DOCUMENT RESUME

ED 046 403	52	LI 002 397

AUTHOR	Holmes, Donald C.
TITLE	Determination of the Environmental Conditions Required in a Library for the Effective Utilization of Microforms. Interim Report.
INSTITUTION	Association of Research Libraries, Washington, D.C.
SPONS AGENCY	Office of Education (DHEW), Washington, D.C. Bureau of Research.
BUREAU NO	BR-8-0786-I
PUB DATE	Nov 70
CONTRACT	OEC-0-8-080786-4612(095)
NOTE	50p.
EDRS PRICE	EDRS Price MF-$0.65 HC-$3.29
DESCRIPTORS	*Environmental Influences, *Information Utilization, Library Education, Library Guides, Library Instruction, *Library Research, Library Science, *Library Services, *Microforms

ABSTRACT

This report contains recommended guidelines for selected aspects of the environment affecting the use of microforms. Environmental factors discussed include those related to the convenience and comfort of the readers and the custodianship of the material. The recommendations focus on daily routine problems faced by librarians and readers when using microforms, and are addressed toward the basic and fundamental considerations to which the librarian must address himself if readers are to feel comfortable in the use of microforms and accept them as viable information carriers. Technical details are relegated to appendixes for the technically oriented readers, and a glossary of terms is provided. (AB)

INTERIM REPORT

Contract Number: OEC-0-8-080786-4612(095)

PART ONE:

Determination of the Environmental Conditions Required in a Library for the Effective Utilization of Microforms

Donald C. Holmes

ERIC Users Please Note: Part 2 has been processed as a separate document. It is not reproduced here. ERIC/CLIS

~~PART TWO: (Interim Report)~~

~~*Determination of an Effective System of Bibliographic Control of Microform Publications*~~

~~Felix Reichmann and Josephine M. Tharpe~~

Association of Research Libraries
1527 New Hampshire Ave., N.W.
Washington, D. C. 20036

November 1970

The research reported herein was performed pursuant to a contract with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U.S. Department of Health, Education & Welfare
Office of Education
Bureau of Research

CONTENTS

PART ONE

CONTENTS (Cont'd)

PART ONE

ILLUSTRATIONS

PART TWO (Interim Report) } Not reproduced here. See note on title page

FOREWORD

The report which follows presents the results of two distinct studies directed toward solution of two of the major problems which inhibit full utilization of microforms. Since the problems were distinct, although related, different investigators worked on them and the report is presented in two separate parts. Part One deals with determination of the environmental conditions required in a library for the effective utilization of microforms; Part Two is concerned with an effective system of bibliographic control of microform publications.

Part One is the work of Mr. Donald C. Holmes, who served as principal investigator for the environmental portion of the study and as overall project director. Part Two was prepared by Dr. Felix Reichmann and Miss Josephine M. Tharpe, principal investigator and assistant principal investigator, respectively, of the bibliographic control study.

These two studies are part of a larger and still developing whole, known informally as the Microform Technology Project of the Association of Research Libraries. It originated in the summer of 1968 when the Association was awarded a contract by the Office of Education for a study to identify the chief problems inhibiting the full and effective use of microforms as instructional and research tools in libraries, especially college and university libraries. Mr. Donald C. Holmes served as project director and principal investigator for the project.

The result of this effort was an interim report submitted to the Office of Education in the summer of 1969.[1] Emphasis in the report was placed upon the unmet everyday needs of the users of microforms, and it contained a documented list of those problems which have prevented microforms from being used to their full potential. Among the more important difficulties cited by Mr. Holmes were the following:

1) The variety of types of microform, each of which demands specialized equipment for storage and use.

2) The lack of an optimum physical environment for microform use, including proper lighting, temperature and humidity controls and equipment, such as reading machines and furniture.

3) The amount of handling involved in the acquisition, cataloging and use of microforms, which results in loss and damage and subsequent inconvenience to the user.

4) The lack of an adequate system of bibliographic control of microforms, which presents difficulties in their acquisition and cataloging and diminishes access to them.

5) The lack of sufficient data on the most effective means of administering microform collections.

6) The absence of an effective method of insuring that all producers of microforms will observe appropriate production standards.

7) The lack of an authoritative structure or procedure which could effect a more rational decision-making process in determining the most appropriate type of microform for the reproduction of any given publication.

1. Donald C. Holmes, *Determination of User Needs and Future Requirements for a Systems Approach to Microform Technology* (Association of Research Libraries: Washington, D. C., July 19, 1969). For U.S. Department of Health, Education and Welfare, Office of Education, Bureau of Research, Contract No. OEC-0-8-080786-4612(095).

As a result of these findings, the principal investigator concluded that although microforms are essential to the information services offered by all types of libraries, their use will not reach its full potential until these problems are overcome. Consequently, the report recommended a number of research projects aimed at solving the more serious difficulties. These recommendations ranged from the establishment of a permanent national microform agency to a comprehensive and in-depth study of the possible physical and psychological factors involved in the use of microforms.

When it became apparent that the Office of Education was willing to support further research along these lines, the Association decided to pursue two of the recommended studies, each of which appeared susceptible to successful completion with in a limited period of time. The two-part study which follows was the result.

Advisory committees were assigned to each study. The members, all expert in the subject matter of the project for which they were appointed, were:

For Part I (Physical Environment):

Thomas Bagg
National Bureau of Standards

Forrest Carhart, Jr.
Director, Library Technology Program
American Library Association

Charles LaHood, Head
Photoduplication Services
Library of Congress

Carl Nelson
Consultant

Peter Scott, Head
Microreproduction Laboratory
Massachusetts Institute of Technology

Carl Spaulding
Council on Library Resources

For Part II (Bibliographic Control):

Samuel Boone
University of North Carolina Library

Helen Brown
Pennsylvania State University Library

Lyman Butterfield
Editor of Adams Papers
Massachusetts Historical Society

Richard DeGennaro
Harvard University Library

Allen Veaner
Stanford University Library

Mr. Holmes' report on the facilities necessary for the effective use of microforms (Part One) brings to a close that particular phase of the Microform Technology Project. The report on the bibliographic control of microforms (Part Two), however, is an interim report, in that work will continue on this aspect of the project during the next year. Dr. Reichmann and Miss Tharpe will present their final report in June 1971.

ACKNOWLEDGEMENTS

All concerned, and especially the principal investigators, are indebted to the members of the advisory committees for the quantity and quality of the assistance they rendered. Between meetings individual members were available by letter and telephone during the entire period of the investigations, and frequent and profitable advantage was taken of their proferred help. Indeed, several members of the advisory committee for Part One prepared initial drafts of key portions of the report. By means of frequent informal communication between committee members and principal investigators, each committee as a whole kept itself *au courant* with each project as it developed. It should be mentioned, however, that the committees were in fact as well as in name "advisory" and that full responsibility for the reports rests with the principal investigators.

The authors of both parts of the study want to express special gratitude to the two chief officers of the Association of Research Libraries, Stephen A. McCarthy and Louis E. Martin, for adroitly and unobtrusively handling numerous administrative details.

Both the ARL and all others involved with the studies are greatly indebted to those officials at the Office of Education who took interest in the project and made the studies possible by financial support.

Mr. Donald C. Holmes wishes his tanks to be recorded to the numerous individuals and institutions throughout the country who received him cordially, allowed him to inspect their microform facilities, and who imparted many valuable facts, figures and ideas. The author borrowed freely from the best features of their systems and was pleased with the high quality of the work from which he skimmed the cream. These persons and organizations are listed in Appendix A.

Special mention also is richly deserved by Vernon R. Tate, an enduring pioneer of microphotography, whose concepts of the overall problem of environment were gratefully received and used.

An "idea man" to whom Mr. Holmes is particularly grateful is William R. Hawken whose writings, especially those listed in the Bibliography to Part One, have been valuable and reliable contributions not only to this study but the the entire field of microcopying.

Those responsible for the pictorial material in Part One should be given special credit. DeGroot and Associates, Architects, produced the sketches of the proposed carrel. Not only were they meticulous in rendering ideas into graphic form, John DeGroot was also a careful and creative judge of what would be mechanically feasible. Finally, the author wants to thank his friends and former colleagues at the Photoduplication Service of the Library of Congress for the photographs of the microform editing work station which they helped him design and construct.

Felix Reichmann and Josephine M. Tharpe, authors of Part Two, want to add their personal endorsement to the tribute paid above to the advisory committee members with whom they have worked, and continue to work so congenially, and who have contributed so much to their study.

Donald C. Holmes, project director and author of both the Interim Report, which led to this study and Part One thereof, was and is always ready with greatly appreciated advice.

Special thanks are due to Mr. Lyman H. Butterfield whose paper on the microfilm publications sponsored by the National Historical Publications Commission and the Presidential Papers Program is added as Appendix D.

The research paper of Linda and Don Schnieder, who investigated the *National Register of Microform Masters*, was of great help.

The authors of Part Two would like to mention with sincere gratitude the cooperation of Mr. Fred Blum, who put at their disposal his entire correspondence and all the papers he had collected in preparing his thesis, *Guide to Selected Research Material on Microform*, 1968, (Thesis for M.S. in L.S.) Catholic University of America.

Mr. Reichmann and Miss Tharpe are also greatly indebted to the officials of the Library of Congress, to their colleagues in libraries on both sides of the Atlantic and to the many microform publishers who cooperated fully.

I

INTRODUCTION

This report contains recommended guidelines for selected aspects of the environment affecting the use of microforms. There is also a chapter devoted to staff and user training. It is hoped that the report as a whole may serve as a useful manual for librarians in their day-to-day responsibilities as administrators of microform collections.

The environmental factors discussed include not only those directly related to the convenience and comfort of the reader, but also those which affect the custodianship of the material. The former concern such matters as proper size and configuration of space alloted, the most convenient furniture, including carrels, the performance characteristics of an ideal microform reader, including proper screen angles, various types of lighting, etc. The latter involve services by the staff: quick access to requested material, assistance in using the equipment, proper maintenance of microforms and reading devices, etc.

It was originally intended, as part of the project, to have a prototype of a microform study carrel actually manufactured. Early in the course of the study, the principal investigator and the advisory committee, with approval of the Office of Education, decided for a number of cogent reasons to abandon the prototype and instead to delineate in detail and with drawings the ideal characteristics of a microform carrel.

Acknowledgement of the contributions of members of the advisory committee has been made in the Foreward. It cannot be overemphasized, and deserves reiteration, that members of the committee both individually and in session undertook numerous tasks and supplied the principal investigator with much valuable information as well as advice. Any reader of this report who may not be familiar with the names of the members listed in the Foreward should understand that every one of them is a recognized expert in the technology and user experience of microforms in research libraries. Collectively, they represent many decades of experience, expertism and dedication, allowing the author to state without immodesty that what follows bears the weight of considerable authority.

Throughout this report, every attempt has been made to be as practical as possible in developing guidelines. The recommendations focus on the daily, routine problems faced by librarians and readers when using microforms.

It must be emphasized that what is presented in this report are guidelines, not specifications. Creative innovation is vital for providing an effective physical environment for microform usage. That environment admits of many variations. This report, therefore, addresses itself to the basic and fundamental considerations to which the librarian must address himself if readers are to feel comfortable in the use of microforms, and, consequently, accept them as viable information carriers.

Anticipating a readership of this report which would not be predominantly technical in background, the author has reduced to a bare possible minimum technical terms, jargon which seems inevitably to grow up in any highly specialized field, and the scientific and technical background underlying the functions of both microform material and the machinery with which they must necessarily be associated. Several of the essential technical details were therefore relegated to appendixes to which the attention of the more technically oriented reader is invited. For a better understanding of both text and appendixes a glossary has been provided.

The writer is convinced that if librarians and users could become as familiar with the operation of microform equipment as they are with driving their automobiles the widespread apathy or even antipathy toward the medium would disappear. One purpose of this report, therefore, here and there explicitly stated, is to try to alleviate microphobia.

II

SUMMARY

Method and Procedures

The methodology of this study consisted of the following elements:

1. A literature search on the environmental factors involved in the use of microforms.

2. Determination of the scope of the study, with advice from the advisory committee.

3. Correspondence with firms which manufacture microform equipment, requesting suggestions of microform installations which should be visited.

4. Inspection by principal investigator and, on occasion, members of the advisory committee of organizations and institutions throughout the country which use microforms extensively.

5. Compilation of data acquired from inspection of microform installations and submission of these data to the advisory committee for review.

6. Preparation of successive drafts of the final report and submission to the advisory committee for review.

Findings

MICROFORM READING AREAS

Microform reading areas should offer facilities designed for the protection of the microforms and the comfort of users. The general lighting should be adequate for moving about, but should be of a low intensity so as not to detract from the clarity of the reading machine screen image. The area should be acoustically treated to reduce machine noise. It should be air conditioned, and temperature and humidity should be carefully controlled. A minimum of 40 sq. ft. should be provided for each reader station.

Security measures for microforms in the reading area need be no more strict than those for conventional library materials, particularly since only use copies – never master negatives – should be provided to users.

Essential to the efficient operation of the reading area is an adjoining work station in which microforms can be inspected, cleaned and repaired.

MICROFORM STUDY CARREL

There is general support – documented during a previous study – for the development of a microform reader carrel which would enable users to change the viewing angle of microform reading machines in accordance with comfort requirements. Present microform reading stations require a somewhat unnatural and largely unchanging posture. Users also expressed a desire for a microform reader carrel which would allow individual lighting; space for note-taking and consultation of other reading materials was also considered an important requirement.

Design sketches of a microform reader carrel which achieves these objectives will be found in the body of this report.

SUPPORTING FUNCTIONS

The priority accorded microforms by the technical processing staff of a library is the key to the successful integration of microforms into the library collections. Proper attention to the accessioning, cataloging and shelf-listing of microforms is essential to the use of microforms as important instructional and research tools. If microforms are accorded a low priority, the information they contain will be buried beyond the ability of user and reference librarian alike to locate. The priority given to the technical processing of microforms must, therefore, compare favorably with that given to books and journals.

A prerequisite for effective processing of microforms in a library is proper and complete inspection. Microforms should be inspected as soon as possible after receipt for both technical and bibliographical quality.

STORAGE AND HANDLING

Microforms need suitable storage and care in handling. Properly processed silver emulsion films, if suitably stored and handled, will remain in good condition as long as the best papers. To attain long life, both books and films need optimum storage conditions.

For microforms, these conditions are set forth in the latest American National Standards Institute's Standard Ph5.4, "Storage of Processed Silver Gelatin Microfilm." The camera negative, usually referred to as the master copy, is reserved for making additional copies. Intermediate copies, which are direct copies from masters, are also reserved for making additional copies. Both master and intermediate copies must be stored in accordance with the specifications of the Ph5.4 standard.

Use copies, usually made from master or intermediate copies, are intended to be used in working files. While normal temperatures and humidities comfortable for human bodies are generally satisfactory for storage of use copies, ideally the temperature should not exceed 70°F for extended periods, and the relative humidity should be no higher than 60%.

Specially constructed, slide drawer metal cabinets are the most satisfactory means of storing microforms. These cabinets are designed specifically to accommodate reels of microfilms or sheet microforms. Their use minimizes misfiling and loss of microforms, protects them from dust and dirt, and uses available floor space efficiently.

Teaching the Use of Microforms and Related Equipment

Acceptance of microforms by library patrons is dependent to a large degree upon the attitude of the library staff toward the medium. For this reason, it is essential that the library staff thoroughly understand microforms, their use, and the operation of related equipment. A staff member, embarrassed by his own inept attempts to assist or instruct a user, often reacts by developing a dislike for the source of his embarrassment, and, consequently, tries to avoid contact with it. He also tends to prejudice the user against it, sometimes in an overt fashion. The user, having similar difficulties, readily adopts the prejudice.

Careful explanation of the use and operation of microform reading equipment, coupled with a modicum of practice and perusal of printed instructions, will enable almost anyone to use it satisfactorily.

III

METHOD AND PROCEDURES

The methodology of this study consisted of the following elements:

1. A literature search on the environmental factors involved in the use of microforms.

2. Determination of the scope of the study, with advice from the advisory committee.

3. Correspondence with firms which manufacture microform equipment, requesting suggestions of microform installations which should be visited.

4. Inspection by principal investigator and, on occasion, members of the advisory committee of organizations and institutions throughout the country which use microforms extensively.

5. Compilation of data acquired from inspection of microform installations and submission of these data to the advisory committee for review.

6. Preparation of successive drafts of the final report and submission to the advisory committee for review.

The principal investigator conducted an extensive literature search for documents relating to the optimum environmental conditions for the use of microforms. Although not a great deal of information was found, several important articles and reports were noted and were distributed to the advisory committee.[2]

The principal investigator wrote to several manufacturers of microform equipment, asking them to suggest microform installations which should be inspected, Although only a few replies were received, they proved helpful.

The advisory committee met with the principal investigator on September 6-7, 1969, to determine the scope of the study, and to discuss the specific topics involved in the "microform environment" which should be given emphasis. Several members of the committee agreed to accept responsibility for providing information on several of the topics agreed upon.

During the months of November and December 1969, Mr. Holmes conducted the bulk of his investigations of microform installations throughout the country. The purpose of these visits was to acquire data on the physical facilities related to the use of microforms. Discussions were held with individuals responsible for microform collections, with special attention directed toward those physical facilities which have proven useful and those which have not. Suggestions for improvement were solicited and were freely given.

The principal investigator fully documented his inspections. This documentation provided the substance of the next two meetings of the advisory committee, held on December 4-5, 1969, and January 6-7, 1970. Decisions were made as to those topics which would serve as the focus of the study report. During these meetings, members of the advisory committee assisted the principal investigator in drafting the preliminary text of some of the recommendations for the optimum microform environment.

As a result of this work, the principal investigator was able to prepare a draft of the final report, which was distributed to the committee during the spring. A review of this draft was the principal business of the fourth and last meeting of the advisory committee, held on May 12-13, 1970. Subsequent to that meeting, a revised draft was prepared and mailed to the committee members for their review.

2. See Bibliography.

IV

FINDINGS

General Microform Reading Area

The use of microforms requires the same environmental conditions, except for lighting, as are found in a well designed library area. The microform reading room should have facilities designed for the protection of the microforms and the comfort of the user.

In arranging the furniture and equipment, it is desirable to place the staff desk near both the room entrance and the catalog. This enables a staff member on duty to aid users and to exercise whatever supervision or control may be necessary. Generally speaking, the area in which the microform use copies are stored should be set apart (not necessarily by partitions) from the area in which the microforms will be used. One advantage in such a separation is more efficient use of floor space, and, in addition, the arrangements for lighting can be made more flexible and convenient. Obviously, the staff member's desk and the bibliographer's desk must each be in a well lighted area, yet so arranged that the light will not disturb the users of the microform readers.

LIGHTING

General lighting in the microform reading area should be of low intensity. The light measured by meter at the work surface should be 15 to 20 footcandles and should be indirect, reflected light. The level of light should be adequate for moving about, but should be of lower intensity than that required for reading or other desk work. If possible, the general lighting intensity should be adjustable by employing a commercially available dim[illegible] device. If the reading room is large, it is desirable to control separate sections of the room's general ligh[illegible] intensity in accordance with the desires of individuals working in particular areas of the room.

If it is necessary to use a room with windows for the microform reading room, curtains or shades should be provided to control entering daylight, which is highly variable and can often interfere with the reading machine screen image. To guard against this, reader screens should be turned away from the windows a full 180°.

CEILING AND WALLS

The ceiling and walls of the reading room should be treated with materials to prevent undesired light reflections from interfering with the reading machine screen image. Glossy paints should not be used. A diffuse, reflective, white material is recommended on the ceiling since it is to serve as a component of the indirect lighting system for the room.

ACOUSTICAL TREATMENT

Acoustical treatment of the reading room should be provided to reduce noise created by reading machines, typewriters, and required conversation of patrons and staff. Many available materials for wall and ceiling acoustical treatment have appropriate light reflection characteristics and can serve dual roles. Further, noise reduction can be gained by covering the floors with a good grade of institutional carpeting.

AIR TREATMENT

The room must be air conditioned and have proper air filtration, humidity and temperature. The air must be constantly filtered to eliminate extraneous matter harmful to microforms, such as dust and industrial gases. Humidity must be maintained at a level which will keep the film flexible but which will not encourage the growth of molds. To be avoided is a condition so dry that static electricity will be generated, thereby attracting dust particles to the film as it is used.

TEMPERATURE

Temperature control for greater than normal reading room capacity will be required. Taken into account must be the body heat of the maximum number of persons who may use the room and the considerable heat given off by projection lamps, motors and auxiliary desk lamps. Temperature should be kept below 80°F for the well-being of the microforms and above 65°F for the comfort of the users. Recommended relative humidity levels are between 40% and 60%.

SPACE REQUIREMENTS

The area needed by users of microforms will vary in accordance with the nature of their work. One using microforms continuously will need more work space than another who consults a film for a few minutes only. Reader stations arranged back-to-back, to take advantage of common electrical outlets as well as common aisles, will usually save floor space. A minimum work space of roughly 40 square feet per user should be provided for furniture, equipment and aisle space. Table height must be coordinated with the chair provided. Reader-printers require more space than simple reading machines to provide access for paper loading and other servicing.

Electrical outlets properly placed and in sufficient number must be provided and, of course, sufficient electrical power must be available.

SECURITY

Microforms used in reading facilities are, or certainly should be, service copies only; i.e., like books they are relatively expendable. While the investment in microforms at times may seem very high, it is generally true that book for book, volume for volume, the unit cost of a microform edition of older materials (ignoring the question of unavailability of hard copy) may be lower than for a paper edition. This is mentioned to place in perspective the value of the microform as compared to books or other generally available materials in the library collections; and, further, to put forth the idea that protection for microforms need not be carried to an extreme. Security measures need not differ greatly from those imposed for regular book material. For certain microforms, however, such as sheet microforms which might be easily carried off without authorization, a charge or other record of use might be warranted. Only the library staff should refile microforms.

Microform Workroom

Essential to the efficient operation of a microform reading room is an adjoining work station at which microforms can be inspected, identified, cleaned and, if required, repaired. Periodic spot inspection of the collections, inspection of microforms used outside of the control of the library, occasional splicing or resplicing of broken film, and film cleaning are the major tasks to be performed at the work station. The inspection of microforms prior to their acceptance and cataloging by the library may also be carried out at the station.

Reading machines are required for close inspection. A quick, general inspection of roll film and microfiche can be accomplished, however, using a light box and magnifying lens. Essential equipment for the work station would be a light box, a pair of film rewinds mounted on a table, a film splicing machine, a magnifying lens and film cleaning equipment.

Over the years, the Library of Congress Photoduplication Service developed by "trial and change" a functional film inspection and splicing desk. More than twenty of these desks are now in use and they have proved to be convenient as well as an efficient aid for the technicians who work with them. It would seem that such a desk or desks could serve many of the requirements of the microform work station.

Thermal butt weld splices are used exclusively by the Library of Congress Photoduplication Service, and, therefore, the desk is equipped with a hinged plate to which the butt weld splicers are attached. For splicing, the machine is pulled forward to accept the film held between the rewinds. (See Figure 1.) For light box inspection and other tasks performed at the desk, the splicers are pushed to the back on a hinged plate with the rear part disappearing below the table top as shown in Figure 2. Other features of the desk are: a built-in light box; a limited storage space for reels in work process; an eye shielded light for desk top illumination; a pair of film rewinds; and drawers to house supplies and personal items belonging to the technicians.

Film cleaning also may be done at the desk. Roll microfilms and microfiches may be satisfactorily cleaned with the non-toxic solvent, Freon TF, and lint proof cloths, high quality chamois or fine, chemically produced sponges. Carbon tetrachloride should not be used in the cleaning process because of its toxicity.

The Central Microform Library (Non-circulating)

The non-circulating central library concept has been particularly successful for special libraries using microfiche. In lieu of making material available for use on the premises, diazo or vesicular copies (fiche-to fiche) are made of desired titles, from intermediate copies, in response to requests of researchers, teachers and others entitled to the service. Typically, the researcher, or his secretary, places the order and carries it away in a single transaction, since copying can be accomplished in a few minutes. Requests can also be made by telephone and the fiches delivered by messenger or even mailed. This service is often free of charge to the user in industrial libraries where costs are absorbed in overhead. In academic institutions, a nominal fee would probably be required.

Fiche-to-fiche duplicating equipment and staff to operate it are required in such a library. Microform reading machines, both portable and non-portable, are usually furnished for permanent assignment or for loan by the library.

A prerequisite to the assignment or loan of a microform reading machine is an indoctrination in the proper use and care of the machine.

Additional Microform Reading Areas

If microforms are dispersed within a library or among a number of libraries according to subject, the additional microform reading facilities should conform as much as possible to the conditions set forth above for a general microform reading room.

Microform Carrel

The survey conducted during the interim study, *Determination of User Needs and Future Requirements for a Systems Approach to Microform Technology*, revealed that library users believed presently available microform reading machines were inadequate for prolonged use. One of the reasons frequently cited for this belief was that the height and angle of reading machine screens were fixed. The fixed position required the reader to be in a disciplined posture which had to be maintained with little or no variation for the duration of use. Not only do individuals vary in height and bulk, but human muscles and nerves demand, for comfort, occasional changes in posture. It was recommended that a microform reader carrel be designed that would easily permit a

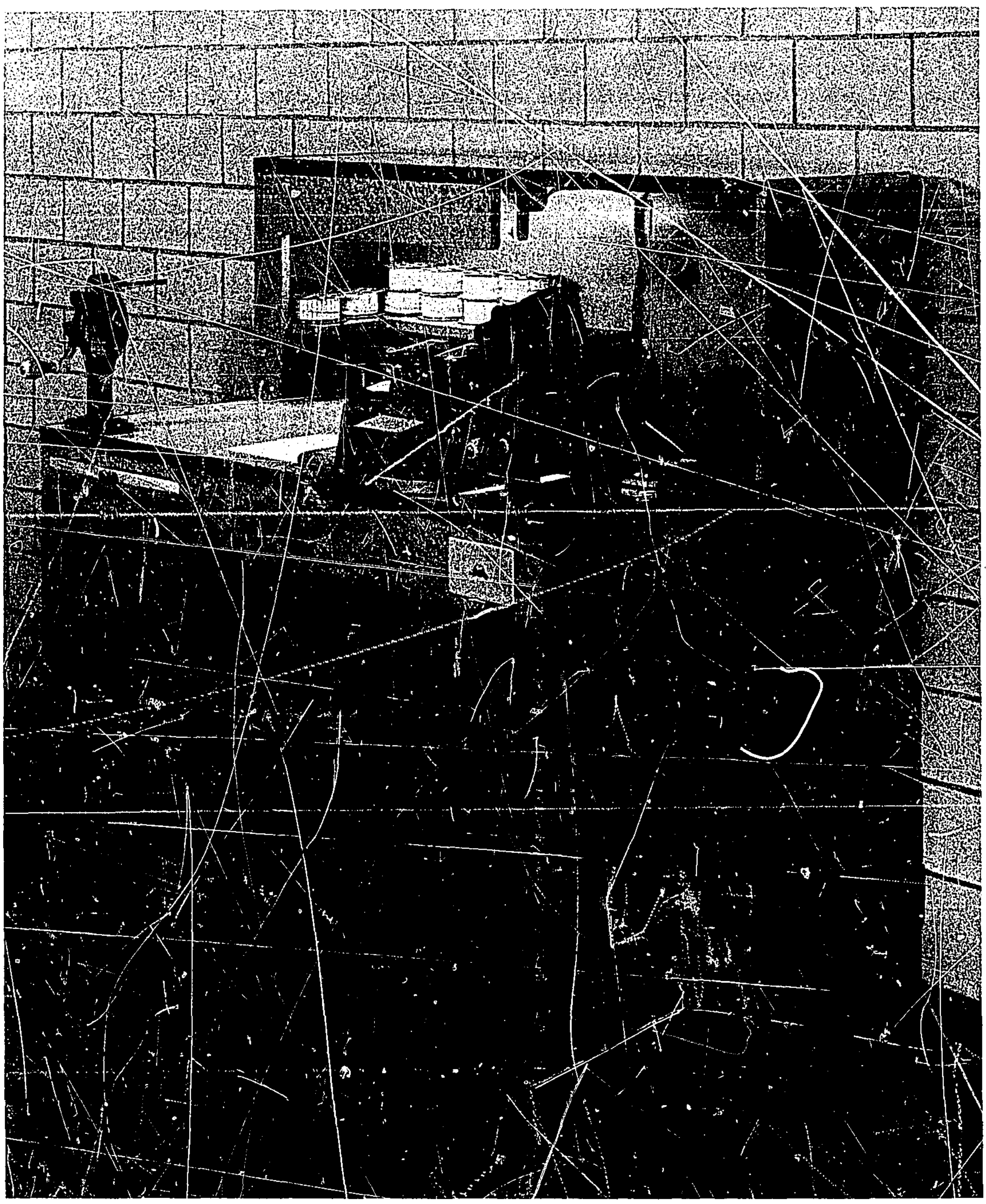

Figure 1
Film Inspection and Splicing Desk
Developed by Photoduplication Service,
Library of Congress

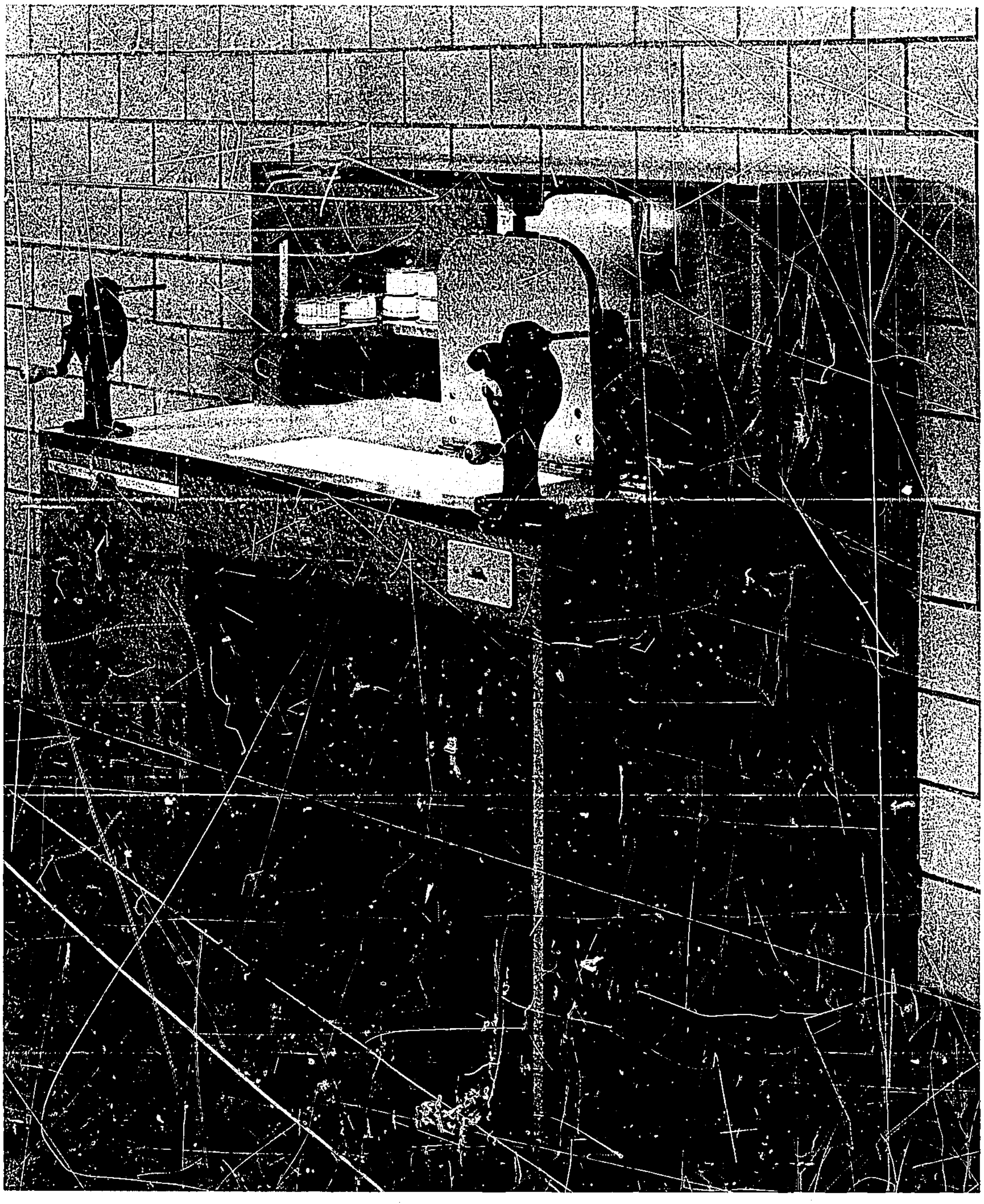

Figure 2
Inspection and Splicing Desk with Splicers Retracted

change in the height and angle of the reading machine screen in order to accommodate the comfort requirements of the individual user. Other desired features of the carrel were adequately illuminated auxiliary work space for note-taking, and shelving for a limited number of reference books.

The following sketches illustrate desired performance features of such a carrel. (See Figures 3-6.) They do not include engineering specifications since the performance characteristics can be accomplished in a variety of ways, from manual to push-button adjustments. Construction costs, of course, will vary with the degree of complexity of the adjustment mechanism.

The sketches show that the carrel table is divided into two sections. An auxiliary work space on the right has a fixed height above the floor. The space on the left (the "stage"), intended for the microform reading machine, should be able to be raised or lowered from the fixed height of the auxiliary work space. A user should be able to lock it firmly at any point within its vertical path. (See Figures 4 and 6.) The turntable, which pivots horizontally and tilts both forward and backward with lock positions anywhere within its travel span, allows the microform reading machine to be moved and then held securely into any one of a number of positions. (See Figures 4 and 5.) With such a device, one may change the viewing screen height and viewing angle and alter his posture during long terms of microform reading. For added convenience, a drop-down, pull-out shelf is placed under the reading machine holder and a pull-out shelf is included in the auxiliary work space. (See Figure 4.) Adjustable book shelves and a non-glare work lamp are also provided.

Specifications for the carrel are as follows:

1. Carrel dimensions:

height:	60 in.
width (ID):	60 in.
depth (ID):	54 in. (Pull-out shelves extended)

2. Height of work space table and normal height of reading machine stage: 29 in. above floor.

3. Width of work space table: 28 in.

4. Depth of work space table: 32 in.

5. Adjustable shelves to be placed above rear of work space table.

6. 2 in. clear space to be provided on side and at rear of reading machine stage.

7. 27 in. turntable to be centered within the designated area (30 in. x 30 in.) for reading machine stage.

8. Stage to move 4 in. above and 4 in. below normal position, with stop positions at any place within the 8 in. travel.

9. Turntable to revolve on pivot, 30° maximum, with provision to lock at any position.

10. Turntable to tilt from horizontal position 6° upward from front or back, with stop positions any place within its travel.

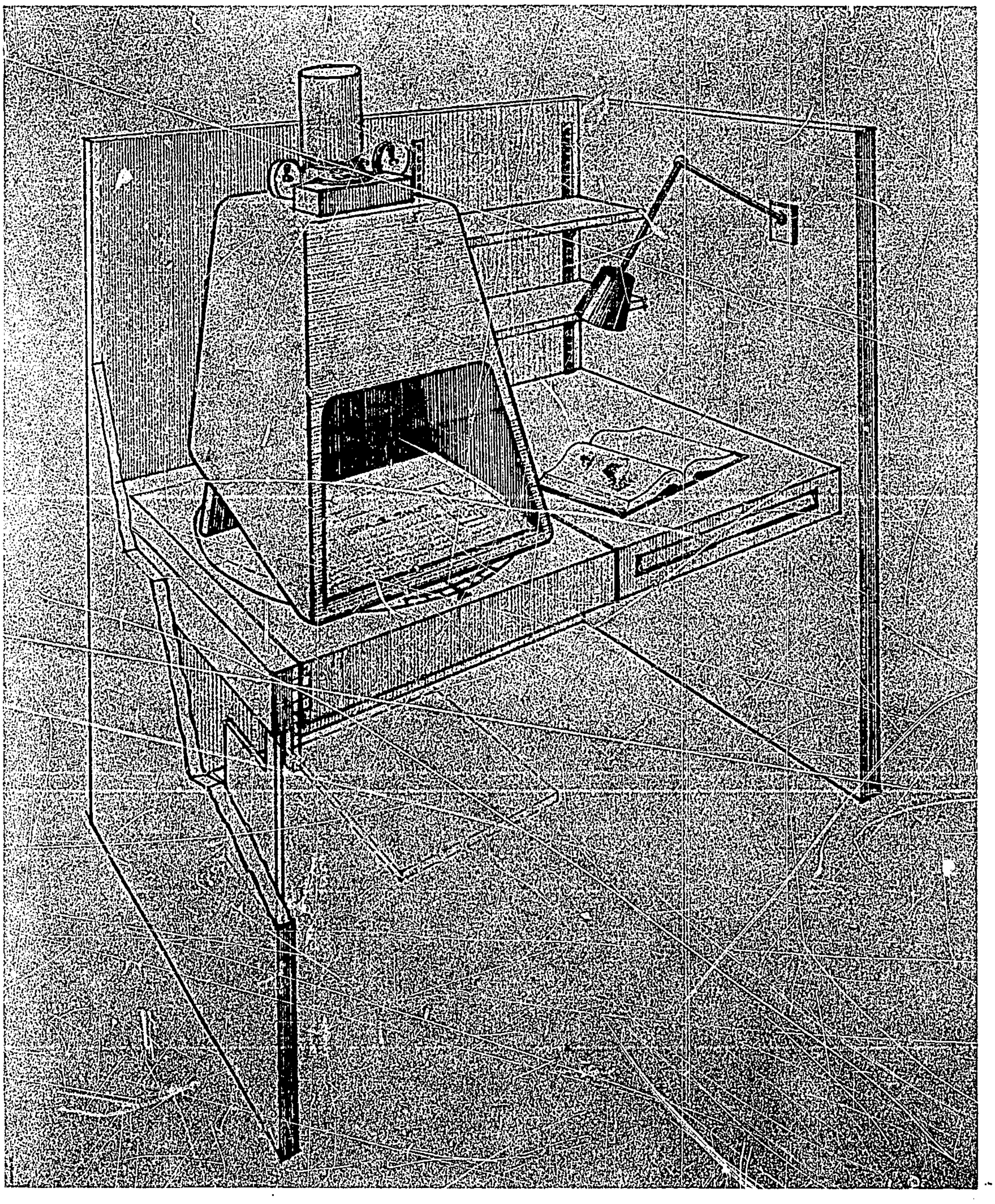

Figure 3
Design Sketch of Proposed Microform Carrel, Showing Reader Stage in Place at Normal Height and Angle

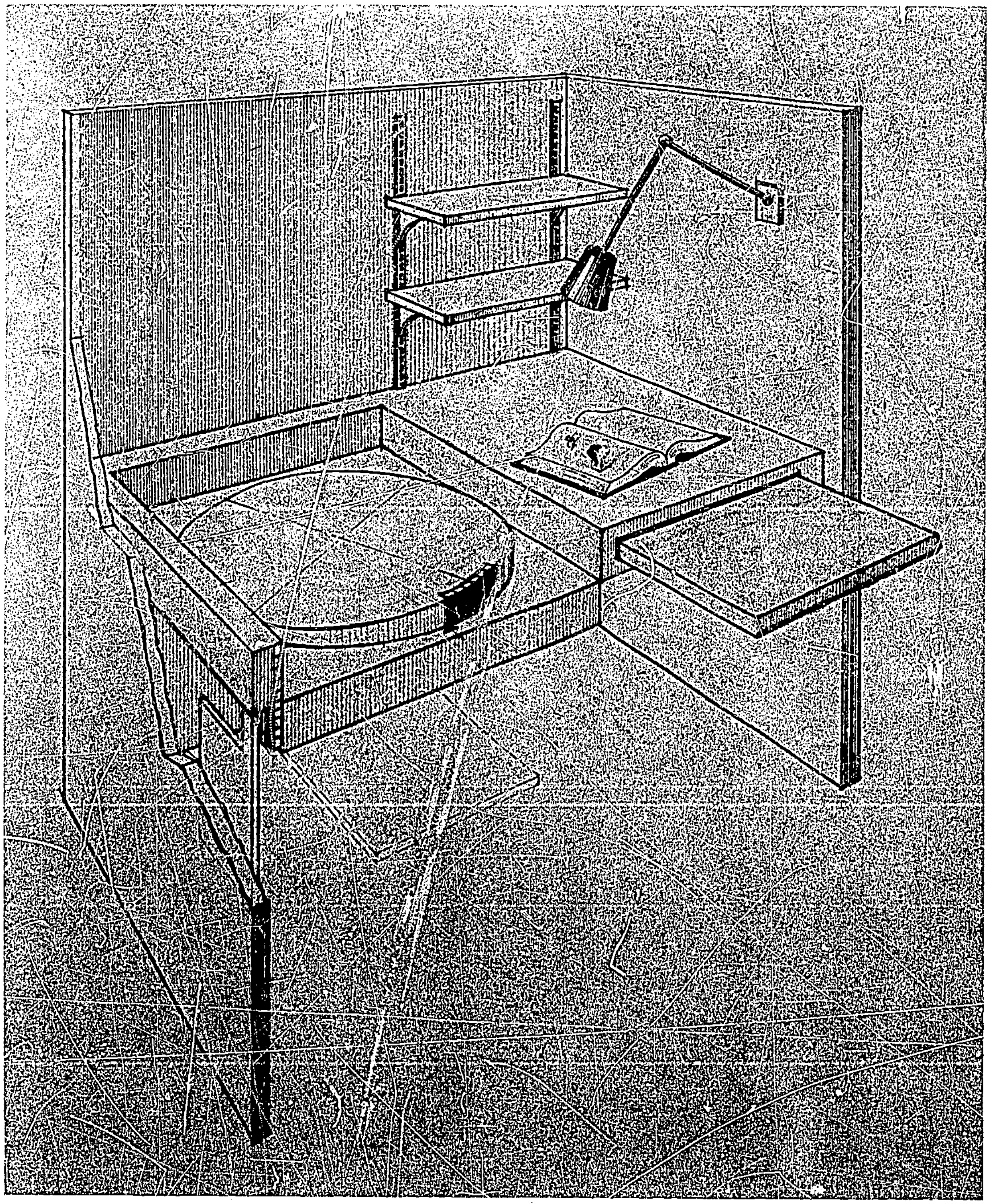

Figure 4
Proposed Carrel, Showing Stage in Lowered Position with Turntable Tilted Backward and Turned Counter-Clockwise

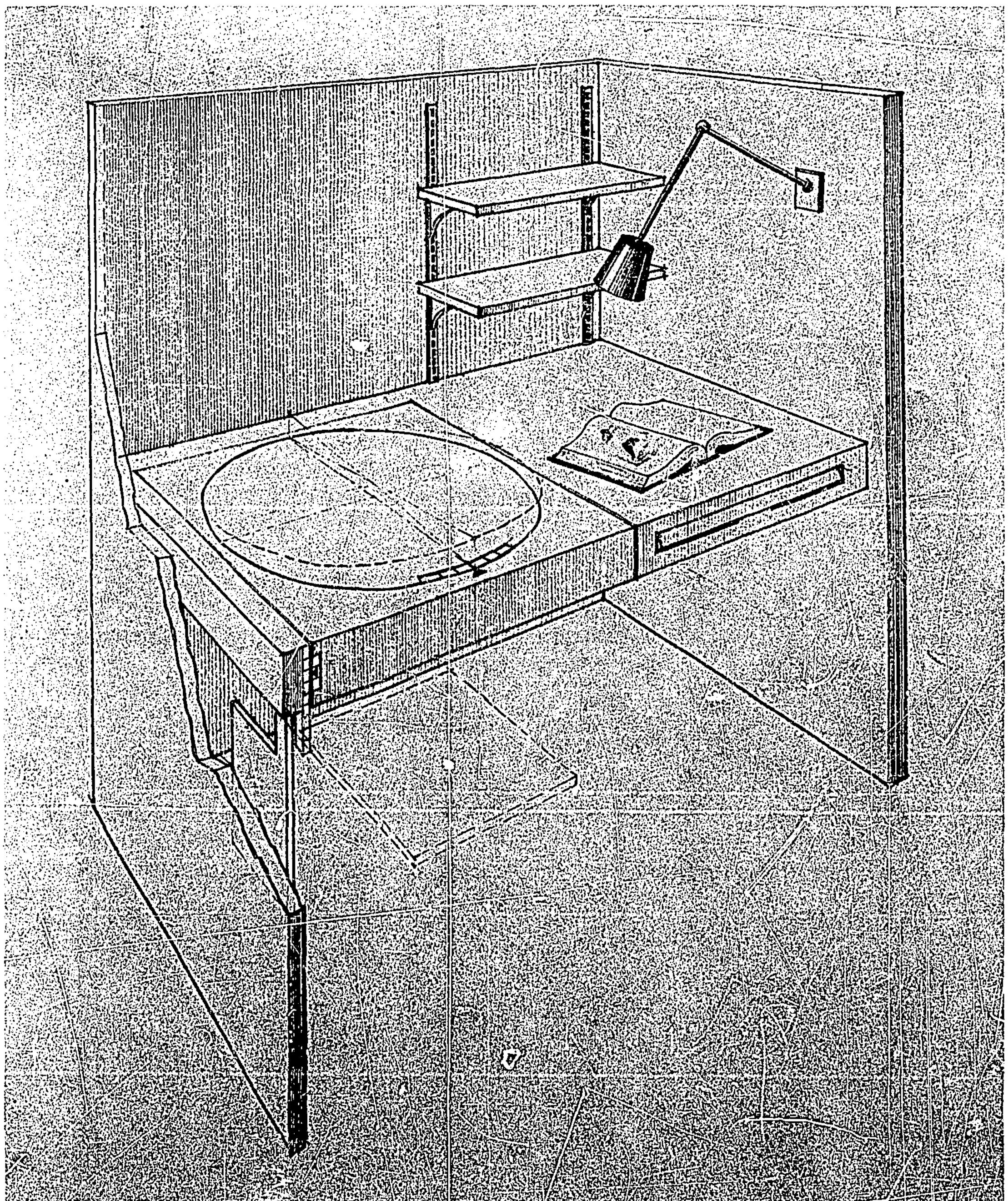

Figure 5
Proposed Carrel, Indicating Tilting Capabilities of Turntable

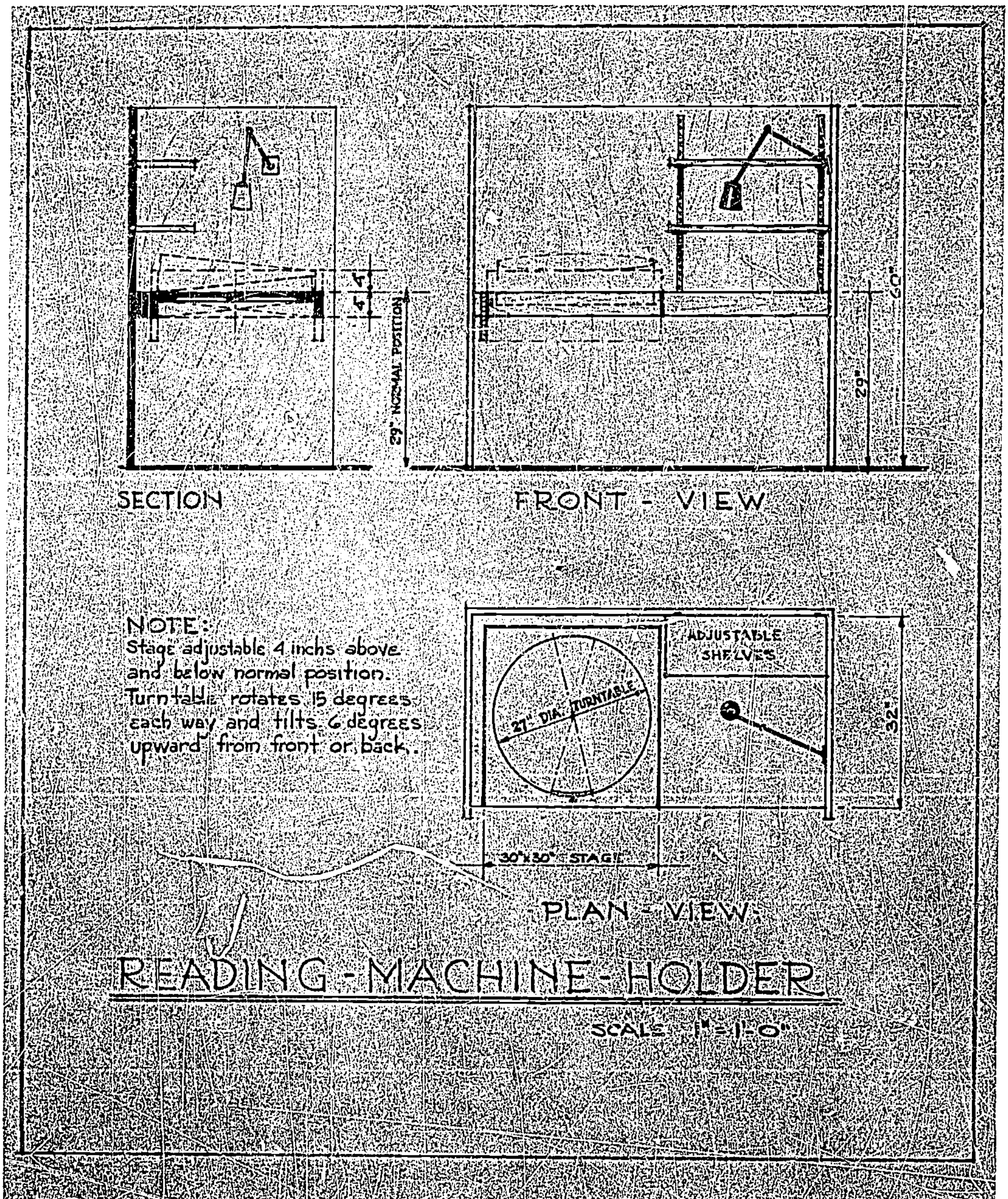

Figure 6
Proposed Carrel: Section; Front View; Plan View.
Dimensions Indicated.

CATALOGING

The key to the successful integration of microforms in a library collection is probably the treatment to which they are subjected by library staff in making them available in the reading rooms. The priority assigned to technical processing of microforms – accessioning, cataloging, shelflisting, etc. – can either establish a new research tool in a library or can bury the information beyond the ability of user and reference librarian alike to locate it. Processing of microforms should enjoy equal priority with macroforms, i.e., hard copy. Otherwise, technical services personnel are allowed to make arbitrary judgments on which format takes precedence over content. By such logic, a novel by Spillane in eye-legible print is more important than the Dead Sea Scrolls in microform. Yet failure to assign priority in processing in accordance with content rather than eye-legibility of print persists and probably is the most serious road-block impeding full and free use of micropublications.

While on the subject of equal treatment, it is appropriate to remark that the environment in which catalogers of microforms work should be at least as comfortable and convenient as that provided the users of the end product. This environment should include ready access to acceptable microform reading machines, adequate training in their use and provision of all facilities mentioned in connection with microform reading areas.

INSPECTION

A prerequisite for effective processing of microforms is proper inspection. Microforms should be inspected as soon as possible after receipt for both technical and bibliographic quality. Technical inspection should verify that the microform is on a safety base carrier, that all images are properly aligned, and that they are fully legible, clear, sharp and evenly lighted. Scratches, abrasions, dust and dirt impair the life of microforms, as well as reading equipment; their presence should be detected and ameliorative measures taken.

Microfilm should be wound on reels in length of no more than 100 feet and should be provided with at least 18 in. of leader and 18 in. of trailer. Splices are a potential source of trouble in reading machines and should not be present when microfilms are delivered by the publisher or producer. The existence of splices made with cellophane, pressure-sensitive tape should be cause for immediate rejection of the film.

The reels of film should be received in boxes that allow easy access to the reels and are made of material free of chemicals harmful to the film. Outside dimensions of the boxes should not exceed 4 in. x 4 in. x 1 $^{9}/_{16}$ in. for 35mm film. Each box should bear a label on one end, giving as much of the bibliographic information taken from the enclosed microtext as possible, without crowding the label. If the reel is part of a set, the label should also indicate the reel number and a full citation of the bibliographic contents of the particular reel (inclusive dates, volumes, etc.), criteria for bibliographic arrangement, and targets.

Material which requires more than one roll of film should be divided on a systematic and bibliographically acceptable basis. Serials should be divided so that each reel contains the issues for an entire volume or volumes. Newspapers should be divided on a regular calendar basis. All sections and pages of newspaper files should be recorded on the film. Numbered or lettered sections should appear in numerical or alphabetical order, followed by unnumbered sections.

Appropriate targets should appear at the beginning and end of each reel of film and as necessary throughout the film. The first frame on a reel of film should contain the one word, "START," and the last frame the word, "END." The height of the letters measured on the film of these and subsequent targets referred to should have a minimum height of 2mm (0.8 in.).

Following the "START" target and preceding the "END" target, there should be bibliographic targets identifying the work.

For newspapers, the target should provide at least the country and city of publication, the title, and the inclusive dates filmed. For monographs, the author, title, edition (if other than the first), place of publication, publisher and date of publication should be provided; for serials, the title, place of publication, inclusive volumes and dates recorded. For manuscripts, a general description of the material should be given. If the material covered by the bibliographic target extends over more than one reel, a secondary bibliographic target indicating the contents of the particular reel should appear immediately following the primary bibliographic target. Bibliographic data should be established in conformity with the *Anglo-American Cataloging Rules* and *Rules for Descriptive Cataloging in the Library of Congress* and supplements thereof.

The name of the organization or institution responsible for the actual filming and the year of the filming should be provided in a preliminary target. With microfilms of newspapers and serials, there should appear a list of missing issues filmed on a separate frame or frames immediately after the bibliographic target and, if used, the secondary bibliographic target. If the file is fragmentary, a list of issues filmed may appear.

An indication of the reduction ratio should be provided on one of the preliminary targets by inclusion of a metric rule fifteen centimeters long.

Microfilm of newspapers should include a target indicating the month of publication preceding the issues of each respective month. When several volumes of a serial have been filmed, a target indicating each volume (or year, or year and volume, as appropriate) should appear before the issues for that volume or year.

Faults in the original (i.e., mutilated or illegible pages) should be shown by targets indicating that the faults were not errors in filming.

REPRODUCTION FROM MICROFORMS

Until recent years, the reproduction of library materials, either from bound volumes or from microform, was performed by commercial service companies or by the relatively few libraries equipped with photoduplication laboratories. Hard copies (eye-legible copies) were produced from microforms in a darkroom, using photographic projection equipment, materials and wet processing. Such procedures often required more time than the library patron could tolerate for his "walk away with" reference needs. Manufacturers have responded to this problem by designing reader-printers which combine the functions of microform reading machines and automated darkroom processing facilities into a single housing or box for operations in a normally lighted room. Most reader-printers have fixed enlagement ratios and some difficulties are encountered when the reduction ratio of the microform is not compatible with them. Reader-printer viewing screen sizes and the dimensions of the prints produced by the machines may also contribute to these difficulties.

As with microforms reading machines, a variety of reading screen sizes are available. The reading screen size of a reader-printer often parallels the dimensions of the prints which it produces. For this reason, the size of the reader-printer screen chosen for library use is more important than the screen size of a microform reading machine. By manipulating a microform to cause sections of its image to appear on a microform reading machine screen, it is possible, although not convenient, to view an entire image even though the screen is too small to accommodate it all at one time. If the dimensions of the viewing screen of a reader-printer and the hard copy that the machine produces are too small to record the entire microform image at hand, neither manipulation of the microform nor adjustment of the machine can produce a satisfactory reproduction.

A number of processes are employed by various reader-printers for making hard copy from microforms, Some reader-printers deliver prints that contain chemicals that may damage neighboring library materials with which they may be interfiled. Some deliver damp prints that curl in the process of drying. Some provide prints with white backgrounds and black letters when positive microforms are used; however, most require negative microforms to accomplish this. Some produce prints with poor blacks that lack contrast with their backgrounds and are difficult to read. Many require critically accurate exposures that cause wastage with trials to produce fully satisfactory reproductions. Some use papers that in time change background colors from white to shades of yellow or brown. Some require specially made paper, with metal sandwiched between its two outer layers, which is stiff to handle and cracks when folded.

It is recommended that before purchasing a reader-printer for library use, the machine be acquired on loan or by rental purchase agreement to learn if it will satisfactorily perform the desired functions using the microforms at hand.

MAINTENANCE

There can be no doubt that poor care and maintenance of microform reading equipment has a very adverse effect on the user. Unsatisfactory condition of equipment speaks louder than words that microforms are not high priority library resources, but rather something to be tolerated, a mere substitute for a hard copy version of the "real document."

Neglect is the most eloquent unspoken indication that a person holds an object in low esteem, whether it be a house, a lawn, an automobile or a beard that is allowed to degenerate. Unless the librarian has sufficient regard for the use of microforms he is likely to give little or no attention to the upkeep of equipment which is an indispensible auxiliary to the use of microforms. A negative or positive attitude toward microforms on the part of the librarian will in this wordless manner be quickly communicated to the potential user. Any microform program must entail, for these reasons as well as more obvious ones, routine, but genuinely attentive, maintenance effort for the reading equipment. This should include a daily check, and a daily or weekly cleaning, as well as a regular preventive maintenance routine. Additionally, the timely repair of defective equipment should be provided.

Storage and Handling

Microfilms, like books, need suitable storage and care in handling. Properly processed stored silver emulsion films will remain in good condition as long as the best papers. To attain this long life both books and films need optimum storage conditions. For microfilms, these conditions are described in the latest American National Standards Institute's Standard Ph5.4., "Storage of Processed Silver Gelatin Microfilm."

This standard cautions against using any materials near the film which will deteriorate and give off peroxides or other oxidizing agents. It is emphasized that the use of paper and rubber products are to be avoided and that only non-deteriorating plastics or inert materials should be used for container coatings.

TEMPERATURE AND HUMIDITY

Temperature and humidity limits are also specified by the standard, and their effects are discussed. It is established that low relative humidity and temperature lessen the possibility of degradation of the film.

However, the standard also indicates that maintaining these conditions constantly is also important, since cycling the film in both high and low temperatures and humidities, if not carefully controlled, may cause physical and chemical changes. Therefore, the lowest convenient constant temperature and relative humidity below the values stated will provide the best storage conditions.

Where silver films must be available for regular use, it is not feasible to adhere fully to the American National Standards Institute's standard. The life of the film can be adversely affected by careless handling, exposure to contaminated atmospheres, high relative humidity and temperature. Tests indicate that, ideally, silver film can safely be used for extended periods in a temperature of 80°F or less and humidity of 60% or less. However, normal temperatures and relative humidities for human comfort will probably prove satisfactory for use of microforms without damage.

While the ANSI standard does not include diazo or vesicular film, most of it applies equally well to them. Tests have indicated that diazo film will fade if exposed for long periods to ultraviolet light. With normal use and if filed in library filing cabinets, it is known to remain substantially unchanged for over 20 years. Its total life could be much longer. Vesicular film, if not properly processed, can deteriorate when exposed to high temperatures. When stored at temperatures below 80°F and a relative humidity of 60% or lower, its life appears to be very long.

STORAGE EQUIPMENT AND FACILITIES

The storage standard previously referred to details the care needed in the selection of storage supplies, equipment and facilities. An article in the *International Micrographic Congress Journal*, (Second Quarter, 1969), and the accompanying bibliography of original source material, provide much additional information. In addition to temperature, humidity and air purity conditions, other important factors should be considered.

1. Microfilm, either for use or archival storage, should be well protected from physical or chemical damage by placing it in containers which are free of acid, sulphur and peroxide. Corrosive metals should not be used.

2. Specially designed filing facilities, such as upright drawer files, are available for 35mm and 16mm film boxes, aperture cards, various sizes of microfiches and jackets. Shelving is also available for microfilm containers.

3. Some years ago it was a common practice to put a humidity stabilizing solution in the bottom portion of filing cabinets in which microfilm was stored. This practice has been almost completely abandoned and is not recommended.

4. The storage facilities should be constructed with either a metal, well covered by inert paint, or with stainless steel or aluminum.

5. Films should be stored high enough above ground to avoid flood damage.

6. Interfiling of vesicular and silver film for archival storage is not recommended. While no interaction has been observed between diazo and silver film, some authorities advise against it. Interfiling of use copies is acceptable. A study on this latter subject appears in the *1958 Proceedings of the National Microfilm Association*.

7. When it is not possible to store valuable films in a fire-proof vault, a fire rating of at least one hour should be required for storage cabinets.

8. Unless sheltered from water, film should not be stored in an area where fire sprinklers are installed. In fires, internally generated steam accounts for a substantial part of the damage.

9. Tightly packed films are less affected by either fire or humidity than loosely packed films.

10. Uric acid from hands and skin deteriorates silver film, and care should be exercised to handle the film only at its edges.

STORAGE OF MASTER, INTERMEDIATE AND USE COPIES

The term, "master copy," is susceptible to a number of definitions, but it usually means the camera negative. If it is not available, the master copy is the nearest generation to the camera negative. In either case, this film is normally treated with great care, stored in archival storage conditions described in American National Standards Insitute Standard, Ph5.4, "Storage of Processed Silver Gelatin Microfilm," and brought our for use only when absolutely necessary.

Most libraries do not possess master microform copies and for this reason details of archival storage are not provided in this report. (The standard referred to does provide complete details and may be obtained from the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.)

An "intermediate copy" is often called a "sub-master" and is a direct copy from the master. It is made for the purpose of making additional contact copies so as to protect the master from wear and possible damage resulting from too requent removal from and return to archival storage conditions.

The intermediate is often stored in favorable but accessible facilities.

A "use copy" is usually made from an intermediate or a master and is intended to be used in a working file. While comfortable working temperatures and humidities are generally satisfactory, ideal storage conditions should not be over 70°F for extended periods and the relative humidity should not exceed 60%. High temperatures and particularly high humidity encourage fungus growth, blemishes, cause layers of film to stick together, and also speed chemical reactions and deterioration if films have not been properly processed.

Microform use copies may be shelved in a variety of ways. The most satisfactory method employs specially constructed slide-drawer metal cabinets. These cabinets are designed specifically to accommodate reels of microfilm or sheet microforms. Their use minimizes incidents of misfiling and loss of microforms, protects them from dust and dirt, and efficiently utilizes floor space. The cabinets are approximately the height of the familiar office file cabinets but some are constructed so they may be double or triple stacked where ceiling height permits. Although multiple stacking reduces required floor space, such a practice diminishes convenient access to the higher drawers and is not recommended for active microform files.

A method frequently employed for shelving microfilm reels in libraries is to place them in their labeled container boxes on regular stack shelves. Open-stack shelving makes use of readily available space, but space utilization is not efficient, dust protection is not offered, and losses occur when boxes are pushed out of sight to the rear of the shelf.

Where "in-house production facilities" exist, shallow depth shelves have been inexpensively fabricated of wood or sheet metal to house limited collections of reel microfilms around the walls of the microform reading room. Some libraries have had such shelves installed on the walls of book stack areas. While this type of storage is not as desirable as storage in cabinets specifically designed for the purpose, the cost is small by comparison and, in any event, it is preferable to use of standard stack shelves because it saves space and reduces incidence of loss.

With the exception of the ink printed micro-opaque cards manufactured by the Readex Co., which are furnished in labeled, dust protective boxes, sheet microforms are generally stored in slide-drawer cabinets to maintain their orderly arrangement and to protect them from dust and loss. The boxes supplied by the Readex Co. have dimensions that resemble an average book and are conveniently housed on stack shelves. Photographic type micro-opaques that are not laminated have a strong tendency to curl and must be stored in cabinet drawers or boxes under constant pressure to maintain them in a flat condition for use. Rigid blocks of substances not harmful to the cards, with a minimum thickness of ½ in. cut to the size of the cards and inserted as separators at intervals of 25 to 50 cards, are almost a necessity to maintain a full file drawer of non-laminated cards in a non-curl condition.

A recent development for microform storage is the cartridge carrousel filing system for both roll and sheet microforms. Single tiered, desk-top units, movable at finger touch, to seven tiered, motor driven units up to 9 feet in diameter, are available. A single tiered, desk-top unit is said to house 5,000 microfiches in special cartridges, while a tier of the large diameter carrousel is said to house more than 125,000 microfiches. Such equipment is not inexpensive, but its cost might be justified by need for compact storage of high use material requiring rapid access.

V

TEACHING THE USE OF MICROFORMS AND RELATED EQUIPMENT

GENERAL

Acceptance of microforms by library patrons is dependent to a large degree upon the attitude of the library staff toward the medium. For this reason it is essential that the library staff, particularly the chief librarian, thoroughly understand microforms, their use, and the operation of the related equipment. Only then can users be persuaded that microforms have real utility and are a medium with which a person with no special aptitudes can work. If, however, the head of the library is negatively disposed toward the microformat, or if he is ignorant of its virtues and the mechanics of its use, it is almost certain that his viewpoint will be transmitted to at least a portion of the staff and thence to users. Moreover, because of the many other demands upon the library's space, money and personnel for functions which he understands much better, the librarian is less likely to establish or support an effective microform activity, especially since it is not an inexpensive undertaking. Education, then, must begin at home – with the chief librarian and his senior staff. Somehow they must be convinced that microforms are a modern form of publishing which makes resources available in college and university libraries which would otherwise be hard pressed to build and expand their informational resources to the level commensurate with the academic programs.

STAFF TRAINING

In training the staff, operation of microform equipment should be given emphasis equal to that given the intellectual aspects of administering the collection. Much of the dissatisfaction with microforms, felt by librarian and user alike, is caused by the frustration and embarrassment resulting from inability to competently operate reading machines. The librarian, finding himself inept as he attempts to assist or instruct a user, often reacts by developing a dislike for the source of his embarrassment and, in consequence, tries to avoid contact with it. By his reaction, he also tends to prejudice the user against microforms and associated equipment, frequently in an overt fashion. The user, encountering similar difficulties, readily accepts the negative attitude.

Few persons not in the business of selling microforms or reading machines would claim that such equipment, especially that used with roll film, is easy to operate. Most first-time users will have at least some difficulty with roll film readers and many will make a complete botch of it, even to the point of damaging the film. Quite a number of individuals will be so repelled by initial difficulties that they will not make another attempt except when forced to do so. Nevertheless, years of experience with novice-users' encounters with microform machines have demonstrated to custodians of microform reading rooms that careful explanation of the operation of the devices, coupled with a modicum of practice and study of printed instructions, will enable almost anyone to do a satisfactory job of using them. Therefore, it is important to carefully and patiently explain the details of operating microform reading machines and to provide detailed printed instructions for the user to refer to when on his own. It is also highly desirable for a staff member always to be available who would be able and happy to assist when difficulties arise.

Training the staff to operate reading equipment should not, in the main, be left to sales representatives, although it can be quite helpful to use whatever training services they provide to develop an understanding on which to base an instructional program. The man who sells the machine is ordinarily the best person to ask first. He should also be able to provide instruction manuals.

USER TRAINING

Training for the user should include oral instruction, demonstration and provision of a user's manual. Initial instruction can be provided to groups of new users, but during the first time a person actually loads, operates, and unloads the equipment he should be given personal assistance to see that he has gotten "the hang of it." This applies particularly to microfilm readers and to all reader-printers. If training classes are held for groups of potential users, it would be well to supply a training film. Among other things, it should illustrate the special characteristics peculiar to microforms (such as images requiring 90° rotation, positive and negative images, etc.), using samples from either sections cut from defective film or a specially prepared film.

Instruction should include explanations of how to use equipment to the best advantage, as well as techniques for circumventing or lessening the effect of limitations of microforms. For example, small text can often be made more readable by using a lens of greater magnification than that required to produce an image equal to the size of the original; or eye-legible reader-printer copies of tables or graphs can be made, to be referred to when reading the associated text in microform.

The importance of user attitude to the success of a library microform program can hardly be overemphasized. Librarians should imbue a positive viewpoint toward the medium as a source of information, and minimize any incidental factors which may tend to produce anxiety or excessive caution in the user. The importance of feeling comfortable and familiar with the minor technicalities of the machines has been stressed. Also important is to underplay the danger of damaging the film or the equipment. While it is true that microfilm is in some ways a more fragile medium than most books and that reading machines and film can be relatively easily damaged by misuse, this consideration must be subordinated to the objective of encouraging the freest possible use of microform materials. Users should be encouraged to report damaged film or equipment without concern that they will be required to pay for the damage. Such reporting can be made a part of a general scheme whereby the user is invited to comment on any aspect of the total system which is deficient, whether it be film damage, poorly processed microforms, missing pages, unsatisfactory environmental conditions in the reading area, bibliographic deficiencies, incorrect shelving, or any other unsatisfactory circumstance he experiences. Wherever this technique can be made to operate, it offers an excellent means of keeping tabs on a mumber of factors related to the adequacy of the installation. Toward this end, it is worth considering a very simple form, copies of which can be kept near each reading machine and on which the user can note any difficulty or deficiency he encounters.

MANUALS

Operating manuals should be as clear and concise as possible. They should be illustrated to the maximum degree practical. In particular, illustrative diagrams should be included for threading microfilm reading machines (header position for microfiche reading machines). Any other function likely to cause difficulty or to result in damage to the media or equipment should be carefully explained and illustrated. Instructions should include a trouble-shooting section to enable the user as often as possible to clear the fault without assistance. However, each situation which suggests a condition from which damage might result if the user attempts to correct it should be clearly marked as one for which assistance should be sought. Generally, the user's manual should not explain procedures which the user should not perform, for example, replacement of lamps in readers and adding developer to a reader-printer. At the same time, it is desirable to include a limited amount of information concerning cleaning of the equipment. If there is a doubt as to whether manuals provided by equipment manufacturers are satisfactory, a worthwhile procedure is to try them for a while. If they are not, it is usually best to produce a new manual rather than add to the existing one.

BIBLIOGRAPHY

Applebaum, Edmond L. "Implications of the *National Register of Microform Masters* as Part of a National Preservation Program." *Library Resources & Technical Services* 9 (Fall 1965): 489-94.

Avedon, Donald M. *Glossary of Terms for Microphotography and Reproductions Made from Micro-Images.* 3d edition. NMA Informational Monographs, 2. Annapolis, Md.: National Microfilm Association, 1964. 67pp.

Ballou, Hubbard. *Guide to Microreproduction Equipment*. 4th edition. Annapolis, Md.: National Microfilm Association, 1968. 493pp.

Boone, Samuel M. *Current Administrative Practices in Library Photographic Services*. Chapel Hill, N.C.: University of North Carolina, 1964. 81pp. Unpublished M.A. thesis.

Born, Lester K. "Planning for Scholarly Photocopying." PMLA 79 (September 1964): 77-90.

Clapp, Verner W., Henshaw, Francis H., and Holmes, Donald C. "Are Your Microfilms Deteriorating Acceptably?" *Library Journal* 80 (March 15, 1955): 589-95, 612, 613.

Educational Facilities Laboratories. *The Impact of Technology on the Library Building*. 1967. (ERIC #ED 018 147; microfiche, 25 ¢; hard copy, 56¢).

Fouquet, Bernard H. "The NBS Microcopy Resolution Test Chart." *Proceedings of the National Microfilm Association, 1963.* Annapolis, Md.: National Microfilm Association, 1964. (Includes the record of an extensive discussion on use of the charts.)

Fussler, Herman. *Photographic Reproduction for Libraries: A Study of the Administrative Problems.* Chicago: University of Chicago Press, 1942. 208pp. Out of print.

Hawken, William R. *Copying Methods Manual.* LTP Publication No. 11. Chicago: American Library Association, 1966. 375pp.

Hawken, William R. *Enlarged Prints from Library Microforms.* LTP Publication No. 6. Chicago: American Library Association [1963]. 131pp.

Hawken, William R. *Photocopying from Bound Volumes.* LTP Publication No. 4. Chicago: American Library Association, 1962. 208pp.

Hawken, William R. "Photocopying from Bound Volumes." 3 supplements. Chicago: American Library Association, 1964.

Henn, R. W. and Wiest, D. G. "Microscopic Spots in Processed Microfilm: Their Nature and Prevention." *Photographic Science and Engineering* No. 7 (1963): 253.

Holmes, Donald C. "The Needs of Library Microform Users." *Proceedings of the National Microfilm Association, 1969.* Annapolis, Md.: National Microfilm Association, 1970. pp. 256-260.

LaHood, Charles G. "Production and Uses of Microfilm in the Library of Congress Photoduplication Service." *Special Libraries* 51 (February 1960): 68-71.

LaHood, Charles G. "The Serial Microfilm Program at the Library of Congress." *Library Resources & Technical Services* 10 (Spring 1966): 241-248.

Lewis, Chester M. and Offenhauser, William H. *Microrecording: Industrial and Library Applications.* New York: Interscience, 1956. 456 pp. Out of print.

McCamy, C. S. and Pope, C. I. "Redox Blemishes: Their Cause and Prevention." *The Journal of Micrographics* 3 (Summer 1970): 165-170.

Marriotte, John. "How Close Is Your Neighbor?" *Industrial Engineering,* October 1969, pp. 14-18.

"Microcopies: Legibility Tests. Description and Use of the ISO Micromire (ISO Micro Test Object) for Checking a Reading Apparatus." (ISO/R 68901968). 1st edition. Geneva: International Standards Organization, 1968. 7 pp.

National Microfilm Association. *Glossary of Terms for Microphotography and Reproductions Made from Micro-Images.* Edited by Donald M. Avedon. 4th. Revised Edition. Informational Monograph No. 2. Annapolis, Md.: 1966. 70pp.

Nelson, Carl E. *Microfilm Technology: Engineering and Related Fields.* New York: McGraw-Hill, 1965, 397pp.

Nelson, Carl E. "Status Report on Micro-Blemishes." *International Micrographic Congress Journal* No. 7 (Second Quarter, 1969): 17-26.

Simonton, Wesley. "The Bibliographic Control of Microforms." *Library Resources & Technical Services* 6 (Winter 1962): 20-40.

"Storage and Preservation of Microfilms." Kodak Pamphlet P-108. New York: Recordak Corporation, 1965. 10pp.

U.S. National Bureau of Standards. *Report of a Study of Requirements and Specifications for Serial and Monograph Microrecording for the National Library of Medicine.* By Edward J. Forbes and Thomas C. Bagg. NBS Report 9446. Washington: National Bureau of Standards, 1966. 100pp.

Veaner, Allen B. "The Crisis in Micropublication." *Choice* 5 (June 1968): 448-453.

Warburton, C. D. "A New Test Method for the Measurement of Residual Thiosulfate in the Processed Film Based upon Borohydride Reduction to Sulfide and Methylene Blue Formation." *Photographic Science & Engineering* 10 (March-April, 1966): 86-92.

Weber, David C. "Design for a Microtext Reading Room." *UNESCO Bulletin for Libraries* 20 (Nov.-Dec., 1966): 303-308.

Wiest, D. G. "An Introduction to Microfilms and Their Properties." *Proceedings of the National Microfilm Association, 1969.* Annapolis, Md.: National Microfilm Association, 1970. pp. 336-342.

Wooster, Harold. *Microfiche 1969 – A User Study.* Washington, D. C.: Air Force Office of Scientific Research, 1969. Copies available from the Clearinghouse for Federal Scientific and Technical Information, Department of Commerce, National Bureau of Standards, Springfield, Va. 22141. Document No.: AFOSR–69-1847TR.

Appendix A

INSTITUTIONS AND ORGANIZATIONS VISITED AND INDIVIDUALS CONSULTED BY PRINCIPAL INVESTIGATOR

1. Eastman Kodak Company, Rochester, New York:

   Dwight C. Burnham, Product Specialist
   Robert B. Smith, Head of Information Services
   Warren Reckhow, Assistant Head, Information Services.

2. Fullerton Junior College, Fullerton, California:

   Mrs. Shirley Bosen, Head Librarian.
   Mrs. Doris McCormac, Assistant Head and Reference Librarian.

3. The Genealogical Society of the Church of Jesus Christ of Latter-Day Saints, Inc., Salt Lake City, Utah:

   Delbert Roach, Librarian.

4. Hamline University, St. Paul, Minnesota:

   Miss Tinna K. Wu, Research Associate.

5. William Hawken, Microform Technology Consultant, Berkeley, California.

6. Hughes Aircraft Missile and Space Plant, Culver City, California:

   Mr. B. Campbell, Head, Library Services.

7. Library Microfilm and Materials Company, Culver City, California:

   Mrs. Edna Spreitzer.

8. Lockheed Missile and Space Plant, Palo Alto, California:

   William Kozumplik, Head, Research Library.

9. State University of New York at Buffalo Libraries:

   Frederick K. Henrich, Head, Documents & Microform Division.

10. Technical Library, Naval Weapons Laboratory, Dahlgren, Virginia:

    Mrs. Cathryn C. Lyon, Librarian.

11. 3M Company, St. Paul, Minnesota:

    Lennard Michelson, Sales Manager for Related Products.
    John E. Bohman, Development Coordinator.

12. U. S. Patent Office, Crystal City, Virginia:

Leonard Lawrence, Organization and Systems Analysis Division.

13. U. S. Social Security Administration, Baltimore, Maryland:

Harry Wade, Head, Microfilm Systems, Bureau of Data Processing and Accounting.

Appendix B

TYPES OF MICROFORMS

Microphotography is usually defined as the process whereby documents are photographed and, subsequently, reproduced in images too small to be read without magnification.

By reducing the size of the images greatly with respect to the size of the original document, microforms are finding wide and varied uses. Through this technique, vast quantities of information, some of it not obtainable otherwise, are being made available at low cost and are being utilized efficiently in information systems.

Over the years, a variety of microforms have been developed, each with advantages for the type of information system in which it is used. A brief description and explanation of the various microforms follows.

1. ROLL FILM

Roll film, sometimes called ribbon film, is most familiar in libraries. Microimages appear along the length of the film which is wound on a reel. 35mm roll microfilm is almost standard in libraries. 16mm film also is used, but, generally, its use is limited to recording materials of small dimensions, such as catalog cards. It also has been used on occasion to record collections of typescripts and manuscripts. 16mm roll film in cartridges has been used very successfully for special publishing projects, such as *Chemical Abstracts.* However, where documents of large page size are filmed and when very high film quality is required, it is likely that 35mm microfilm will still be used extensively. Roll film has been used widely to film newspaper files, manuscript collections, serials and monographs.

Cartridges designed to accept 16mm or 35mm roll film offer protection to the film and, when used with an appropriate reader, make loading and the use of roll film very convenient. Whether installed in cartridges or simply provided on open reels, roll film lends itself well to indexing for retrieval purposes.

Much equipment is available for reading and duplicating roll film. As with other microforms, however, there is still a lack of completely satisfactory equipment for making hard copy from the film.

2. MICROFICHE

A microfiche is a sheet of film on which microimages are arranged in rows and columns. It is used extensively for multiple copy distribution of complete bibliographic units that are relatively short in length, such as technical reports, journal articles and excerpts from reference books.

If microfiche is not laminated and if proper equipment is available, it can be duplicated in a library to serve in lieu of interlibrary loan or for local distribution in a non-circulating library. It has gained favor with some individuals, because it allows them to build a personal library which does not occupy much space and does not require large expenditures.

The two most common dimensions of microfiche are: 75mm x 125mm (3 in. x 5 in.); and 105mm x 148mm (4 in. x 6 in.). The 105mm x 148mm dimensions are the preferred dimensions of those bodies dealing with standards both in the United States and abroad.

3. JACKETS

Jackets are transparent film sheets containing one or more slide-in pockets arranged horizontally. They are obtainable in various sizes, from 3 in. x 5 in. to 5 in. x 8 in. Sheet form microimages can be produced from either 16mm or 35mm microfilm rolls by cutting strips from the rolls and inserting them into the pockets.

Jackets have many of the characteristics of microfiche and one outstanding advantage: strips of film can be added or replaced readily. For active information systems, this often is essential.

There are, however, some additional factors to be considered: a) The cost of jackets raises the unit cost per film frame. b) Duplication, even with very thin jackets, involves a loss in quality which makes it difficult to meet strict standards; reasonably legible contact copies can be made and for some applications are satisfactory. c) Occasionally, short strips may be lost because they have worked their way out of the jacket. d) The thickness of the jacket requires additional file space.

One further advantage of the jacket is that it does provide a good external cover which protects the microfilm.

4. APERTURE CARDS

An aperture card is a tabulating card with a rectangular hole, into which is fitted a piece of film bearing one or more microimages.

While aperture cards have found their greatest application in the engineering drawing field, they are now beginning to be used in certain special libraries for recording documents which are only a few pages in length.

Some of the characteristics of aperture cards are: a) Searching is facilitated. b) Tilting for ease of reading can be done completely by machine. c) Up-dating and purging are simple. d) The cost of a completed card makes the information unit cost rather high.

Ample equipment is available for production of the card and for reading, duplicating and making hard copy from it. Automatic searching equipment for aperture cards is also available.

5. MICRO-OPAQUES

Micro-opaques are sheet microforms produced from transparent film masters on either photosensitive paper, by contact printing, or by ink press, employing a photolithographic plate. They are similar in format to microfiche. Like microfiche, considerable preparation is required to make and format the film master. This means the cost of one to a few micro-opaque copies of an item very expensive compared to a like number of roll microfilm copies. However, with the film master at hand and as the size of the micro-opaque edition increases, the cost of copies becomes less. Where demand exists for an edition of fifty to one hundred or more copies, micro-opaques have been used extensively for inexpensive republication of quantities of out-of-print materials.

Since micro-opaques must be viewed with reflected light projection, their use requires reading machines specially designed for them. Being opaque, hard copy duplicates can not be produced from them as easily or with equal clarity as those produced from the transparent microfilm and microfiche.

The most commonly encountered sizes of micro-opaques are 3 in. x 5 in. and 6 in. x 9 in.

Appendix C

GENERAL CHARACTERISTICS OF FILMS

SILVER EMULSION FILM

Silver film, as it is generally called, is the most widely used film in the microfilm field because of its quality, its versatility, and its ready availability in many forms.

The production of silver film involves coating a light-sensitive emulsion of gelatin and silver halide on the surface of a film base of acetate, triacetate, or polyester. The first microfilm used a tinted base in which the base carried a dye to absorb light so that it would not be reflected from the reverse side of the film back to the sensitive emulsion. The second major advance was the use of a light-absorbing backing on clear base film. The present most popular microfilm is one which has an antihalation layer immediately under the emulsion. This film brought with it substantial improvement in quality and it essentially eliminated the harmful effects of halation. During development, the dye layer is changed so that it is transparent and the film is of high quality.

At present, all camera films are silver films because they are sensitive enought to light to reduce exposure time to a practical working basis. The reason for the higher speed of silver films is that the light-sensitive emulsion on the film is made up of billions of tiny grains of silver halide, each of which can be exposed and a latent image formed by less exposure than with other types of film.

The high resolution obtained from silver emulsion microfilms is partially due to the extremely small grains of silver halide which, when developed, convert to metallic silver if they have been exposed to light. This also is the way in which density on the film is created. The amount of metallic silver formed during development is a function of the amount of light to which any area of the film is exposed. Consequently, a film which has great exposure develops more metallic silver and is dark. That which receives no light or only a small amount of light develops an amount of metallic silver in proportion to the exposure. The metallic silver prevents passage of light and consequently creates density.

Silver film also is used extensively as a copy film and generally is considered "reversing film" because it changes polarity (negative to positive and positive to negative) from generation to generation. "Non-reversing" silver film is presently available.

DIAZO TYPE FILM

Diazo film has characteristics quite different from silver film. While it may use the same base material, the light-sensitive coating is composed of dyes. This coating is very thin and, since it has no grain, it can be of very high resolving power.

Diazo films are available in a number of colors; however, most used for microform copies are blue or black. Either high contrast or low contrast films are offered to serve particular requirements. The popularity of diazo film has been increasing because of its lower sensitivity to visible light and its simple processing makes it possible to produce copies easily and immediately under normal office conditions.

Diazo film is used only as a copy film because it requires much more light exposure than silver film. This is readily understood when one considers that a dye is a compound of molecules. A molecule is up to several million times smaller than a grain of silver in silver emulsion film. However, it takes as much exposure to light to expose a molecule of diazo film as it does a larger grain of silver in silver emulsion film.

Diazo film is sensitive almost entirely in the near ultraviolet range and, consequently, when it is exposed, a light source rich in ultraviolet is required.

Early diazo films had a shelf life of three months or less, but improvements in present-day films have extended their shelf life to a year or more when stored in a cold room. After exposure and development, its image life is affected mostly by exposure to ultraviolet light. If it is left exposed for extended periods to sunlight or to any other source containing ultraviolet light, it eventually will fade. Tests over the past 20 years indicate that diazo film does not deteriorate when kept under normal filing conditions and not exposed unduly to light sources containing a great amount of ultraviolet. Extrapolation of these tests implies that diazo film has a very long life in file and a very much longer life if stored in accordance with archival recommendations for silver emulsion films.

All commercial diazo film presently is non-reversing, that is, a negative diazo will result from exposure to a negative master and a positive diazo image will result from exposure to a positive master.

VESICULAR HEATING DEVELOPING FILMS

Vesicular thermal developing films are the latest to be used commercially. A substance containing a diazo dye and other chemicals is coated onto a polyester base. When it is exposed to ultraviolet light, the diazo dye generates nitrogen in proportion to the amount of exposure.

Most vesicular films are developed by the application of heat in the range of 240°F to 265°F. Some are developed by means of electronic flash. During the development process, the coating is softened so that the released nitrogen creates "bubbles" or permanent light-scattering cells in the film. Density variations in the film are created by light being reflected by the bubbles. Light so reflected is scattered in many directions. Consequently, most of it does not reach the eye and the area which reflects the light away appears dense. Since density is a function of exposure, an image can be created. In order to achieve maximum stability, some vesicular films require a re-exposure to ultraviolet light after development. With some vesicular films, the re-exposure or clearing step is indicated in order to avoid accidental exposure and development of sensitive material remaining in the film. Some vesicular films do not require the clearing step to insure stability, but clearing facilitates further duplication and hard copy production.

Appendix D

DESIRABLE CHARACTERISTICS FOR READERS AND READER-PRINTERS

Characteristics considered desirable for a microform reader are listed below in Section A, and for a microform reader-printer in Section B. It is thought that a reader-printer should incorporate all of the characteristics deemed desirable for a reader. Hence, these are not repeated. Only characteristics pertaining to the print capability appear in Section B.

Certain assumptions were made in preparing these design characteristics. It was assumed that a combination roll film and sheet microform reader (or a combination roll film and sheet reader-printer) would complicate construction problems and would be likely to cause the user difficulty when changing accessories for use of either rolls or sheets. Roll film readers should accommodate 35mm and 16mm microfilm, and microfiche readers should accommodate sheets up to 5 in. x 8 in. Further, it was assumed the readers or reader-printers would be a "permanent" fixture in a reading room (either on tables or as part of carrels) as opposed to their being portable for circulation. Finally, it was assumed they would be used to read materials for a long period of time as opposed to their being used as scanning devices only.

A. Readers

1. DIMENSIONS

The size and weight of the reader will depend largely on the ability of the manufacturer to integrate in a compact fashion the design characteristics listed below. It would be inappropriate to specify a particular size and weight.

2. SCREEN

a. *Size*

Screen size should be at least 11 in. wide by 14 in. high. For reading newspaper on microfilm, it is desirable to have a screen at least 15½ in. wide to accommodate a 1:1 blowback of a newspaper.

b. *Angle*

The reading angle on the screen should be variable to prevent fatigue caused by reading in a fixed position.

c. *Height*

Screen height above the table should be variable to enable reading ease for tall and short users.

d. *Illumination*

The screen should be evenly illuminated from the corners to the center.

e. *Brightness*

Brightness should be adjustable to accommodate:

1) Reading positive and negative microforms
2) Various degrees of ambient lighting.

f. Surface

Screen surface should be non-glare to suppress reflections from the surrounding area.

3. IMAGE QUALITY

a. Type of Projection

There should be internal projection to allow for use under conditions of ordinary lighting.

b. Resolution

The image should appear with sufficient definition as to compare favorably with the original from which the microform was produced. (The Library Technology Program's microform reader test program specifies resolution of 5.0 l/mm at the center and 4.0 l/mm at the edges and corners as good performance.)

c. Focus

The focus of the image should be constant and should not be affected by vibrations caused by normal machine use or changes in filmgate temperatures.

d. Distortion

The image should appear bright, clear and sharp and refocusing should not be required to read any portion of it.

4. MAGNIFICATION

The reader should provide a range of magnifications from 15X to 24X. A single lens system, providing variable magnification and automatic focusing, is preferable to a series of interchangeable lenses which require careful storage, installation and maintenance.

5. IMAGE ROTATION

Image rotation of 360° should be provided.

6. FILM TRANSPORT ASSEMBLY

The glass flats which hold the film in place must be separable and easily removed for cleaning. The glass flats should automatically separate when the film advance knob is rotated and it should be impossible to advance the film if the flats are closed.

7. FILM ADVANCEMENT

It should be possible to advance and reverse the film at two speeds — at a rapid speed and a slower speed. If the film drive is motorized, it should be variable between high and low speed.

8. CONTROLS

All controls, e.g., film advancement, focusing, scanning, etc., should be easily accessible from a seated position. All controls should be clearly labelled.

a. *Focusing*

The focusing device should operate smoothly and easily and should move the image to either side of the "in-focus" position with a single turn of the hand. It should be securely mounted so that no lateral shifting of the image occurs during focusing.

b. *Scanning*

A scanning device should be provided for both horizontal and vertical positioning.

c. *Magnifying*

A variable magnification knob should be provided to allow the user to determine (with a zoom lens or an autofocus lens and screen) the most legible size of the image.

9. HEATING, COOLING, NOISE

The filmgate temperature must be within the acceptable limits specified in ANSI Standard Methods of Testing Printing and Projection Equipment, Z38.7.5 and Microfilm Reader Standard, PH5.1. A cooling system should be provided if required to meet these specifications and if provided its operation should be silent.

10. ELECTRICAL POWER REQUIREMENTS

The reader should be operated on standard 120 volts, 60 cycles.

11. SAFETY FACTORS

All surfaces, corners, and edges of the reader should be free from burrs and roughness to prevent damage to film or hands. The reader should have a stable base to prevent its being knocked over. There should be no hazardous electrical current leakage.

12. MAINTENANCE

All accessories should be attached to the machine. Parts should be easy to attach and accessible for cleaning and repair. The projection lamp should be of a type readily available from commercial sources and easy to change. Glass flats, mirror, screen, and lenses should be easy to clean.

13. OPERATION

Operation should be simple and clearly illustrated. A diagram for threading reels should be provided at each reading station. Simple, well illustrated, attractive instructions should also be provided.

B. Reader-Printer

1. PROCESS

Ideally, the printing process should yield positive hard copy from both negative and positive microtransparencies at the flick of a switch. Recent announcements from a manufacturer of microform reader-printers indicate that machines capable of producing positive prints from both positive and negative prints are forthcoming. In the meanwhile, although some reader-printers employing an Electrofac process are capable of producing positive prints from negative and positive film, one must select either a negative-positive machine, which produces positive prints from negative microtransparencies, or a positive-positive machine, which produces positive prints from positive microtransparencies. Mr. Hawken's discussions of processes in the Library Technology Program's publications, *Enlarged Prints from Library Microforms* and *Copying Methods Manual* are most useful.

2. QUALITIES OF THE HARD COPY

a. Sharp, clear, legible.
b. Non-curling.
c. Non-smearing.
d. Non-fading.
e. Capable of being marked with pen, pencil, felt-tip, typewriter.
f. Permanent paper and image.
g. Available in two sizes – 8½ in. x 11 in. and 11 in. x 14 in. to allow compatibility with existing filing systems.

3. CONTROLS

a. Print button should be easily accessible from a seated position.
b. Multiple copy feature would be desirable.
c. It should be possible to install a coin meter.
d. Finished hard copy should be accessible from a seated position.

4. SPEED OF PRINT PROCESS

Print processing should be completed within 30 to 45 seconds.

5. PRINT AREA

There should be marks on or beside the screen to indicate the exact dimensions of the image that will be produced in hard copy.

6. WASTE

Exposure control should be automatic and sufficiently accurate that trial exposures are not required. Wastage normally should not exceed 5%.

7. QUIET OPERATION

The reader-printer should have a quiet operation, making it suitable for use in an open reading area.

8. MAINTENANCE

If a process involving the use of solutions is employed, the solution trays should be easily accessible for filling and easily removable for cleaning with the least possible hazard of spillage. The rollers should also be readily accessible for daily cleaning. Loading the paper supply should be an easy operation.

Appendix E

GLOSSARY

(Terms and definitions taken from National Microfilm Association's *Glossary of Terms for Microphotography and Reproductions Made from Micro-Images*.)

ACETATE FILM (ACETATE BASE)

Safety film with a base composed principally of cellulose acetate or triacetate.

ANTIHALATION

The reduction of halation within a film. Three common methods are used to reduce halation.

(1) Tint the film base with a light absorbing dye.
(2) Coat the back of the film with a light-absorbing material.
(3) Introduce a layer of light-absorbing dye between the base and the emulsion. (See Antihalation Undercoat.)

ANTIHALATION UNDERCOAT (AHU)

A separate layer of light-absorbing dye located between the emulsion and the base. During development of this film, the dye layer becomes transparent.

APERTURE CARD

A card with a rectangular hole or holes specifically designed to hold a frame or frames of microfilm.

BASE STOCK

The carrier for a photosensitive emulsion such as paper, plastic or cloth.

CELLULOSE ACETATE AND CELLULOSE TRIACETATE

Transparent plastics used widely as a film base because of their dimensional stability, transparence, and relative non-flammability.

CELLULOSE NITRATE

A transparent plastic which was once used almost universally as a film base. Because of its flammability, it has largely been replaced as a film base.

CONDITIONING

A process of restoring microfilm for active use after a period of storage. This generally includes rehumidifying and cleaning.

DENSITY

The light-absorbing quality of a photographic image (degree of opacity of film and blackness for prints), usually expressed as the logarithm of the opacity. Several specific types of density values for a photograph may be expressed but diffuse transmission density is the one of greatest use in the case of microfilm and diffuse reflection density is generally of interest for prints. See ANSI Standards PH2.17 and PH2.19.

DEVELOPER

A chemical reagent used to produce a visible image on an exposed photographic layer. It may take many forms for different materials, such as conventional formulae for silver emulsions, plain water used to develop blueprints, or a gas, such as ammonia vapor, used to develop diazo films and prints.

DIAZO MATERIAL

A slow print film or paper, sensitized by means of diazonium salts, which, subsequent to exposure to light strong in the blue to ultraviolet spectrum and development, forms an image. Diazo material generally produces nonreversible images, i.e., a positive image will produce a positive image and a negative image will produce a negative image.

DIRECT IMAGE FILM

A term used to describe the type of film which produces a negative from a negative and a positive from a positive in one step.

DIRECT POSITIVE

A positive image obtained directly from another positive image without the use of a negative intermediate. This process will also produce a negative from a negative directly.

DUPLICATE FILM

Film copies generally made by a contact printing process continuously or frame by frame.

DYE-BACK FILM

Any film having a light-absorbing dye coating on the base side of the film to improve daylight loading characteristics and to reduce halation. The dye must be removed during processing.

ENLARGEMENT RATIO

The ratio of the linear measurement of a micro-image of a document to the linear measurement of the enlarged image, expressed as 15X, 20X, etc.

EXPOSURE

The act of exposing a light sensitive material to a light source.

FILM, HEAT-DEVELOPING

A type of film in which the image is developed by heat.

FILM, MASTER

The camera microfilm. It is also known as the original film.

FILM, NEGATIVE

Film in which the image of the dark portions of the subject appear light and the light portions appear dark.

FILM, NONREVERSING (DIRECT POSITIVE)

Film which does not change from positive to negative images or vice versa in successive generations, for example, diazo film.

FILM, REVERSAL

A film which after exposure is specially processed to produce a positive image instead of the customary negative image.

FILM, ROLL

Flexible film, wound on a reel, spool or core, normally 100 ft. or 200 ft. in length.

FILM, SAFETY

That film which does not readily support combustion and which meets ANSI Standards for Safety Film (PH 1.25).

FILM, SILVER

A film which is coated with a silver halide emulsion.

FILM, UNITIZED

The separation of a roll of microfilm into individual frames or strips and insertion in a carrier.

FILM, FINE-GRAIN

Descriptive of film emulsions in which the grain size is small. The term is relative as there is a wide variation in grain size among various fine-grain films.

HALATION

A halo ghost image or fog caused by reflection of rays of light from the base to the emulsion or by internal scattering of light within the film.

HALIDE

Any compound of chlorine, iodine, bromine, or flourine, and another element. Silver bromide, silver chloride, and silver iodide are the light-sensitive materials in silver emulsions.

HARD COPY

An enlarged copy usually on paper.

HUMIDITY, RELATIVE

The amount of water vapor present in the atmosphere expressed as a percentage of the amount required for saturation at a given temperature.

IMAGE

A representation of an object or information produced by means of light rays.

IMAGE, LATENT

The invisible image produced by the action of radiant energy on a photosensitive surface. It may be made visible by the process of development.

JACKET, ACETATE

A transparent plastic carrier with a single or multiple sleeves or pockets made to hold microfilm in flat strips.

KALVAR

A trademark for the film and equipment products of the Kalvar Corporation.

FOOT CANDELA (FOOTCANDLE)

A unit of illumination. The measure of luminous flux density falling upon any surface. One foot candela is equal to one lumen per square foot of area.

LIGHT-SENSITIVE

Materials which undergo changes when exposed to light.

MICROFICHE

A sheet of microfilm containing multiple micro-images in a grid pattern. It usually contains a title which can be read without magnification.

MICROFILM

A fine-grain, high resolution film containing an image greatly reduced in size from the original.

MICROFORM

A generic term for any form, either film or paper, which contains micro-images.

MICRO-OPAQUE

A sheet of opaque material bearing one or more micro-images.

MICROPHOTOGRAPHY

The application of photographic processes to reproduce copy in sizes too small to be read without magnification.

ORIGINAL

The material from which copies are made, such as handwritten copy, typed copy, printed matter, tracings, drawings, and photographs.

POLARITY

The tonal relationship of an image, with respect to the original, that is, either negative or positive.

POLYESTER

Transparent plastic used as a film base because of its transparency, stability and relative non-flammability.

READER

A projection device for viewing an enlarged micro-image with the unaided eye.

READER-PRINTER

A machine which combines the functions of a reader and an enlarger-printer.

REDUCTION RATIO

The ratio of the linear measurement of a document to the linear measurement of the image of the same document expressed as 16:1, 20:1, etc.

REFLECTED LIGHT

Light which has been deflected from a surface, not having been absorbed.

RESOLVING POWER (PHOTOGRAPHIC)

The degree to which a lens, optical system or film emulsion is able to define the detail of an image, expressed as the number of lines per millimeter, discernible in an image.

SAFETY FILM

A term designating a comparatively non-flammable film support (base) composed mainly of cellulose esters of acetic, propionic, or butyric acids and which meets USA Standards for Safety Film. (See ANSI PH 1.28.)

TINTED STOCK (TINTED BASE)

A film base having a light-absorbing color for antihalation purposes and which remains after processing. Generally the transmission density is greater than 0.06.

ULTRAVIOLET

Pertaining to or designating those radiations which lie beyond the blue end of the visible spectrum, approximately from 2000 to 4000 Angstroms.

UNITIZE

(1) The separation of a roll of microfilm into individual frames and insertion in a carrier.
(2) The microfilming on one or more sheets of microfiche a unit of information, such as a report, a specification or a periodical.

VESICULAR FILM

Film which has the light-sensitive element suspended in a plastic layer and which upon exposur: creates strains within the layer in the form of a latent image. The strains are released and the latent image made visual by heating the plastic layer.