

METHODS IMPROVEMENT TECHNIQUES
AS APPLIED TO A SMALL POTTERY PLANT

By

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Bachelor of Science

Oklahoma Agricultural and Mechanical College

Stillwater, Oklahoma

1951

Submitted to the Faculty of the Graduate School of

The Oklahoma Agricultural and Mechanical College

in Partial Fulfillment of the Requirements

for the Degree of

MASTER OF SCIENCE

1952

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THESIS AND ABSTRACT APPROVED:

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PREFACE

Tamac Pottery manufactures a line of dinnerware and accompanying pottery. The volume of sales and the area of distribution have greatly increased during the six years it has been in existence. This is due to it's unusual shape and harmonizing colors. These factors, together with a concerted sales effort, have begun to change the type of sales outlet from retail and gift chain stores to large department stores. Orders are now contracted in truck load quantities rather than small lots. The expanding market has led the management of Tamac to seek advice primarily concerning ways to increase production. Reducing the effort of manufacturing and also minimizing unit cost is a natural companion to any such study. This report is the result of a series of observations of the plant from November, 1951 to April, 1952.

The plant was studied for it's over-all method of manufacture and each department observed for ways to increase production and reduce unit cost. Frequent trips were made to the plant in order to become thoroughly familiar with the technical aspects of the process and to observe all phases of the plant activity. Initial trips were confined to familiarization of routines and getting acquainted with both the management and the employees. Later trips were concerned with observation of the many operations and discussion of various improvement schemes with the management. In many cases the ideas for improvement were also discussed with the employees concerned to sound out their viewpoint and degree of accept-

ance.

The recommendations cited herein are based upon the present and probable needs of the organization and tempered with a view toward excluding changes which might be desirable but prove to be too costly. In some cases the changes recommended are substantiated by economic appraisals.

These recommendations are concerned with the existing plant although expansion of the organization would probably necessitate segregating various operations in other buildings. This consideration would require a further analysis.

The techniques used in studying the broad aspects of the plant's activity include plant layout, routing, and storage. Material handling techniques as well as process analysis were also used to help evaluate the manufacturing method. Organization analysis was applied to the functions of the management.

Motion pictures were taken of the various operations. A study of these pictures as well as direct observation was used to apply the principles of motion and time study. Time studies were not used extensively since it is felt that the plant has not reached a stable level of operation. If the recommendations suggested by this study are incorporated and the plant reaches a stable level of operation, then time studies can be used more effectively to increase production and reduce unit cost by making the various operations easier and quicker to perform.

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CHAPTER I

INTRODUCTION

The building which houses Tamac Pottery is of the quonset type, with a width of 40 feet and a length of 120 feet. Approximately 85% of the total floor space is used for the manufacture of the pottery while the remaining 15% is used for offices, lavatories, and storage. A brief description of the method used at Tamac is given here as a basis for understanding the recommendations found later in this report.

Four different kinds of clay material are shipped to the plant. The bulk of this material is kept in a warehouse while a small portion is kept in temporary storage at the rear of the plant.

The first operation is that of mixing these clays with water and a small amount of deflocculent chemical. After the initial mixing, this slip is screened and stored in an elevated tank. From here it flows through pipe and hose to fill the various molds in the casting department.

These molds are made from Plaster of Paris and have the peculiar property of absorbing water from the slip wherever it comes in contact with it. As the water is removed along the mold surface, this boundary layer becomes more compact and forms the outline of the piece. After about 20 to 30 minutes, when this layer is $1/4$ to $1/2$ inches thick, the extra slip is poured from the mold and this shell of clay is allowed to dry.

In three to four hours the shell has been dried by evaporation and the absorbing of moisture by the mold, to the condition where it can be

removed and placed on the shelf of a ware truck. Here it will dry further and after 20 to 64 hours (depending on weather conditions and the size of the piece), the ware may be handled.

The next operation is that of trimming. Rough edges are sanded off and all surfaces are smoothed by rubbing with a moist sponge. When this is finished, the ware is fired for the first time. This is called bisque firing and it partially vitrifies the ware, giving it a permanent shape. The ware is now 16% smaller than it's original size. The temperature reached in the kiln is about 2100 degrees Farenheit.

After firing, the ware is decorated by spraying the glaze on, dipping it, or filling the ware with glaze and then emptying it. In most cases two different colors are applied.

The next step is the glaze firing which melts the glaze and bonds it to the ware. This firing is done at a lower temperature than the bisque firing. After removal from the kiln, the ware is taken to a table where the sharp points found on some of the ware are ground off. These points are left as the ceramic pieces used to support the ware during the glaze firing are broken off (the glaze melts and welds these pieces fast). Some items rest on glaze-free rims and do not need this operation performed. At this point the ware is sorted as to quality and is shipped or stored for future disposition.

Tamac

14. Ashtray
1.00 ea.



7. Salt Shaker
8. Pepper Shaker
1.00 pr.



5. Sugar Bowl
w/lid 1.75



6. Creamer
8-oz. 1.25



19. Cup
8-oz. .60 ea.



20. Saucer
.40 ea.



9. Fruit Bowl
12-oz. .65 ea.



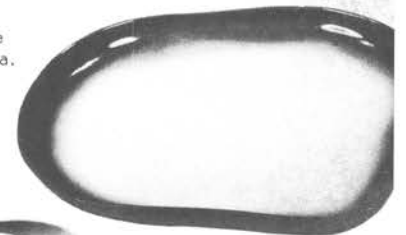
12. Soup Bowl
16-oz. .80 ea.



18. Butter Plate
.55 ea.



17. Dinner Plate
10" 1.25 ea.



21. Single
Candleholder
2.25 pr.

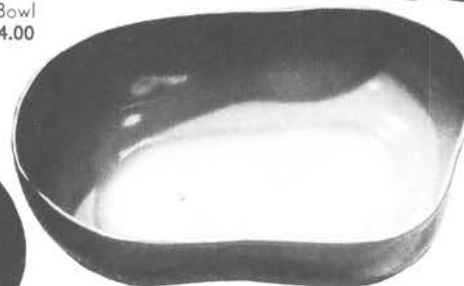
22. Double
Candleholder
(not shown) 3.75 pr.



16. Vegetable Bowl
1-qt. 1.75

10. Vegetable Bowl
2-qt. 2.75

11. Salad Bowl
3-qt. 4.00



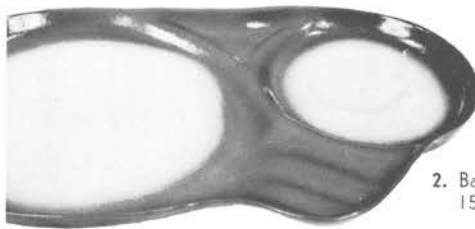
1. Chop Plate
18" 6.00 ea.



4. Barbecue Saucer
.55 ea.



15. Tumbler
20-oz. 1.00 ea.



2. Barbecue Plate
15 1/2" 2.00 ea.



13. Pitcher
4-qt. 4.00 ea.

HANDMADE BY SOUTHWESTERN
CRAFTSMEN IN AVOCADO — A
BLEND OF GREEN & CHARTREUSE

Tamac, Inc.

Box 108

Perry, Oklahoma

FIG. 1

Tamac

. . . presents a unique dinnerware designed to please YOU. We do not let our own convenience rule our choice of designs. Instead, we form every piece to fit your hand, nestle for easy storage, and to hold plenty of food or drink. Tamac is made to use. We also deviate from conventional outlines. Our modern free-form shapes subtly change when viewed from different angles. You will never tire of them nor our refreshing "Avocado" greens. Here's to many moments of dining pleasure!

Tamac, Inc.

Perry, Oklahoma

CHAPTER II

ORGANIZATION AND MANAGEMENT

1. It is recommended that a "production supervisor" be utilized at least part-time, the position to function in accordance with the existing formal organization of the plant (see Figure 2).
2. It is recommended that a suggestion system be incorporated in the plant activity to stimulate the flow of ideas toward management.
3. It is recommended that regular meetings with the various department heads be inaugurated to facilitate the communication of policies and new ideas.

ORGANIZATION AND MANAGEMENT

"Production Supervisor"

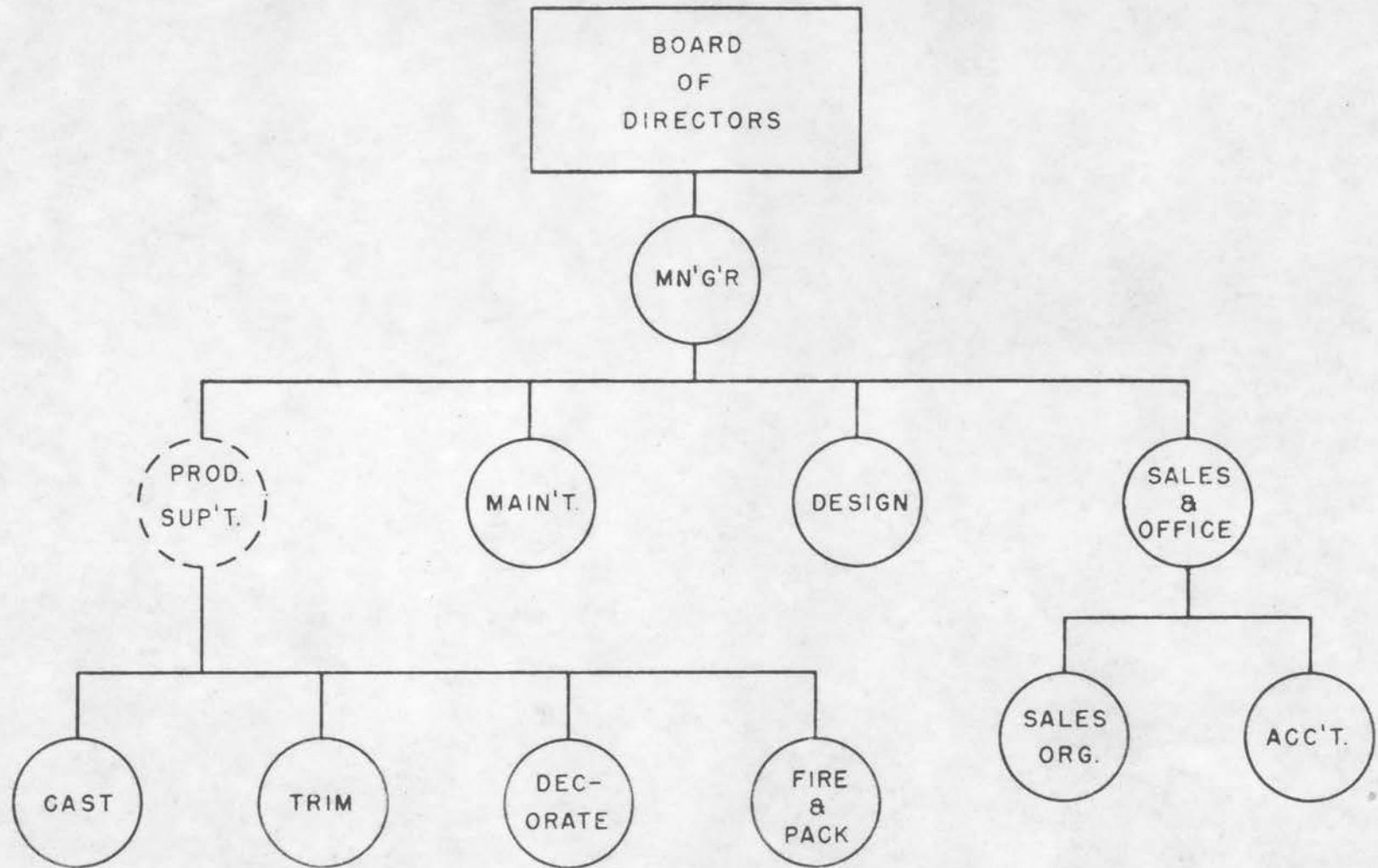
It has been noticed that the formal organization, as depicted by the line chart of Figure 2, includes the function of a production supervisor. At the present there is no one operating specifically in this capacity and there seems to be a definite need for this function. With someone operating either part-time or full-time as a production supervisor, a buffer zone would be created between the activity of the work plant and the manager. This would reduce the number of less important decisions that the manager must make since these details would be handled by the supervisor. Also, this allocation of responsibility will enable the manager to devote more time to administrative duties and less time to strictly technical duties. The administrative duties as stated here refer to the broad decisional functions which are a necessary part of formulating the organizational objective.¹

One of the major aspects of the administrative duties of the manager is his dual role as comptroller as well as manager. This status requires the careful decisions of money expenditures and their relative value to the plant. By relieving himself of some of his present responsibilities he will be able to devote more time to the consideration of money matters as they effect the efficiency of the plant.

Suggestion System

The suggestion system recommended stems from talks with the employees

¹ Herbert Simon, Administrative Behavior, p. 245.



ORGANIZATION CHART OF TAMAC POTTERY

FIG. 2

wherein it was learned that a few had ideas of their own concerning the improvement of work in the plant. Without such a system the employees have no formal outlet for these ideas. Furthermore, they feel that management does not invite the expression of ideas and would not give them fair consideration.

A system should be worked out whereby the employees would be fairly compensated for any suggestions offered and which were subsequently put into practice.

Regular Meetings

Another possibility is to arrange for weekly meetings with the department heads to discuss the suggested improvements in the work plant. This discussion period will allow these leaders to bring forth the ideas of the group and will certainly facilitate better communication going up the line. The department heads will then have a reason to encourage ideas from their groups. This activity all leads to a better flow of communication both up and down the line of authority.²

These regularly scheduled meetings will also allow management to integrate the work of the various departments. Included here would be the explanation of any company policies or general policies as regards the functioning of the plant. The basic concept here is the much to be desired attitude of regarding the various departments as groups of people, rather than as a functional activity.³

² Delbert C. Miller and William H. Form, Industrial Sociology, p. 485.

³ Ibid, p. 183.

These meetings can also be used to set production goals for the days to follow or for an entire week. Production problems can also be discussed. Since all departments are represented at these meetings, solutions can be arrived at which are more apt to satisfy all personnel and which will be more effective.

CHAPTER III

GENERAL LAYOUT AND METHODS PROCEDURE

1. It is recommended that the Trimming Department and the packing area be interchanged.
2. It is suggested that a control-drying oven be installed between the Casting Department and Trimming Department, and that freshly loaded ware trucks be placed in this oven prior to trimming.
3. It is suggested that a 10 minute rest period for the entire plant be put into effect, starting at 10:15 a.m. and lasting until 10:25 a.m. The present afternoon rest period is satisfactory.
4. It is suggested that the wooden shelves of the ware trucks be replaced with $\frac{3}{8}$ inch thick shelves. These shelves should be turned over when warpage becomes excessive.
5. It is suggested that larger castors (4 inch dia.) be placed on the slip drainage cart.
6. It is suggested that larger castors (3 inch dia.) be placed on the ware trucks. Two on one end should be stationary and the remaining two should be of the swivel type.
7. It is suggested that a small two-wheeled hand truck be provided for general transportation of material.
8. It is recommended that more light be supplied to working areas with particular emphasis given to the present packing area. The working surfaces now have about 10 foot-candles of illumination and it should be increased to between 15 and 20 foot-candles.

9. It is recommended that a water heater be installed in the hot water system to supply warm water for employees to clean equipment.
10. It is recommended that the advertising signs on routes 64 and 77 be repainted and a phrase added saying that the store is open on Sundays.
11. It is recommended that the storage closet be removed and this area be used for the temporary storage of orders awaiting shipment.
12. It is recommended that a general clean-up policy be put into effect.

GENERAL LAYOUT AND METHODS PROCEDURE

Change Departments

Inter-changing the location of the Trimming Department and the packing area will greatly simplify the transporting of the pottery by means of the ware trucks. Total moving distance of the material in the proposed method has been reduced from 360 feet to 242 feet, a savings of 32.8%. The routes of the ware trucks are more direct and present a smoother flow of the pottery.

An important factor that was considered is that most shipments leave by the front of the plant even though double sliding doors are available at the rear for truck loading. The reason for this is that the road passing by the rear of the plant is virtually impassable for heavy trucks during the winter and spring months. Attention was directed toward repaving the road but it would be of little benefit to any future buildings erected on company property. Coupled with this fact is the consideration that future operations may discourage the display room (retail store) even existing. The expanding market calls for large wholesale shipments and it is felt that the energies now directed toward the display room can be better employed in running the plant. If the display room is abandoned in the future, it can be used as a storage and shipping area since orders will be of the truck load size.

Another consideration to be made in inter-changing these areas is that the dust put into the air by both the mixing of the clays and the Trimming Department will be largely confined to the rear of the plant. Here it can be drawn off more quickly by the large ventilating fans located in the ends of the building. By the same token, the floor can be

PROCESS CHART

PT CHARTED _____

| SUMMARY | | | | |
|--------------|---|---------|------|--------|
| METHOD | | PRES | PROP | SAVING |
| Operation | ○ | 8 | | |
| Movements | ○ | 10 | | |
| Storage | ▽ | 4 | | |
| Inspection | □ | 1 | | |
| Man Hours | | | | |
| Dist. Travel | | 360 ft. | | |

DATE 4-22-52

CHART BY A.M. Pope

CHART NO _____

SHEET NO 1 OF 2

| DIST FT | TIME MIN | CHART Hr | SYMBOLS | PROCESS DESCRIPTION |
|------------|-------------|-------------|---------|---------------------------------------------------|
| | | | | |
| | | | ○ ○ ▽ □ | Clay in temporary storage |
| 19 | | | ○ ● ▽ □ | Transport to mixer |
| | | | ● ○ ▽ □ | Mix clays to form slip |
| | | | ○ ○ ▽ □ | Store slip in elevated tank |
| 28 | | | ○ ● ▽ □ | Transport slip to molds |
| | | | ● ○ ▽ □ | Cast pieces |
| 35 | | | ○ ● ▽ □ | Carry pieces to ware truck in trimming department |
| | 32 | | ○ ○ ▽ □ | Wait to dry |
| | | | ● ○ ▽ □ | Trim pieces |
| 57 | | | ○ ● ▽ □ | Transport to kiln for bisque firing |
| | | | ● ○ ▽ □ | Bisque fire |
| 42 | | | ○ ● ▽ □ | Transport to decorating department |
| | | | ● ○ ▽ □ | Decorate |
| 20 | | | ○ ● ▽ □ | Transport to kiln for glaze firing |
| | | | ● ○ ▽ □ | Glaze fire |
| 41 | | | ○ ● ▽ □ | Transport to packing area |
| | | | ○ ○ ▽ ■ | Inspect |
| 7 | | | ○ ● ▽ □ | Transport to temporary storage |
| | | | ○ ○ ▽ □ | Temporary storage in packing area |

PROCESS CHART

CHARTED _____

| SUMMARY | | | |
|-------------------------------------|------|------|--------|
| METHOD | PRES | PROP | SAVING |
| Operation <input type="radio"/> | | | |
| Movements <input type="radio"/> | | | |
| Storage <input type="checkbox"/> | | | |
| Inspection <input type="checkbox"/> | | | |
| Man Hours | | | |
| Dist. Travel | | | |

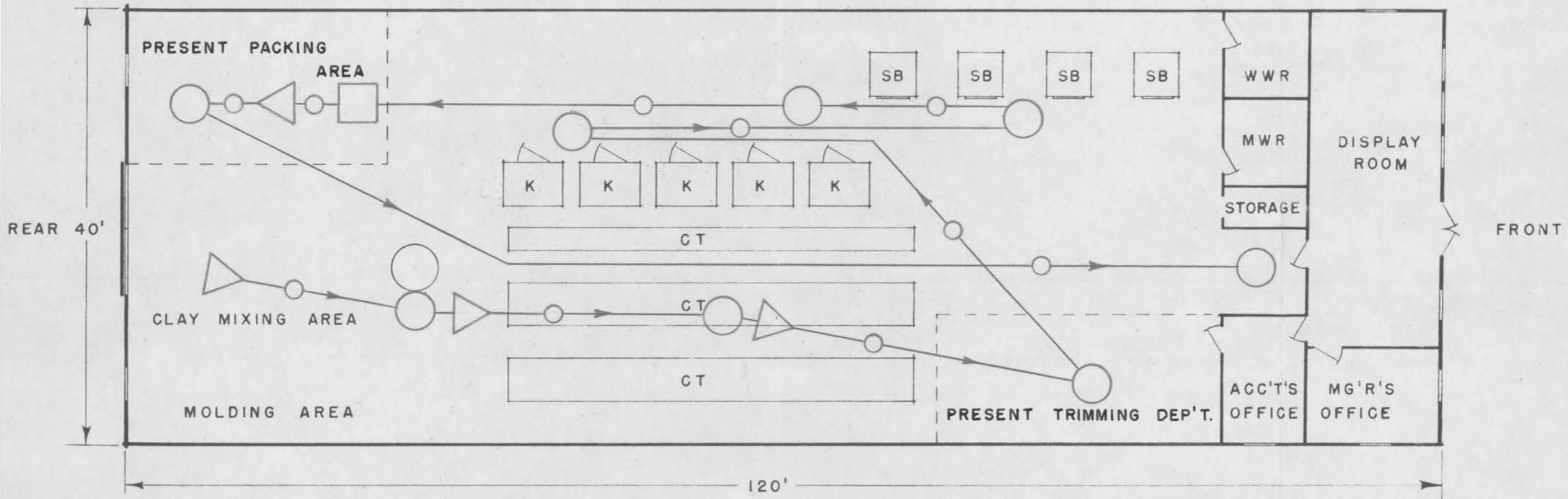
DATE _____

CHART BY _____

CHART NO _____

SHEET NO. 2 OF 2

| DIST FT | TIME MIN | CHART SYMBOLS | PROCESS DESCRIPTION |
|------------|-------------|---------------------------------------------------------------------------------|--------------------------------------|
| | | | |
| 8 | | <input type="radio"/> ● <input type="checkbox"/> | Transport to packer |
| | | <input checked="" type="radio"/> <input type="radio"/> <input type="checkbox"/> | Pack |
| 103 | | <input type="radio"/> ● <input type="checkbox"/> | Transport to front door for shipment |
| | | <input checked="" type="radio"/> <input type="radio"/> <input type="checkbox"/> | Ship order |
| 360 | 32 | <input type="radio"/> <input type="radio"/> <input type="checkbox"/> | |
| | | <input type="radio"/> <input type="radio"/> <input type="checkbox"/> | |
| | | <input type="radio"/> <input type="radio"/> <input type="checkbox"/> | |
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FLOOR PLAN OF TAMAC POTTERY

- LEGEND - K = KILN
 SB = SPRAY BOOTH
 WWR = WOMEN'S WASH R
 MWR = MEN'S WASH RO
 CT = CASTING TABLE

SCALE: 1" = 10'

PROCESS CHART

OBJECT CHARTED _____

| SUMMARY | | | | |
|--------------|---|------|------|--------|
| METHOD | | PRES | PROP | SAVING |
| Operation | ○ | 8 | 7 | 1 |
| Movements | ○ | 10 | 9 | 1 |
| Storage | ▽ | 4 | 4 | |
| Inspection | □ | 1 | 1 | |
| Man Hours | | | | |
| Dist. Travel | | 360 | 242 | 118 ft |

DATE 4-22-52

CHART BY _____

CHART NO _____

SHEET NO 1 OF 2

| DIST FT | TIME MIN | CHART | | PROCESS DESCRIPTION |
|------------|-------------|-------|---------|-------------------------------------|
| | | Hr | SYMBOLS | |
| | | | ○ ○ ▽ □ | Clay in temporary storage |
| 19 | | | ○ ● ▽ □ | Transport to mixer |
| | | | ● ○ ▽ □ | Mix clays to form slip |
| | | | ○ ○ ▽ □ | Store slip in elevated tank |
| 28 | | | ○ ● ▽ □ | Transport slip to molds |
| | | | ● ○ ▽ □ | Cast pieces |
| 29 | | | ○ ● ▽ □ | Roll ware truck into drying oven |
| | 16 | | ○ ○ ▽ □ | Wait to dry in oven |
| 20 | | | ○ ● ▽ □ | Transport to trimming department |
| | | | ● ○ ▽ □ | Trim |
| 30 | | | ○ ● ▽ □ | Transport to kiln for bisque firing |
| | | | ● ○ ▽ □ | Bisque fire |
| 41 | | | ○ ● ▽ □ | Transport to decorating department |
| | | | ● ○ ▽ □ | Decorate |
| 20 | | | ○ ● ▽ □ | Transport to kiln for glaze firing |
| | | | ● ○ ▽ □ | Glaze fire |
| 37 | | | ○ ● ▽ □ | Transport to packing area |
| | | | ○ ○ ▽ ■ | Inspect and pack |
| 18 | | | ○ ● ▽ □ | Transport to temporary storage |

PROCESS CHART

ACT CHARTED _____

| SUMMARY | | | |
|-------------------------------------|------|------|--------|
| METHOD | PRES | PROP | SAVING |
| Operation <input type="radio"/> | | | |
| Movements <input type="radio"/> | | | |
| Storage <input type="radio"/> | | | |
| Inspection <input type="checkbox"/> | | | |
| Man Hours | | | |
| Dist. Travel | | | |

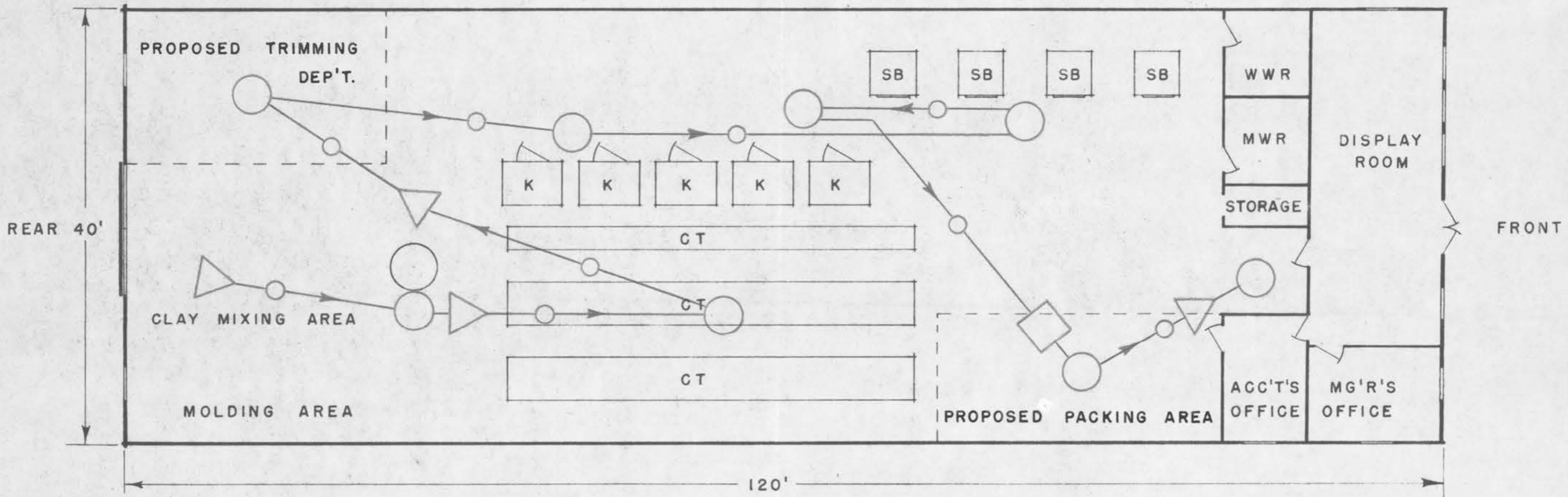
DATE _____

CHART BY _____

CHART NO _____

SHEET NO 2 OF 2

| DIST FT | TIME MIN | CHART SYMBOLS | PROCESS DESCRIPTION |
|------------|-------------|-------------------------------------------------------------------------------------------------------|-----------------------------------|
| | | <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="checkbox"/> | Temporary storage before shipment |
| | | <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="checkbox"/> | Ship order |
| 242 | 16 | <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="checkbox"/> | |
| | | <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="checkbox"/> | |
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FLOOR PLAN OF TAMAC POTTERY

- LEGEND - K = KILN
 SB = SPRAY BOOTH
 WWR = WOMEN'S WASH
 MWR = MEN'S WASH R
 CT = CASTING TABL

SCALE: 1" = 10'

kept clean since loose clay from both operations will not be tracked from one end of the plant to the other. Communication will also be facilitated between the accountant's office and the packing area. Frequently, orders must be checked and verified, together with promised dates of shipment, etc. With the departments placed according to the new arrangement, much less time and effort will be consumed with these details even though they are more numerous.

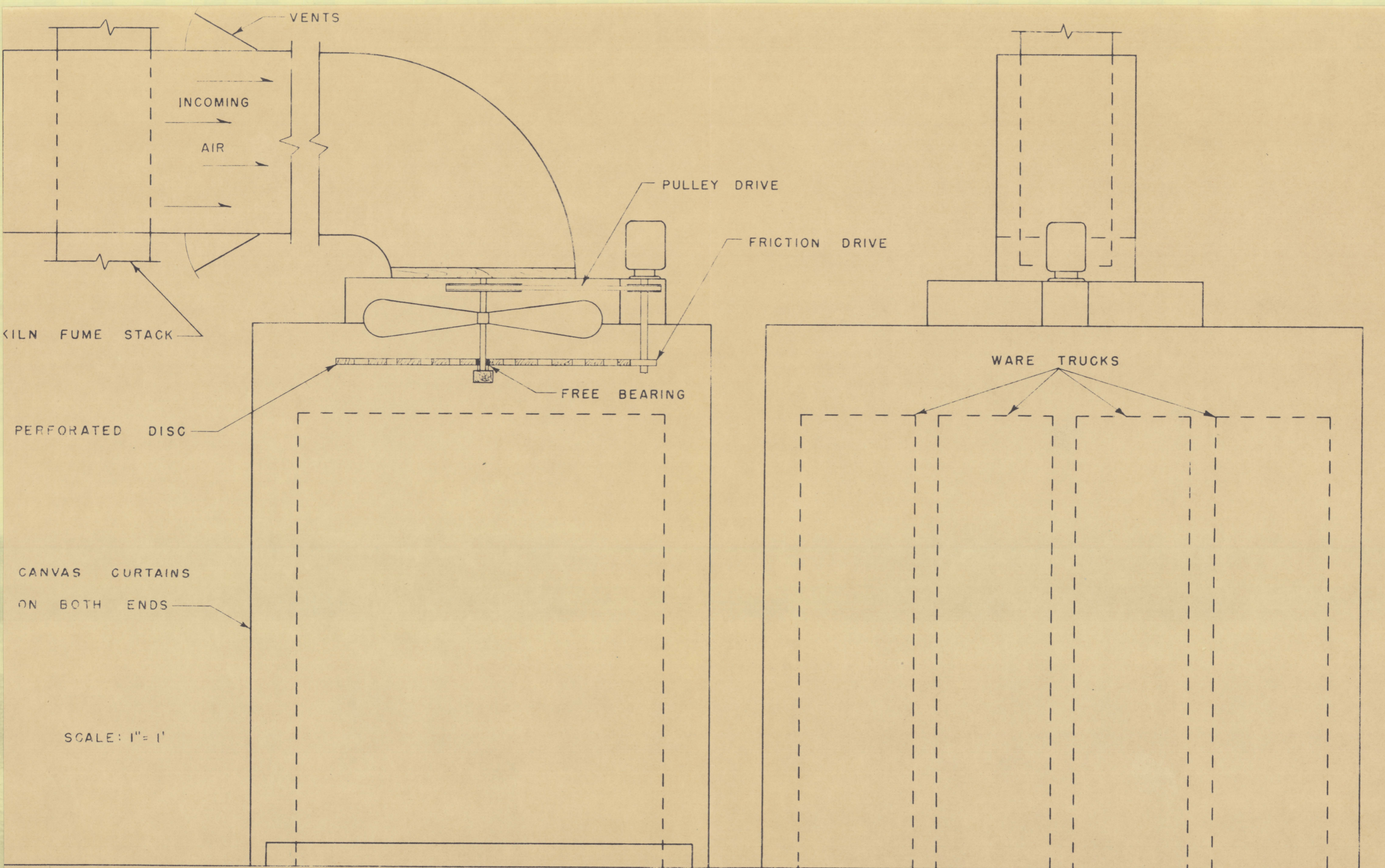
Drying Oven

A control-drying oven that is capable of holding four ware trucks will reduce the drying time necessary for freshly cast pottery. Since this drying procedure is almost entirely dependent upon weather conditions, a great deal of uncertainty exists as to the length of this period. The drying oven (see Figure 7) would utilize part of the heat that is lost by the fume stacks of the bisque firing kilns. By regulating the dampers of the intake system, air can be drawn in which is entirely heated by the stacks or not at all. In this manner, a large range of drying conditions can be achieved in the oven which will compensate for adverse weather conditions during the winter and spring months. It is estimated that the savings in drying time with the oven may be as high as 50%.

The oven is designed to hold four trucks under the premise that eventually the Trimming Department will draw out two trucks in the morning and two in the afternoon. These vacancies would be filled by the morning and afternoon casts of ware.

Rest Period

Rest periods are a necessity during continuous arm movements such as



PROPOSED CONTROL-DRYING OVEN

FIG. 7

found in the Trimming Department. Employees will rest during a considerable part of the day whether "official" rest periods are allowed by management or not.¹ It has also been shown in tests that definite rest periods sanctioned by management have a far greater recuperative effect than those which must be taken surreptitiously.²

Since a study of a normal output curve reveals that maximum output is usually reached in two or two and a half hours, the time to introduce a rest period has been suggested as 10:15 in the morning, and to last for 10 minutes. The afternoon rest period which is now in effect is looked upon with great favor by the employees. Aside from the fact that employees like the rest periods, here are some other reasons why they are important:

- (1) rest periods increase the amount of work done in a day.
- (2) rest periods decrease the variability in the rate of working and tend to encourage the operator to maintain a level of performance nearer his maximum output.
- (3) rest periods reduce physical fatigue.
- (4) they reduce the amount of personal time taken during the working hours.³

The close proximity of the Trimming Department to the other departments makes it necessary to give these same considerations to the entire plant.

Wooden Shelves

The present shelves used on the ware trucks are too thin to properly

¹ Ralph M. Barnes, Motion and Time Study, p. 186.

² Ibid, p. 187.

³ Ibid, p. 186.

support the weight of freshly cast ware. These deformed shelves may partly be the cause of misshaped ware since the weight of the piece is concentrated toward one side. For this reason it is suggested that thicker shelves replace the present ones. Should $3/8$ inch thick shelves warp slightly, they would be turned over to neutralize this effect.

Castors on Drainage Cart

When loaded, the slip drainage cart is exceedingly difficult to propel and to manage. Larger castors (two stationary, two swivel) would resolve this problem and decrease the time necessary to drain the molds. They should be at least 4 inches in diameter.

Castors on Ware Trucks

For the same reasons cited above, the present castors should be replaced on the ware trucks. Involved in this consideration is the fact that two persons are required to successfully manage a loaded truck at present. This is a needless consumption of skilled labor coupled with the ever present danger of having a truck load of ware destroyed by tipping over.

Hand Truck

It is often desired around the plant to transport heavy objects for short distances or bulky objects for long distances: a small two-wheeled hand truck turns out to be a real labor saving device. This is especially important since women employees greatly outnumber the men in the plant. It may be that a man is not always free to do heavy lifting chores for a woman. In this respect, even a wheelbarrow is hazardous since the object must still be lifted into the barrow. A two-wheeled truck obviates this

risk and effort since objects can be loaded by simply tilting it forward.

More Light

At the present time the packing area is critically in need of adequate lighting. The light source is a (bare) high wattage bulb which throws shadows and produces glare. This is particularly undesirable since inspection of the ware is done in this area. When the intensity of illumination is low, more time is required to perceive a defect. Together with this undesirable element is the fact that eye strain also has a definite effect upon the physical comfort, mental attitude, output, and fatigue of the worker.⁴

Proper illumination calls for the elimination of glare, proper intensity of light, and it must come from the proper direction. It is recommended that two fluorescent fixtures each containing two 40 watt tubes be placed in this area. They should be placed eight feet above the working surface.

Other areas of the plant, while adequately illuminated during hours of sunlight, tend to be poorly lighted during other hours of work. It is suggested that the present lighting system be used to a greater extent during non-sunlight hours of work.

Warm Water

All equipment in the decorating department is cleaned daily using water supplied to the wash tub for this purpose. This source is also used by members of the Trimming Department for water needed in sponging the

⁴ Ibid, p. 187.

ware. The water is not heated and the coldness is a great inconvenience to the women employees. This is especially true during the winter months. The suggestion to install a water heater for the purpose of heating this water has been made in the interest of the employees. Rectifying this condition will tend to increase the happiness of the employees by making the working conditions more pleasant.

Advertising Signs

Since the retail store is open all day Sunday, this fact should be advertised to maximize the efforts involved. The easiest way to do this is to use the existing signs on highways 64 and 77. These signs should be repainted and at the same time a phrase can be added to advertise a rather unusual thing - the store is open on Sunday. The signs are effective in drawing customers in the form of tourists and should be used to their fullest extent as long as the store remains in operation.

Storage Closet

The supplies that are now being kept in the storage closet can be kept in the men's wash room. This alludes to the suggestion to remove this small room and use the space for temporary storage of orders awaiting shipment. If truck load shipments are to be collected, more space must be allotted for temporary storage. Since space is at a premium, the area which the wash room occupies can be used more effectively if it also houses the supplies (office and lavatory supplies, soap powder, packing labels, etc.) kept in the present storage closet.

Clean-up

It has been noticed that empty boxes, barrels, and assorted containers seem to be taking up valuable space. They also block the natural passageways which must be used to route the ware trucks. This condition is deemed a fire hazard as well as a hinderance to traffic.

Scattered about the plant there also seems to be a preponderance of ware which is not being processed. These items are in various stages of manufacture and present a problem for any kind of inventory control. It is therefore suggested that a general clean-up policy be encouraged. Such a policy, besides making the quantity of items being processed visibly easier to ascertain, will also give a more favorable impression to visitors going through the plant.

CHAPTER IV
CASTING DEPARTMENT

1. It is recommended that the present slip screener be replaced with a power screener similiar to the Combs Gyrotory Riddle, manufactured by the Great Western Manufacturing Company.
2. It is suggested that the loading of ware trucks be accomplished by rolling the truck along the casting tables and loading the pieces directly onto the truck.
3. It is recommended that ware of a similiar form (flat-ware or hollow-ware) be loaded on the same trucks to facilitate trimming and decorating, and to reduce the added moving of ware which require different drying times.
4. It is suggested that the tub receiving the slip after the screening process be tilted so that one corner is the lowest and that the drain of this tub be replaced in this low corner.



Filling the molds with slip.



Pouring excess slip from molds.

FIG. 8

CASTING DEPARTMENT

Power Screener

Noise is an undesirable element in almost all working situations and is known to be detrimental to an employee's efficiency. Most people are quite emphatic about their dislike of it and are fatigued by it. Performance does not change appreciably in a noisy environment but it has been found that employees require more energy to do the same amount of work.¹ Therefore, it seems advisable to eliminate as much noise in the work plant as can be reasonably done.

This is the basis for the recommended change from the present slip screener to one similiar to the Combs Gytratory Riddle. This change also has the additional advantage that it will shorten the time for this operation. It has been estimated that the new type screener will perform the work in about half the present time.

Loading of Ware Trucks

The loading of the ware trucks in the casting department has been observed to be a time consuming operation that requires a considerable number of trips by the employee. The time required for loading can be reduced as well as the number of steps taken if the truck is pushed along the casting tables and the pieces loaded on the shelves directly. At present the shelves are brought to the casting tables, the pieces loaded on the shelves, which in turn are carried back to the truck.

¹ A. Chapanis, W. R. Garner, C. T. Morgan, Applied Experimental Psychology, p. 417.

Load on Separate Trucks

Since a majority of similiar pieces are unloaded from the molds at one time, this new procedure also has the advantage that similiar pieces will be loaded on the same truck. This is also a desirable condition since all similiar pieces will require the same drying time and will not necessitate any additional moving of individual pieces. Different size ware have different drying times and require additional handling as they are processed by the Trimming Department.

Tub Drain

It has been noticed that extra time and energy is consumed in cleaning the tub which receives the slip after the screening process. This is caused by not having a proper drainage system. The present system is not satisfactory since the bottom is flat. Either sloping bottoms can be added to the tub or the drain can be relocated in a low corner. The latter suggestion is believed to be the least costly and easiest to accomplish.

CHAPTER V

TRIMMING DEPARTMENT

1. It is recommended that the present work tables and chairs be replaced or altered to reduce fatigue.
2. It is suggested that full carts of either hollow-ware or flat-ware be moved between the work tables as illustrated in Figure 11 and that the employees specialize in trimming one type of ware.
3. It is suggested that the present sanding table be altered to the design shown in Figure 12.
4. It is suggested that the Trimming Department be supplied with a group incentive plan.
5. It is suggested that Trimming Department employees arrange finished pottery into kiln loads. These loads can be moved directly into the kilns.



General view of Trimming Department.



Smoothing ware with sponge and water.

FIG. 9

TRIMMING DEPARTMENT

Tables and Chairs

Studies as long ago as 1926 have been made concerning the workers posture and the most desirable seating arrangement. It is generally agreed that a worker should be permitted to vary his position by either sitting or standing as he prefers. This is in effect now although one very important aspect is missing. This aspect is that the position of the worker, relative to the work, should be substantially the same whether seated or standing.¹ To correct this situation it has been suggested that the present tables and chairs be replaced or altered to the design suggested in Figure 10. The important thing is that the hand should be allowed to work from 1 to 3 inches below the elbow.² Since 40 inches is taken as the average elbow height (it was found to be exactly 40 inches in the Trimming Department), the average height of the working surface should be from 37 to 39 inches. In connection with the table, it has been found that a distance of not more than eight inches between the elbow height and the underside of the table can be permitted if a restful position is to be maintained.³ A greater distance than this interferes with the natural position of the knee. Therefore, the table should be relatively thin (3 to 4 inches).

Another important consideration is the chair provided. It should be

¹ Ralph M. Barnes, Motion and Time Study, p. 271.

² Ibid, p. 272.

³ Ibid, p. 273.

of the type and height to permit good posture and to keep the position of the worker constant in relation to the work, whether seated or standing.

The following are some of the features a good chair should possess:

1. The chair should be adjustable in height so that it may be readily fitted to the particular individual who is to use it. The chair should be adjusted to a height that permits the worker to sit comfortably with both feet resting on the floor or the foot rest.
2. The chair should be rigidly built, preferably of steel frame with wood seat and back. It is important that a wood seat and back be provided since wood is more comfortable than metal. The edges of the seat and back should be rounded so that no sharp edges can cause discomfort and impede the circulation.
3. The chair seat should be form fitting. A saddle seat permits the weight of the body to be evenly distributed and so promotes comfort. The front edges of the seat should be well rounded. For normal work the front edge of the chair should be about 1 inch higher than the back edge. The seat should be of sufficient width to accommodate the body - 16 to 17 inches is none too wide. However, the seat should not be over 13 or 14 inches in depth. A deep seat tends to cut off circulation of the blood through the underside of the thighs near the knee.
4. A back rest should be provided to support the lower part of the spine. The body should sit well back on the seat so that the back rest can support the small of the back. The lower edge of the back rest should be 6 to 7 inches above the seat depending upon the individual. The back rest may be 3 to 4 inches wide and 10 to 12 inches broad. The back rest may be small and yet give satisfactory support. When the worker bends forward while working, the back rest is of no use; however, the worker can use it while resting and it serves a very valuable purpose in being there for momentary relaxation.⁴

A foot rest is also an important consideration whenever high chairs are used. It should be attached to the floor or the bench. Though less desirable, it may also be attached to the chair. The foot rest should be

⁴ Ibid, pp. 277-279.

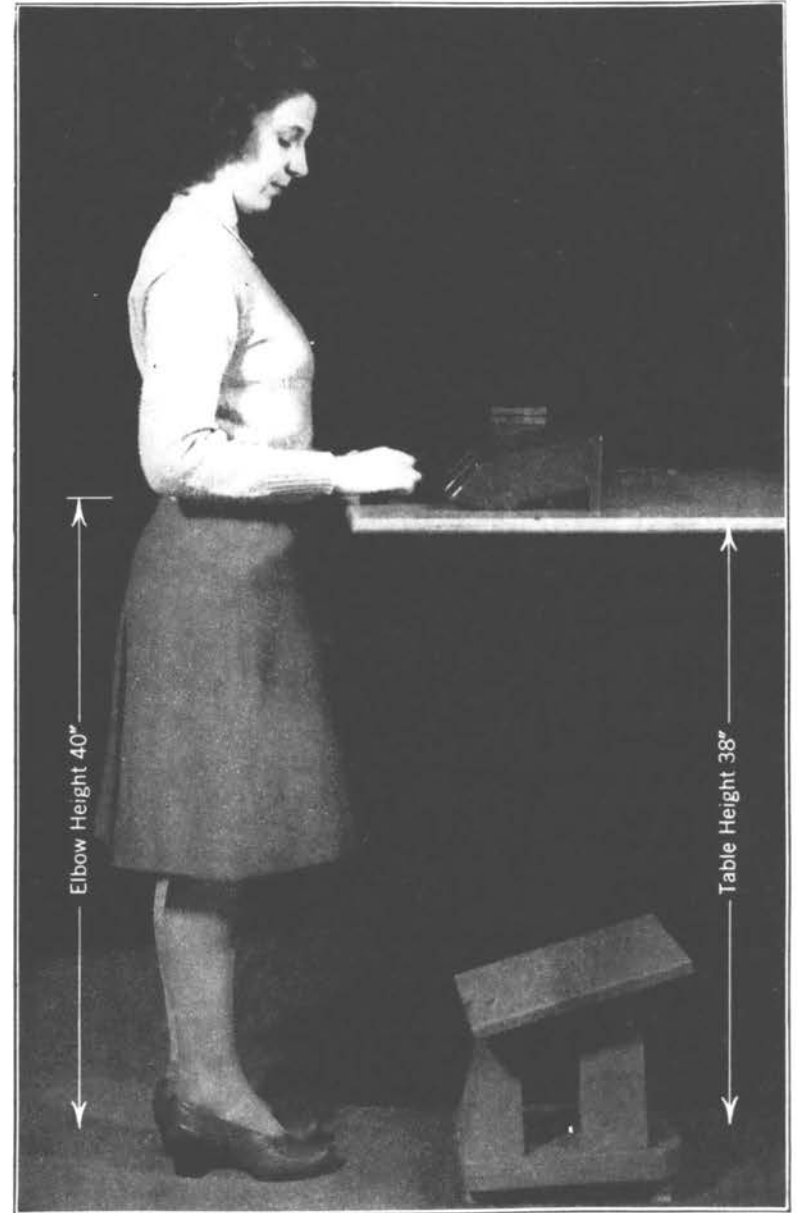
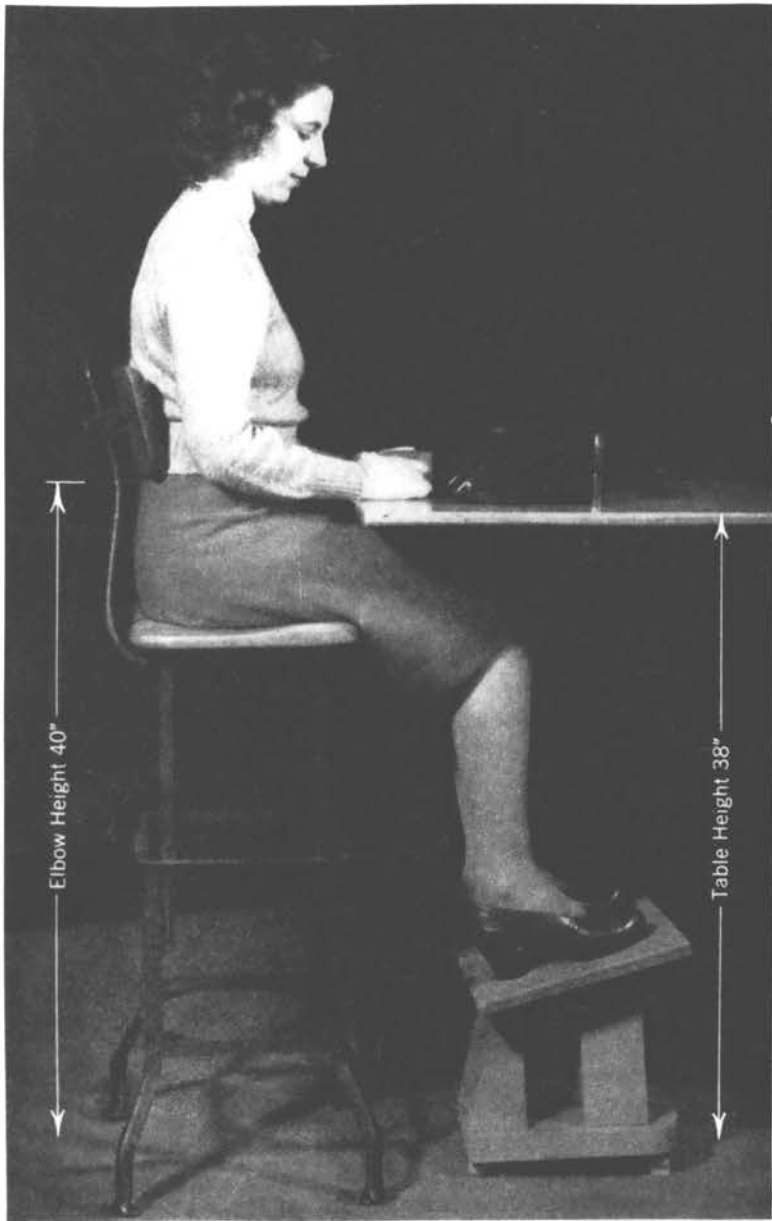


FIG. 10 With this arrangement between chair and table height, it is possible to maintain the same position relative to the work place whether sitting or standing. [Reproduced by permission from Barnes, Ralph M., Motion and Time Study, page 274-275, New York; John Wiley and Sons Inc., 1948]

of ample width and depth to permit the entire bottom of both feet to rest on it and to allow for some movement. This usually requires a depth of 12 inches or more. The absence of a foot rest forces the worker to hook the heel of his shoe over the rung of the chair, or else let the feet dangle in the air, both of which positions are uncomfortable.⁵

Specialize in Trimming

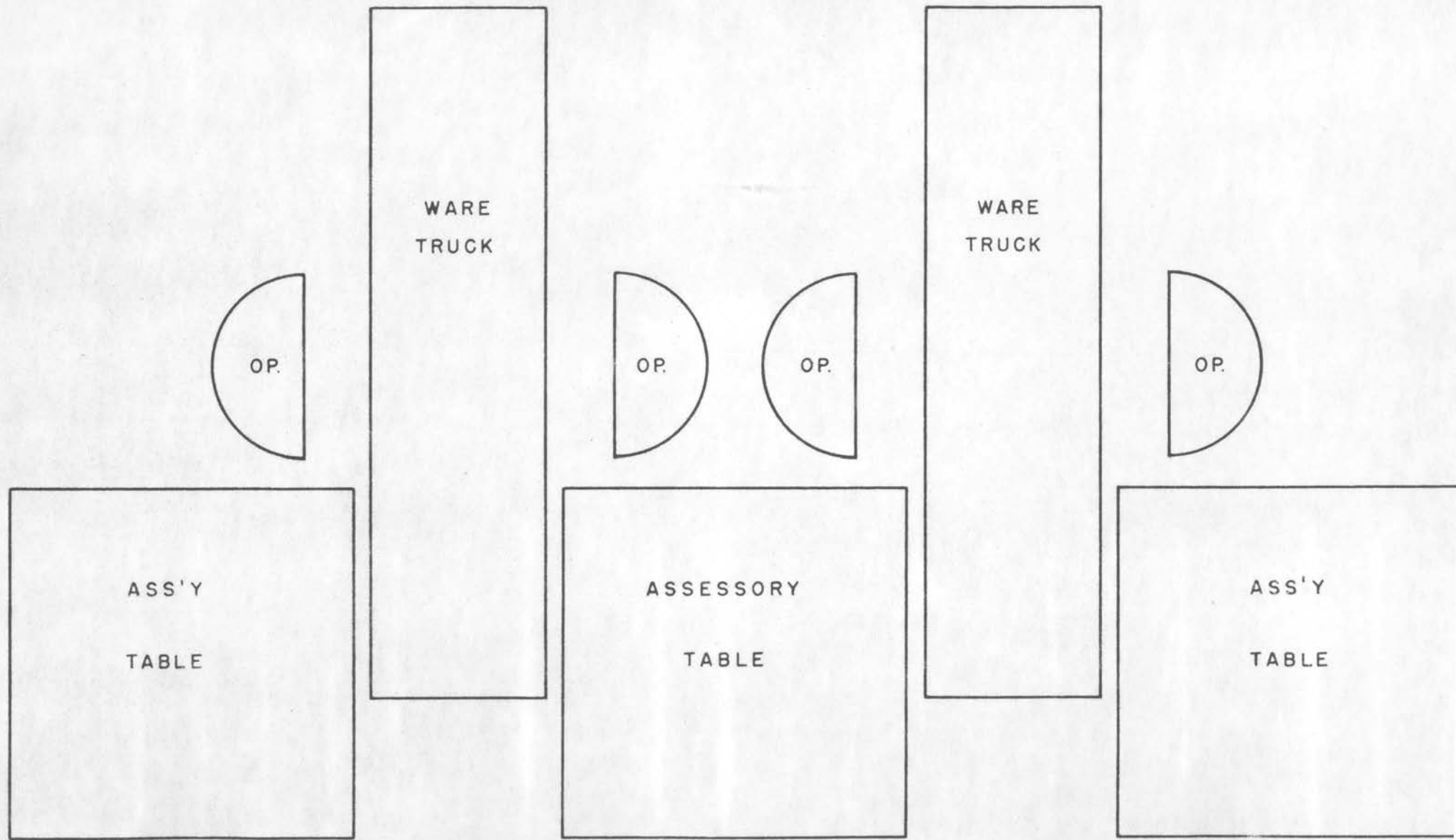
Specialization has many known advantages and it would seem proper to introduce some form of this into the trimming of the pottery. The specialization recognized here is the way in which the work is done and is reinforced by the fact that two of the bases of specialization -- superior natural personal adaption to the task (namely, skill) and the effect of repetitive experience, are an important part of this work.⁶ Therefore, a recommendation has been made to position trucks containing ware of the same type (flat-ware or hollow-ware) between two workers so that each can operate on one side of the same truck.

If the trucks contain the same type of ware the workers will become more skilled in handling one particular type. This added skill will result in the following benefits:

1. Fewer pieces broken.
2. Less time spent in handling each piece.
3. A resultant increase in production.
4. A better method from which to obtain data for a possible incentive plan.

⁵ Ibid, p. 276.

⁶ Chester I. Barnard, The Functions of the Executive, p. 127.



ARRANGEMENT OF WARE TRUCKS FOR TRIMMING

Monotony of this repetitive type of work will be relieved somewhat by the handling of different sizes of pottery. An added method of relieving monotony may be to switch the workers around every week or two weeks between the two types of pottery handled. The same benefits will still remain in effect, however.

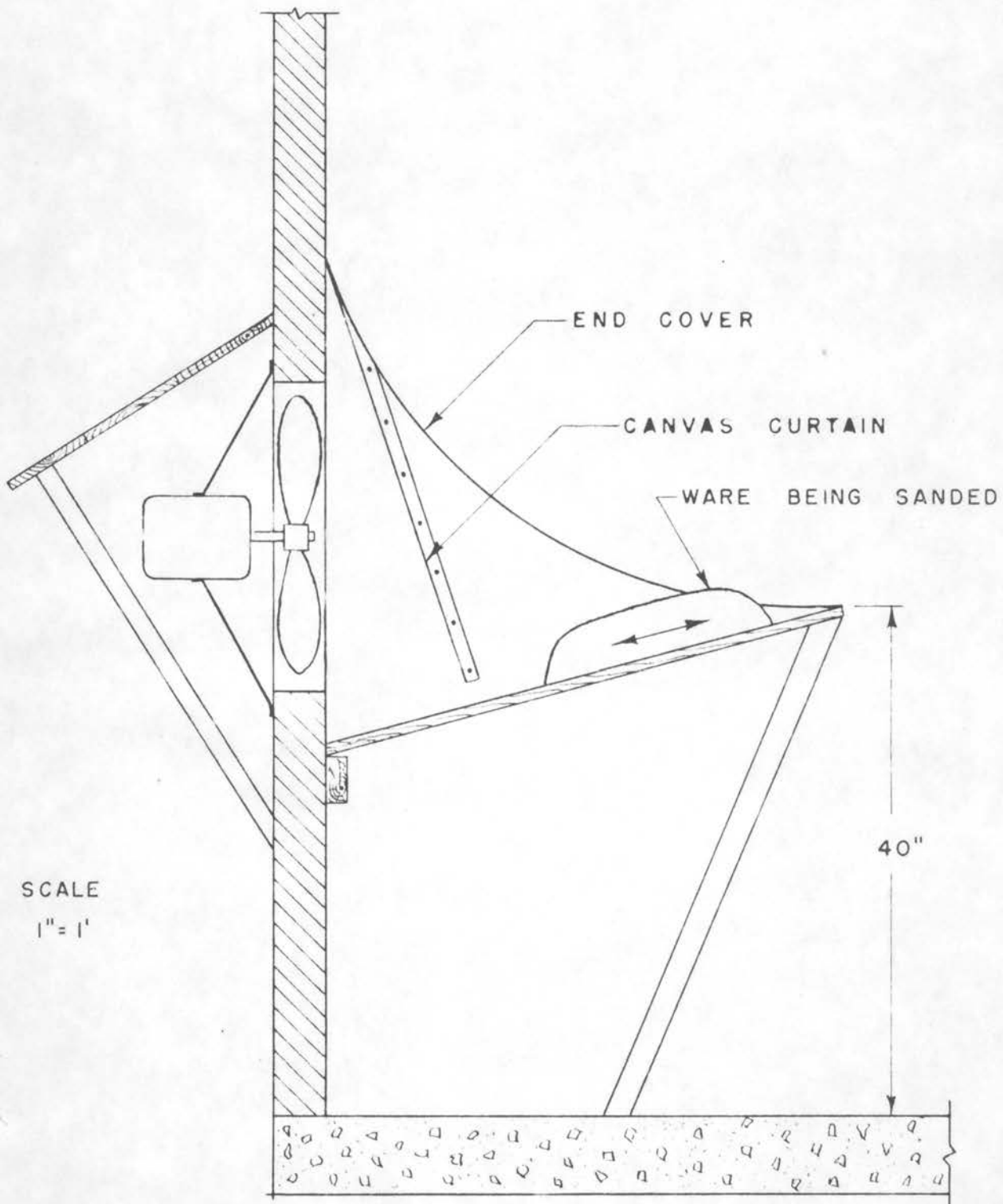
Sanding Table

The present sanding table requires an excessive amount of energy to sand ware of any type or size. The sanding board is located at an angle of 60 degrees from the horizon and is above waist height. This region is outside the normal working area and the operator's arms become exceedingly tired from sanding in this position. The operation then becomes a wearisome task and is displeasing to all those who must do it.

A new arrangement of the sanding table is suggested which will make sanding any size ware a more pleasurable task. The new table is located waist high at an angle of 15 degrees, with the back edge being lower than the front. A canvas curtain which covers the air-removing fan extends to about two inches above the board. Since the sides of the board are also covered, all air removed by the fan must pass over the surface of the board. This air action will keep the board relatively clean and will remove excessive accumulations of powdered clay.

Group Incentive Plan

It is believed that the Trimming Department is capable of higher output than is currently being produced. Since the process is almost entirely a hand operation and the shape of the ware is unusual, a group incentive plan is recommended as a means of increasing production. A good incentive



PROPOSED ARRANGEMENT OF
SANDING TABLE

plan encourages, stimulates and spurs to action.¹ Most of the holding back that is acknowledged to occur in industry and business is because employees lack sufficient incentives. Knowing that he is definitely to share in the savings and profits it is possible to earn, it is but a question of time and effort until most of the workers are able to control and regulate their activities and influence the actions of others to bring about results which it had not been anticipated would be possible.²

Any group incentive plan should account for the quality of the product.³ This is very true in producing dinnerware, since a high quality product has a greater sales appeal. Therefore, it is imperative that the spoilage, quality, and material usage factors be considered fully when making the analysis leading up to the development of the bonus standards and controls.⁴

Before any plan can be administered, a thorough study must be made to standardize the operation on each different size of ware and reduce all elements of fatigue. The standard time for each piece of ware can then be determined. By comparing the standard time of all the work turned out each day and each pay period with the actual time taken by the workers in the group to turn out the work, a report is obtained of the work turned out and the time taken to accomplish it. Using such a plan, a record should be kept of the output of the group rather than of individuals.⁵

¹ Hugo Diemer, Wage-Payment Plans That Reduced Production Costs, p. 13.

² Ibid, p. 14.

³ J. K. Loudon, Wage Incentives, p. 59

⁴ Ibid, p. 131.

⁵ Diemer, op. cit., p. 40.

Properly designed reports to reflect earnings for each day and pay period, and the results obtained, should be provided for. Procedure should be instituted for posting results promptly. For example:

1. Daily bonus reports (before noon the following day).
2. Pay period bonus report (second day following the last day of the period).⁶

Any group incentive plan should be sanctioned by the group before it is installed. Group meetings should be used to explain fully the fundamentals of the plan to all the workers affected by it. When these meetings are held it will be necessary to explain how the standard was developed and how the bonus is computed so that each worker will understand how to compute his own bonus earning. It is advisable to review fully with the worker any and all data used in establishing standards.⁷ The point should also be stressed that under no circumstances can an individual earn less than he does under the present system.

A plan which follows the foregoing suggestions should materially boost the rate of production. This type of incentive plan is especially adaptable to small groups where a good spirit of cooperation is already in effect. Since the Trimming Department falls into this category, there should be no difficulty to utilizing such a plan to the utmost.

Making Kiln Loads

After completion of the trimming operation, two or more workers should contribute to building up a kiln load. This load should be made up using

⁶ Louden, op. cit., p. 62.

⁷ Ibid, p. 60.

kiln shelves and stilts, and placed in a loading stand (for description of equipment, see Chapter VII). The loading stand can then be moved into the kiln area and as the fired loads are removed, these fresh loads may be inserted in the kiln as a unit. This method will reduce the loading time of the bisque ware approximately 50% and will help to arrange larger loads since it is made up outside the kiln. The labor cost saved with this method is approximately:

$$\$.75/\text{hr.} \times .50 \text{ hrs.} \times 255 \text{ days} = \$95.50 \text{ per year.}$$

CHAPTER VI

DECORATING DEPARTMENT

1. It is suggested that the glaze mixing table, rolling mill, and washing tub be rearranged to the positions in Figure 14 so that fewer steps will be needed to prepare glaze and to clean equipment.
2. It is suggested that another glaze agitator pressure tank be supplied, similiar to a Binks Agitator Pressure Tank D-5428, so that no time need be wasted in changing the color of glaze.
3. It is suggested that the dipping table be arranged as illustrated in Figure 15 so that various color glazes will be readily available for use.
4. It is suggested that a board for footing ware be installed as illustrated in Figure 18 and 19. Experiments should be performed on both of these suggestions to determine which arrangement performs the operation most satisfactorily.
5. It is suggested that a ware truck containing pottery to be footed or dipped be placed in the position illustrated in Figure 14 when these operations are to be performed so that one trip will bring all the ware to this area of operation.
6. It is suggested that wooden platforms be provided in front of each spray booth for employees to stand on. These should be at least 24 inches wide and 24 inches long.

- 7. It is recommended that Decorating Department employees arrange finished pottery into kiln loads. These loads can be moved directly into the kilns.



Applying glaze to large bowls.



Applying trimming coat of glaze.

FIG. 13

DECORATING DEPARTMENT

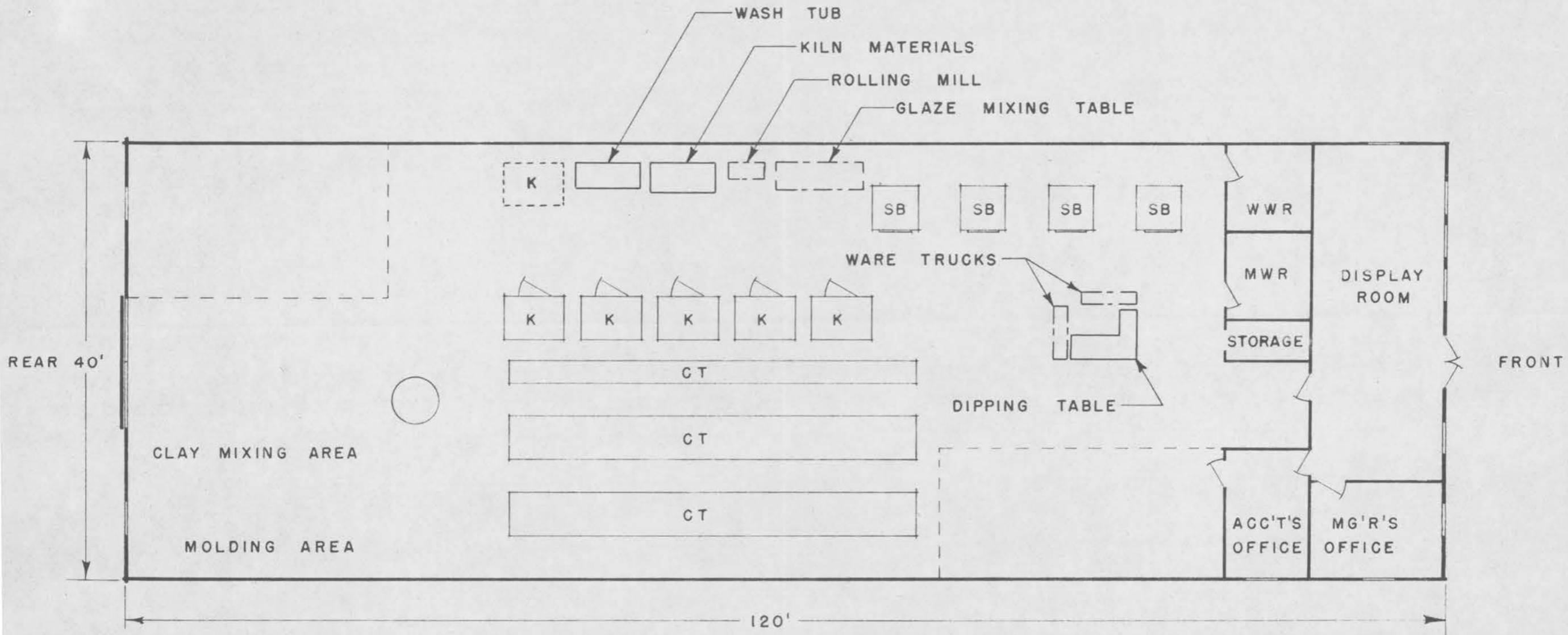
Rearrange Equipment

The general activity of the Decorating Department has been observed to be scattered over a relatively large area. A great many additional steps are required each day in the process of decorating, mixing and screening glaze, and washing the spray equipment. This has been the basis for the recommendation for rearranging the glaze mixing table, rolling mill, and washing tub. Having these items closer to the general work area will reduce the distance traveled each day and result in more efficient work.

Add Pressure Tank

It has been observed that of the three spray booths that use agitator pressure tanks, only two tanks are supplied. Since each booth is used for the application of one color of glaze, each time the center booth is used an agitator pressure tank must be moved from one of the other booths. This means that the tank must be cleaned again at the end of its use before it is replaced. This procedure is time consuming and therefore costly. The justification of an additional tank is explained on page 46. It will be noted that even if an employee with a lower rate of pay is used to change agitator tanks, there is still a savings to be realized with an additional tank. The annual depreciation cost has been calculated using a straight line depreciation formula, which itself is conservative. The annual savings is therefore dependent upon the depreciation method used and the various assumptions prevailing. It is necessarily then an estimate but serves to show the advantage of the

----- NEW EQUIPMENT
 - - - - - NEW LOCATION OF EXISTING EQUIPMENT



FLOOR PLAN OF TAMAC POTTERY

LEGEND - K = KILN
 SB = SPRAY BOOTH
 WWR = WOMEN'S WASH ROOM
 MWR = MEN'S WASH ROOM
 CT = CASTING TABLE

SCALE : 1" = 10'

FIG.14

additional piece of equipment.

Estimated savings with one additional glaze agitator similiar to a Binks Model D-5428:

$$P = \$180 \text{ (with s.s. liner and including freight charges)}$$

$$L = 5\%P = (.05) \$180 = \$9.00$$

$$n = 15 \text{ yrs. } i = 6\% \text{ } M = \$2.00$$

$$\text{Annual Cost} = \frac{P-L}{n} + \left[(P-L) \frac{n+1}{n} \right] \frac{i}{2} + Li + M^1$$

Where P = first cost

L = salvage value

n = number of years estimated life

i = interest rate

M = average annual maintenance cost

$$\begin{aligned} \text{Annual Cost} &= \frac{\$171}{15} + \left[\$171 \times \frac{16}{15} \right] \frac{.06}{2} + \$.54 + \$2.00 \\ &= \$11.40 + \$5.37 + \$.54 + \$2.00 = \$19.31 \end{aligned}$$

Savings in cost of operation per year:

Total cost consumed in changing paint in present agitator =

20 min./change x 3 times/wk. x 51 wks. x \$1.00/hr. = \$51.00

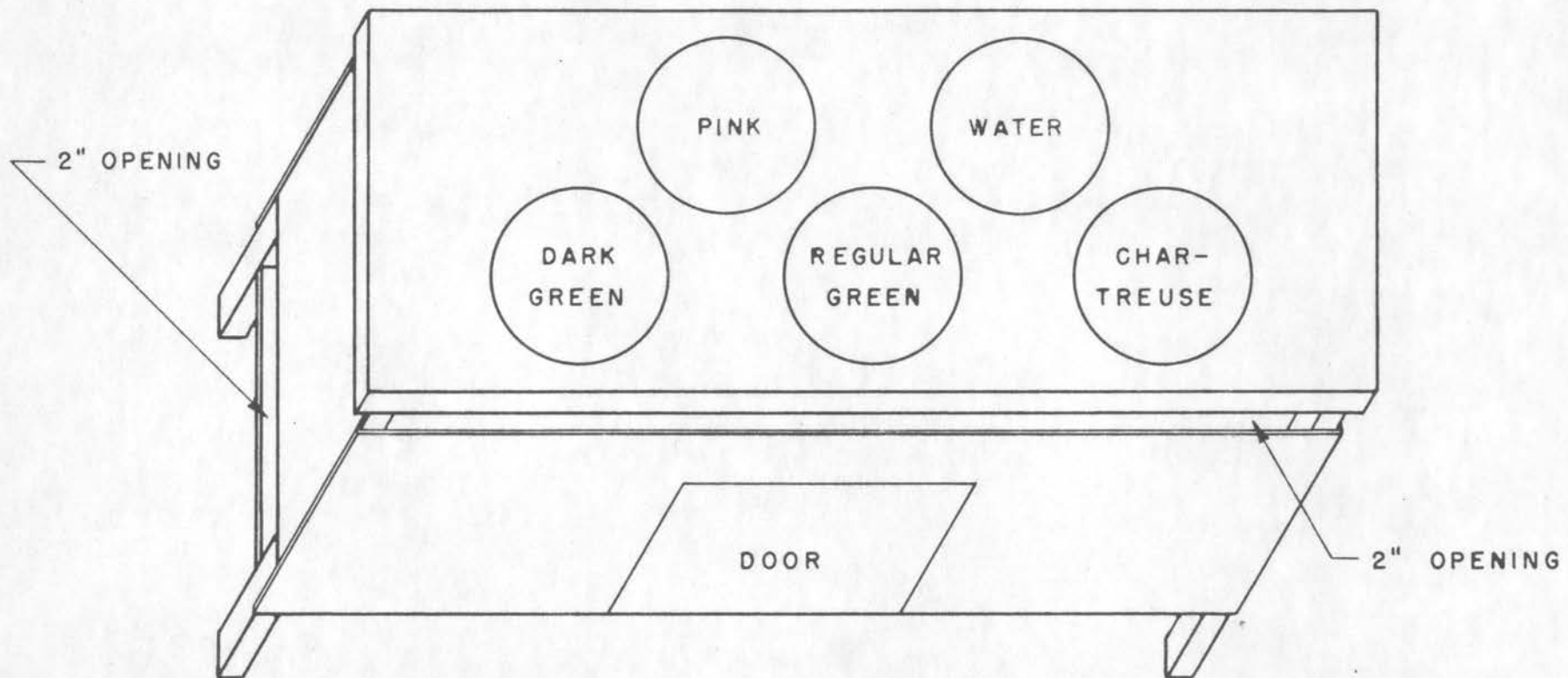
Total savings per year with additional agitator =

\$51.00 - 19.31 = \$31.69

Dipping Table

For much the same reason, the dipping table was found to be short of equipment. In this case it has been recommended that the working

¹ H. G. Thuesen, Engineering Economy, p. 93.



PROPOSED ARRANGEMENT OF DIPPING TABLE

surface be rearranged to accommodate five bowls of the present variety.

These bowls should each contain one of the following:

1. frosty pine green
2. regular dark green
3. chartreuse
4. pink
5. water

Much time is lost at present when a new glaze is needed. The present bowl used for glaze must be emptied and cleaned before a new glaze can be used in it. By having a bowl for each glaze and one for water, considerable time and confusion can be saved when dipping various kinds of pottery.

Along with this new arrangement of the work area, an additional feature can be employed. It was found that during the winter months the glaze was difficult to keep at the same viscosity. This is due to a change in temperature and has a considerable range throughout a working day. To remedy this situation a worker must add epsom salt or water to change the viscosity of the glaze. The viscosity is important to get the correct application of glaze to the pottery.

With this condition in mind, it is recommended that the lower part of the dipping table be enclosed and a small gas burner be placed inside. By lighting the burner early in the morning of a cold day, the bowls will be warmed. By regulating the burner slightly throughout the day, the glaze can be kept at a more uniform viscosity. This will insure a more even distribution of the glaze. Also, using a sponge dipped in warm water will be a much more cheerful experience than a sponge dipped in cold water.

Footing Board

The footing operation is necessary to prevent the melted glaze from sticking to the kiln shelves. Removing the glaze before it is fired has been rather time consuming since it was done with a small sponge. The sponge was moistened with water and with the ware held in the left hand, it was used to rub the glaze from the foot (the glaze is water soluble).

The method suggested employs a new piece of equipment called a footing board. This can be of either form shown in Figures 18 and 19, depending upon which one operates the best. Figure 14 shows a wooden board which has a few layers of soft cloth. These are held down by end clamps which permit the top layer to be removed and cleaned. The process calls for the ware to be pushed and pulled across the cloth layers. By first wetting these layers of cloth with water and then pressing down on the ware as the foot is drawn across the cloth, the ware will sink into the layers of cloth enough to have the glaze taken off the foot completely.

Figure 19 shows a shallow dish with a rubber mat laid on the bottom. The mat is made of sponge rubber, of the type manufactured by "Rubbermaid". It is $5/8$ inches thick, 6 inches wide and 12 inches long. By having a $1/4$ inch layer of water in the bottom of the dish the entire mat will remain moist. The same action should be used with this arrangement as described before. Since the mat is relatively soft and will be constantly moist, ware drawn across the mat will have the glaze removed from the foot. This latter arrangement has the advantage of a constantly moist surface. Both arrangements will require periodic cleaning.

The activity data sheet of both the present and the proposed method (Figure 16 and 17) was made from a film taken of the old and new method.

ACTIVITY DATA SHEET

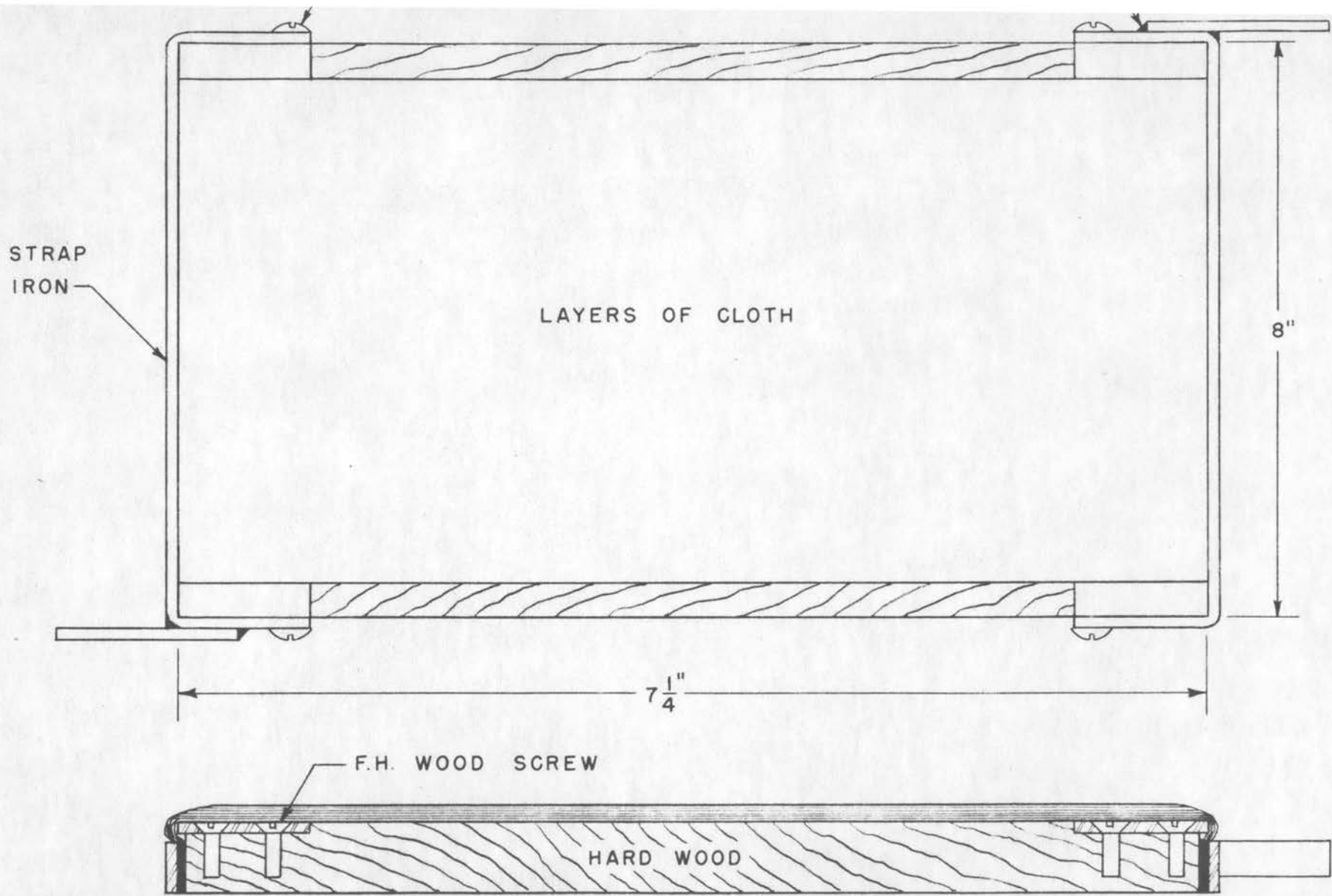
Operation Footing Sheet No. 1 of 1 Sheets

Film No. Tamac

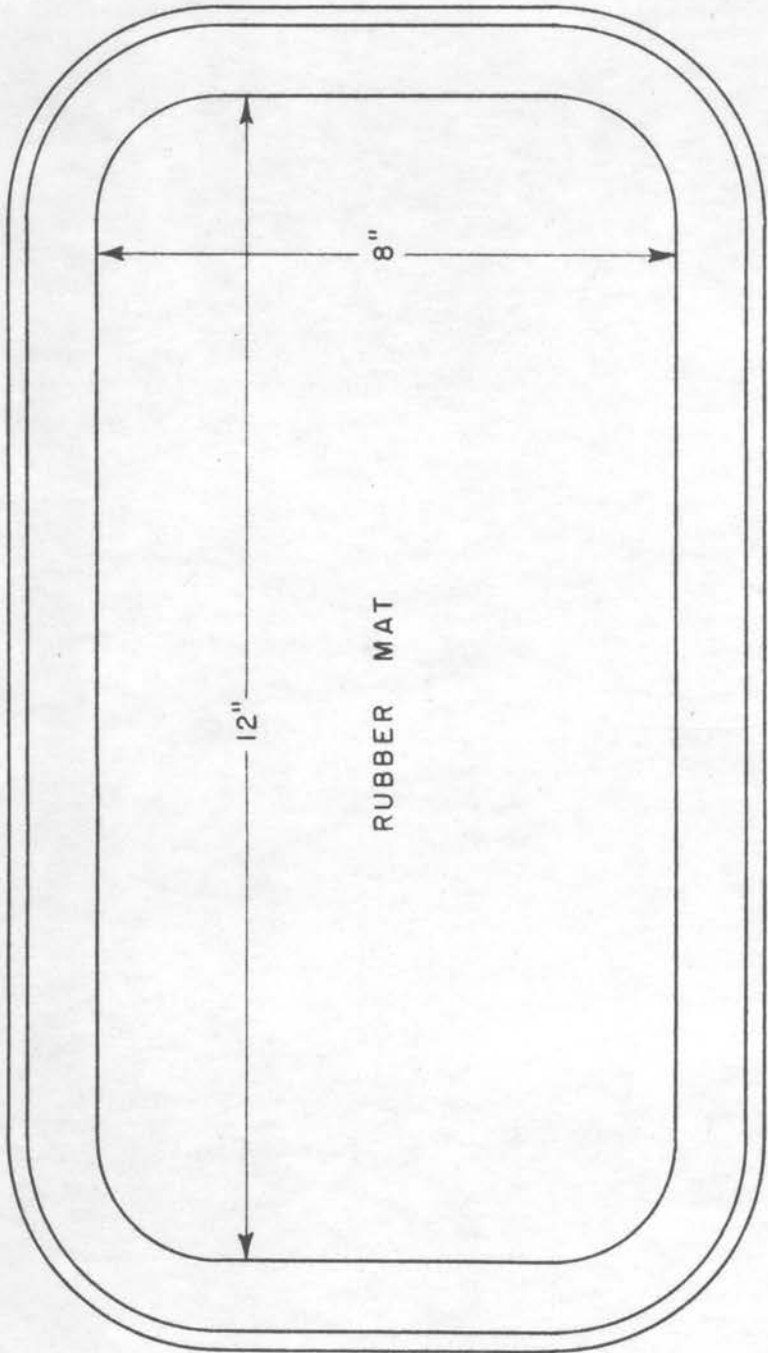
Part Large ash tray Part No. _____

Operator Mary Carson Observer A.M. Pope Date: _____

| Time Reading | Subtracted Time | Description of Activity |
|--------------|-----------------|-------------------------------|
| .000 | | |
| .080 | .080 | Foot piece on footing board |
| .118 | .038 | Foot piece with sponge |
| .141 | .023 | Foot piece with footing board |
| .262 | .121 | Foot piece with sponge |
| .302 | .040 | Stamp piece |
| .342 | .040 | Lay piece on shelf |
| .364 | .022 | Put stamp away |
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PROPOSED ARRANGEMENT OF FOOTING BOARD (NO.1)



PROPOSED ARRANGEMENT OF FOOTING BOARD (NO.2)

In each of these operations, only one piece was footed at a time. It is proposed that when the operator becomes familiar enough with the new method and can foot the ware without having to retouch it with a sponge, that both the left and right hand be used to foot two pieces at the same time.

These pieces should then be placed on a cloth mat in front of the operator, inverted, so that they may be stamped on the underside.

The time for just the footing operation, using the new method, has been reduced from .602 min./piece to .364 min./piece, a saving of 25.3%. This same advantage of time can be applied proportionately to other pieces of ware which are footed.

Ware Truck Position

It has been observed that much of the time devoted to footing and dipping is concerned with walking to a ware truck to get or replace pottery. These pieces are usually handled in lots of from six to nine pieces, and many trips are required in a normal day's work. This unnecessary expenditure of energy can be saved by moving a truck, which contains pottery to be footed or dipped, to a position close to where the work will be performed. For footing, the truck should be to the left of the operator and for dipping, it should be to the right of the operator (see Figure 14). The operator can then take the ware directly from the truck, place it on an empty shelf as the operation is completed, and replace the entire shelf back on the truck. This procedure will reduce the time and energy needed to perform these tasks.

Wooden Platforms

A cement floor can often be the cause of tired feet after standing all day. This type of floor can also be very cold during the winter months. The operators at the spray booths were noticed to be standing on sheets of paper in order to remedy these effects. It is therefore suggested that wooden platforms be provided for those booths that do not now have them. For a person to stand comfortably on them, they should be at least two feet square.

Making Kiln Loads

Each operator, after completing the decorating of the pottery, should make up a kiln load in a loading stand. This basic procedure has been explained in Chapter 5. The glaze load requires more elaborate care in setting up since the pieces should not touch each other. Pieces which are not footed must be placed on setting buttons, saddles, or tripods so they will not stick to the shelves when the glaze melts. Since the procedure is a tedious one, it can be performed faster and with more accuracy outside the kiln.

In order that each kiln will require approximately the same amount of heat and attention during the firing period, the loads should be fairly balanced. That is, if a load contained a great many small pieces it would actually have a larger volume of pottery and kiln furniture than a load containing fewer pieces of a larger size. This load would require more heat to fire properly and would shut down later than the other kilns. It is desirable to have each kiln operate about the same so that no one kiln will require special attention.

Since each of the two spray booth operators handle basicly different sizes (one handles large pieces while the other handles small ones), they should each contribute to a single load. After partially setting up a load, these loads should be exchanged. The footing and dipping operator, after finishing a quantity of ware, should contribute to the load which needs to be balanced the most. She should also be responsible for supplying the other operators with the kiln furniture used to make a kiln load.

CHAPTER VII

FIRING AND PACKING DEPARTMENT

1. It is recommended that two glaze loads be fired in each kiln per day. Both the trimming and the decorating departments should arrange loads which can be moved directly into the kilns.
2. It is recommended that starter sets and quantity orders of the same item be packed in boxes provided with compartmental spaces. These boxes and spacers should be specially designed for the product.
3. It is suggested that the packing area be arranged as illustrated in Figure 21.
4. It is suggested that the additional kiln (which is ordered) be placed as illustrated in Figure 14.
5. It is suggested that a paper rack be provided on the left end of the main packing table as illustrated in Figure 22.
6. It is suggested that the two persons pack orders simultaneously, one wrapping the pottery and the other pack the pottery into the shipping cartons.
7. It is suggested that sealing the shipping cartons, placing labels on the cartons, and weighing each carton be done at successive times on each carton.
8. It is suggested that a small parcel post scale be provided for the packing area.
9. It is suggested that a pottery firing rack arrangement be used (as illustrated in Figure 23) to increase the quality of glaze fired ware.

10. It is recommended that the tables in the present packing area be elevated so that the working surface is from 37 to 39 inches above the standing surface.
11. It is recommended that the storage box containing cut paper be elevated so that the top edge is from 37 to 39 inches above the standing surface.
12. It is recommended that a small table be provided on which a carton may be packed. This table should be 32 inches high.



This is a glaze kiln partly filled.



Wrapping the ware before packing.

FIG. 20

FIRING AND PACKING DEPARTMENT

Two Firings Each Day

With an increase in the size of orders due to sales by truck load quantity, merchandise should not be produced in such small quantities that they must be stored until a truck load is accumulated. Finished goods in storage represent an idle investment. It is therefore a much sounder economic policy to employ a flexible manufacturing schedule whereby truck load quantities may be produced in as short a time as possible before it is shipped. It is this consideration which lead to the recommendation that two glaze firings be done each day. Such a method will directly increase production by 100%. And by keeping two loads ahead of the kilns, one shift of production workers will be sufficient.

In order to employ this new method, the following equipment will be needed:

| | |
|----------------------------------------------------------------------------------|----------------|
| 1 Fork-lift kiln loader (FL-20) | \$ 390.00 |
| 15 Loading Racks (LS-20) | 575.00 |
| 30 1" x 11" x 28" Sillimanite type, base setter slabs @ \$6.20 each | 186.00 |
| 210 5/8" x 11" x 28" type AA setter slabs @ \$6.50 each | <u>1365.00</u> |
| Total | \$2516.00 |

(All this equipment can be furnished by A. D. Alpine, Inc., 11837 Teale Street, Culver City, California).

Each load, both bisque and glaze, should be made in the confines of a loading rack. This rack has four vertical angle-iron posts which position each pair of shelves directly above the base setting slabs. Stilts are used to separate the shelves, with the ware positioned on

each pair of setter slabs.

After a load has been arranged, the rack may be rolled on it's castors to the kiln area. At the time of changing kiln loads, the kiln door is opened and the fork-lift is used to remove the fired load. This load is then transported to the area where it will be processed next. The lift is then brought back and used to place the fresh load into the kiln. This system requires only five minutes per kiln for loading or unloading.¹

A long cooling period is not necessary since the ware will not be actually touched by hand. A cooling period of three to four hours will replace the overnight cooling period of 14 hours required at present. Firing of the load will begin immediately since the kiln has not cooled off to the point previously demanded for hand unloading. This double daily firing of each glaze kiln will use virtually less fuel per load because the kiln's preheat has not been lost during the rapid transference of loads. It will certainly fire the ware faster and make substantial savings in fuel possible.²

The following is a suggested time schedule to be used with the new method of firing:

- 7:00 a.m. - First load is put in the kiln and fired.
- 1:30 p.m. - Fire off.
- 4:30 p.m. - Kiln unloaded.
- 4:35 p.m. - Second load is placed in kiln and fired.
- 11:00 p.m. - Second fire off. This load cools overnight and is ready for unloading at 6:55 a.m. the following morning.

¹ "Streamlining Ups Output 100%", Ceramic Industry LV (September, 1949), 46-47.

² "Ridgewood Combines Eight Kilns, Fork Lifts For Output Economy", Ceramic Industry, LVIII (April, 1952), 22-23.

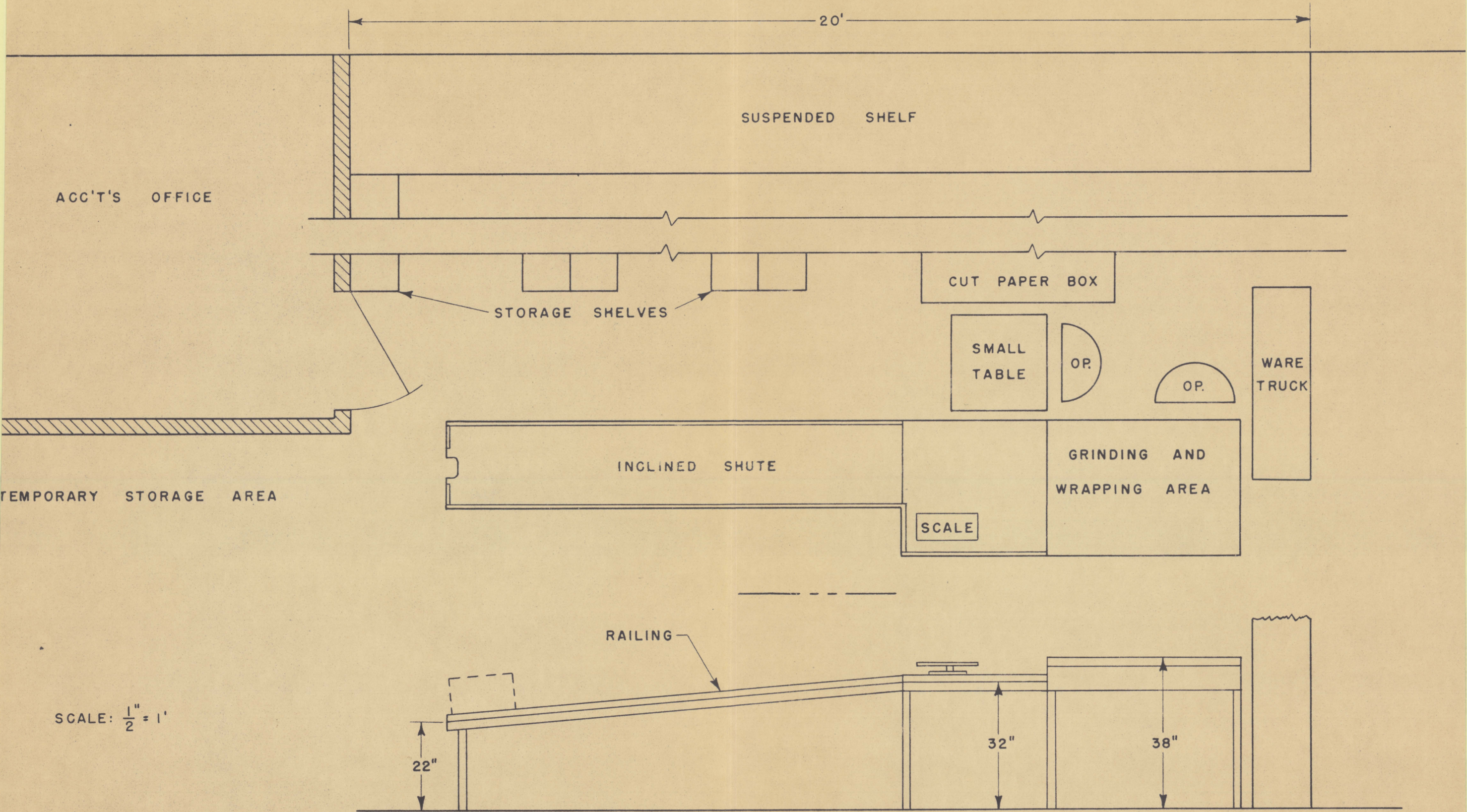
It will not be necessary to fire two loads of bisque per day since bisque flats may be loaded inside each other, in descending sizes. This allows many more pieces per bisque load than a glaze load, the ratio being about three to one. The bisque loads should be removed directly to the Decorating Department while glaze loads should be removed to the grinding table. Here the load may be taken down, ground, and packed in a single operation.

Compartmented Shipping Cartons

Much time is consumed first in wrapping each piece of finished ware and second, in packing cut paper around each piece in the shipping carton. Inasmuch as truck load orders will be made up of quantities of the same article, or groups of standard articles, these pieces should be shipped as such units. This can best be done by using cartons which are designed to hold a standard quantity (usually one dozen) of similiar articles. Separation should be effected by means of specially designed spacers which will compartmentalize the carton and keep each piece firmly in place. With such an arrangement, very little time will be consumed in unloading a glaze load, grinding sharp edges, inspecting and packing the ware all in one operation.

Packing Area Arrangement

Since the packing area will handle twice as much volume if two firings per day are started, the area must be set up to reduce the handling time of the ware. It is also anticipated that fewer items will be kept in stock since a flexible production schedule will reduce to a minimum the delays encountered in filling an order. This factor has suggested the arrangement



SCALE: $\frac{1}{2}'' = 1'$

PROPOSED ARRANGEMENT OF PACKING AREA

FIG. 21

shown in Figure 21. Here the finished ware flows in a straight line from ware truck to temporary storage. It is taken from the truck by one operator who grinds the sharp edges left from breaking off the setting buttons. It is then passed to the next operator who inspects for quality and either packs the piece or sets it aside for further disposition.

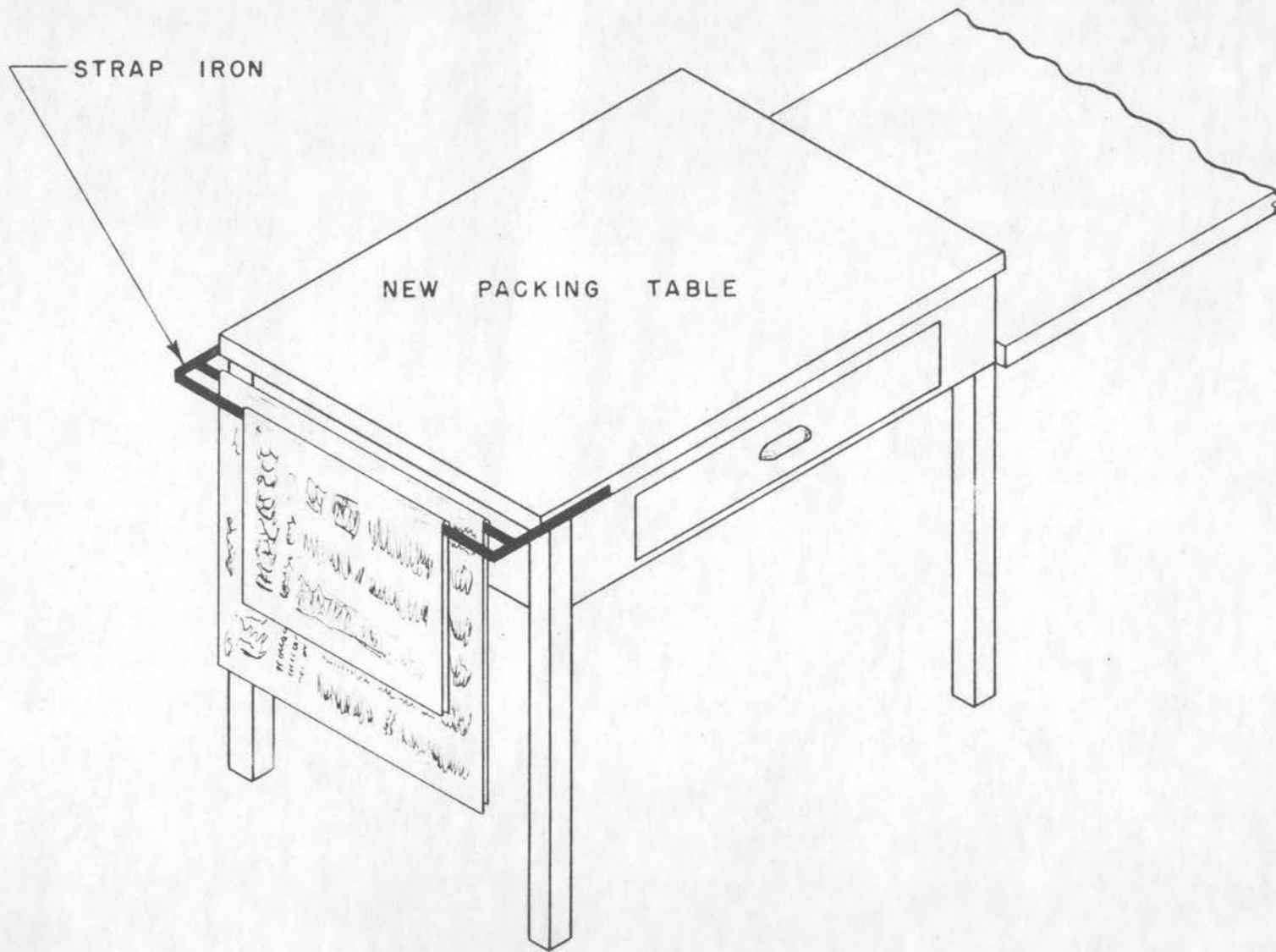
As the cartons are filled, they are sealed and carried to the floor by means of the inclined chute. As one ware truck is emptied, the first operator should proceed to the inclined chute and taking the cartons from the low end, stack them in the temporary storage area. The packing table and inclined chute combined should be able to hold all the cartons which have been filled from one ware truck (4 to 7 cartons). The empty cartons should be stored in a vertical position (flat) and enough should be opened and glued to handle the anticipated load of a ware truck before it arrives.

Additional Kiln

Figure 14 shows the suggested position of the new kiln which is on order. This position allows for future expansion since it will require an extension of the existing gas line. This extension should be run along the West wall. With the new kiln in this position, it will contribute heat to the present packing area where there is a deficiency during the winter months.

Paper Rack

Even though most ware will be shipped in cartons each containing a dozen pieces or more, some orders will still have to be filled for small quantities. In this case, the pieces should be individually wrapped and packed as they are now. To facilitate this operation, a paper rack is



PROPOSED PAPER RACK FOR PACKING TABLE

suggested (shown in Figure 22). This rack allows a ready storage of newspaper. By moistening the fingers from a sponge placed in a shallow dish of water, individual double sheets can be drawn from the rack. This arrangement obviates the usual time consuming efforts to separate pages of a newspaper.

Two Persons Pack

Teamwork can be used to good advantage in the packing area to reduce the time of packing small orders. Two people are necessary to act as a team that can increase production considerably. One person should concern himself with getting the necessary items of pottery and wrapping them. For this purpose he should have a small cart, similiar to a grocery store carriage, with two or three shelves that will enable him to collect separate orders on each shelf from the storage area. Wheeling this cart back to the wrapping area he can then wrap three orders and only use a few more steps than would be needed for a single order.

After wrapping one complete order, it should be pushed within reach of the second operator. He in turn will pack these items in the shipping carton, using cut paper from the box in the center of the area. To facilitate packing a box, this operator should stand so that cut paper can be reached on his right and the wrapped article can be reached on his left. The table used to hold the carton being packed should be movable to allow flexibility of the area.

As the cartons are packed, they should be slid to the packing table (small table and packing table are same height) and pushed toward the inclined shute. When the first operator finishes wrapping a number of orders, he should shift to a position farther along the table where he can proceed

to seal the cartons, place labels, and weigh the carton in one operation. The carton should then be placed on the inclined chute and later placed in the temporary storage area.

Sealing, Labeling, and Weighing Cartons

It has been noticed that after a carton has been packed, the next operations are not done at the same time. Since small orders containing different pieces will still be processed in the same manner, it is recommended that the sealing, labeling and weighing of the carton be done at successive times. This will reduce the time of handling small orders.

Parcel Post Scale

If the Trimming Department and packing area are inter-changed, a small parcel post scale should be provided for weighing cartons.

Firing Rack

Employing one of the firing rack arrangements in Figure 23 will not appreciably change the capacity of a kiln load. However, this suggested method of arranging a glaze load does have two main advantages.

The first consideration is that the proposed method will reduce the number of "seconds" (defective pieces of pottery) to a marked degree. This is possible since the rack holds the pieces one above the other, thereby preventing kiln wash from marring any more than the topmost piece of ware as it chips off the shelves and top of the kiln. Since all items are manufactured as a potential "first" (high quality ware), a competent manufacturing process should protect each one from losing any of its inherent value. Every "second" produced represents a loss to the manufacturer. The suggested arrangement assures a maximum of first quality ware which