Ergonomic Mail Room Redesign

prepared for the Materiel Services Department
University of Michigan Medical Center

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1.0 Executive Summary

The project was broken down into four main divisions: redesign of the entire Mail Room and Storage Room, the primary sort area, the secondary sort areas, and the delivery carts. Each of these divisions has been further broken down into the elements which comprise each one. Several problems exist in each division. This project suggests solutions to help alleviate these problems.

A major concern was the overcrowding of the Mail Room in general and the underutilization of the Storage Room next door. We have created four alternatives to the present design of the Mail Room area. Two of these designs require the removal of the wall that separates the two rooms. We have incorporated complaints and preferences from the Mail Room personnel as well as recommendations from the previous Management Systems team in formulating recommended redesigns. Taking these factors into account, our recommendation is Mail Room Redesign 2 (refer to diagram on page 13).

Primary sort bins were another area of concern. Again, we incorporated suggestions from Mail Room workers in redesigning these bins. To alleviate stress on the back and arms from lifting the white U.S. Mail tubs out of the gray primary sort bins, a flip down panel could be added by the Hospital's maintenance department (refer to diagram on page 17).

The main concern with the secondary sort area was the height of the cubby-hole sections. Presently, the secondary sort work area is comprised of three cubby-hole sections stacked on top of one another. Our recommendation is only two sections high, but increases the length of each work area by 50% to ensure the same number of cubby-holes. Consequently, two work areas (previously two separate desks) are now combined (refer to diagram on page 19).

Finally, we attempted to redesign the delivery carts. We were concerned about the carts' height and manageability. Our recommendation is Delivery Cart Redesign 2 (refer to diagram on page 22). However, the cart recommendations are the least feasible due to there potential construction costs.

2.0 Introduction, and Background

The purpose of this project was to suggest changes to the physical environment of the Mail Room. Our goal was to create a safer, and more comfortable working environment.

The room which is currently used as the Mail Room was not designed for this purpose. The space is too small, and difficult to efficiently organize. Our team was brought in by Frank Krupansky and Tom Cheesman of the University of Michigan Materiel Services Department to examine, and suggest solutions to these problems.
3.0 Approach

3.1 List of key issues, and/or alternatives affecting project

- lack of space for personnel in present design
- history of health problems
- receptiveness of the Mail Room personnel
- the room used as the Mail Room was not intended for this purpose
- unresolved Mail Room issues already exist
- the recommendations from the Management Systems Department
- suggestions from Mail Room workers.

3.2 Methodology

A main focus of our project was to incorporate the recommendations of Chris Parin and Lisa Cayen of the Management Systems Department, while also taking into account the recommendations of the workers. We have assumed that the suggestions of Chris Parin and Lisa Cayen will be incorporated. Specifically, there are 11 more primary sort bins in our designs. Workload equity concerns have not been fully addressed. We had hoped to discuss equity with the workers when we met with them on November 17, 1993. Though the workers were concerned, the issue was not resolved. Workers were unwilling to discuss it unless all workers were present. The likelihood of all workers being able to attend a meeting is small.

In the proposal, we listed the following steps as additional parts of our approach (refer to Section 2.4 of the Proposal):

- talking to Mail Room personnel for suggestions and input
- periodically speaking with Frank Krupansky and Tom Cheesman to give them project updates, and for their suggestions and input
- contacting United States Post Office for information on how mail is sorted there
- examining the Mail Room injury statistics
- measuring dimensions of the Mail Room, mail carts, et cetera...
- accompanying several workers on their delivery routes to examine how the mail carts are used.

As of December 16, 1993, we have accomplished the following:

- talked to Mail Room personnel on numerous occasions
- met with Mr. Krupansky and/or Mr. Cheesman on six separate occasions
- reached and are in the process of setting a meeting with Terry Crouson, the United States Post Office contact
- obtained the Mail Room injury data
- measured dimensions of the Mail Room, mail carts, et cetera...
- accompanied one worker on her delivery route.
In addition, we have:

- contacted and toured the Mail Service Department on Central Campus
- photographed the Mail Room's current conditions, and the Mail Room personnel at work
- contacted John Miles, Building Manager to examine Mail Room structural concerns
- developed redesigns of the Mail Room, delivery cart, and primary sort bins
- obtained a mail supply catalogue (delivery carts, cubby-holes, et cetera...)
- obtained blueprints of the Mail Room area.

3.3 Problems experienced

We had difficulty in the following:

- scheduling an appointment with Terry Crouson, the United States Post Office contact
- determining the source of the original equipment
- obtaining an accurate representation of work days missed due to work related injuries.

4.0 Current Designs

Drawings of the current designs of the Mail Room/Storage Room, primary sort bins, secondary sort areas, and carts are included on the following four pages.
Current Mail Room Design

- Work area
- Cart
- Column
- Desk
- Chair
- Alternate cart

Mail Room

U.S. cart

Primary sort

Lockers
- Fridge
- Desk

Storage Room
Current Primary Sort Bin Design

Top View

Front View

Side View
Current Secondary Sort Design

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There are several empty cells in the table.
Current Delivery Cart Design

Pull-out buckets

Pull-out drawer

Dimensions:
- Height: 39" (1.8m)
- Width: 310" (7.9m)
- Depth: 18" (0.46m)
5.0 Alternative Designs

A cost analysis of these designs was difficult. We were not able to find a catalog that contained carts that were even similar to the current carts. The carts we were able to find were smaller. They would cost between $300.00 and $650.00. We did not obtain a cost for the elimination of the wall between the two rooms or the primary sort redesign. We were afraid that calling maintenance for cost estimates might cause inter-departmental tension (even though these are simply preliminary ideas). We assume that the cost of the redesign of the primary sort bins would be minimal. It would involve cutting off one side, adding one or two hinges and attaching a lock. Other costs include labor and time lost delivering mail when the sort areas are rearranged.

5.1 Mail Room Redesigns

As previously stated, all of these redesigns assume that the suggestions of Chris Parin and Lisa Cayen are implemented. More specifically, we assumed that 11 new primary sort bins will be added. When asked which they preferred, the workers indicated that it was better to place the bins on top of the tables, rather than have some below. Special preference has been given to designs which accomplish this. In addition, all of these designs incorporate the secondary sort redesign explained in section 5.3.

Mail Room Redesign 1 utilizes the Storage Room as a primary sorting room.

Advantages:

- all primary sort bins are on top of tables
- increases secondary sort area
- decreases worker crowding.

Disadvantages:

- "horseshoe" design increases total walking during primary sort
- minimal storage area.
Mail Room Redesign 2 eliminates the wall between the Mail Room and the Storage Room.

Advantages:

- all primary sort bins are on top of tables
- increases secondary sort area
- decreases worker crowding
- primary and secondary sort areas are close to each other (primary sort bins can be placed next to their respective secondary sort areas.)

Disadvantages:

- the "two-parallel-lines" design increases total walking during primary sort
- potential cost of eliminating wall
- minimal storage area.

Mail Room Redesign 3 again eliminates the wall between the Mail Room and the Storage Room. However, in this design, the primary sort bins are below the tables as well as on top of them.

Advantages:

- increases secondary sort area
- decreases worker crowding
- primary and secondary sort areas are close to each other (primary sort bins can be placed next to their respective secondary sort areas)
- greater storage area than in previous designs
- decreases walking distances.

Disadvantages:

- potential cost of eliminating wall
- requires bending to lift primary sort bins on floor.
Mail Room Redesign 4 does not eliminate the wall. As in Redesign 3, the primary sort bins are below the tables as well as on top of them.

Advantages:

• increases secondary sort area
• primary and secondary sort areas are close to each other (primary sort bins can be placed next to their respective secondary sort areas)
• greatest storage area of all designs
• decreases walking distances.

Disadvantages:

• does not decrease worker crowding as much as other designs
• requires worker's personal belongings to be in another room.
• requires bending to lift primary sort bins on floor.
Mail Room Redesign 1

work area

cart

desk

column

chair

lockers

fridge

desk

primary sort

U.S. cart

Secondary Sort Room

Primary Sort Room

12
Mail Room Redesign 3

Note: Primary sort includes bins that are on top of desks as well as underneath.
Mail Room Redesign 4

Note: Primary sort includes bins that are on top of desks as well as underneath.
5.2 Primary Sort Redesign

The majority of the complaints about the primary sort bin had to do with its depth. The workers were having trouble lifting the white U.S. Mail tubs out of the bins without hurting their knuckles or putting strain on their backs. They like the bins, though, since they the mail in the proper tubs while the workers were "throwing" the mail.

This redesign takes into account a suggestion from Dorothy. It uses the current bin, but adds a flip-down door. Workers can simply let the door down, and pull the white tubs out of the bin thereby eliminating the need for lifting. We are assuming that this can easily be done by the Hospital maintenance or at a low cost by an outside vendor. The rework required is simply separating one side, reattaching it with hinges, and adding a latch to keep the bin closed.
Primary Sort Bin Redesign

Top View

Front View

Side View
5.3 Secondary Sort Redesign

Complaints with the secondary sort area dealt mainly with its height. At present, the sort area is three cubby-hole sections high. The redesign combines two work stations that are each two cubby-hole sections high. The reduced height will allow the workers easier access to all cubby-holes without having to strain to reach them.
5.4 Delivery Cart Redesigns

There were not many complaints about the carts, but we observed the need for some workers to climb the carts in order to reach mail on the top shelf. Therefore, our redesigns are concerned with decreasing the height. To increase maneuverability, a handle has been added in both designs. Design dimensions have been checked against potential route problem areas (i.e. the elevators) to ensure the new carts could fit. Unfortunately, redesigning the delivery carts is the least feasible of any of the redesigns. Problems exist because:

- workers are the least concerned about the design of the delivery carts
- a similar design could not be found to assist us in creating a cost analysis or a check for design feasibility.

The design of the cart needs to be addressed, however, because of the potential danger to the workers and cost of workers' compensation should a serious accident occur.

**Delivery Cart Redesign 1** decreases the height and increases the length, while the width remains the same as the current cart.

Advantages:

- decreases height.

Disadvantages:

- decreases number of tubs that will fit on cart
- potential cost of redesign.

**Delivery Cart Redesign 2** makes the same changes as Redesign 1, but also increases the width so as not to decrease the number of tubs that will fit on the cart. A diagram is included that shows the change of the arrangement of the tubs on a cart shelf in this redesign (refer to the diagram on page 23).

Advantages:

- decreases height
- increases number of tubs that will fit on cart.

Disadvantages:

- potential cost of redesign.
Delivery Cart Redesign 1

Width remains constant. For side view dimensions refer to the current delivery cart design.

4'9"  3'0"
Expansion of Length and Width of the Delivery Cart

Current Cart Topview w/ Mail Baskets

Cart Redesign 2 Topview w/ Baskets
6.0 Findings and Conclusions

Our findings and conclusions are that the:

- primary sort area is very crowded
- gray primary sort bins are designed so that it is difficult to easily remove the white sort tubs within them
- highest cubby-holes are inaccessible
- labels on the cubby-holes are difficult to read
- delivery carts are awkward, and too tall
- Storage Room is not being effectively used
- computer is not regularly updated, and therefore rarely used
- workers are enthusiastic about making the Mail Room more comfortable for them to work.

7.0 Recommendations

7.1 Redesigns

We recommend the following designs:

- Mail Room Redesign 2
- Primary Sort Bin Redesign
- Secondary Sort Redesign
- Delivery Cart Redesign 2.

Our primary reason for recommending Mail Room Redesign 2 is that all of the primary sort bins are on top of the tables. When we met with the workers to discuss potential redesigns, they indicated that this was their preference. Mail Room Redesign 2 also places the primary sort bins close to the secondary sort areas. The main disadvantage of this design is that it requires removing the wall between the Mail Room and the Storage Room. If this design is implemented, management would need to take into account what effects the removal process would have on the mail delivery on that particular day. Should the removal of the wall be a problem, a more feasible solution may be Mail Room Redesign 4 in which the wall is kept in place. In this design, the primary sort bins are still close to the secondary sort area.

The advantages of the primary sort bin and secondary sort redesigns are discussed in sections 5.2 and 5.3. The redesigns are simple to put into effect and implementation is strongly encouraged.

Delivery Cart Redesign 2 was selected because it decreases height while increasing tub capacity. It has been brought to our attention that a handle (in either redesign) may cause back strain due to pulling instead of pushing. We have been unable to obtain any evidence to this effect, but further study may be required. The cart redesign may prove costly as well. A possible
solution may be to use the frame of the current delivery cart while repositioning the shelves. However, this does not take into account the height problem.

7.2 Miscellaneous

During our study, we also developed the following further recommendations:

We were told that there have been complaints about the lighting. New softer lighting (to reduce glare) could be added to the Mail Room. In addition, more lighting will definitely be necessary in the Storage Room if it is used for purposes other than storage.

We recommend future project to teach and enforce safety to the workers.

The working environment could be made more pleasant by adding a corkboard to each work area. Currently, the workers tape pictures and motivational quotes to the wall. Corkboards would be a small investment that would increase worker morale. This could easily be done when the secondary sort area is reduced to be only two cubby-hole sections high.

The rearranging of the sort areas could occur:

• on a weekend by building maintenance personnel
• on a weekend by Mail Room workers
• on a weekday in which no U.S. Mail is delivered (i.e. Columbus day) by the Mail Room workers themselves - they could have some input - in the afternoon after the routes have been delivered
• on any day, but only deliver priority mail.

The last two suggestions also apply to the timing for removal of the wall between the Mail Room and the Storage Room.

Cleaning up the secondary sort area would be quite easy. The box numbers could be typed on a computer in a large, readable font, and printed out on a laser printer. These could either be done on Avery laser printer labels, or on paper and taped. For example, Helvetica in 72 point:

0067

It would be very advantageous to involve the workers as much as possible. In the short time that we interacted with them, they had many ideas and
suggestions (i.e. Dorothy's hinge on the primary sort bin.) We were told that the Mail Room on central campus asked three of its workers to redesign their working environment. The results were very positive. They are the ones who work in this environment every day, and they know it very well.

We observed that the reference computer was not used very often. This is due to the fact that it is not up-to-date. If there were some way that it could be regularly updated, this would be extremely advantageous - it could be an even better resource.

If the Storage Room is used for sorting mail, the lock on the door to the elevator lobby would need to be fixed. Further, the ID lock would need to be activated.

It was brought to our attention that UMMC has approximately twice the interdepartmental mail than other hospitals at major universities. We would suggest a further study to determine why this is, and what can be done to alleviate it. Over half of all of the mail that is delivered is campus mail, and if this could be reduced, then this would decrease the strain on the workers.

Foam mats could be added to the floor around the sort area to decrease stress on the workers' feet from walking.

Most importantly, something needs to be done to the Mail Room. Worker morale is steadily decreasing due to their impression that management is addressing their concerns, but not making the necessary changes. Even the slightest change (foam mats, corkboard) would at least demonstrate to the worker, management's concern for them.

7.3 Expected Impact

Implementation of our, proposed solution will result in:

- decreased injury
- increased worker efficiency
- increased worker morale
- more effective use of space
- increased organization.