

**CSF**

GLASSWARE WASHING ANALYSIS

# 358 - 67

AUTHOR: R. McCLEARY

COMMUNITY SYSTEMS FOUNDATION

Executive Building, Suite 200

22 West Road

Towson, Maryland 21204

May 31, 1967

Mr. Walter E. Williams  
Assistant Director for  
Mechanical Services  
Baltimore City Hospitals  
4940 Eastern Avenue  
Baltimore, Maryland 21224

Dear Mr. Williams:

Enclosed are the findings, results, and recommendations of the  
Laboratory Glassware Washing Analysis.

I wish to thank Dr. Howard Rathbun, Miss Irene Govoni, Miss Mary Blanks,  
and Miss Agnes Gyuriseck for their complete cooperation and assistance  
during the analysis.

Yours very truly,

*Richard M. Cleary*

Richard McCleary  
Project Engineer

RM/ab

## OBJECTIVES

1. Evaluate machine capacity versus requirements.
2. Evaluate manpower availability versus requirements.
3. Determine if additional machinery and/or personnel are required to meet daily requirements.

I. EQUIPMENT

The following equipment was analyzed and the machine cycle times determined.

- A. Two American Sterilizers Model 57CR. The cycle time for each of the below mentioned items was arrived at by discussion with Dr. Howard Rathbun, Chief of Clinical Laboratories.

<u>ITEM</u>	<u>CYCLE TIME</u>
1. Petri Dishes (Glass or Plastic)	1 hour
2. Test Tubes	30 min.
3. Blood Culture Bottles	1 hour
4. Swabs	1 hour
5. Centrifuge Tubes	1 hour
6. Syringes	30 min.
7. Mice Kits	1 hour
8. Pipettes	1 hour
9. Serum Bottles	1 hour
10. Solutions	15 min.

- B. One Better Built Turbomatic Glassware Washing Machine Model 3000.

Cycle Time - 21 minutes (Appendix I)

- C. One Chorlab-Laboratory Glassware Washing Machine (Serial #666)

Cycle Time - 53 minutes (Appendix II)

II. PERSONNEL

Personnel are supplied to the glassware washing room from three areas: Bacteriology Laboratory, Chemistry Laboratory, and the Hematology Laboratory. An average of 7-3/4 man-hours/day are allocated on Mondays and Wednesdays and an average of 9-1/2 man-hours/day are allocated on Tuesday, Thursday, and Friday (Appendix III).

It is of interest to note that although the Chemistry Laboratory glassware washing load is heavier than the Bacteriology Laboratory load, the personnel from the Chemistry Laboratory spend an estimated 15 minutes/day in the glassware washing room whereas the Bacteriology Laboratory personnel spend a minimum of 6-1/2 hours/day in the glassware washing room. This is because all the preparation of the Chemistry Laboratory items to be machine washed is done in the Chemistry Laboratory workroom. This need not be the case as there is ample time in the glassware washing area in the morning.

### III. MACHINE UTILIZATION

Discussions were held with each of the principal technicians of the laboratories to determine the volume of items to be machine washed in the glassware washing area. (See Appendix IV). Since test tubes are the largest volume and most time-consuming item, machine capacity for this item was closely examined.

Two sizes of test tube holding baskets are being used, 6" x 6" and 7-1/2" x 12". The 6" x 6" baskets can make 100% use of machine capacity, but not the 7-1/2" x 12" baskets due to the dimensions of the rack in the Better Built machine. It is therefore recommended that the 7-1/2" x 12" baskets be replaced with 6" x 9" baskets which would allow these baskets to make 100% utilization of the machine capacity.

Assuming the #16 test tubes the average size and 100% utilization of machine capacity, the Better Built machine is capable of washing 620 test tubes in each cycle period. The cycle time for the Better Built machine was determined to be 21 minutes. At practically 3 cycles per hour, this would allow 1860 test tubes to be machine washed in one hour and therefore

the daily requirements to be washed in less than 3 hours. The remaining daily requirements can be machine washed in 2-1/2 hours. The total time of 5-1/2 hours is 69% of machine capacity based on 8 working hours.

#### IV. PREPARATION FOR GLASSWARE WASHING

The preparation of test tubes for machine washing constitutes the majority of the glassware washing personnel's time, therefore, observations and time studies were performed to determine the number of test tubes prepared per hour. These observations and time studies took into consideration the three major sizes of test tubes, 13's, 16's and 20's, and the screw top and non-screw top which are the two predominant types. The results are as follows:

##### Screw Top Type

13's - 22/min x 60 min = 1320/hour

16's - 18/min x 60 min = 1080/hour

20's - 14/min x 60 min = 840/hour

##### Non-Screw Top Type

13's - 35/min x 60 min = 2100/hour

16's - 26/min x 60 min = 1560/hour

20's - 20/min x 60 min = 1200/hour

The following assumptions were made in determining the average number of test tubes that can be prepared for machine washing per hour.

- A. #16 test tube is considered the average size.
- B. An average of 90% of the test tubes are non-screw top type and 10% are screw top type.
- C. No interruptions to personnel.

The number of test tubes that can be washed per hour is:

Test Tubes X Percent Allocation = Number/Hour

1080 (Screw Top Type) X 10% = 108/Hour

1560 (Non-Screw Top Type X 90% = 1404/Hour

Total Test Tubes/Hour = 1512

Since the same individual normally operates the machine and prepares the test tubes, the allowable preparation time is reduced to 50 minutes per hour, or 1260 test tubes per hour based on the utilization of the Better Built machine (See Appendix I).

The total number of test tubes requiring washing per day was estimated at 4635 (See Appendix IV). Since 1260 test tubes can be prepared per hour, the total of 4635 test tubes can be prepared in less than 4 hours.

By examining the remaining workload and the time available to perform this workload, it can be stated that ample man-hours exist to perform the total workload in the glassware washing area.

The primary function of the Chorlab machine is to wash those test tubes from the Chemistry Laboratory which have been marked with a crayon. The Better Built machine apparently will not remove this identification. If a different method of identification can be found, the only need for retaining the Chorlab machine would be for emergency use in case of a breakdown of the Better Built machine. A different identification method would also allow for improved glassware washing personnel efficiencies which can be seen by the difference in personnel time required by each machine (See Appendix I and II).

Discussions held with Dr. Howard Rathbun, Chief of Clinical Laboratories, concerning the utilization of the two American Sterilizers resulted in the

identification in writing of those items required to be autoclaved and the cycle time for each item which was shown on page 1. In addition, it was agreed that the total volume of items needing autoclaving were not in excess of the two machines capacities and that improved machine utilization of equipment can be realized by scheduling some of the items to be autoclaved.

The primary question concerning the availability of autoclaving equipment appears to arise from occasional conflicts of needing the equipment when it is in use. These occasional emergencies can be greatly reduced if some type of scheduling work is put into effect and adhered to.

#### SUMMARY

Existing equipment in the glassware washing area is adequate and in fact could absorb increased loads if required.

Based on the time studies and observations of the required operations, the total available man-hours are adequate for the required workload.

#### RECOMMENDATIONS

1. Replace 7-1/2" x 12" baskets with 6" x 9" baskets.
2. Schedule items to be autoclaved when possible.
3. Schedule personnel presently preparing items for washing in the Chemistry Laboratory wash area into the glassware washing room in the morning.
4. Install lights on autoclave equipment which will allow personnel washing items to know when the sterilizing cycle has been completed.
5. Adhere to revised scheduled hours. (See Appendix V)



A P P E N D I X

APPENDIX I

BETTER BUILT TURBOMATIC GLASSWARE WASHING MACHINE

Model 3000

<u>ITEM</u>	<u>MAN TIME</u>	<u>MACHINE TIME</u>
Load Machine	2.00 min.	--
Rinse		1.00 min.
Add Detergent	.75 min.	
Wash		10.00 min.
Rinse (2)		6.00 min.
Remove	<u>1.25 min.</u>	_____
Total Time	4.00 min.	17.00 min. = 21 minutes

3 cycles per hour.

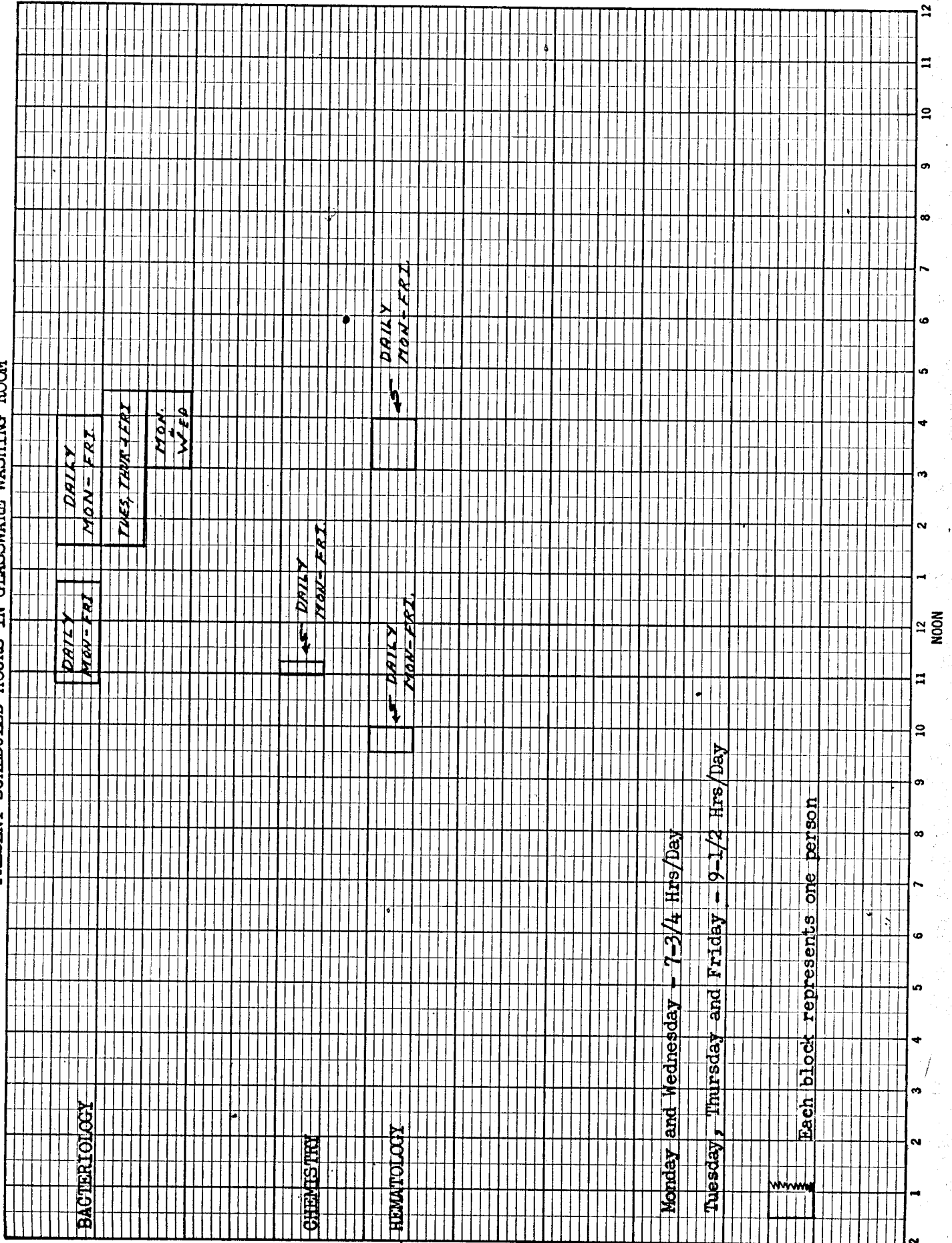
APPENDIX II

CHORLAB-LABORATORY GLASSWARE WASHING MACHINE

Serial #666

<u>ITEM</u>	<u>MAN TIME</u>	<u>MACHINE TIME</u>	
1. Load 4 holders	4.00 min.		
2. Add water, detergent, and shut off water.	2.00 min.		
3. Open steam valve to 190°F and shut off	1.50 min.		
4. Wash		15.00 min. est.	
5. Drain water	1.00 min.		
6. Add rinse water	1.50 min.		
7. Add steam	1.25 min.		
8. Rinse		10.00 min. est.	
9. Drain water	1.00 min.		
10. Add rinse water	1.50 min.		
11. Add steam	1.25 min.		
12. Rinse		10.00 min. est.	
13. Drain water	1.00 min.		
14. Remove	2.00 min. est.		
	<hr/>	<hr/>	
Total	18.00 min.	35.00 min.	= 53.00 min.

PRESENT SCHEDULED HOURS IN GLASSWARE WASHING ROOM



ITEMS AND ESTIMATED QUANTITIES MACHINE WASHED MON. - FRI.

<u>ITEM</u>	<u>CHEMISTRY LAB.</u>	<u>HEMATOLOGY LAB.</u>	<u>BACTERIOLOGY LAB.</u>	<u>BLOOD BANK</u>	<u>T. B. SECTION</u>	<u>TOTAL DAILY REQUIREMENTS</u>	<u>BETTER BUILT CAPACITY/CYCLE</u>	<u>MACHINE CYCLES PER DAY</u>
<u>#10 Test Tubes</u>				465		465	1160	.40
<u>#13 Test Tubes</u>	850	200	450	70		1570	1080	1.44
<u>#16 Test Tubes</u>	750		900		50	1700	620	2.72
<u>#20 Test Tubes</u>	200	150	450		100	900	440	2.04
<u>Sub-Total</u>						4635		6.60
<u>Liter Bottles</u>	24					24	20	1.20
<u>Specimen Vials</u>		150				150	128	1.17
<u>Centrifuge Tubes</u>		200				200	156	1.28
<u>Petri Dishes</u>						180	70	2.5
<u>Grand Total</u>								12.75

REVISED SCHEDULED HOURS IN GLASSWARE WASHING AREA

