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INSTALLING ELECTRONIC OFFICE EQUIPEMENT:

A FACILITY GUIDE

by

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INSTALLING ELECTRONIC OFFICE EQUIPEMENT:

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by

Audrey G. Kaplan

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April 1987

This document was commissioned by the Organizational Research Directorate, Canadian Workplace Automation Research Center, Communications Canada. The views expressed in this document are those of the author.

* La version française du rapport est aussi disponible.

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FOREWORD

The Women's Centre of Montreal submitted a research proposal to the Canadian Workplace Automation Research Centre (V. Kisfalvi, June 1986) for assistance with planning the automation of their services. Like most non-profit organizations, the Women's Centre must cope with bubget cuts while demands from the public continue to increase. Despite budgetary constraints, the Centre wished to improve their efficiency, hold the line on staff increases, and continue to provide quality services to the public through the automation of all possible office procedures and functions. The proposal consisted of an environmental scan and study of the Centre's short-and long-term needs, an analysis of present manual systems, the definition of the system required, and defining the role of the business partner. The proposal did not specifically request assistance in planning the installation of the equipment in the facility. Michèle Guay, Director of Organizational Research, CWARC, noted the omission and the Women's Centre Building Committee was pleased to have guidance on the facility-related concerns of the automation.

Audrey Kaplan of Public Works Canada was hired by CWARC through a Special Service Agreement to work with the Centre's Building Committee from September 1986 to March 1987. Guidance was provided during that time and this report summarizes the recommendations and discussions. Members of the Building Committee, Danielle Desrosiers, Mona Forrest, Raymond Panasuk, and Tina Serafin, assisted in the collection of information on the facility, and Pierre Goumain of CWARC offered useful advice and comments.

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INTRODUCTION

Workers and employers are increasingly sensitive to the importance of the office environment to their well-being and productivity. As offices change the tools used to do the business at hand, ensuring future flexibility and functionality, is key to the success of a facility in meeting the occupant's needs. With more pressure being placed on the facility to contribute to an organization's bottom line, the design for an automated office cannot tolerate constant bottlenecks created by obsolete building services, deficient environmental conditions, or inappropriate furnishings.

The purpose of this study was to advise the Building Committee for the Woman's Centre on an approach for automating the facility at 3585 St. Urbain St., Montreal. This report describes the approach taken to do this study, and specific guidelines for this facility. For the purpose of this report, "office automation" refers to the addition of electronic office equipment such as video-display terminals, micro-computers, local area networks, desk-top publishing microprocessors, etc. Automation involving robots or machinery is not required by this organization and no consideration is given to their use in the recommendations.

The Women's Centre is typical of non-profit organizations in that their program is dynamic and fluctuating with available funding. This had a significant influence on recommendations regarding automation of the facility, specifically concerning design issues of circulation, security, location of equipment, and flexibility of workspaces. Key drivers in the design to automate organizations and their facilities are that facility design and organizational structure are interwined, and facility-related office automation issues must be incorporated with traditional design criteria. The strategic approach taken for this organization was to maximize flexibility of spaces to best accommodate projects and personnel which change frequently.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

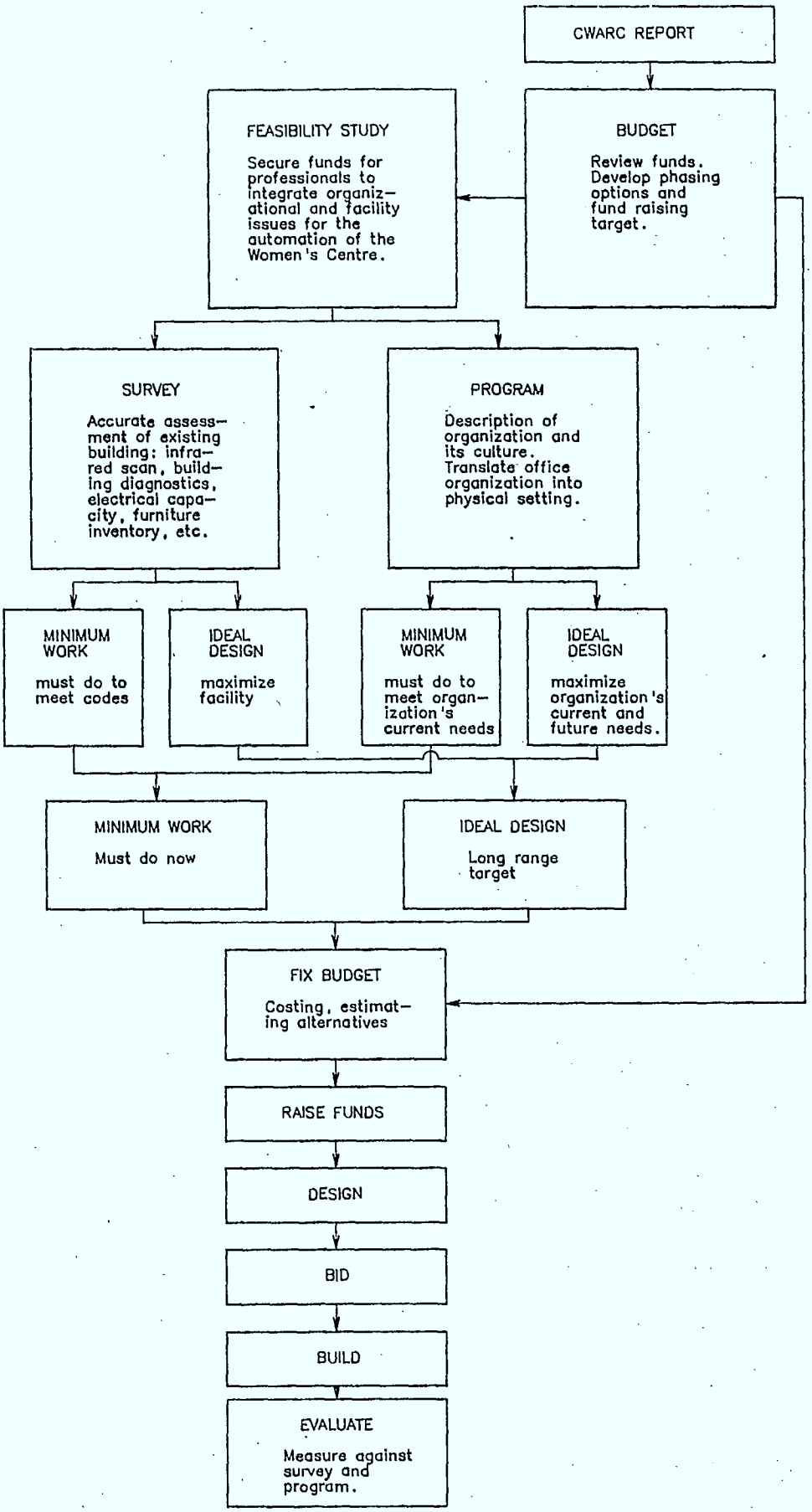
Before a renovation can begin, it is recommended that the Women's Centre Building Committee follow the steps identified in the flowchart on the following page. This process will identify the priorities of the organization and provide a budget within which a design can be created. When renovating older structures, certain work must be done (such as bringing the structure up to standard, and meeting construction codes) and other work would be "nice" if it could be done (such as opening walls to let in more daylight, upgrading interior finishes). A designer can work most effectively if an actual budget is known and then he or she will work within that constraint. As well, a proposed time and phasing schedule is required to guide the execution of minimum work in the short term towards the ideal design.

Owing to the dynamic nature of this typical non-profit organization, the design must incorporate a strategy for coping with frequent change. Not only does the size and composition of the work force change, but the equipment and procedures within the office will change. A flexible design will reduce the cost and inconvenience of implementing physical changes over time, minimize the disruption to work, and (ideally) eliminate computer downtime when the office is rearranged.

With the growing corporate interest in the contribution of facilities to organizational health, the organization's structure cannot be separated from the office setting. Now more than ever before, the designer must identify opportunities in a facility for integrating the objectives of the organization with the building's program. The aspiration for excellence in work and "intelligence" in building are interrelated and must be viewed in context of each other.

This facility offers more obstacles than opportunities for accommodating the Centre's activities with electronic office equipment. Seven obstacles are listed below illustrating the interrelationship of facility and organizational concerns.

Recommended steps for the Women's Center Building Committee.



1. Volunteer nature of workforce

A unique aspect of the Women's Centre's operation is the enthusiastic volunteer workforce which passes through. This adds to the spontaneous, supportive nature of their special service, however, it presents a range of physical characteristics and individual adaptability to work in an electronic office. Age affects eyesight and the viewing distance from the videodisplay screen; education may influence the rate one masters the system; previous exposure to computers or word processors may affect the ability to deliver the required service; etc. A training room and resident computer expert may be required to keep volunteers productively using the system. As volunteers may not be available for training at the same time as regular staff, training may be an ongoing activity for the Centre. (See P. Hayes, March 9, 1987 in references.)

2. Usable space

The current activities fill the facility and there appears to be a shortage of space in which to add the new equipment. Manual and automated systems will be used concurrently for a significant while and it may negatively influence the workers if they are squeezed for space.

The residential layout of the renovated building is inefficient for office use. Almost one-quarter of the area is devoted to circulation and this cramps the workspaces. Work activities need to be reorganized to reduce circulation.

3. Cable distribution

The flexibility required by the organization due to its frequent changes may be constrained by the lack of obvious or natural vertical or horizontal routes to lay a cable network. There are many slight changes in floor level and activities shift from floor to floor offering no place for a straight vertical duct.

Cable management must be treated in a systematic way to avoid expensive errors such as outlets located too far from workstations, requiring a service call (again) to get it moved. Once cables are routed to a floor, the primary (floor distribution), secondary (group cluster), and tertiary (individual terminal) paths must be planned. Outlets are most often provided from the perimetre of a work area. This makes it difficult to connect terminals in the center of a space. In certain cases, this can lead to hazardous cable routes, resulting in loose cases which people can trip over or catch their heels on. A sufficient number of power outlets must be placed near workstations for the addition of terminals and printers as well as the ancillary requirements of individuals (for example, radios, coffee maker). A minimum of four electrical outlets per workstation should be provided.

The cables (data, voice, and power) are the "central nervous system" for the building. The building should be prewired in anticipation of future connections and movements. The increased capital cost will have a quick pay-back, allowing workers to move locations easily with little delay to become operational.

The incoming electrical capacity seems adequate but this has to be confirmed by an electrician.

4. Environmental conditions

Tasks with video-display terminals (VDTs) require different lighting conditions than paper-based work. The offices in the extension are small (approx $9m^2$, 96 ft^2) and the activities include interviewing, counselling, telephoning, and file updates. This combination makes it difficult to place the VDT correctly to reduce glare and reflections from the window and overhead lights while maintaining a good connection/communication with the interviewee.

Most terminals give off about the same amount of heat as a person. If every worker has a terminal, the effect is that of doubling the occupancy heat load. Although other activities and equipment (especially lights) contribute much more to the heat load, the heat gain from the VDTs may make rooms stuffy, especially the smaller offices. Workers may wish to keep office doors open to improve thermal comfort and air circulation but they may be affected by noise distractions from the corridor.

Specifics of the type and model of computer system are not known. The requirements for the heating, ventilation, and air conditioning system for the central processing unit (CPU) must be determined.

Standard impact printers add noise and although laser printers are quiet, they put out considerable heat. A particularly annoying aspect of noise from printers is that people within earshot rarely know when the printer will start, unless they have initiated the print request. This unknown noise schedule can stress workers. Impact printers can send vibration through the building structure, especially in the old building which has some springy floors.

5. Security

Much information technology equipment is light and portable and hence presents a security problem. Its vulnerability means that the Centre must control access to parts of the building and provide for out-of-hours security. Controlling the flow of general public through the building will also give better security for personal items belonging to the workers such as coats, purses, and books.

The intended computer training room in the extension (installed with anti-static carpet and grounded outlets) is not a secure location for the equipment. It is on ground level with windows which can easily be broken. It is also isolated at the back of the building, fronting an alleyway.

6. Furniture

The Centre is furnished largely with desks and chairs "inherited," or purchased from government surplus. This collection must be reviewed for appropriateness for work with new technology. It is expected that this inventory will be kept and the maximum benifit must be found. Should new furniture be acquired, a caution is raised to avoid pieces designed for specific equipment. "Over-designed" furniture is soon redundant due to the rapid obsolescence of the electronic office equipment.

7. Funding

It is a considerable expense to any organization to renovate, prewire for automation, and acquire electronic office equipment at the same time. The Centre's building fund must be sufficient to renovate and prewire but it might be advantageous to phase in the installation of the equipment. Several case studies have shown that it is very stressful on employees to change office setting and work procedures simultaneously.

An incremental approach is suggested where the Centre has a target end-goal for the facility and all work builds to that final design. All upgrades to the building should satisfy the occupants needs in the automated facility.

APPROACH TO THIS STUDY

This was an applied-research study. The purpose was to advise a client, prior to construction, on modification required to the design of their facility to ease the installation and maintenance of electronic office equipment. Field data was collected for two purposes: 1) to add to the experience in solving this type of design problem towards the creation of a global guide to renovating facilities for office automation, and 2) to address the specific situation in this facility.

The Women's Centre provided CWARC with architectural drawings for the recently completed extension and the soon-to-be constructed renovation. As per the client's requirements at the time the designs were done, both the extension and the renovation were designed as traditional offices. In spring 1986, the Centre identified their need to add electronic office equipment and to adapt the design for the renovation before starting the construction.

A new set of architectural floor plans and a section was made showing the extension as built and the renovation as designed. The intention was to identify the opportunities and obstacles for automating the facility, and to quantify the changes required to modify the design for a traditional office to accommodate the electronic office equipment. Greater attention was given to the renovation because recommendations could be implemented. The extension was built and modifications, although perharps advantageous, may be less feasible.

Information on the existing patterns of the organization and its use of the facility was collected through site visits, meetings with the Building Committee, and interviews with the architect and the occupants/client. Some assumptions were made about the building and its characteristics and several questions are posed without providing answers. These would be answered through the survey aspect of the recommended Feasibility Study (see Summary of findings and recommendations).

The new set of floor plans were annotated with comments related to the automation of the facility. Some specific solutions were incorporated in a revised set of floor plans. Although these designs are not complete, they are provided as a springboard for the Survey and Program recommended as part of the Feasibility Study.

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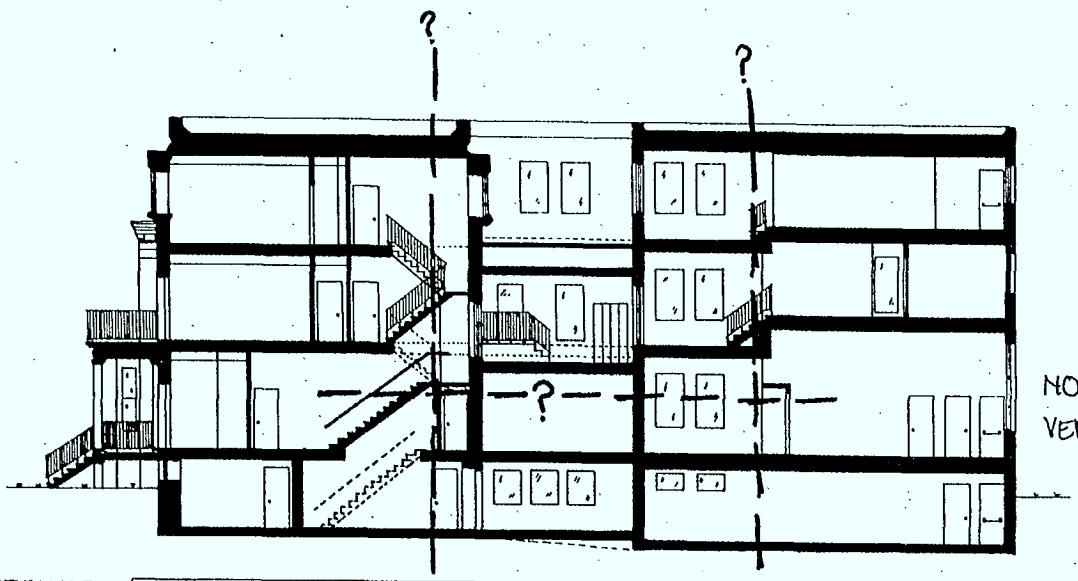
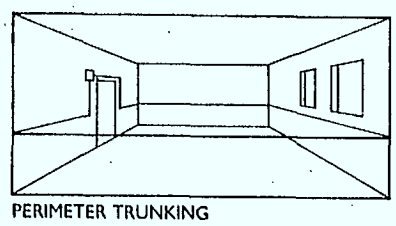
APPENDIX 1 - ANNOTATED FLOOR PLANS

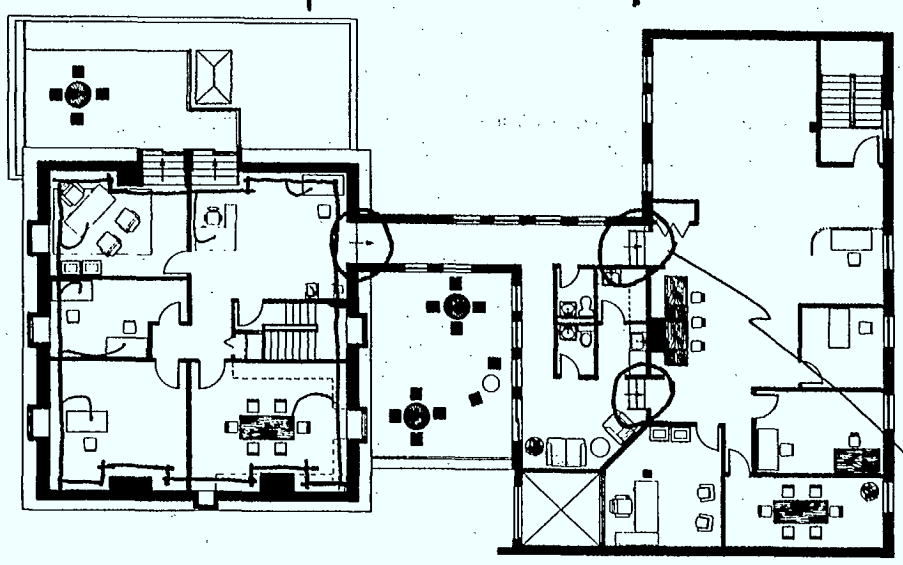


NO NATURAL HORIZONTAL OR VERTICAL ROUTES FOR CABLES.

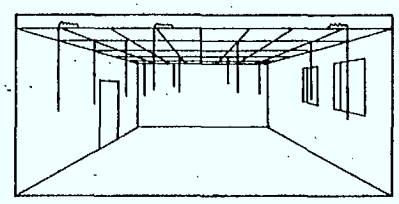
STRATEGY TO PREWIRE BUILDING



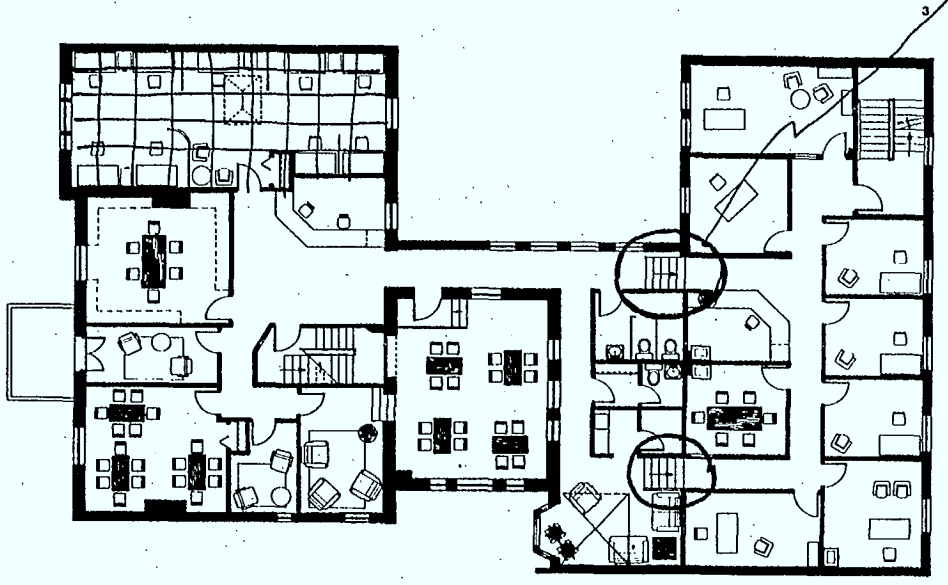
PERIMETER TRUNKING

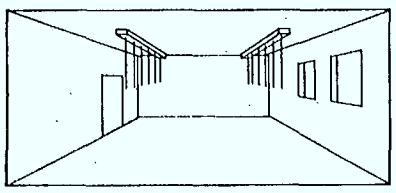


FREQUENT CHANGES IN FLOOR LEVEL IS A OBSTACLE TO ROLLING OR MOVING SHARED COMPUTERS. IT ALSO LIMITS ACCESS TO THE HANDICAPPED.

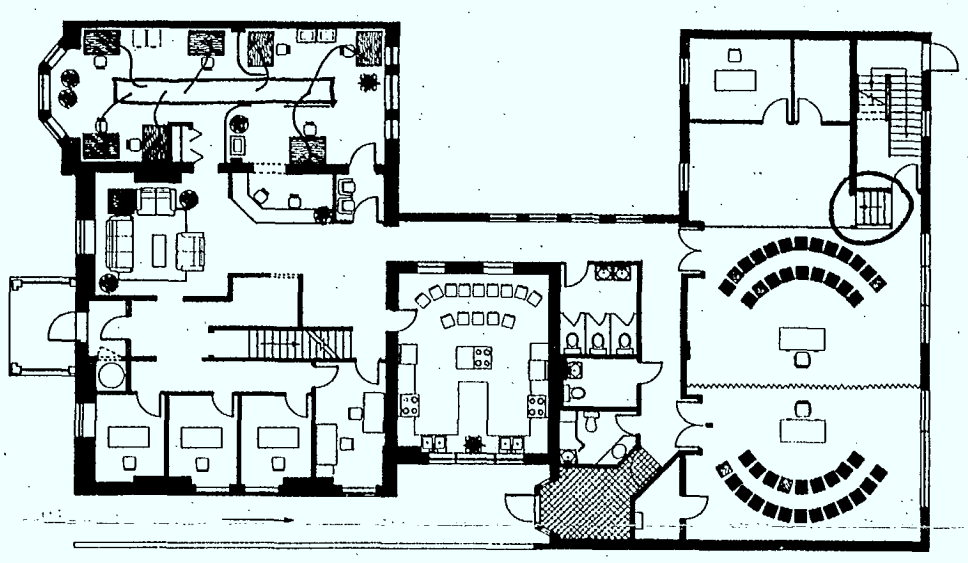


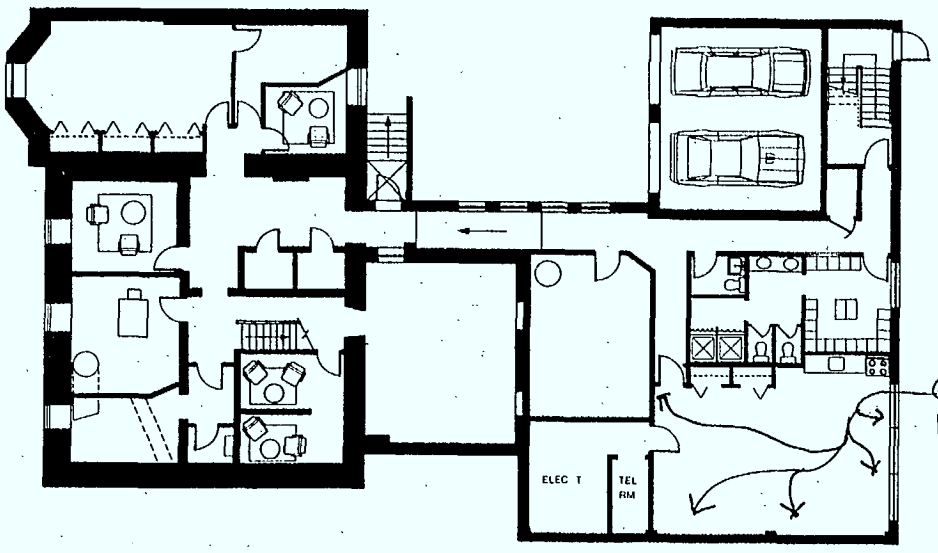
SUSPENDED CEILING





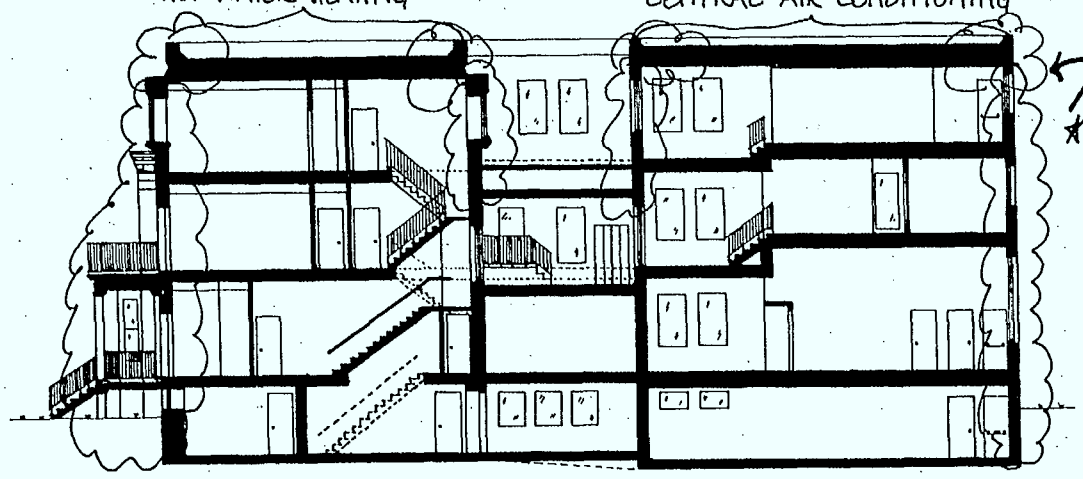
SUSPENDED BOOM



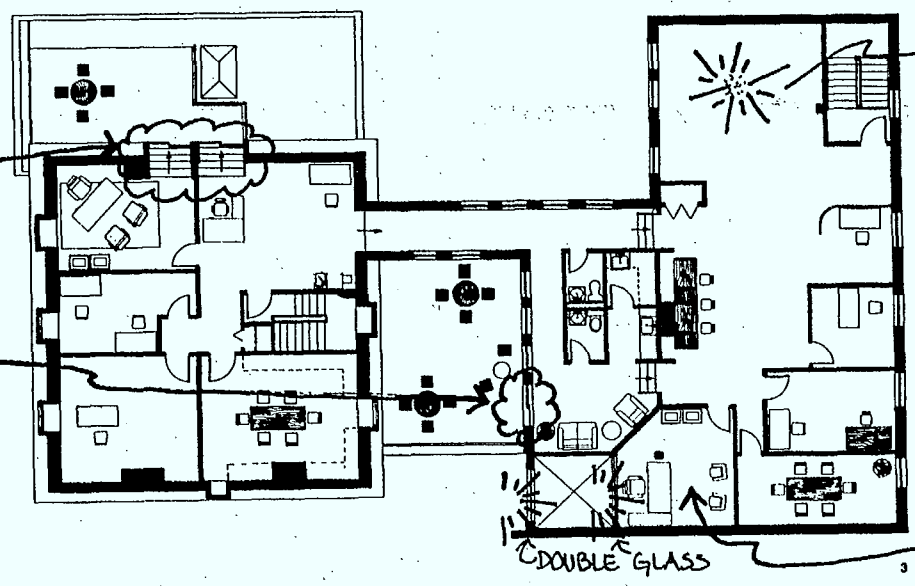


GROUNDED OUTLETS HAVE BEEN INSTALLED. THE FRIDGE MUST BE REMOVED FROM THE CIRCUIT. IN GENERAL, NO EQUIPMENT WHICH IMPOSES INTERMITTANT ELECTRICAL LOADS SHOULD BE PLUGGED IN THE SAME OUTLET WITH A VDT (i.e., KETTLES, PRINTERS, HEATERS).

CABLE DISTRIBUTION



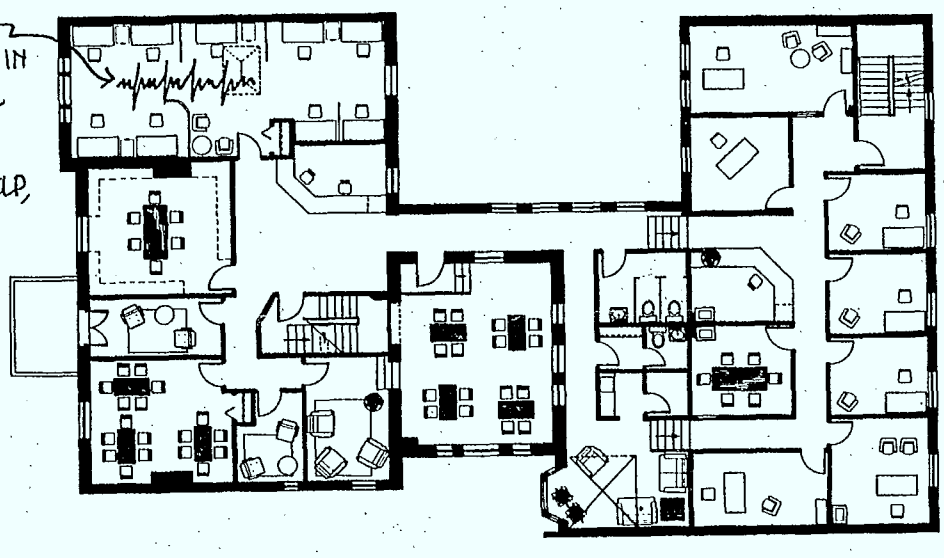
★RECOMMEND INFRARED SCAN OF COMPLETE BUILDING TO FIND PATHS OF AIR LEAKAGE. UNCONTROLLED AIR MOVEMENT ACROSS EXTERIOR WALLS WILL MAKE IT DIFFICULT TO MAINTAIN A LEVEL OF RELATIVE HUMIDITY REQUIRED FOR UNINTERRUPTED COMPUTER OPERATION.



BRIGHT SPACE · GLARE MUST BE CONTROLLED. TEMPERATURE INCREASE FROM SUN.

SLIDING GLASS DOORS RARELY PROVIDE A TIGHT SEAL AGAINST AIR LEAKAGE. A SWING DOOR WILL PROVIDE BETTER CONTROL OVER TEMPERATURE, DRAFTS, AND RELATIVE HUMIDITY.

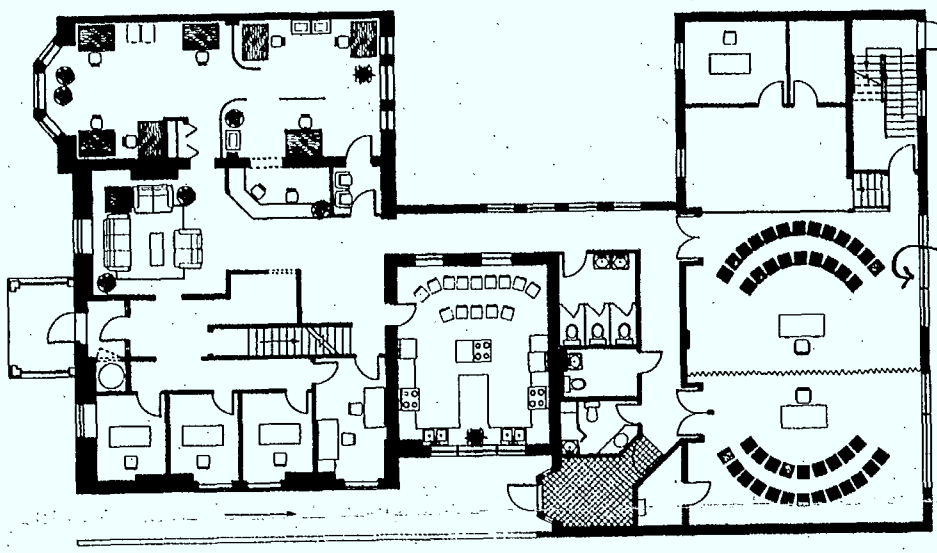
HIGH TEMPERATURE INCREASE FROM SUN. THIS ROOM OVERHEATS (GREEN HOUSE EFFECT) AND IS VERY BRIGHT. THIS IS NOT A GOOD ENVIRONMENT FOR WORK WITH VDTs.



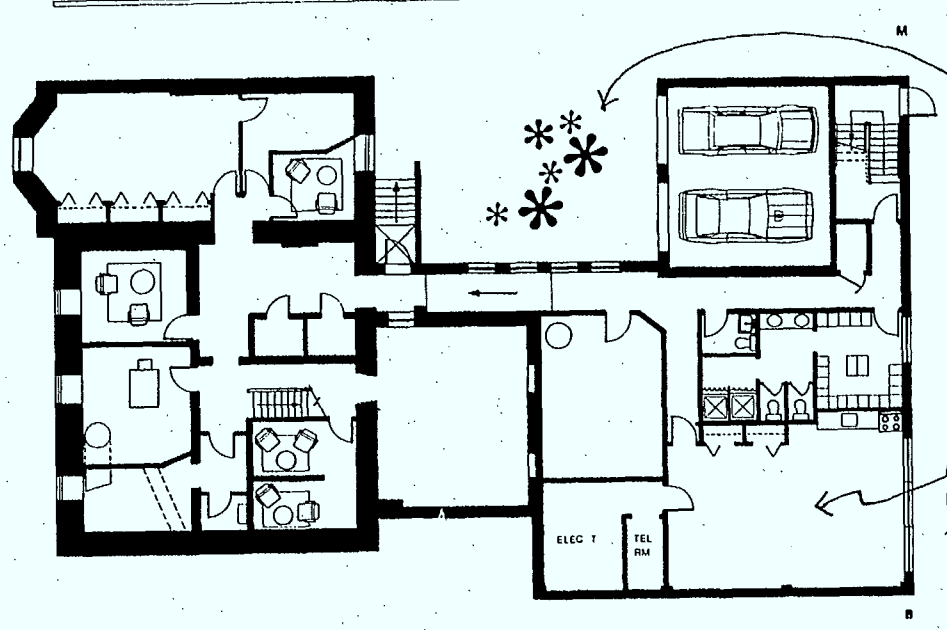
PRINTERS SHOULD NOT BE IN OPEN OFFICE AREAS WHERE THE NOISE WILL DISTURB MANY. ACOUSTIC HOODS HELP, IF USED PROPERLY, BUT AN ENCLOSED ROOM, NEAR TO WORKERS IS BETTER.

SMALL OFFICES MAY BECOME STUFFY FROM COMPUTER HEAT OUTPUT.

GENERAL COMMENT: THE BUILDING OFFERS A RICH VARIETY OF SPACES AND SETTINGS. THIS IS INCREASINGLY IMPORTANT WHEN PEOPLE WORK ON AUTOMATED SYSTEMS.



'U'-SHAPED WINDOWS MAKE A COMPLEX VISUAL ENVIRONMENT FOR WORK WITH VDTs.

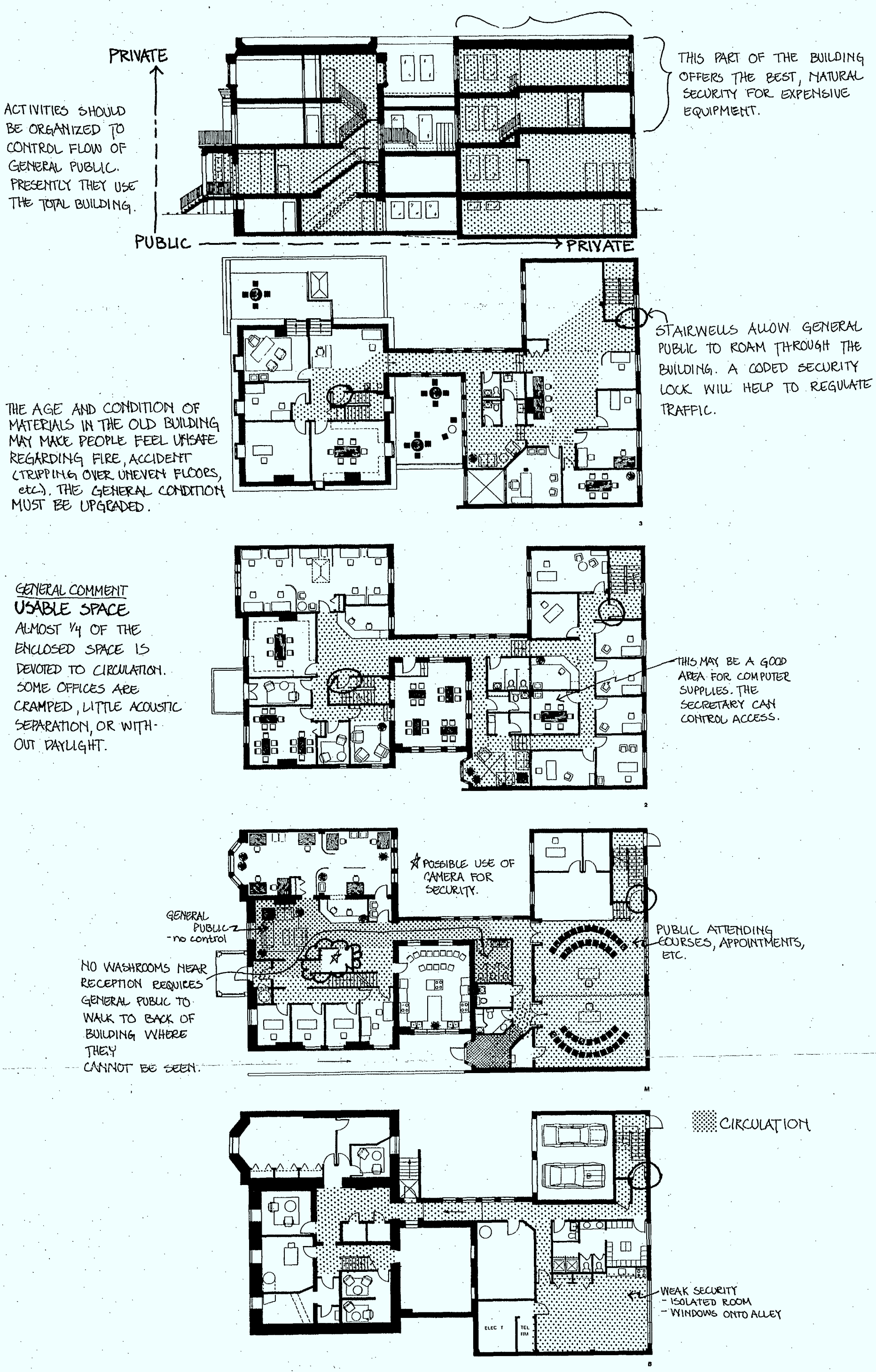


IN WINTER, SNOW ACCUMULATION BLOCKS LANEWAY MAKING DELIVERY OF BULKY EQUIPMENT MORE DIFFICULT.

CLASSROOM - "WHITE BOARDS" SHOULD BE USED, NOT CHALK WHICH ADDS DUST TO THE AIR.

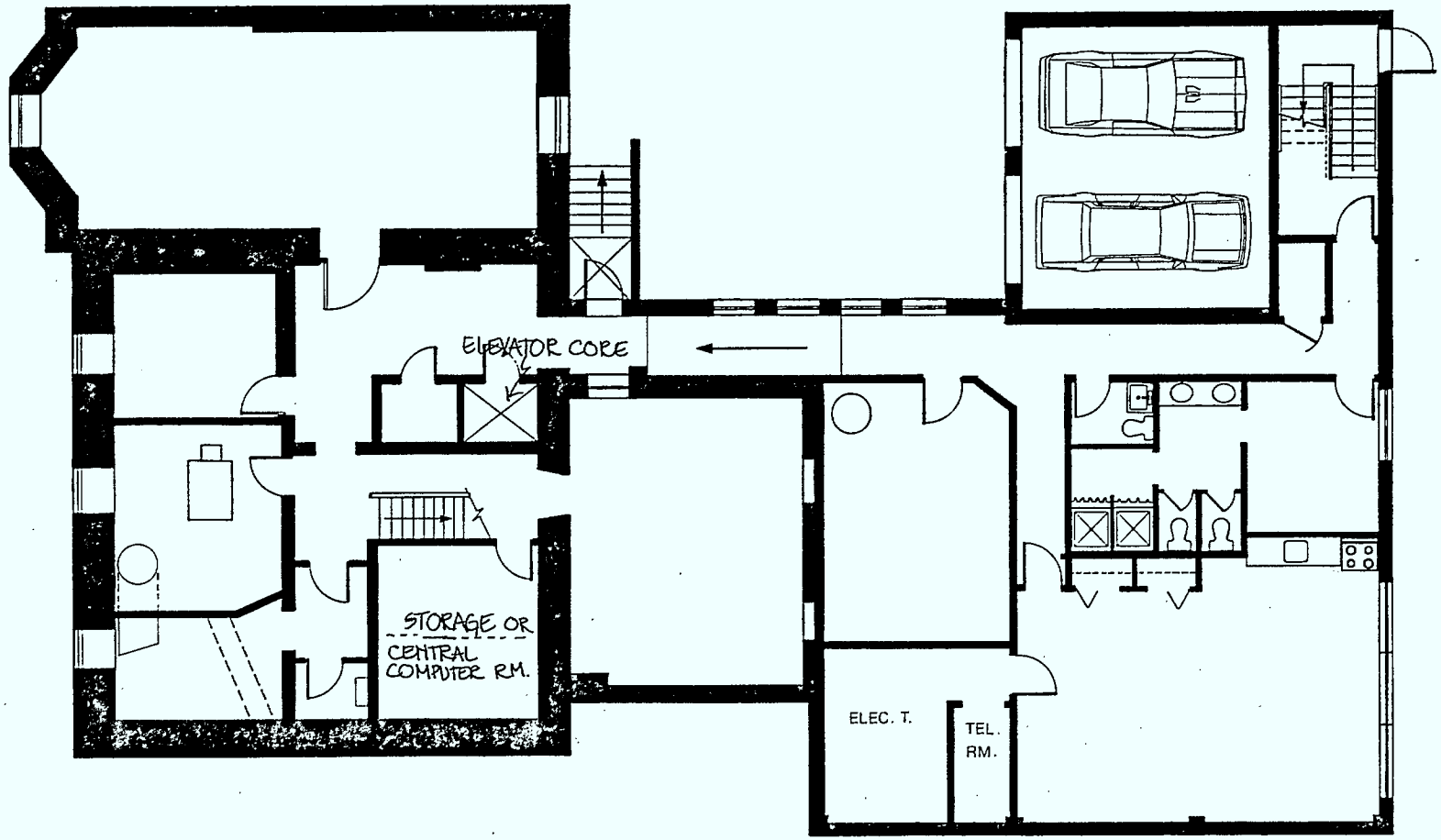
N→

ENVIRONMENTAL CONDITIONS

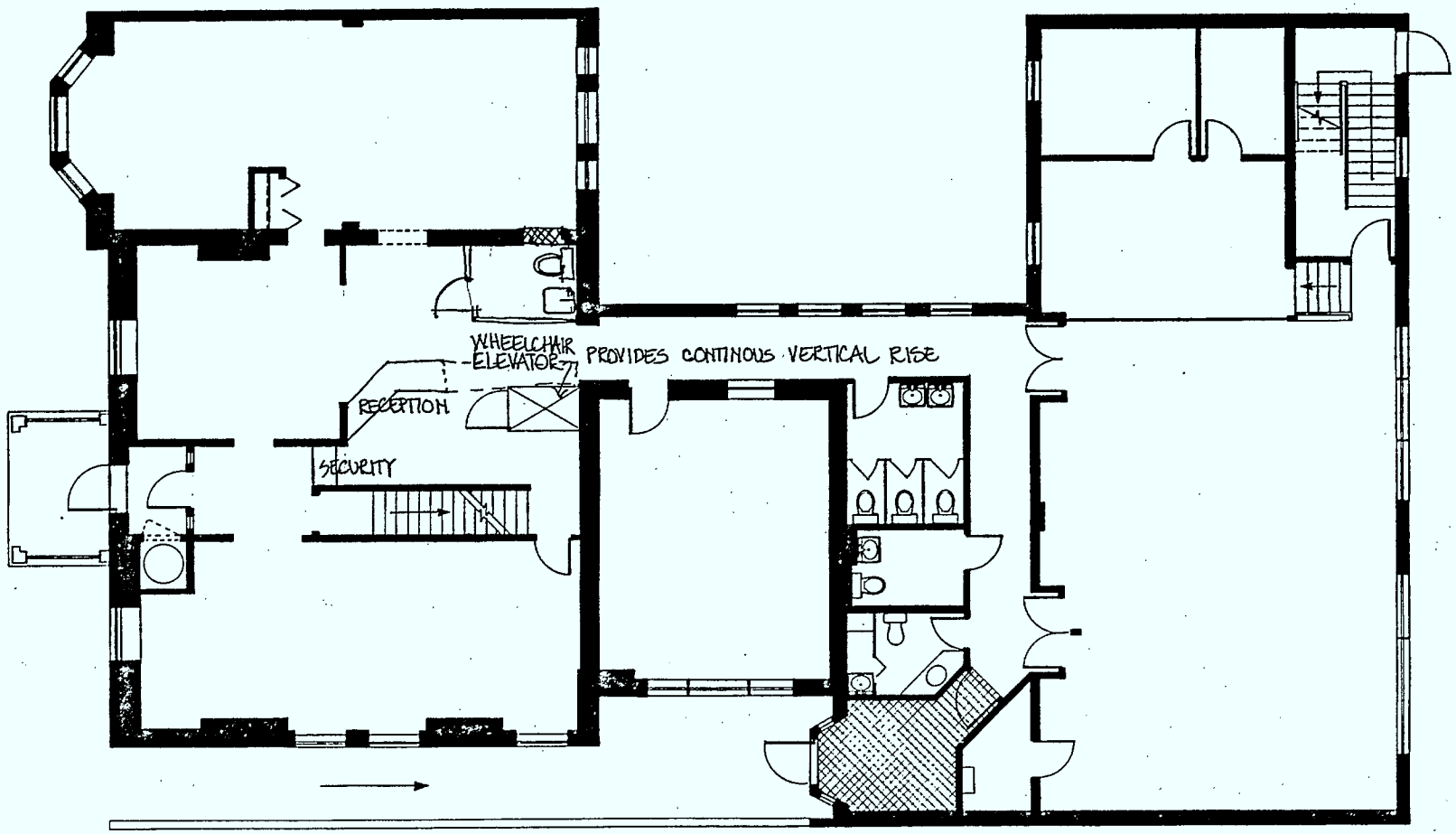

PRIVATE
ACTIVITIES SHOULD BE ORGANIZED TO CONTROL FLOW OF GENERAL PUBLIC. PRESENTLY THEY USE THE TOTAL BUILDING.
PUBLIC
PRIVATE
THIS PART OF THE BUILDING OFFERS THE BEST, NATURAL SECURITY FOR EXPENSIVE EQUIPMENT.
STAIRWELLS ALLOW GENERAL PUBLIC TO ROAM THROUGH THE BUILDING. A CODED SECURITY LOCK WILL HELP TO REGULATE TRAFFIC.
THE AGE AND CONDITION OF MATERIALS IN THE OLD BUILDING MAY MAKE PEOPLE FEEL UNSAFE REGARDING FIRE, ACCIDENT (TRIPPING OVER UNEVEN FLOORS, etc.). THE GENERAL CONDITION MUST BE UPGRADED.
3
GENERAL COMMENT
USABLE SPACE
ALMOST 1/4 OF THE ENCLOSED SPACE IS DEVOTED TO CIRCULATION. SOME OFFICES ARE CRAMPED, LITTLE ACOUSTIC SEPARATION, OR WITHOUT DAYLIGHT.
THIS MAY BE A GOOD AREA FOR COMPUTER SUPPLIES. THE SECRETARY CAN CONTROL ACCESS.
2
POSSIBLE USE OF CAMERA FOR SECURITY.
GENERAL PUBLIC - no control
NO WASHROOMS NEAR RECEPTION REQUIRES GENERAL PUBLIC TO WALK TO BACK OF BUILDING WHERE THEY CANNOT BE SEEN.
PUBLIC ATTENDING COURSES, APPOINTMENTS, ETC.
M
CIRCULATION
WEAK SECURITY
- ISOLATED ROOM
- WINDOWS ONTO ALLEY
ELEC T
TEL RM
B

SECURITY

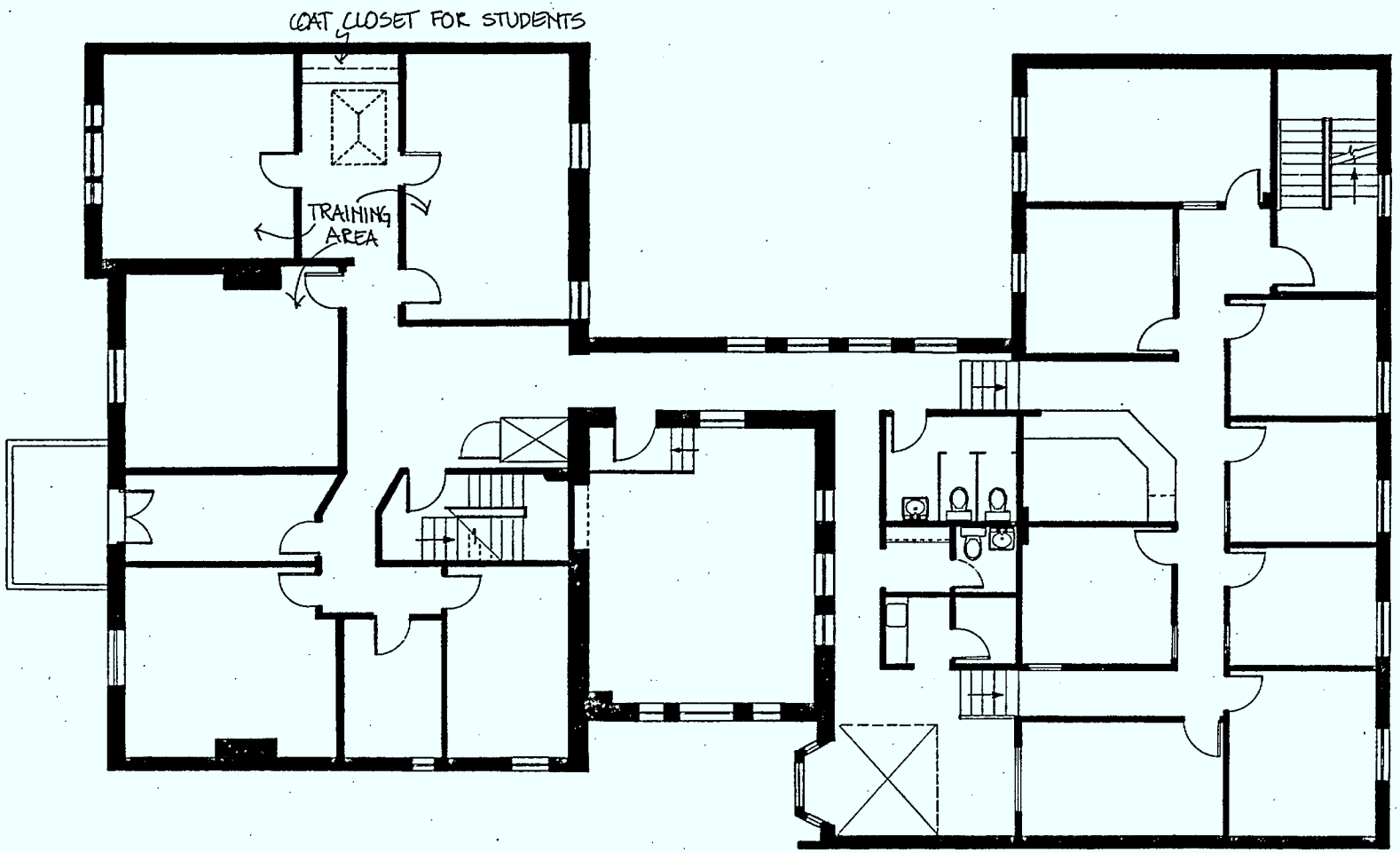
APPENDIX 2 - REVISED FLOOR PLANS - WORK IN PROGRESS

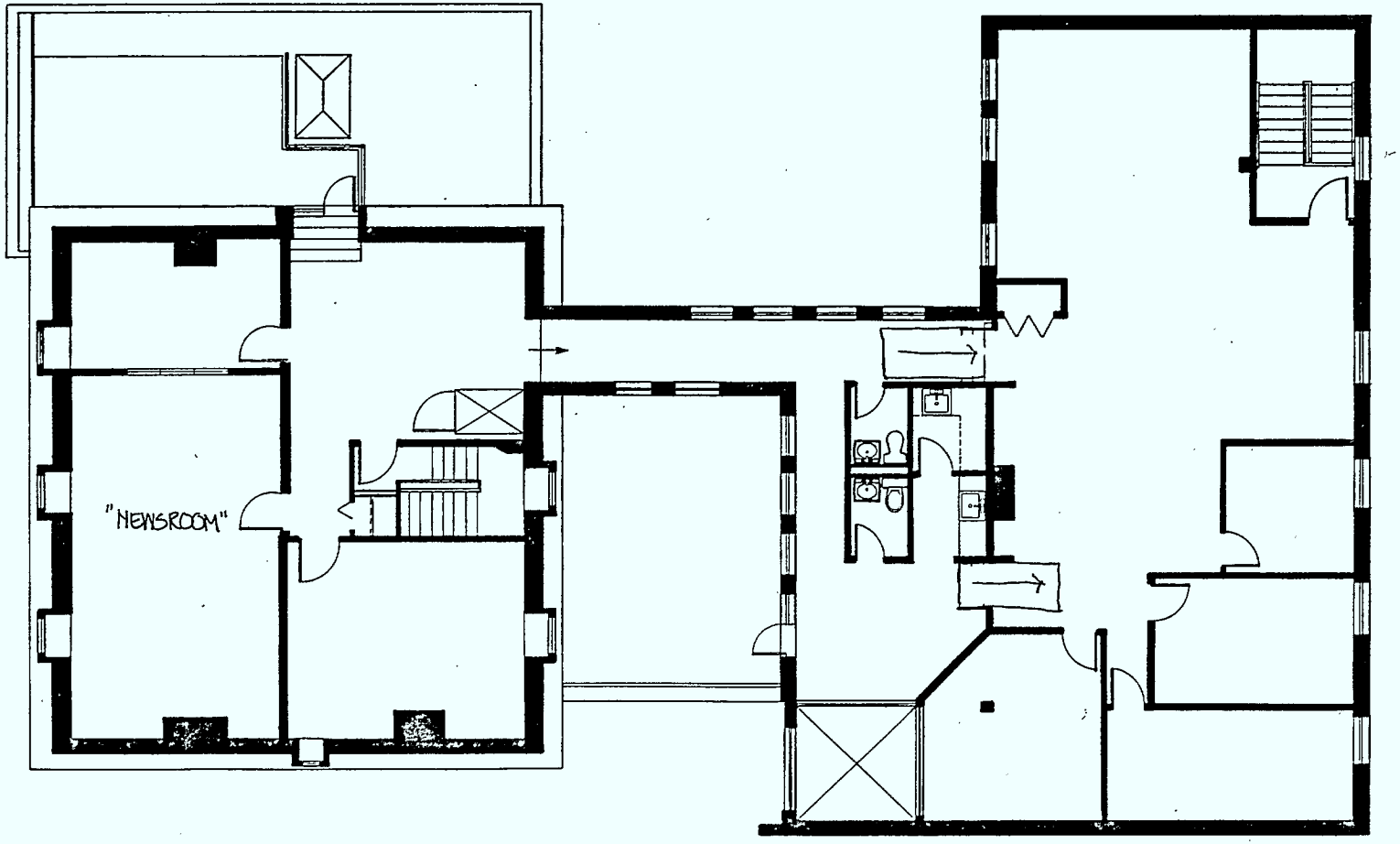


B


WHEELCHAIR ELEVATOR
PROVIDES CONTINOUS VERTICAL RISE
RECEPTION
SECURITY

M


COAT CLOSET FOR STUDENTS
TRAINING AREA


"NEWSROOM"

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Kaplan, Audrey G.
Installing electronic office

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Le Centre canadien de recherche sur l'informatisation du travail
1575, boulevard Chomedey
Laval (Québec)
H7V 2X2
(514) 682-3400

For more information, please contact:

Canadian Workplace Automation Research Centre
1575 Chomedey Blvd.
Laval, Quebec
H7V 2X2
(514) 682-3400