.

In many instances perpetual inventory records are kept on bin cards in the stock room in addition to the perpetual inventory records maintained in the business office. Where this practice is followed the dual records serve mainly to detect and reconcile clerical errors rather than to provide assurance against misuse, theft, or fraudulent conversion. These types of losses are best controlled by attention to the stock room requisitions and administrative controls applying to the issuance and use of supplies and materials, particularly after these supplies and materials have been delivered to the requisitioner.

Analysis of institutional inventories showed that, in most instances, 70% of the value of the inventory was accounted for by only 15% to 20% of the items. This indicates that a great deal of clerical effort is presently spent in controlling items having comparatively little effect on the inventory value.

G. Ordering Practices

It was found that institutions place little importance on the Virginia Catalog as a means of identifying items which they stock or purchase. In many instances the institutions have set up their own identification code which must then be translated to the Virginia Catalog code when requisitions are placed with the Department of Purchases and Supply. The latter department is presently revising the Virginia Catalog code system to make it simple and more useful. This action is highly commended since use of the catalog presently places an unnecessary burden on the institutions.

There has been little attempt by the institutions to review specifications of such items as canned goods and institutional supplies among themselves. Consequently orders are placed for an unnecessarily large number of grades, styles, packs, and sizes, which tend to result in lower procurement quantities and higher prices.

H. Organizational Problems

Some instances were found where organizational responsibility for supervision of stocks was not clearly defined. There were tendencies at some institutions for those in control of stores operation to disregard those inventories not completely under their jurisdiction. In still other instances there was less than full cooperation between the personnel responsible for stock room operation and the departments served by them.

RECOMMENDATIONS

I CENTRALIZED WAREHOUSING AND DISTRIBUTION

A. Analysis

During the course of our survey, it early became apparent that the most serious inventory problems of the institutions resulted from the policy of separate quarterly ordering by each institution—particularly of such items as staple foods and institutional supplies. At first we explored the possibilities of reducing these problems by such means as providing for shorter ordering periods (say, six weeks), allowing institutions to order direct from vendors as their needs required, or by having vendors schedule their deliveries during the quarter. None of these alternatives appeared to reduce the problems materially; or, if they did, they introduced serious new problems in their stead.

We therefore considered the possibility of providing the institutions with a centralized warehousing service, augmented by a regularly scheduled delivery service. The advantages of such a plan appeared to be impressive. But there remained the important question as to whether such a service could be economically justified.

The next step then was to explore carefully the costs of warehousing and delivery which are presently included in the vendors' prices. Next, we analyzed the warehousing and distribution costs of the State Convict Road Force, the Alcoholic Beverage Control Board, and the Department of Highways, each of which operates a centralized warehouse and delivery system. In addition, we compared these costs with some commercial warehousing activities having similar problems.

Following this, we examined the present bidding procedure to determine its effect on prices paid to suppliers. This procedure requires individual bids for every item for every institution. The vendor is never sure, therefore, whether he will be awarded bids representing a few cases or an entire truck load. To be safe he must establish his bid price on the assumption that he may sell only a relatively small quantity.

The complex bidding procedure requires that over a month elapse between the time a vendor places his bid and the time he is notified of its acceptance. After acceptance, the vendor frequently has but one or two weeks in which to make delivery. He must therefore set goods aside during the long interim, persuade a producer to give him an option, or run the risk of being unable to deliver to the institution on schedule. During this same period there is always the possibility that the price will rise above that on which the bid was based.

It appeared that these price inflating factors would be avoided with a central warehouse. Invitations to bid could be issued with assurance of notification within a few days. Bids on several quantities could be invited at the same time. Quantities of interest to producers and manufacturers could be offered for bid.

In addition to these advantages, it would be possible to capitalize on temporary oversupply conditions in the market. Seasonal prices could be obtained for long term requirements. In short, purchasing could be put on about the same flexible basis as is used in commercial practice. With these possibilities in mind the Department of Purchases and Supply was asked to study the degree of price reductions which could be expected with such a purchasing plan. This study—although of necessity not very comprehensive—has indicated that price reductions as high as 10% may be expected on some items and that an over-all average reduction of 2% seems assured.

B. Operating Costs

Estimated operating costs of a central warehouse have been calculated as follows:

Proposed Central Warehouse and Distribution	Annual Cost	Cost per \$1 of Goods Handled
Warehousing (Exhibit V)	\$84,896	\$.027
Distribution (Exhibit VI)	37,580	.012
Total	\$122,476	\$.039
Costs Presently Included in Vendors' Prices		
Warehousing (Exhibit V)	\$31,660	\$.010
Distribution (Exhibit VI)	37,580	.012
Total	69,240	.022
Net increase in handling cost	\$ 53,236	\$.017

Offsetting these costs are the savings which are expected to be obtained through lower prices made possible by improved buying conditions brought about by the proposed central warehouse. Prices

will be lower because the handling costs (as estimated above) will not be included in them, but in addition, we anticipate that price advantages, beyond the reduction in vendors' handling costs, will average at least 2%. Based on an annual consumption of \$3,166,000 in staple foods and institutional supplies, this will amount to \$63,320. Thus the over-all effect on handling costs would be:

	Annual Cost	Cost per \$1 of Goods Handled
Net increase in handling cost	\$53,236	\$.017
Net reduction in prices	63,320	.020
Net saving	<u>\$10,084</u>	<u>\$.003</u>

The estimated operating costs are believed to be liberal and there should therefore be good opportunity to improve the above saving. Hence, it appears that the advantages of central warehousing and distribution in servicing the institutions may be obtained at no additional cost and possibly with considerable saving. The impressive advantages to the institutions and to the State are given in the last section of this report.

C. Recommended Approach

1. General

We recommend that a central warehouse be established and operated by the Department of Purchases and Supply. We make this recommendation because we have established that central warehousing and distribution of *staple foods* and *institutional supplies* will result in tangible savings, as well as render a much needed service to the institutions of the State. The analysis was restricted to these commodities because it was believed they caused the most serious problems to the institutions and that if central warehousing was to be justified it must stand or fall on these. Moreover these commodities were susceptible to more positive analysis than others. Once the warehouse and distribution facilities and organization have been established, however, many other services should present themselves. Detailed planning for these would be premature at this time.

In our analysis of costs we have assumed that goods would all be received at a warehouse in the Richmond area and then distributed direct to each institution. It is quite possible, however, that further benefits could be obtained by creating one or two regional warehouses at strategic points within the State. For example, Western State Hospital's present warehouse might be designated a regional warehouse from which both the hospital and the smaller nearby institutions could withdraw supplies as required. This would permit some producers' shipments being made direct to the regional warehouse. Consideration of these possible developments, along with many others, points clearly to the fact that, although we are certain central warehousing and distribution is desirable for staple foods and institutional supplies, we are *not* certain how much *more* extensively the concept may be applied. Also, we are not certain to what extent seasonal purchasing will be found desirable, nor whether it is practical to reship heavy items like flour and sugar immediately upon receipt by the central warehouse to large institutions. All these considerations have an important effect on the space re-

quired in the central warehouse and to a certain extent on the type and location of the warehouse.

We have therefore ascertained the approximate space requirements for initial operation on a limited basis which will nevertheless permit much improved service to the institutions, with a modest capital outlay. As operating experience is gained it will be possible to determine with accuracy the future space requirements, as well as the most desirable location, and type of building.

2. Space Requirements

Minimum central warehouse space requirements based on maximum utilization and no seasonal purchases have been calculated to be about 42,000 sq. ft. (See Exhibit VIII).

Long-time storage of seasonal purchases would require additional space. Part of this study included a review of the Highway Department central warehouse at Fulton. This indicated the possibility that storage space could be made available there. This was discussed with the Commissioner of Highways and, after study of the Highway Department's own needs, he has agreed that 29,000 sq. ft. can be made immediately available. Although this is less than sufficient for full operation, it is considered adequate to get started and to determine future needs more exactly from actual operating experience.

The State of Virginia is very fortunate therefore in being able to inaugurate the proposed program without recourse to heavy capital outlays for building construction. If experience later shows that an expanded operation is justifiable it will be possible to construct a building with exact knowledge of the type, size and location required. In this event it is believed that new modern facilities could be provided without increasing the operating cost. A modern one-story warehouse would reduce labor costs significantly. Most of the originally provided equipment could be transferred to a new building with little expense.

3. Initial Organization

With the central warehouse in full operation it is expected that a total of 21 persons will be required (Exhibit V). However, at the outset the smallest possible crew should be employed inasmuch as a relatively small excess of personnel would cause a much greater handling cost than has been estimated.

It is recommended that one of the first steps be the employment of a warehouse manager. He would serve to great advantage in selecting the required personnel and equipment, setting up records, and planning operations. One of the first decisions to make is whether to employ convict labor. In weighing this decision, the following advantages and disadvantages should be considered:

Advantages

- (1) It is probable that the operating cost could be reduced by about 40%.
- (2) It will probably be very difficult to obtain qualified paid labor within the established rate ranges. Quite likely better qualified labor may be obtained from the ranks of the convicts.

- (3) Convict labor is seldom absent and may be easily replaced or substituted.
- (4) A supply of vigorous personnel is always assured, whereas with paid personnel, effectiveness in the hard work of warehousing falls off greatly in their later years.

Disadvantages

- (1) Arrangements must be made to transport the convicts to and from the Penitentiary.
- (2) Working hours may be somewhat less flexible than with paid labor.

The State Convict Road Force warehouse management is very satisfied with the use of convicts in the light of many years experience. The question therefore deserves very serious consideration in the early stages. Once a policy of using paid labor is established, it will be difficult to change.

It is recommended that the warehouse manager be responsible for distribution of supplies as well as managing the warehouse. He should be the principal contact with the institutions regarding all questions of service, shipping schedules, and similar matters. The position of warehouse manager is critical to the success of the proposed plan. This position should report to the Director of Purchases and Supply.

4. Plan of Development

We have discussed earlier the numerous factors which tend to make it impractical to plan in detail for the ultimate warehousing and distribution system. Nevertheless, the natural tendency to commence on a hit or miss basis and to assume that the service will "just grow" should be avoided. Otherwise there will be a tendency to establish facilities or take other action which would later require costly changes.

To facilitate an orderly development the following plan of growth is recommended.

First Level of Operation

It is recommended that we commence with a trial program of carload lot purchases. This will establish definite information as to price advantages obtainable by this method. In the beginning the goods purchased in this way could be distributed by contract carrier or trucks rented from other State agencies. This would make it possible to limit the transportation expenses to those required for the particular shipment. The goods received in this manner could be kept at the warehouse until required or could be transported immediately to the institutions.

Next we would purchase canned goods and household supplies on a favorable market basis for future needs. This would permit a comparison of prices thus obtained with those obtained through present bidding practices.

This type of activity would represent the level to which a number of other states have carried central warehousing. A program such as this would permit taking maximum advantage of bulk prices with minimum organization change or expense. To go beyond this level of activity it is believed desirable to establish a coordinated system of truck delivery and a carefully engineered inventory control.

Second Level of Operation

Having established the practical advantages of carload purchasing and having gained some experience in the operation of a central warehouse and distribution system, it is believed that steps should be taken to expand the operations of the warehouse as a source of supply for the institutions of the Richmond area for the purpose of ascertaining whether such expanded operations would be practical on a state-wide basis. Before doing this it will be necessary to determine the most effective number of deliveries to each of the participating institutions and to have arranged for accumulation in the central warehouse of sufficient inventory to accommodate these institutions. This would require some analyses and joint planning with the institutions but should not be difficult.

At this same time a carefully engineered system of warehouse inventory records should be set up, and plans prepared for purchasing stock upon demand of the warehouse rather than according to the institutional quarterly requirements. An individual should be carefully selected as warehouse manager and he in turn should assist in selecting the first of the warehouse personnel. A truck should be selected and procured. Arrangements for transferring goods from the Department of Purchases and Supply to the institutions should be carefully worked out, including the application of a surcharge for handling. That phase of the warehousing activity currently operated in rented facilities by the Medical College of Virginia could be transferred with considerable advantage to the college.

The second level of operation should be completed six to nine months after initiating the program. By this time there will be good indication of the amount of car load and seasonal buying which is practical and how much can be shipped or reshipped direct to the larger institutions, such as Central State Hospital and the Penitentiary. At the conclusion of this stage, therefore, it should be possible to determine whether the space available at the Fulton warehouse will be adequate for full operation of the proposed service.

Third Level of Operation

Granting successful experience at the second level of operation, it should now be possible to advance surely and rapidly into the full scope of service to all institutions. The Staunton-Charlottesville area could perhaps best be serviced first; quickly followed by the other areas. The advantages of designating regional warehouses would be evaluated. This in turn would permit determining whether a second truck were necessary.

Fourth Level of Operation

This level would involve consideration of all possible services which might be included once the transportation and warehouse system was in full operation. Careful consideration would be given to the advantages of central cutting, packaging and storing of meat. This would require refrigerated storage space and refrigerated trucks, as well as good meat-processing facilities. Frozen fruits and vegetables as a replacement for canned goods should be explored. There appear to be excellent possibilities in warehousing office supplies. Impressive savings would appear

possible by reducing institutional inventories, and purchasing in larger quantities.

With an efficient distribution system in operation, it would appear that many buildings and grounds items could be effectively handled from a central warehouse. These items tend to be small in size and low in unit value so that they would not justify transportation if considered alone. But if a truck is making a trip anyway, these items can be carried without seriously affecting the load weight or space—thus in effect riding at no cost. The ease of requisitioning such items from a central warehouse rather than through the usual separate purchase routine would make significant cost reductions. Total inventories of such items—for example, paints and door checks—could be materially reduced and obsolescence avoided. Also worthy of consideration are the following:

- Back hauling used corrugated containers for sale as waste; this is presently a source of income for the Alcoholic Beverage Control Board to the extent of approximately \$37,000 per annum.
- Using return trips to carry goods from producers to the central warehouse; this has been explored by the Department of Purchases and Supply with producers and found to be feasible and economical.
- Storing and distributing, with the assistance of the State Department of Agriculture, Federal surplus food commodities; this would reduce the excessive inventories of these commodities now carried in many institutions.
- Store and distribute such buildings and grounds items which are commonly used by many agencies and institutions.

5. Starting Costs

It will be necessary to build up an inventory in the central warehouse. The value of this inventory is expected to total about \$304,000* for staple foods and institutional supplies—not counting stocks purchased on a seasonal basis. This amount must therefore be provided in a revolving fund which will finance the operations between procurement and payment by the institutions.

Note: Offsetting this revolving fund it is anticipated that the proposed warehousing plan will eventually reduce the total institutional inventories of staple foods and institutional supplies by about \$759,000*.

In addition to providing for the central warehouse inventory, the following estimated initial costs must be provided for:

Modifications to the Fulton Warehouse	\$15,000
Office equipment (Including a bookkeeping machine)	10,000
Warehouse material handling equipment	10,000
Highway tractor	15,000
Trailers (2)	15,000
Total	\$65,000

* See Exhibit VII.

6. Financing the operation

The costs of operation are expected to add about 3.9% to the prices paid suppliers (see page 15) by the Department of Purchases and Supply. Thus, in normal operation, a 4% surcharge should liquidate all operating costs. In the initial stages, however, the costs of operation may be relatively higher due to low handling volume. It is recommended that the 4% surcharge be established at the outset and that any under-liquidation due to high starting costs be provided from other funds. If a fully liquidating surcharge were applied in the first few months of operation, it would be discouraging to the institutions which first receive the service and might put the whole program in a bad light.

Note: The 4% surcharge is expected to be more than offset by reduced prices.

II VALUE ANALYSIS COUNCILS

There has been too little communication between institutions regarding their common purchasing problems. One institution was purchasing dehydrated potatoes while a nearby institution had such a supply of fresh potatoes that several thousand pounds were lost through spoilage. Another institution ordered diced carrots while an institution in the same town ordered sliced carrots. Frequently two institutions would order the same item in alternate quarters. Some institutions always order a fancy grade while others with the same feeding problems order choice grade, yet none of the institutions may have been aware of the price differential between grades. Institutions frequently had complaints regarding quality or delivery service, but not knowing other institutions had similar complaints, would not take the initiative in registering the complaint.

With these conditions in mind, it was felt that much good could result from the formation of regional councils of institutions having common procurement problems. The following proposal was therefore developed jointly with the Department of Purchases and Supply.

PROPOSAL FOR ESTABLISHING REGIONAL VALUE ANALYSIS COUNCILS

General

1. Analysis of the quarterly requisitions for groceries, canned goods, meat products, and similar items has shown there are frequent instances of ordering for more than one quarter. In many instances, closely situated institutions order substantial quantities of identical items for alternate quarters.

The effect of this condition is to cause both inventories and prices to be higher than necessary.

2. Closely situated institutions may order the same items with different packs. Although this may frequently be justified by the difference in institution size or other considerations, there may also be instances where different packs are not justified.

By standardizing on packs it would be possible to increase ordering quantities and thus reduce prices.

3. The type and grade of items are frequently chosen without thorough consideration by the individual institutions. Current price differentials between types and grades are difficult to obtain.

As a result of these conditions the food requisitioner is frequently put in the position of ordering with less than adequate knowledge of price quality relationships.

Basic Objective of Regional Value Analysis Councils

To reduce costs while maintaining or improving quality.

Functions of Regional Value Analysis Councils

1. Planning the ordering of the participating institutions so that all order the same items for the same period.
 - A. This would mean that large consumption items would be ordered for uniform periods unless seasonal prices, or other extraordinary circumstances, dictated otherwise.
 - B. Certain low consumption items might be found to be more economically ordered semiannually. In this event, all participating institutions should order a semiannual supply.
2. Standardizing on packs, types, and grades to as great an extent as the differing requirements of the participating institutions permit. Such standardization to be based on a careful evaluation of price quality relationships.
3. Determining uniform delivery schedules for the participating institutions.
4. Exchanging ideas as to practices, methods, and policies of the participating institutions.
5. Informing the Department of Purchases and Supply of means by which service and coordination could be improved.

Organizational Relationships

1. The regional council, being composed of institutions responsible to diverse State agencies, would be purely advisory, cooperative, and voluntary. Agreed upon ordering plans and delivery schedules would, however, be mandatory for the period in question, since they would constitute an agreement between the individual institutions and the Department of Purchases and Supply as at present.
2. Each council would elect a chairman who would be responsible for arranging meetings, submitting the pooled requisitions of the participating institutions, and coordinating the council's efforts toward achievement of its objectives. He would act as liaison with the Department of Purchases and Supply.
3. The chairmen of the various councils would meet as required to discuss and recommend state-wide practices, methods, and policies regarding standardization of items, delivery schedules, and similar matters. Recommendations would be submitted to and discussed with the Department of Purchases and Supply.

Methods of the Councils

1. Each council would arrange to meet prior to the period when usual requisitions are prepared. Each member would come pre-

pared with his inventory and consumption records so that he could plan jointly with the others as to which items should be ordered for the period. His exact requirements for each item could be determined later at his own institution.

Note: At the first meeting of the council it will not be possible to take full advantage of pooled ordering because certain items required by one institution will have already been provisioned for that quarter by other institutions.

2. Discussions of grades, types, packs, and prices, directed toward standardization and cost reduction, would be implemented by samples, price data, and similar information obtained by the participating institutions or, if requested, through the Department of Purchases and Supply.
3. The Department of Purchases and Supply would stipulate in the invitations to bid for each region that the price of each item would be the same for each participating institution in that region.

The Department of Purchases and Supply immediately took the initiative and organized such a council in the Charlottesville-Staunton area. The participating institutions greeted this idea with enthusiasm and are presently at work. It became apparent immediately that the council would serve to meet a need for closer communications between the institutions and the Department of Purchases and Supply, as well as among themselves.

It is planned to extend the councils to other areas in the near future. It is also intended for the scope of the councils' work to be broadened to embrace all commonly used items. The chairmen of the various councils will then serve as a state-wide advisory board to the Department of Purchases and Supply.

III ESTABLISHING POLICIES AND PROCEDURES FOR THE DISPOSITION OF GOVERNMENT SURPLUS MATERIALS

In view of the serious nature of this problem to many of the institutions and also in view of the confusion as to what constitutes approved practices and regulations, the following recommendations are made:

1. The supervisor of surplus property of the Department of Education should be instructed to prepare a manual which would serve all eligible institutions in the following ways:
 - (a) State the applicable Federal government regulations involving disposition of excess materials and supplies acquired through the surplus property program.
 - (b) Provide uniform instructions and procedures required to comply with the above regulations.
 - (c) Provide uniform instructions and procedures for acquiring surplus property.
2. The surplus property agent of the Department of Purchases and Supply should arrange with the supervisor of surplus property of the Department of Education to incorporate in the above-mentioned manual the proper procedures to assure clear and coordinated relationship with his own function.

3. Housekeeping procedures for the disposition of obsolete and used materials and supplies should likewise be clarified by the Department of Purchases and Supply.

It is believed that to a large extent, improvement in housekeeping will be slow until these disposition problems are resolved. However, some institutions could take immediate action to clean up and straighten out storage areas—particularly those areas associated with buildings and grounds supplies. In most instances no specific person has been charged at the institutional level with this responsibility and hence action is slow.

4. In his visits to the various institutions, the inventory specialist of the Department of Purchases and Supply should make sure the responsible individuals are acquainted with the provisions of the above-mentioned manual. In the event there appears to be an unreasonable amount of government surplus property or that the institution is slow in disposing of it, the inventory specialist should report the facts to his superiors for their handling.

IV INVENTORY MANAGEMENT PRACTICES

Although development of a central warehouse and distribution system is expected to alleviate many of the inventory problems of the institutions, it was found that there were still many improvements which could be made in inventory practices. Some of these applied only to stock categories which were not affected by central warehousing, while others would apply broadly regardless of the manner in which goods were received.

Inventory practices invariably require careful attention to many details which must dovetail closely with other administrative procedures, organizational responsibilities, and operating conditions. It is not sufficient to simply lay down broad principles to be followed, for the conditions vary greatly among the institutions. Offering on-the-spot suggestions at each institution likewise was not considered effective, since much that seemed to require changing would have involved detailed discussion and explanation to the personnel involved.

It was decided, therefore, that the best approach was to prepare a Manual of Inventory Management which would cover all the important recommendations. This manual has been developed and has been furnished to the Department of Purchases and Supply for printing and distribution to the several State agencies.

It is believed that this manual will have permanent value in maintaining consistent inventory practices. We do not expect that it covers every problem completely, nor that issue may not be taken with some of its recommendations. The important thing is that it establishes a means and a framework for maintaining consistent inventory policies and procedures. It should be modified from time to time as required.

Because of the great variation in conditions among the institutions, we believe it to be unwise simply to issue this manual to all institutions. We recommended, therefore, that the inventory specialist of

the Department of Purchases and Supply use it as a training guide at the institutions. It was suggested that he conduct a course of instruction of one or two days at each institution, explaining the recommendations and answering questions concerning them. Upon the conclusion of the course the manual should be left with the personnel as a guide. This approach would assure adequate coverage of any situation which the recommendations did not cover fully and eliminate the possibility of improper applications of such practices or principles.

The salient policy and procedural recommendations of the manual are:

Policies

- (1) No issues should be permitted from a stock room without a properly authorized requisition.
- (2) Inventory records should be maintained in such a manner as to permit verification that withdrawals have been properly authorized.
- (3) Responsibility for custody, accountability and use of inventories should be specifically stated in the official operating manual of instructions of the institution or agency.
- (4) Records and physical controls of inventories should be maintained as simply and inexpensively as possible consistent with the value of the usage of the inventoried items.

Procedures

- (1) The so-called ABC system of inventory classification is recommended. Under this system, items of low annual usage value (comprising about 70% of all items) are controlled by a simple bin card system. The items of high annual usage value (comprising about 30% of all items) are controlled more exactly.

It is believed that adoption of this procedure will make possible significant reductions in clerical labor at many institutions, while enhancing control over the most important portion of the inventory.

- (2) A new procedure is offered for determining the amount to be ordered. The complicated calculations required to determine the most economical ordering quantity have been reduced to an easy-to-use table. This should serve as a valuable guide to the institutional personnel responsible for determining order quantities and should reduce the tendency to order in excess.

The manual also discusses many of the practices tending to cause high inventories which were found in various institutions. The approach to correction of these practices is suggested.

In addition to the general recommendations contained in the manual, notes were made on problems affecting specific institutions. These have been furnished to the inventory specialist of the Department of Purchases and Supply to assist him in his services to the institutions.

V REVIEW OF STORAGE SPACE REQUIREMENTS

It is recommended that all budget requests for capital outlays involving additional storage space be referred to the Department of Purchases and Supply for review and recommendations to the Director of the Budget before approval. It would be the responsibility of the Department of Purchases and Supply to evaluate such space needs in light of future plans for central or regional warehousing as well as the effects the changes in inventory practices and policies might have upon them.

Many institutions are making plans for additional storage space. In many instances such additional space may be justified, but review of the inventories, space utilization, and building plans of some institutions indicates that contemplated additional space is not justified, is improperly laid out, or improperly located for good inventory control. Many storage space problems will be eliminated or greatly alleviated by the proposed central warehousing and distribution system. Detailed evaluation of inventory practices and policies is difficult for the average administrator. Yet, assistance by the Department of Purchases and Supply revising practices may very well eliminate the need for additional storage space.

SUMMARY

I ADVANTAGES OF CENTRAL WAREHOUSING AND DISTRIBUTION

A. Reduced Clerical and Storeroom Labor

Institutions will be able to make consolidated requisitions of their requirements. This will eliminate the present need for preparing purchase orders for each of the many vendors. The consolidated requisition may also serve as a packing list and receiving report—thus greatly reducing the paper work associated with inventory replenishment. Deliveries to the institutions may be scheduled regularly, frequently and reliably. Thus the work schedule of receiving and stockroom personnel may be planned more efficiently.

These improvements should tend to reduce clerical, receiving and stockroom labor. In most instances, it probably will not be feasible to make reductions in personnel. However, such personnel may become available for other or additional duties. Moreover, as the populations of the institutions increase, the volume of goods handled will increase and, with the advantage of the proposed distribution system, it may frequently be possible to continue without increasing the number of personnel. The total salary cost of institutional personnel involved in inventory and storage activities is estimated to be \$570,000 per year (see page 9). We estimate that at least 10% of this cost (\$57,000) may be utilized for other duties.

B. Reduced Space Requirements

We have estimated that the primary institutional storage space presently required for staple foods and institutional supplies will be reduced by about 75% (Exhibit VII). This will eliminate the overcrowded conditions at many institutions. Additional benefits of reduced labor and improved service within the institution should accrue.

A number of institutions have indicated they are planning construction of additional storage facilities, or believe that such facilities must be planned for in the near future. By reducing the space requirements for staple foods and institutional supplies (the most space-consuming inventories) it is believed that expenditures for such facilities may be lessened by as much as \$400,000 over the next few years.

C. Improved Quality Control

The quality control of commodities (particularly staple foods) will be greatly improved. At present, quality complaints by the institutions are difficult to investigate and even more difficult to track down and correct. With a centralized warehouse, goods may be inspected and tested as received. Communications with the responsible vendors will be much closer and effective.

D. Improved Reliability of Delivery

Although suppliers are currently expected to deliver within specific dates there are frequent failures. These are difficult to correct because of the large number of different carriers making deliveries. The proposed plan will assure reliable deliveries. As a result, stock shortages (because of delivery failure) should be virtually eliminated. Thus food service managers and dieticians will not be required to make last minute substitutions for short items.

E. Improved Menu Flexibility and Cost Control

It will not be necessary to plan menus as far in advance as is now required to order quality requirements. Thus menus may be planned by the month rather than by the quarter.

At present, food service managers and dieticians must order staple foods so far in advance that they are not certain what the prices may be when delivered. With the proposed system *current* prices will be supplied to the institutions by the Department of Purchases and Supply. Thus advantage may be taken of items having current low prices.

F. Reduced Funds Tied Up in Inventory

There will be considerable reduction in the funds institutions now have tied up in inventories. These funds can be used by the institutions for other much needed purposes.

G. Favoring Virginia Producers

With the present system it is possible to take advantage of local seasonal prices of canned goods for only a single quarter. A central warehouse will permit the purchase of a year's supply at the height of the season. Some producers have indicated that under such a procedure they would be willing to store goods in their own warehouses until picked up by State trucks.

H. Additional Use of Trucks

Although operating costs have been estimated on the basis of trucks returning empty from the institutions, they should find it practical to return used corrugated containers (for sale as

waste), obsolete and surplus supplies and equipment, and similar items. They could also be employed to transport canned goods from producers direct to the central warehouse.

I. Improved Purchasing Conditions

The price inflating factors involved in the present system of bidding would be avoided. Purchasing could take advantage of temporary oversupply in the market, seasonal buying, and buying direct from producers. In short, purchasing could be put on about the same flexible basis as is used in commercial practice.

II ADVANTAGES OF IMPROVED INVENTORY MANAGEMENT

The policies, procedures and practices recommended in the Manual of Inventory Management should, when put into effect, result in greatly improved, standardized, and simplified inventory controls in the institutions. It is believed that a reduction of 20% in the affected inventories may eventually result.

It should be emphasized, however, that inventory control is primarily inventory *management* and that the management must be furnished at the local level by the institutions themselves. The manual should serve effectively as a guide to such management.

EXHIBIT I

SUMMARY OF PRIMARY INSTITUTIONAL STORAGE SPACE*

(In Square Feet)

Contents		Mental Hygiene and Hospitals	Health	Welfare and Institutions	Education	Agriculture	Virginia Commission for the Visually Handicapped	Total
Foods {	Refrigerated	7,974	1,980	7,821	10,188	.....	.....	27,963
	Non-Refrigerated	32,661	7,728	30,840	52,589	450	.....	124,268
Household, Institutional and Kitchen		16,276	3,788	9,818	14,419	.....	.....	44,301
Building Supplies and Hardware		18,499	1,100	12,462	37,257	300	.....	69,618
Hospital and Medical		2,100	4,176	441	3,059	.....	.....	9,776
Technical, Industrial and Laboratory		15,890	1,572	57,791	6,116	1,450	26,220	109,039
Drugs		3,033	1,401	897	1,970	100	.....	7,401
Clothing		12,036	250	5,450	4,326	150	.....	22,212
Office and Stationery		2,209	3,036	712	13,778	500	.....	20,235
TOTAL		110,678	25,031	126,232	143,702	2,950	26,200	434,813

* As estimated by the individual institutions.

EXHIBIT II

SUMMARY OF MAN-HOURS PER MONTH FOR RECORD-KEEPING AND OTHER STORAGE ACTIVITIES*

Department/Institution	Record Keeping		Other Storage Activities		Total		Total
	Paid	Unpaid	Paid	Unpaid	Paid	Unpaid	Hours
Agriculture	50	.....	425	.....	475	.....	475
30 Virginia Commission for the Visually Handicapped	4	.....	46	.....	50	.....	50
Mental Health	1,526	.....	4,534	1,476	6,060	1,476	7,536
Welfare and Institutions	1,272	3,565	5,062	24,437	6,334	28,002	34,336
Health	659	.....	1,948	.....	2,607	.....	2,607
Education	2,547	.....	7,644	291	10,191	291	10,482
TOTAL	6,058	3,565	19,659	26,204	25,717	29,769	55,486

*As reported by the individual institutions.

EXHIBIT III

SUMMARY OF INSTITUTIONAL INVENTORY TURNOVERS OF
NORMALLY WAREHOUSED COMMODITIES
June 30, 1957 to June 30, 1958

Classification	Consumption*	Average Inventory	Average Turnover
Canned and Staple Foods	\$2,207,834	\$ 615,470	3.58
Household, Institutional and Kitchen Supplies....	958,518	396,718	2.42
Building Supplies and Hardware	584,557	397,036	1.47
Hospital and Medical Supplies	980,569	205,526	4.77
Technical, Industrial and Laboratory Supplies....	1,494,536	904,314	1.65
Drugs	1,082,758	279,635	3.87
Clothing	585,936	288,344	2.03
Office Supplies and Stationery	658,746	162,729	4.04
TOTAL	\$8,553,454	\$3,249,772	2.63

* Computed on information supplied by the individual institutions.

EXHIBIT IV

CHANGES IN INSTITUTIONAL INVENTORY*

June 30, 1957 to June 30, 1958

Food Inventory Value June 30, 1958.....	\$ 840,365
Increase over June 30, 1957.....	74,116
Increase	10%—
Non-Food Inventory June 30, 1958.....	2,964,784
Increase over June 30, 1957	246,751
Increase	9%+
Total Inventories June 30, 1958.....	3,805,149
Increase over June 30, 1957	320,867
Increase	9%+

*Based on inventories reported by the individual institutions.

EXHIBIT V

ESTIMATED WAREHOUSE OPERATING COSTS

PROPOSED CENTRAL WAREHOUSE

The following calculations are based on a central warehouse having a minimum of 41,865 sq. ft. and provided with the necessary handling equipment. This warehouse is expected to handle \$3,166,000 worth of staple foods and institutional supplies per year.

Personnel Costs:		Annual	Number	Total
Job Classification	Rate *			Annual Cost
Storekeeper Helper	\$3,024	7		\$21,168
Storekeeper Porter	2,400	8		19,200
Total Labor			15	\$40,368
Shipping Clerk (Clerk C)	\$3,456	1		\$ 3,456
Receiving Clerk (Clerk C)	3,456	1		3,456
Inventory Clerk (Clerk C)	3,456	2		6,912
Total Clerical			4	13,824
Storekeeper Supervisor C	\$4,704	1		\$ 4,704
Warehouse Manager (New)	8,200	1		8,200
Total Supervision			2	12,904
Total All Personnel			21	\$67,096
Annual Building Costs (Estimated on basis of similar costs of the Fulton Warehouse)				
Heat				\$ 500
Maintenance				500
Insurance				1,400
Phones				800
Office Supplies				600
Watchman Service				1,500
Total Building Costs				5,300
Other Annual Costs:				
Equipment depreciation \$25,000 over 10 years.....				\$ 2,500
Contingencies**				10,000
Total Other Annual Costs				12,500
Total All Annual Operating Costs.....				\$84,896
Cost Per \$1 Worth of Supplies Handled:				
The estimated cost for each \$1 of supplies handled is therefore (\$84,896 ÷ \$3,166,000)				\$.027

* Highest step of the salary range.

** Contingencies might include additional depreciation for materials-handling equipment not now contemplated.

COMPARISON WITH WAREHOUSE COST OF CONVICT ROAD FORCE

For the year ended June 30, 1958, the following dollar values of supplies were handled by the Convict Road Force Central Warehouse:

Regular warehouse operation

Canned and Staple Foods	\$239,257
Household, Institutional and Kitchen Supplies.....	72,521
Building Supplies	32,296
Drugs	7,600
Office and Stationery	4,000
	\$355,674
Receive, record and reship from warehouse	
Clothing	200,000
Unload, record and reship from railroad docks	
Fertilizer, building materials, seeds, etc. (estimated) ..	250,000
Total Value of Supplies Handled	\$805,674

Personnel Costs:

For the same year the following personnel were employed for this operation:

Warehouse clerk (convict)	1.0
Warehousemen (convict)	4.0
Storekeeper Supervisor C (paid)	1.0
Kardex Clerk (paid part-time on this job).....	.5
General Supervisor (paid part-time on this job).....	.3
Total Personnel	6.8

Assuming the present convict labor is replaced by paid labor, and applying the appropriate annual salaries, the following salary costs are determined:

Warehouse Clerk (Clerk C)	\$ 3,456
Warehouseman (Storekeeper Helper) 4 @ \$3,024....	12,096
Storekeeper Supervisor C	4,704
Kardex Clerk (Clerk B) .5 @ \$2,880.....	1,440
General Supervisor	5,400
Total Salaries	\$27,096
Add for fringe benefits (15%)	4,064
Total Personnel Costs	\$31,160

Building Costs:

Building costs were not available for the Convict Road Force warehouse. The following building costs have, therefore, been estimated by prorating the building costs per square foot of the State Highway Department warehouse at Fulton.....	1,584
Total Cost of Warehousing and Handling.....	\$32,744

Cost per \$1 of Supplies Handled:

The cost per \$1 of supplies handled by the Convict Road Force warehouse organization (assuming the present convict labor replaced by paid labor) would therefore be $(\$32,744 \div \$805,674)$ \$.040
It is believed, however, that this cost is higher than would be expected at the proposed warehouse for the following reasons:

- (a) There are no truck docks for receiving or loading. All supplies must be transferred to pallets before loading or unloading.
- (b) A considerable number of items are handled one at a time. Such items include water heaters, mattresses, dining room utensils and other difficult-to-handle articles.
- (c) Some items are acquired in secondhand condition and are repaired or disassembled as part of the warehouse operation.
- (d) A large variety of building and hardware supplies are handled.
- (e) Drugs are handled.
- (f) No use is made of conveyors as is planned for the proposed warehouse.

With these conditions in mind, we believe it safe to estimate that, with the conditions contemplated for the proposed warehouse, the cost per \$1 of supplies handled could be expected to be reduced from \$.040 to the \$.027 estimated earlier for the proposed central warehouse.

COMPARISON WITH COMMERCIAL WAREHOUSES

A survey* of regional variety store warehouses showed that the average handling cost per retail dollar handled was \$.0315. The handling costs of individual warehouses varied from \$.0654 to \$.0192. Although somewhat higher than the estimate for the proposed warehouse, this can be accounted for by the fact that the cost of goods handled is at retail value.

Another comparison of interest is a survey of certain wholesale grocers' warehouses made by the United States Department of Agriculture**. This cited a typical multifloor grocery warehouse, equipped with conveyors, which had a cost of \$.028 for each \$1 of supplies handled. This should represent a fairly close operating comparison to the proposed warehouse. However, a large part of the goods handled by the proposed warehouse will simply be transferred from railroad car to truck and this should make the potential cost considerably lower.

COMPARISON WITH COSTS OF SUPPLIERS TO THE STATE

The cost of present suppliers is difficult to determine since there are a great many types ranging from distributors whose goods are kept in regular wholesale warehouses to brokers who simply unload railroad cars and reload to trucks for shipment or even arrange for direct shipment from producers. Nevertheless, it seems reasonable to suppose that an average handling cost of 1% must be incurred (exclusive of transportation costs) and absorbed in the price paid by the State.

Thus, the additional cost of warehousing is not expected to be more than 1.7% (2.7% minus 1.0%).

* Modern Materials Handling, March 1959.

** Marketing Research Report No. 142 Agricultural Marketing Service, U. S. Department of Agriculture (1956).

EXHIBIT VI

DETERMINATION OF ESTIMATED TRANSPORTATION COSTS

Analysis of the truck costs of the State Highway Department and the Convict Road Force indicated that the cost of gasoline, maintenance, depreciation, and other operating costs would average about \$.20 per mile. The analysis, on the following page, indicates that about 114,000 truck miles will be required per year. The Convict Road Force trucks travel an average of 4,800 miles per month or 57,600 miles per year. Thus it would appear that two trucks (tractor-trailer) would be sufficient. A third trailer might become necessary later to permit loading during the absence of the other two trailers.

From the above, we calculate the transportation cost as follows:

Truck expense (114,000 miles @ \$.20 per mile).....	\$22,800
Salaries (2 Motor Vehicle Operators B @ \$3,600 per annum)	7,200
Employee benefits (15%)	1,080
Travel expense of drivers	1,500
Contingencies	5,000
TOTAL	\$37,580

The cost of transportation per \$1 of supplies handled is therefore

$$(\$37,580 \div \$3,166,000) \dots\dots\dots \$0.012$$

Comparison with Transportation Costs Absorbed in Vendors' Prices

The 114,000 truck miles estimated to be required with a central warehouse would amount to 1,140,000 ton-miles ($114,000 \div 2 \times 20$ tons). This would give a cost per ton-mile of

$$(\$37,580 \div 1,140,000) \dots\dots\dots \$0.033$$

Analysis of price differentials charged by vendors between distant points for identical supplies has indicated that present vendors incur a similar cost for transportation. We therefore assume that the transportation cost of the proposed central distribution plan would be no more (and

EXHIBIT VI

CALCULATION OF ESTIMATED ANNUAL TRUCK MILES REQUIRED TO DISTRIBUTE STAPLE FOODS
AND INSTITUTIONAL SUPPLIES

Institutions	Annual Consumption*			Annual Pounds**	Annual Tons	Annual 20-Ton Loads	Round Trip Miles from Central Warehouse	Truck Miles Per Year
	Canned and Staple	Household and Institutional	Total					
Virginia Military Institute	\$ 64,140	\$	\$ 64,140	641,400	320.7	16.0	273	4,368
Medical College of Virginia	87,000	40,000	127,000	1,270,000	635.0	31.7	6	190
Madison College	26,398	9,322	35,720	357,200	178.6	8.9	230	2,047
Woodrow Wilson Rehabilitation Center	46,530	3,077	49,607	496,070	248.0	12.4	200	2,480
Longwood College .....	.....	7,315	7,315	73,150	36.5	1.8	126	226
Virginia School for the Deaf and Blind	5,825	934	6,759	67,590	33.7	1.6	218	348
Virginia Polytechnic Institute	165,572	38,300	203,872	2,038,720	1019.3	50.9	418	21,276
Radford College	25,871	6,000	31,871	318,710	159.8	7.9	436	3,444
College of William and Mary .....	.....	10,549	10,549	105,490	52.7	2.6	102	265
College of William and Mary— Norfolk .....	.....	3,684	3,684	36,840	18.4	.9	182	163
Richmond Professional Institute .....	.....	5,958	5,958	59,580	29.9	1.5	10	15
Virginia State College	37,330	20,608	57,938	579,380	289.7	14.4	46	662
Virginia State College—Norfolk	4,223	2,650	6,873	68,730	34.3	1.7	182	309
Virginia State School—Hampton	11,690	5,084	16,774	167,740	83.9	4.2	172	722
University of Virginia	76,621	60,963	137,584	1,375,840	687.9	34.3	142	4,870
Mary Washington College	29,657	18,949	48,606	486,060	243.0	12.1	112	1,355
Central State Hospital	373,102	52,827	425,929	4,259,290	2129.6	106.4	56	5,958
Eastern State Hospital	174,650	58,500	233,150	2,331,500	1165.7	58.2	102	5,936
Southwestern State Hospital	115,080	23,133	138,213	1,382,130	691.0	34.5	548	18,906
Western State Hospital	148,500	71,475	219,975	2,199,750	1099.8	54.9	218	11,968
DeJarnette State Sanatorium	12,318	3,310	15,628	156,280	78.1	3.9	218	850

(Continued on next page)

CALCULATION OF ESTIMATED ANNUAL TRUCK MILES REQUIRED TO DISTRIBUTE STAPLE FOODS
AND INSTITUTIONAL SUPPLIES

Institutions	Annual Consumption*			Annual Pounds**	Annual Tons	Annual 20-Ton Loads	Round Trip Miles from Central Warehouse	Truck Miles Per Year
	Canned and Staple	Household and Institutional	Total					
Petersburg Training School and Hospital	20,807	7,492	28,299	282,990	141.5	7.0	218	1,526
Lynchburg Training School and Hospital	164,448	25,684	190,132	1,901,320	950.6	47.5	230	10,925
State Convict Road Force	239,257	72,521	311,778	3,117,780	1558.8	77.9	8	623
Janie Porter Barrett School for Girls	6,501	1,022	7,523	75,230	37.6	1.9	28	53
Bon Air School for Girls	8,995	2,742	11,737	117,370	58.6	2.9	30	87
Bland Correctional Farm	19,995	8,532	28,527	285,270	142.6	7.1	548	3,890
Beaumont School for Boys	10,060	8,035	18,095	180,950	90.4	4.5	66	297
Southampton Farm	22,090	7,582	29,672	296,720	148.3	7.4	184	1,361
Study Home for White Boys	4,859	2,140	6,999	69,990	34.9	1.7	12	20
Hanover School for Boys	14,781	10,875	25,656	256,560	128.2	6.4	30	192
State Industrial Farm for Women.....	29,200	9,794	38,994	389,940	194.9	9.7	60	582
The Penitentiary	100,573	10,092	110,665	1,106,650	552.2	27.6	8	220
Catawba Sanatorium	21,689	17,210	38,899	388,990	194.4	9.7	366	3,550
Blue Ridge Sanatorium	31,405	20,488	51,893	518,930	259.9	12.9	142	1,831
Piedmont Sanatorium	72,286	6,557	78,843	788,430	394.2	19.7	110	2,167
State Lime Grinding Plant No. 1.....	4,062	803	4,865	48,650	24.3	1.2	218	261
TOTAL	\$2,175,515	\$654,207	\$2,829,722	28,297,220	14147.0	705.9	6,255	113,943

* As reported by the institutions.

** Assuming an average value of \$.10 per pound (derived from comparing price and weight of several typical items).

EXHIBIT VII

CALCULATION OF ESTIMATED INVENTORY REDUCTION RESULTING FROM CENTRAL WAREHOUSING AND DIS- TRIBUTION OF CANNED AND STAPLE FOODS, AND HOUSEHOLD, INSTITUTIONAL AND KITCHEN SUPPLIES

Institutional Inventories

Commodity	Annual Consumption Exhibit III	Average Inventory Exhibit III	Average Turnover Exhibit III
Canned and Staple Foods.....	\$2,207,834	\$ 615,470	3.58
Household, Institutional, and Kitchen Supplies	958,518	396,718	2.42
TOTAL	\$3,166,352	\$1,012,188	3.13

The average turnover of 3.13 represents an inventory sufficient to last an average of 16.5 weeks ($52 \div 3.13$).

With central warehousing and distribution, we would assume that goods would be delivered to the institutions once each month and that a safety stock of two weeks would be maintained at all times. These conditions would result in an average institutional inventory as follows:

Working inventory ($4.3 \text{ weeks} \div 2$)	2.15 weeks
Safety inventory	2.00 weeks
Total average inventory	4.15 weeks

The average institutional inventories would therefore be expected to be reduced from the present 16.5 weeks to 4.15 weeks, or a reduction of 75%. Applied to the average inventory of \$1,012,188, this would represent a reduction of \$759,000, leaving an average inventory of \$253,188 in these commodities.

Central Warehouse Inventory

It is expected that the central warehouse will replenish its inventory every 6 weeks and that it will maintain a safety stock of 2 weeks. The average central warehouse inventory will therefore be:

Working inventory ($6 \text{ weeks} \div 2$)	3 weeks
Safety inventory	2 weeks
Total average inventory	5 weeks

This would represent 30% ($5.0 \text{ weeks} \div 16.5 \text{ weeks}$) of the present average institutional inventory. The monetary value of this average inventory would be 30% of \$1,012,188 or \$303,656.

Summary

Present average institutional inventory	\$1,012,188
Less:	
Expected average institutional inventory.....	\$253,188
Expected average central warehouse inventory	303,656
Expected combined average inventory	<u>556,844</u>
Net combined average inventory reduction	<u>\$ 455,344</u>
	(45%)

EXHIBIT VIII

CALCULATION OF ESTIMATED CENTRAL WAREHOUSE

Let it be assumed that the storage efficiency (value of goods per sq. ft.) will be the same at the central warehouse as now prevails in the storage areas of the State Convict Road Force, Virginia Penitentiary, Central State Hospital, and Western State Hospital.

We then calculate as follows:

Institution	INVENTORY Staple Foods and Institutional Supplies June 30, 1958	Area per Dollar Space Used of Inventory	
		Sq. Feet	Sq. Feet
State Convict Road Force	\$100,000	10,000	.10
Virginia Penitentiary	89,893	11,886	.13
Central State Hospital	131,892	12,362	.09
Western State Hospital	67,310	4,800	.07
TOTAL	\$389,095	39,048	.10

The expected value of the central warehouse inventory is calculated (Exhibit VII) to be \$303,656. Using the value calculated above of .10 sq. ft. for each \$1 worth of inventory we figure a central warehouse storage space requirement of 30,365 sq. ft. ($\$303,656 \times .10$). To this must be added other service space as follows:

	Sq. Ft.
Marshalling areas	3,000
Shipping and receiving areas.....	3,000
Office	500
Reloading areas	5,000
Storage area	30,365
TOTAL	<u>41,865</u>