DOROTHY TRETHEWY

INDOOR AIR QUALITY STUDY

of

STATE LIBRARY

Project No. 92-268

for

State of Washington
Department of General Administration
Division of Engineering and Architectural Services

by

Abacus Consultants, P.S.
401 Second Avenue South, Suite 201
Seattle, Washington 98104

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Contact: Clint Lougheed
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June 21, 1993

PREFACE

This study was completed by Abacus Consultants with the support of Environmental Health Sciences, Inc., Ventilation Consultants, and Technical Communication Consultants, Inc.

We appreciate the input received from General Administration, Division of Capitol Facilities, and the thousands of State employees who provided personal insight.

This study produced separate reports on the following buildings:

- Legislative
- Temple of Justice
- General Administration
- J.L. O'Brien
- Insurance
- State Library
- Employment Security
- Department of Transportation (formerly Highway Administration)
- Office Building No. 2
- Old Capitol

There is also a separate Summary Report covering all these buildings.

TABLE OF CONTENTS

ABBREVIATIONS

ACM	Asbestos-Containing Material
ASHRAE	American Society of Heating, Refrigerating & Air Conditioning Engineers
CFM	Cubic Feet per Minute
CMU	Concrete Masonry Unit
DDC	Direct Digital Control
DCF	Division of Capitol Facilities
EF	Exhaust Fan
HWS	Hot Water System
HVAC	Heating, Ventilation, and Air Conditioning
I.A.Q.	Indoor Air Quality
MSDS	Material Safety Data Sheets
OAT	Outside Air Temperature
OSHA	Occupational, Safety, and Health Act
PEL	Permissible Exposure Limit
ppm	parts per million
QA/QC	Quality Assurance/Quality Control
RTU	Roof Top Unit
sf	square feet
VAV	Variable Air Volume
VOC	Volatile Organic Compounds

SECTION I - INTRODUCTION

A. PURPOSE

The purpose of this study is to determine if the indoor air quality (I.A.Q.) in this facility meets generally accepted standards for office buildings. If the I.A.Q. does not meet these standards, then needed improvements are identified along with budget estimates for such improvements.

B. AUTHORIZATION

This work was authorized under Agreement No. 92-268A between the State of Washington, Department of General Administration, Division of Engineering and Architectural Services, and Abacus Consultants, P.S.

C. SCOPE

The scope of work covers building occupancy and use, custodial practices, building activities and equipment, Heating, Ventilation, and Air Conditioning (HVAC) systems, and external contaminant sources.

Many discussions about I.A.Q. standards and guidelines took place early in this project. With policies and procedures for indoor air quality in facilities on the Capitol Campus not firmly in place, the following guidelines were used to identify deficiencies:

1. Building activities, including normal operations, custodial activities, maintenance, and remodeling work, will be carried out so as to minimize the occupants' potential exposure to hazardous materials. When elevated levels of airborne contaminates (such as carbon monoxide or formaldehyde) are suspected, testing will be conducted and modifications made as needed to maintain levels 70 percent below limits established by OSHA for industrial occupancies.
2. Carbon dioxide will be used as one indicator of HVAC system performance and levels will be maintained below 1,000 parts per million (ppm).

3. Building HVAC systems will provide:

   a. Total ventilation (outside plus recirculated air) rate of not less than six (6) air changes per hour in all spaces to assure adequate circulation of outside air and to avoid stratification or large gradients in temperature.

   b. Outside air ventilation rates of not less than twenty (20) cubic feet per minute (CFM) per person will be maintained during occupied hours. Where occupancies are variable or unknown, outside air rates will be calculated based on one person per 140 square feet.

   c. Temperature control of all spaces between 68 F and 74 F in the heating mode and 72 F - 78 F in the cooling mode. Where heating and cooling are provided by seasonably operated central systems, it will be acceptable to exceed these limits during periods of unseasonable weather (e.g., warm February days when the chilled water system is off, or cold June days when the steam is off), provided the central systems are operated according to a documented annual schedule.

   d. Continuous ventilation during the published occupancy schedule with provision for off schedule ventilation upon demand from the DCF Work Management Section.

   e. All ventilation air supplied to occupied space shall be filtered through minimum 60-65 percent efficient extended surface filters per ASHRAE Standard 52 Atmospheric Dust Spot Test Method.

4. Spaces where potentially unsafe materials are commonly used or stored will be ventilated in such a way as to not recirculate air from these spaces into other areas of the building.

5. Outside air intakes for HVAC systems will be located so as to minimize introduction of significant outdoor pollutants into the building.

The budget estimates are maximum construction cost figures in January 1993 dollars. Other project costs, including inflation, must be added to arrive at a total project budget.

SECTION II - EXECUTIVE SUMMARY

A. SUMMARY

The State Library requires major renovations of its mechanical systems to provide acceptable indoor air quality and a good working environment for employees. Nine hundred and sixty-five thousand dollars ($965,000) in HVAC improvements were identified.

Indoor air quality in the State Library does not meet the proposed guidelines. Ninety-four percent of the people responding to the I.A.Q. survey noted that air quality is a problem for them. Twenty-one people reported visiting their physician because of symptoms related to indoor air quality. Medical fees and lost work time are a significant cost to the State. This cost is much higher if the cost of lost productivity caused by I.A.Q. problems is included. The primary goal of the State's indoor air quality program should be to maintain an office environment that supports a healthy, productive workforce.

Results of the occupant surveys are summarized in Section VII.

B. HVAC SYSTEMS

Most of the I.A.Q. concerns in this building are directly attributable to deficiencies in the heating, ventilation, and air conditioning (HVAC) systems in the building caused by failure to adequately coordinate required changes to HVAC systems during remodel projects and occupancy/equipment changes.

Deficiencies include:

1. Stack Areas:

   The unit ventilators serving the stack areas on the first through fourth floors are incapable of maintaining acceptable indoor air quality. Total air flow in these areas is inadequate for occupied areas, temperature control is poor, and the systems are dirty and in disrepair. These systems need complete replacement. In addition to people-related indoor air quality, book life is reduced considerably by poor temperature control.

2. First Floor:

   Indoor air quality on the entire floor is degraded by inadequate air flow and poor temperature control. Much of this floor has been remodeled without regard to the HVAC system. The personnel office has no ventilation, and other offices and cubicles have low airflows.

3. Basement and Basement Mezzanine:

   These areas have the same problems as the first floor. Again, the occupancy and use of these spaces has been significantly altered (originally designed as book storage) with inadequate provisions for HVAC system improvements.

4. Basement Mechanical Room:

   The current configuration of the mechanical room makes operation and maintenance a formidable task. Much of the equipment is inaccessible. For example, coils and humidifiers are in the overhead ductwork.

C. OPERATION AND MAINTENANCE

Current HVAC operation and maintenance practices can not maintain good indoor air quality. The current practice is to fix what is broken. By this time in the cycle, indoor air quality has probably degraded. There needs to be regular monitoring of HVAC system performance so that repairs are made before system performance degrades the indoor air quality.

Recommended capital improvements in HVAC systems will provide only short term improvements in indoor air quality, if changes in HVAC system operation and maintenance are not enacted. Policies and guidelines need to be developed to ensure indoor air quality through proper HVAC system operation.

Current custodial practices and materials are sensitive to the I.A.Q. issue. The only recommended change that would improve indoor air quality is to increase vacuuming around copiers and printers.

D. AIR SAMPLING

Most I.A.Q. investigations previously conducted in State facilities have focused on scientific sampling of indoor air. These studies measured levels of carbon dioxide as an indicator of ventilation system performance. Carbon dioxide is non-toxic and is not the direct cause of any I.A.Q. problem. An elevated level of carbon dioxide is, however, an indication that an adequate supply of outside air is not present.

Because there are often I.A.Q. problems in a building even when contaminants are at very low levels, scientific sampling for contaminants should not be the sole focus in any investigation of indoor air quality. Some people are susceptible to one or more contaminants at levels far below established guidelines.

Carbon dioxide and carbon monoxide levels were sampled in the State Library as part of this study. The concentration of both were below recommended limits in all areas.

Room temperatures often fell outside the recommended range; however, out-of-control drifting of space temperatures appears to be more of a problem.

More detailed results of the air sampling are summarized in Section VI.

SECTION III - BUILDING DESCRIPTION

A. OCCUPANT

The Basement of the State Library serves as office space, book storage, and stacks accessible to the public; this floor also houses the mechanical room. The Basement Mezzanine is primarily closed access stacks, with one small computer area housing two employees. The first floor is divided into three areas: reference and check out area, office/cubicles for employees (including mailroom), and public access stacks. The first floor mezzanine, second, third, and fourth floors are all stack areas. There is normally someone on each floor of the stack areas at all times.

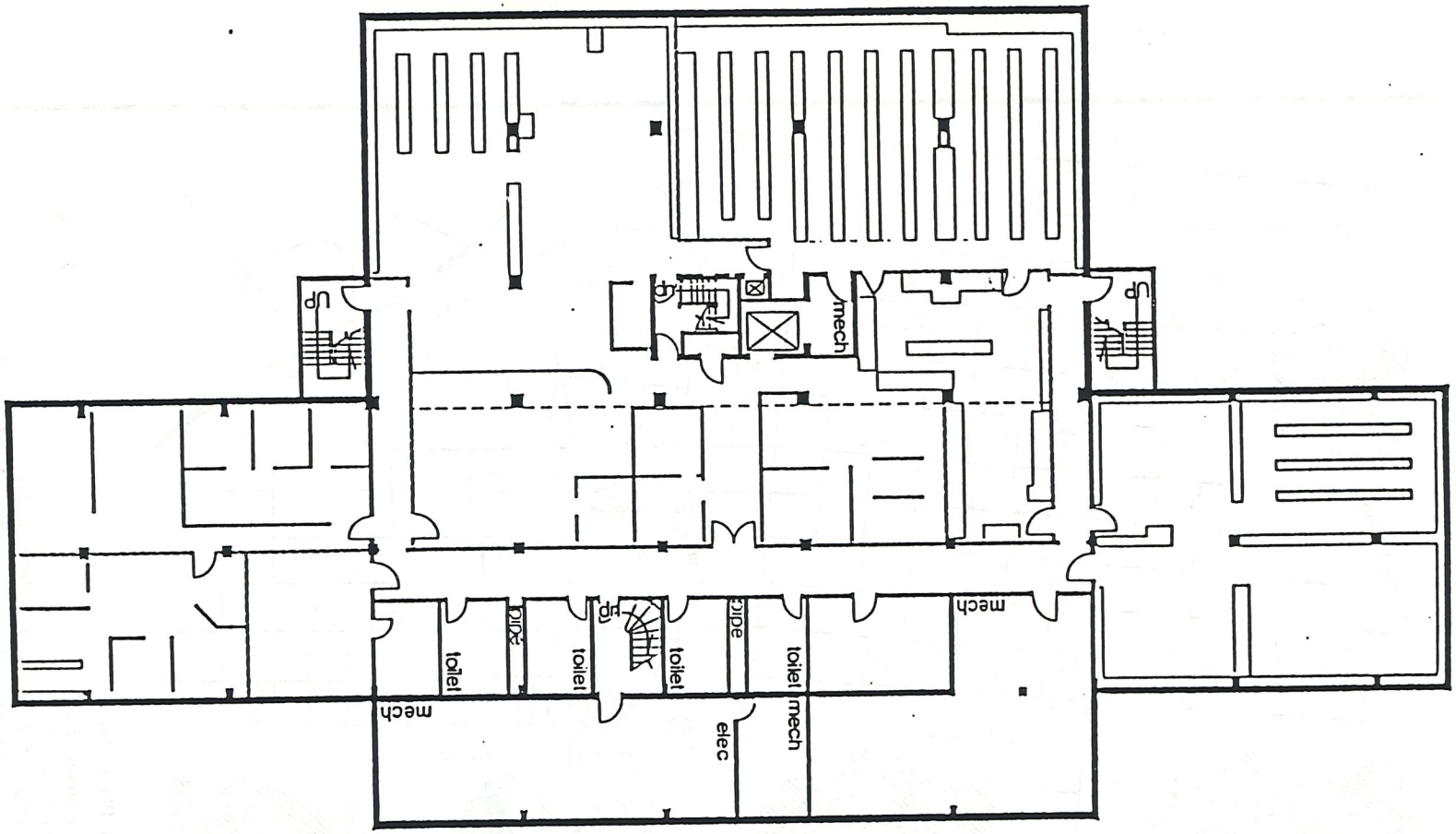
In a fully occupied state, the State Library houses about 85 employees or about one person per 640 square feet. Normal building occupancy is 7 am to 6 pm, Monday through Friday.

B. ARCHITECTURAL

The building is a seven floor 54,526 square foot building originally constructed in 1959. Mechanical space occupies about 1,000 square feet in the basement. The structure is composed of a low-rise reading and administration wing in the front, with a multi-story tower housing books and periodicals rising from the back (south) of the building. The building envelope contains approximately 4,200 square feet of glass, primarily on the first floor. The North side exterior wall of the basement is below grade.

Except for a few new exits, the exterior of the Washington State Library has not changed. Many interior areas have been converted from stack area to employee work space.

The first floor has many walled offices and work areas. Other offices are open cubicle type. All areas of the building are carpeted except for the restrooms, stairwells, mechanical spaces, janitorial closets, the entrance of the first floor, and the majority of the first floor hallways. New carpeting is currently being installed throughout the building.



10

STATE LIBRARY

FEET 10 20 30
METERS 5 10

STATE CAPITOL CAMPUS — OLYMPIA, WASHINGTON
DEPT. OF GENERAL ADMINISTRATION
FACILITIES PLANNING

BASEMENT

1975 F. N. THOMAS

NORTH

REVISIONS

Capitol Campus & Vicinity

Key:

A Legislative Building

B Governor's Mansion

C John L. O'Brien Building

D John A. Cherberg Building

E State Library

F Institutions Building

G Insurance Building

H Temple of Justice

I General Administration Building

J Archives

K Highway/Licenses Building

L Office Building #2

M Highway Administration Building

N Employment Security Building

O State Capitol Museum

P Old Capitol (Superintendent of Public Instruction)

Q Department of Personnel

R Department of Game

S Greenhouse/Conservatory

T Post Office

U Capitol Center Building

V Olympia City Hall

W Department of Community Development

X Information Center

Y Town Square Facility

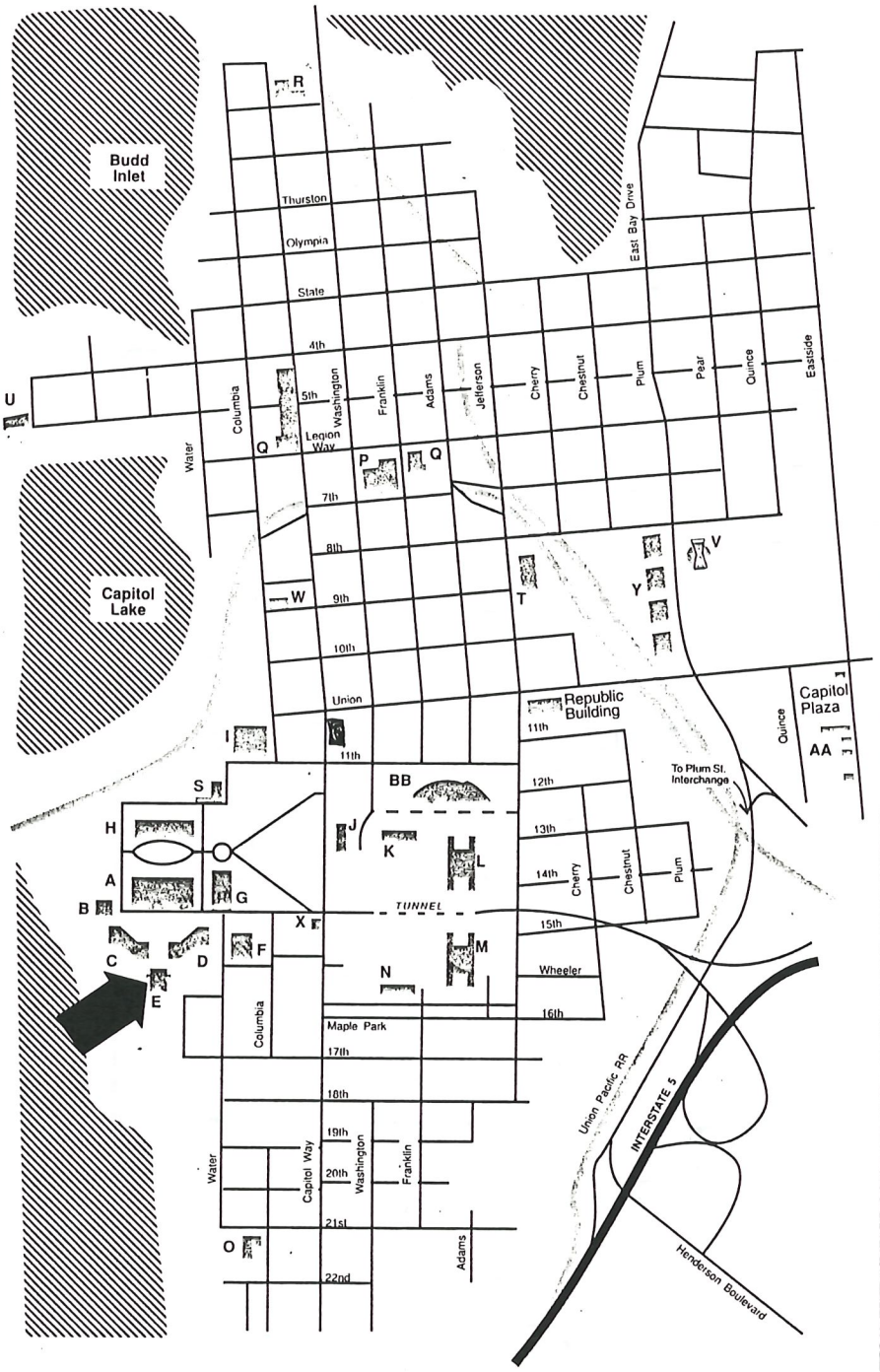
AA Vital Statistics

BB Department of Natural Resources

Update. 012293

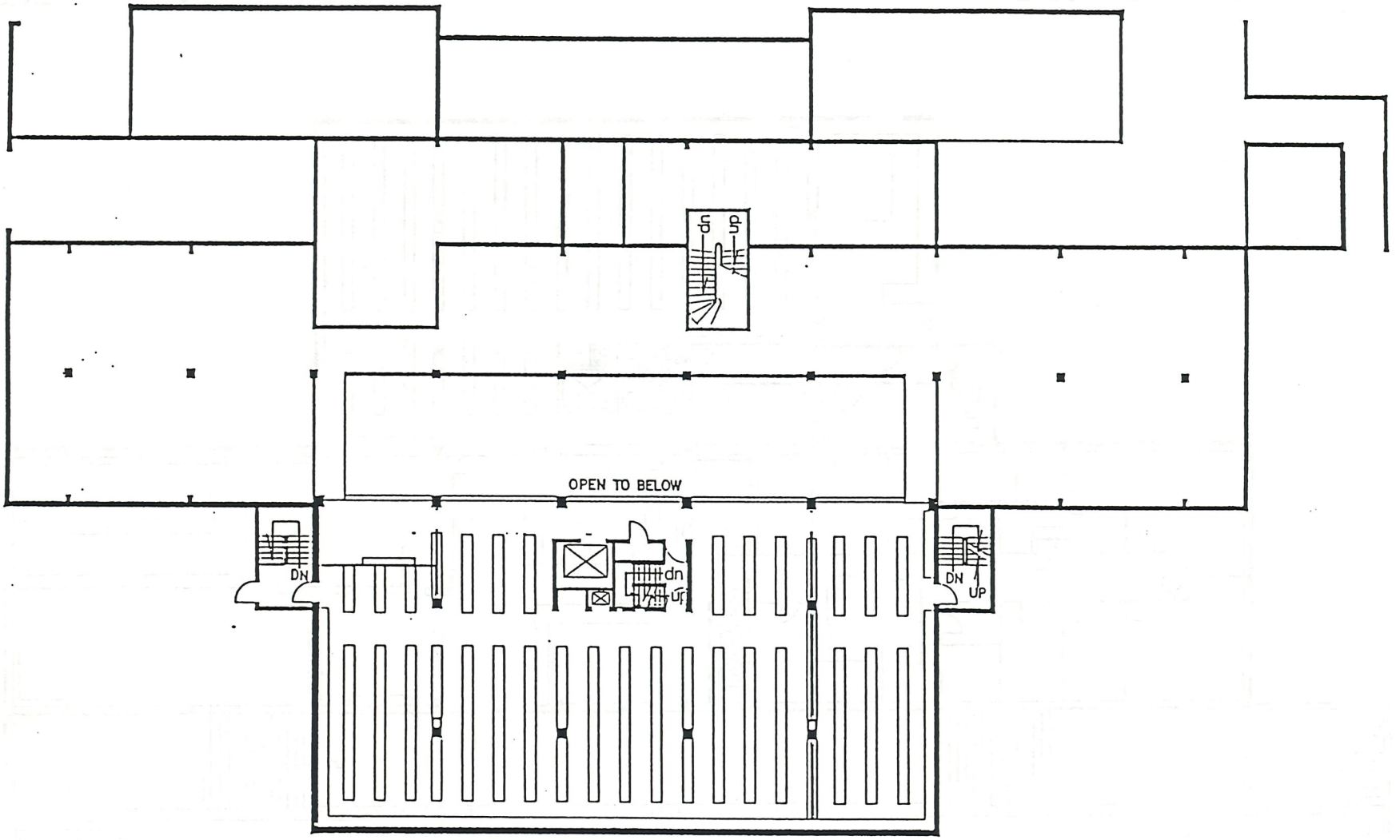
Directions:

From Interstate 5 take exit 105. Proceed through the tunnel and onto the Capitol Campus. Adequate parking is available on Sunday in front and in back of the Legislative Building.



Important Phone Numbers:

Senate Page Room 786-7558
Senate Page Room 786-7498
Senate Security 786-7572 (open 24 hours a day)
When calling on campus you need only dial the last four digits.



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STATE LIBRARY

BASEMENT MEZZANINE

FEET 10 20 30
METERS 5 10

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DEPT. OF GENERAL ADMINISTRATION
FACILITIES PLANNING

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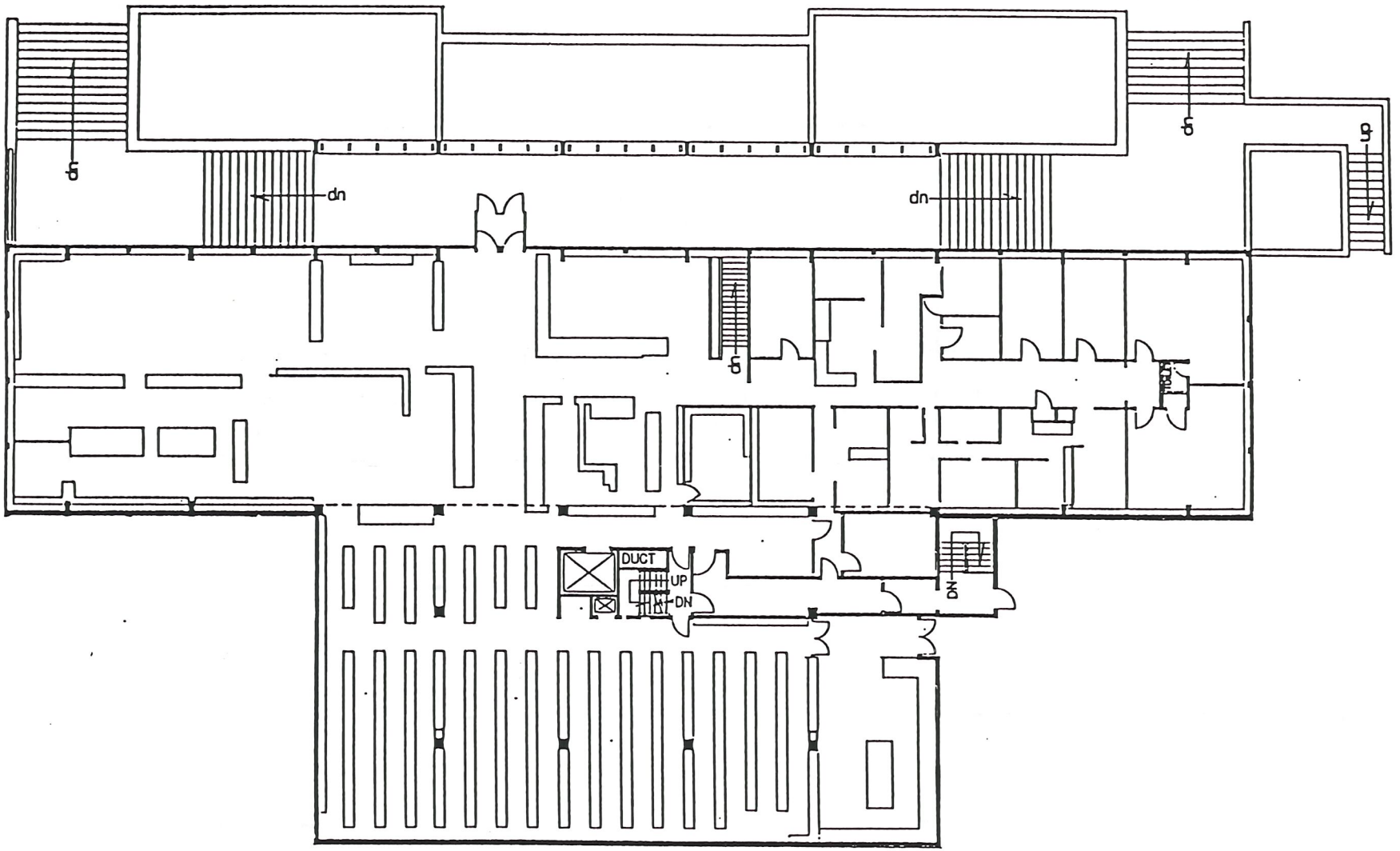

STATE LIBRARY

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DEPT. OF GENERAL ADMINISTRATION
FACILITIES PLANNING

FIRST FLOOR

1975 F. N. THOMAS

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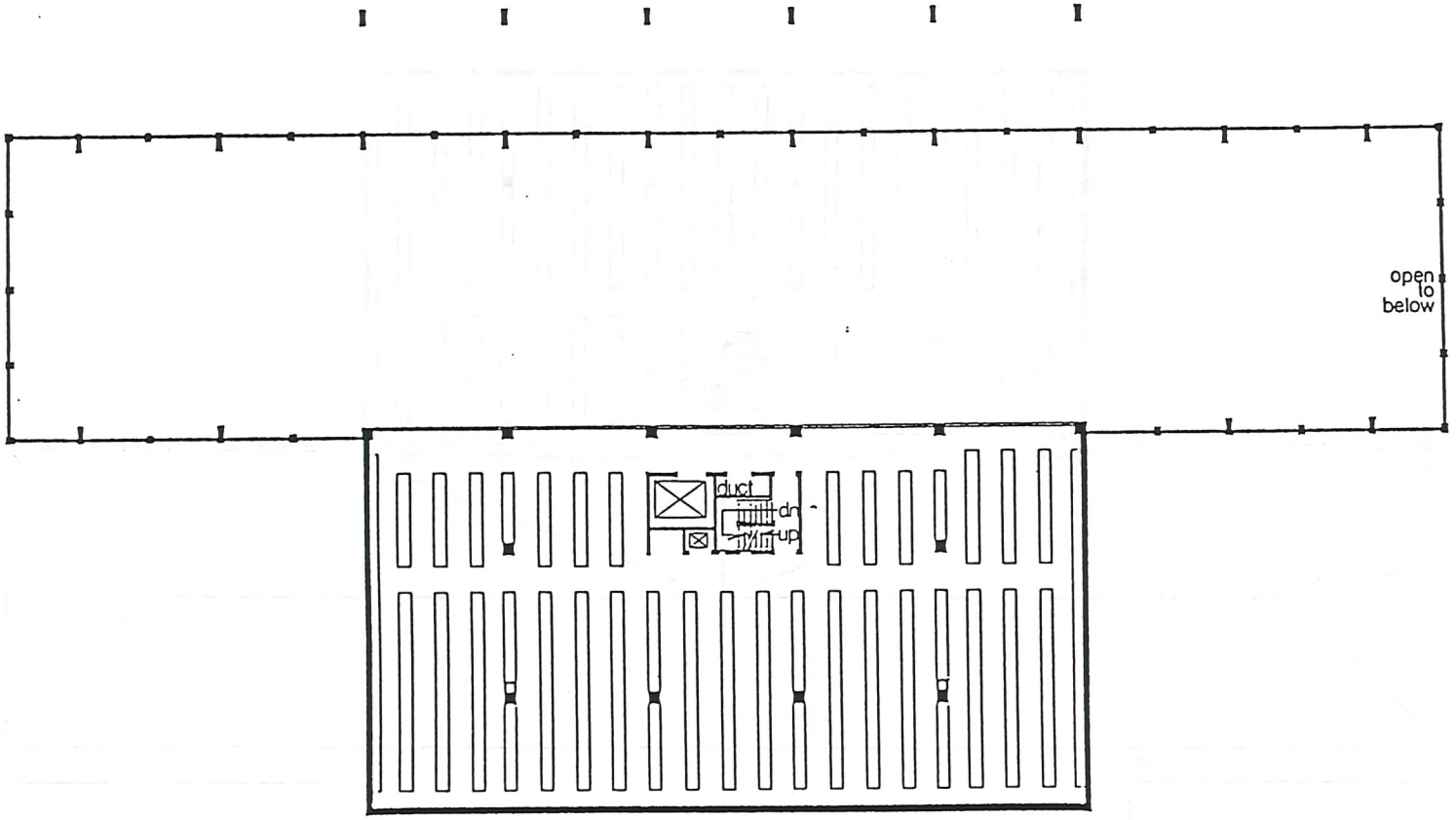

STATE LIBRARY

FIRST FLOOR MEZZANINE

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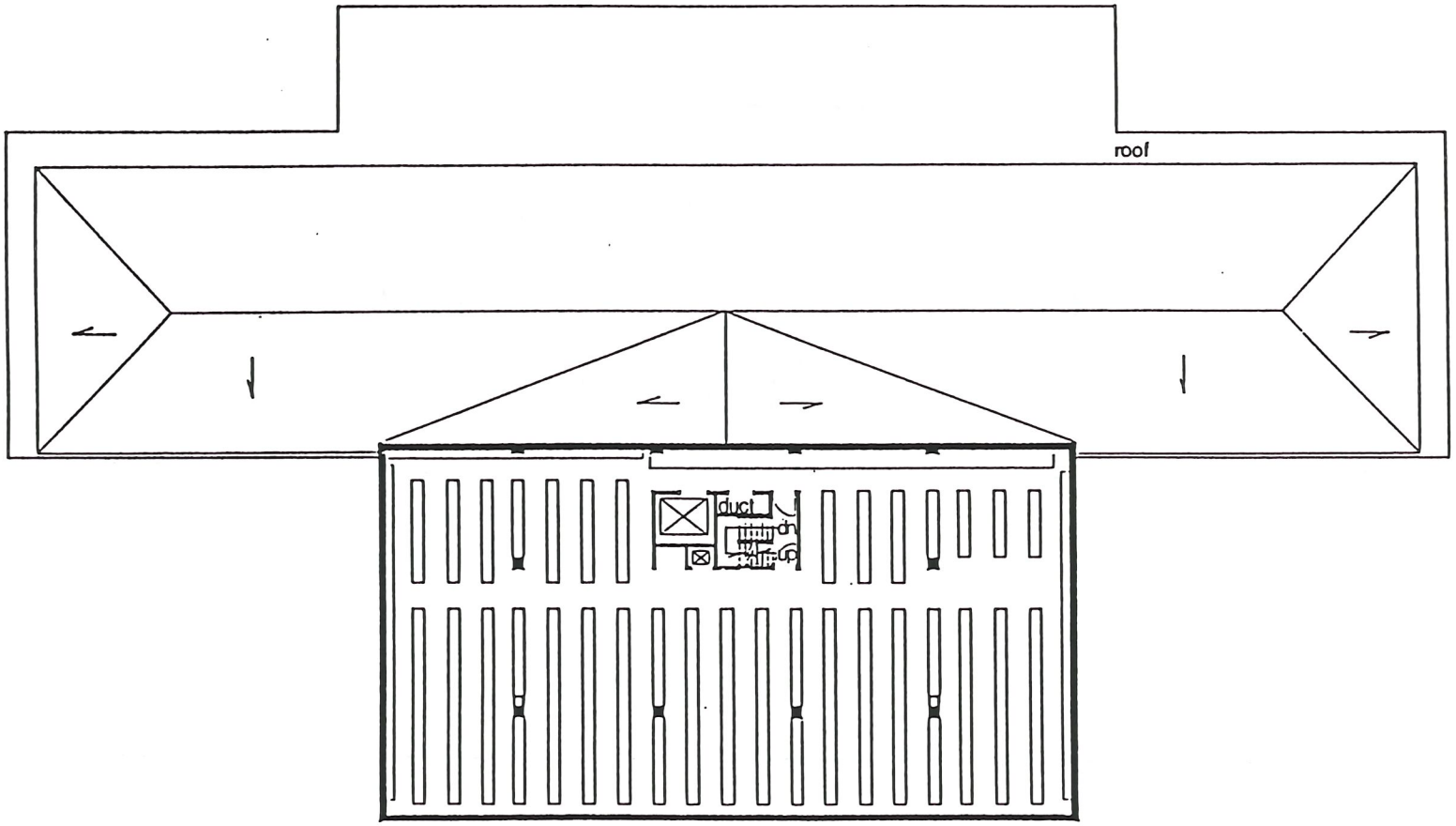

STATE LIBRARY

SECOND FLOOR & ROOF PLAN

FEET 10 20 30
METERS 5 10

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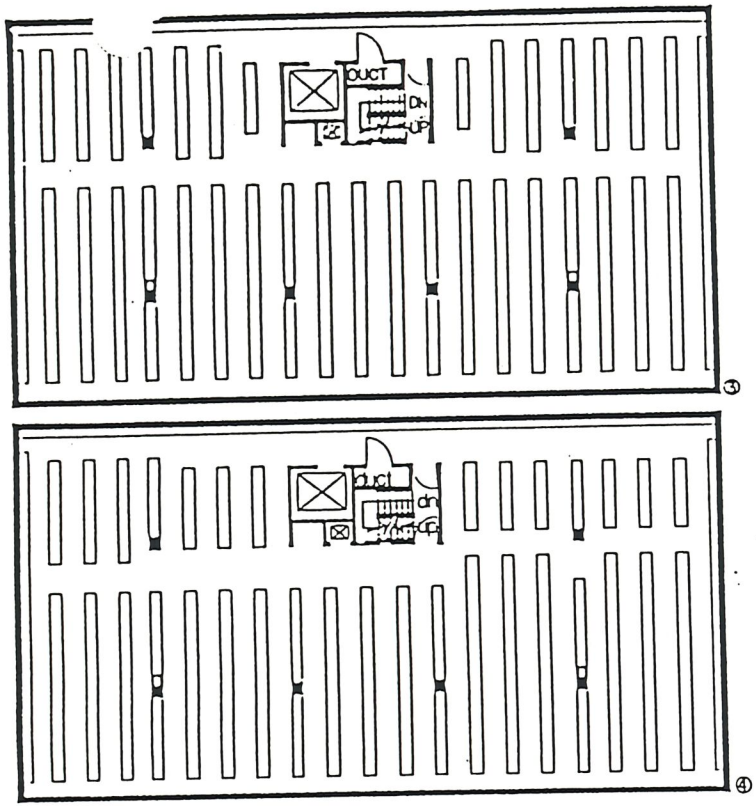
DEPT. OF GENERAL ADMINISTRATION
FACILITIES PLANNING

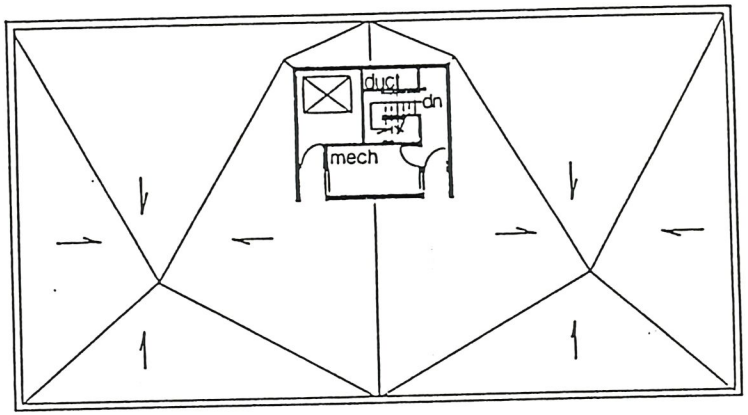
1975 F. N. THOMAS

NORTH

REVISIONS



THIRD and FOURTH FLOOR PLAN



ROOF PLAN

STATE LIBRARY

FEET 10 20 30
METERS 5 10

STATE CAPITOL CAMPUS — OLYMPIA, WASHINGTON
DEPT. OF GENERAL ADMINISTRATION
FACILITIES PLANNING

FLOOR & ROOF PLANS

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NORTH

REVISIONS

SECTION IV - OCCUPANCY AND USE

A. OCCUPANT DENSITIES

The HVAC systems bring in and exhaust air and maintain comfort conditions by providing heating and cooling. HVAC systems are designed based on a certain occupant limit in a space and also on those occupants performing certain activities. If the occupant density exceeds this limit, or unexpected activities are allowed, then the indoor air quality may be degraded. Unexpected activities include adding heat generating equipment or contaminant sources.

It is imperative to coordinate the occupancy and use of all areas with the HVAC system's design capacities.

Occupant and equipment densities in several spaces exceed the design capacities of the HVAC system.

B. EQUIPMENT

Office equipment in the building consists primarily of microfiche readers, desktop personal computers (PCs), laser printers, dot matrix printers, dry toner copiers, and facsimile (fax) machines.

Computers are not typically sources of airborne contaminants. They do, however, along with other office equipment, add heat to the air conditioning loads. When not accounted for by HVAC modifications, continued addition of equipment will lead to overheating of the office environment, as well as overheating of the equipment.

Laser and dot matrix printers are potential sources of paper dust. Dry toner copy machines are potential sources of ozone, carbon, and paper dust. Paper dust from this equipment is often chemically treated. The dust also picks up volatile compounds that may be present in the air. These factors add to the irritation effects of paper dust. The amount of air contaminants generated by office equipment is dependent upon several factors including type, frequency of use, age, and condition. Airborne contaminant levels can be minimized by utilizing the following good practices:

- Reduce dust accumulations by cleaning horizontal surfaces daily. Vacuum or dust with treated cloths. Avoid dry dusting because it reintroduces the hazards into the air.

- Maintain good air distribution near printers to optimize the return of paper dust to the filtering process in the HVAC system. Locate printers and copiers under return or exhaust air grilles.

- Perform periodic maintenance as recommended by printer manufacturer.

- Isolate copy machines in separate, well-ventilated areas if available.

C. CUSTODIAL CLEANING PRODUCTS

Copies of Material Safety Data Sheets (MSDSs) for products used in the building for custodial purposes were reviewed. The State also provided a list of cleaning frequencies and chemicals used in the building. A copy of the cleaning products and frequency is included in Appendix D. Custodial practices do not appear to have an impact on indoor air quality.

The amount of "hazardous chemicals" in the listed cleaning products was minor. Products with more toxic substances are used less frequently than the non-toxic cleaners. The custodial products were found to be acceptable relative to their frequency of use.

D. POTENTIAL CONTAMINANT SOURCES

The following activities or processes which may have the potential to impact indoor air quality were identified.

Paper dust can be generated by a variety of office equipment and, in the case of the Library, by all the books. Paper dust is an irritant and may also contain other contaminants due to special additives to the paper or because of absorption of other contaminants. Paper dust should be removed from the indoor air environment to the extent feasible. HVAC system filtration efficiency should be improved and vacuuming frequency should be increased around dust sources.

Large copy machines are located in or near office areas. Copy machines are potential sources of paper dust, other particulates, and volatile compounds. Ideally, copy machines should be located in areas with dedicated exhaust systems or, as a minimum, near return air grilles.

At the time of this study, new carpets were being installed in the building. Carpets and associated adhesives are potential sources of volatile organic compounds (VOCs). Many carpet manufacturers have been actively attempting to reduce VOC emissions from carpets. However, there may be individuals in the library who are sensitive to low levels of VOCs. The potential impact of VOCs from the carpet can be minimized by using adequate amounts of outside air and air distribution to facilitate dilution of VOCs.

Cooling coils and drip pans in air conditioning units must be periodically inspected for presence of microorganisms (e.g., mold, fungi). The cooling coils and drip pans must also be cleaned at the start of the air conditioning season and periodically thereafter. The cooling coils and condensate drip pans in this building showed signs of inadequate maintenance. Drip pains did not drain, leaving a stagnant pool of water. There is no access for cleaning the coils. If not properly maintained, these are potential sources of bioaerosols. Proper inspection, maintenance, and cleaning of the air conditioning system components is necessary to prevent growth of microorganisms.

The perforated metal supply and return diffusers in the Northwest Room in the basement were covered with black dust and other debris. The presence of this material on the diffuser covers indicates there may be particulate matter within the duct system. In addition, the material may be due to a number of other factors including inadequate housekeeping and/or maintenance.

During the walkthrough, the outside door to the mail room on the first floor was propped open. A loading dock is located just outside the mail room door. Occupants reported the door had been opened to provide fresh, cool air from outside. Although outside doors should not be left open, especially near loading docks, the need of building occupants to leave outside doors open is an indication that the temperature control in the building is not adequate. The extensive use of personal fans by occupants was another indication that temperature control is inadequate.

SECTION V - HVAC SYSTEMS

A. SUMMARY OF NEEDS

In order to meet I.A.Q. guidelines, the entire HVAC system should be replaced with a new system. The recommended HVAC system renovation would include a central rooftop air handling system, extension of the campus chilled water system to the library, new air distribution, and temperature controls. This cost of this renovation is estimated at $965,000.

B. OPERATION/MAINTENANCE

Proper operation of the HVAC systems based on space occupancy levels and use is critical to proper indoor air quality. The current program includes fixing problems and some standard preventative maintenance activities. This type of program has proved insufficient.

To ensure acceptable levels of indoor air quality are met, the identified capital improvement projects need to be completed. To ensure acceptable levels of indoor air quality are maintained, a detailed maintenance plan including monitoring and system inspection must be developed and followed. As part on this plan, an Operating Engineer(s) needs to be assigned to perform system evaluation, monitoring and inspecting, as well as directing technicians in maintenance tasks.

C. SYSTEM DESCRIPTIONS

The following are descriptions of the existing HVAC systems and details of their current deficiencies related to I.A.Q:

1. Unit Ventilators:

   Unit ventilators provide heat and ventilation to the first floor mezzanine through fourth floor stack areas. The units have an economizer cycle and steam heat. Each floor has two unit ventilators on one thermostat.

   The unit ventilators are in poor condition. They are noisy, dirty, and doing very little to provide fresh air or temperature control in the spaces.

Examples of deficiencies include:

a. Steam valves do not close tightly and economizer dampers do not cycle properly.

b. The unit ventilators deliver less than one-half of the total air flow recommended in the I.A.Q. guidelines for the campus.

c. The unit ventilators are located along the south wall of each floor, and do not distribute air to other parts of the floor.

d. Filters were very dirty.

e. Malfunctioning steam valves were evident on some units, providing heat when not needed.

Occupants above the first floor have experienced 85-90 degree room temperatures in the summer. These units require complete replacement.

2. Fan System 1:

Fan System 1 is a constant volume system serving the first floor. It is located in the basement mechanical room. Heat is supplied by the campus steam loop and cooling is supplied by a 30 ton reciprocating compressor located in the mechanical room. This system has an economizer cycle with return/exhaust fan. Air distribution is located along the perimeter, with supply air being directed upwards from registers along the window sill, and return grilles located on the wall directly beneath the supply grilles. The system has three zones of heating and cooling. The system was not originally designed for the current floor plan, resulting in poor temperature control and stagnant air conditions throughout the floor.

Examples of deficiencies include:

a. The system is delivering only two-thirds of the recommended 6 air changes per hour to the area. With this area open to the first floor (mezzanine), the high ceiling promotes stratification. In the winter, the warm air exiting the perimeter supply grilles rises to the ceiling area causing ineffective heating, while the cool air exiting the vents in the summer simply falls to the floor area and the return air intakes.

b. There is poor air distribution to the interior offices and cubicals. The personnel office is fully enclosed but has no supply or return air in the space.

c. Remodels have resulted in de-facto zoning of the first floor, with no corresponding HVAC modifications. Poor air distribution and temperature control are the result.

3. Fan System 2:

Fan system 2 is constant volume and serves the basement and basement mezzanine. This fan system is also located in the basement mechanical room. The single duct system has steam heat and no cooling, but does have an economizer cycle with return/exhaust fan. The distribution system supplies air via overhead diffusers, originally designed to serve reading and document storage areas. The system has poor temperature control and stagnant, stuffy air is a problem in these areas.

Examples of deficiencies include:

a. The system supplies two thirds of the recommended six air changes per hour.

b. No ventilation is provided for a computer area on the mezzanine. Two full-time employees occupy this space and it is an area of high heat gain from computer equipment.

c. There is no cooling in this area and air distribution is poor.

4. Mechanical Room:

Examples of deficiencies include:

a. Filters on all systems are less than 30 percent efficient, allowing dust and particulate matter into the system.

b. Signs of microorganisms were found at drain pans for cooling coils. These pans and the cooling coils need to be cleaned and disinfected regularly, however, access to the cooling coils is very difficult.

c. A broken filter tray on Fan No. 1 allows bypass around the filter. This should be repaired.

5. General:

Examples of deficiencies include:

a. Diffusers and registers are dirty indicating the presence of dirt in the system. An occupant taped a piece of cheesecloth onto one of the diffusers in the rare book storage area; after six months the cheesecloth was black with grime. All systems need a thorough cleaning.

b. Temperature control is generally poor, with various hot and cool areas throughout the building.

c. Air circulation is generally poor. Dead spots are located on the second, third, and fourth floors.

d. While outside air volume is within acceptable limits (based on carbon dioxide sampling), it does little to provide comfort to the occupants due to the poor air distribution within the building.

6. Recommended Modification and Estimated Costs:

In order to meet the I.A.Q. guidelines, the Library should be renovated with a new HVAC system. The cost is estimated as follows:

Description	Cost
a. Demolition work required to remove existing ductwork and mechanical room equipment	$10,000
b. Additional roof support and roofing repair required for new equipment	$30,000
c. Add suspended ceiling and expand the HVAC system to first floor North side (Note: suspended ceiling will not go totally to the windows) 10,000 sf at $3.00 per sf	$30,000
d. Tie-in to campus chilled water system 200ft. 6" direct buried pipe with valves	$20,000
e. New rooftop mechanical system with air distribution to all areas to provide heating, ventilation & cooling 55,000 sf at $15/sf	$825,000
f. Miscellaneous cutting, patching, air shafts and painting:	$50,000
Total cost for new system	$965,000

SECTION VI - I.A.Q. SAMPLING

A. SAMPLING METHODS

All sampling was conducted by Environmental Health Sciences, Inc. (EHS). EHS utilized a Metrosonics AQ-501 Air Quality Monitor to continuously monitor carbon dioxide, carbon monoxide, temperature, and relative humidity. The AQ-501 uses internal datalogging to record the monitor's readings. The AQ-501 was placed in a work space, typically on a desk or table to monitor air in the "occupied zone." An AQ-501 remained in one sampling location for a minimum of two working days. EHS placed one AQ-501 per 20,000 square feet (approximately) of office space. Each AQ-501 was calibrated a minimum of once per week and in accordance with manufacturer recommendations.

EHS also used direct reading colorimetric detector tubes and outside readings as quality assurance/quality control (QA/QC) checks of the carbon dioxide and carbon monoxide readings from the AQ-501. The QA/QC procedures indicated the AQ-501 data was reliable.

Carbon dioxide is a non-toxic indicator of ventilation efficiency in dilution of air contaminants. Carbon dioxide is generated by the process of human respiration and tends to increase in concentration in buildings during the day. Concentrations of carbon dioxide in outside air are typically between 300 and 400 parts per million. The concentration of carbon dioxide in a building is affected primarily by three factors: the amount of outside air provided through the HVAC system, the effectiveness of air distribution to the occupied zone, and occupancy rates. ASHRAE recommends a maximum carbon dioxide concentration of 1,000 ppm with occupancy rates not exceeding seven people per 1,000 square feet.

Carbon monoxide is a by-product of incomplete combustion. Typical sources of carbon monoxide inside office buildings are exhaust from fuel combustion (e.g., heating, hot water heat), smoking, and vehicle exhaust. The Permissible Exposure Limit (PEL) for carbon monoxide is 35 ppm; the recommended level for non-industrial settings is 9 ppm.

ASHRAE recommended temperature ranges are 68 F to 74 F winter and 72 F to 78 F summer. Office temperatures are affected by many factors - some of which include occupancy level, quantity of office equipment used, radiant heat from the sun, and HVAC temperature controls. ASHRAE recommends a relative humidity range of 30 to 60 percent. Humidity levels may be affected by outside air humidity and differences in outside and inside air temperatures.

B. RESULTS

The following table summarizes the air monitoring readings taken while the building was occupied. Complete graphical results of the air monitoring are shown in Appendix B. The monitored concentration of carbon dioxide and carbon monoxide were below the recommended limits. The highest concentration of carbon dioxide in the building was 600 ppm. The peak concentration of carbon monoxide was 2 ppm.

State Library
Monitoring Results
Summary Table

		CARBON DIOXIDE	CARBON MONOXIDE	TEMPERATURE RANGE	HUMIDITY RANGE
Proposed Standard		*1,000 ppm*	*9 ppm*	*68-74 Degrees F*	*30-60 %*
LOCATION	**1993 DATES**	**Max ppm**	**Max ppm**	**Degrees F**	**%**
BASEMENT					
Microfilm Viewing Area	March 8-10	400	2	72-74	**29-37**
FIRST FLOOR					
NW Section	March 8-10	600	4	70-74	**29-40**
SECOND FLOOR					
NE Section	March 8-10	575	3	**76-78**	**27-37**

Note: The readings reported in this table occurred during normal business hours.
N/A-Data not available

The concentration of carbon monoxide was consistently below the EPA ambient air quality standard of 9 ppm. In addition, the levels of carbon monoxide observed in this building were consistent with background concentrations of carbon monoxide in office buildings.

The temperatures in the building during occupied hours varied from 70 F to 78 F. The recommended temperature range is 68 F to 74 F in heating mode. Temperatures were frequently at or above the recommended limit of 74 F. A more significant problem was detected by temperatures varying drastically from area to area and even fluctuating up and down within the same area.

The relative humidity readings were between 27 percent and 40 percent. The low humidity readings were a direct result of unseasonably low outside humidity in March. The building has humidification equipment in the air handling system serving the first floor, but it has been disabled due to potential moisture problems in the ductwork. HVAC system humidification controls are not recommended because of the potential concern with microorganisms. Portable humidifiers may be used on an interim basis; however, portable humidifiers must be cleaned and disinfected frequently. Occupants can increase intake of water or other liquids not containing caffeine to prevent dehydration.

The AQ-501 monitoring data were collected during a three day period in March. These monitoring data are indicative of conditions which existed during the sampling period and are not necessarily representative of conditions at other times of the year.

SECTION VII - QUESTIONNAIRE RESULTS

A. METHODS

The questionnaire presented on the next page was used to collect occupants' opinions on the indoor air quality in this building. The questionnaire was voluntarily completed and returned by employees. The information from the questionnaires was entered into a computer database for compilation and review. No follow-up personal interviews were conducted to verify the authenticity or accuracy of the returned questionnaires because of limited project funds. The questionnaires have been retained by Abacus Consultants, P.S., for the purpose of maintaining the confidentiality of the employees who returned the questionnaires.

INDOOR AIR QUALITY QUESTIONNAIRE

Abacus Consultants, P.S., under contract to the Department of General Administration is assessing air quality in buildings on the Capitol Campus. Please complete and return this survey to your building coordinator before September 15, 1992. The survey team will keep this information confidential, so please fold page in half and staple it at the bottom.

1. Your workplace location:
   Building _____ Floor _____ Room _____
   Are you located near any office equipment? ____ Yes ____ No
   What type of equipment? _____

2. Your work shift: ____ Days ____ Nights Hours: _____

3. Have you any health problems related to working in this building?
   ____ Yes ____ No (If no, please skip to question 11)

4. Please check applicable symptoms or environmental conditions: (Only select choices that may be related to your presence in this building. This is a random list; not all symptoms listed may be applicable to this building).

____ Aching joints	____ Muscle twitching	____ Sneezing
____ Back pain	____ Chest tightness	____ Eye irritation
____ Hearing disturbances	____ Dizziness	____ Problems wearing contact lenses
____ Discolored skin	____ Fatigue/drowsiness	____ Headache
____ Dry, flaking skin	____ Heartburn	____ Temperature too cold
____ Nausea	____ Temperature too hot	____ Other (specify)
____ Noticeable odors	____ Sinus congestion	

5. I have symptoms:
   ____ Daily ____ Weekly/What day(s)? _____ _____ Infrequently

6. My symptoms are worse: ____ In the morning ____ In the afternoon ____ All day ____ Other

7. My symptoms are relieved when I leave the work place: ____ Yes _____ No

8. Have you seen a physician or health care provider for your symptom(s)?
   ____ Yes ____ No Comment _____

9. Do you have the following:

____ Hay fever, pollen allergies	____ Cold/flu
____ Sinus problems	____ Skin allergies/dermatitis
____ Other allergies	

10. Are you a smoker? ____ Yes ____ No

11. Do you believe there is an air quality problem (too warm, too cold, too humid, odors, stuffy, dusty, noisy, etc.) in your building?
    ____ Yes ____ No Problem _____

12. Other comments: _____
    _____

13. Your name (optional): _____

ABACUS

B. RESULTS

Building occupants returned 54 questionnaires. The estimated typical occupancy is 85 employees. The approximate response rate was 63 percent.

The questionnaire results provided insight into the extent that employees believe there is an indoor air quality problem in the Library. Approximately 94 percent of the respondents indicated they felt there was an indoor air quality problem and 80 percent reported air quality symptoms. Approximately 85 percent of the respondents reported the temperature was too hot and/or too cold. These survey results indicate a great deal of concern about the air quality in the building even by those who are not experiencing symptoms or temperature discomfort.

Approximately 96 percent of the occupants work near some type of office equipment; 83 percent of the respondents work with or near a computer. Twenty-six percent of the respondents reported working near a copy machine. These percentages of employees working near this type of equipment is typical of today's office environment. One of the goals of an indoor air quality program should be to reduce the number of employees working near copy machines and printers.

The respondents did not report any particular trend in their symptoms. Over half the people reported experiencing symptoms five days a week. Ninety-eight percent of those reporting symptoms experienced relief from their symptoms at some time after leaving the work place. In addition, approximately 30 percent of the employees have hay fever/pollen allergies and/or sinus problems. These existing medical conditions may make these employees more susceptible to indoor air quality type of symptoms.

Thirty-nine percent of the respondents had seen a physician for their indoor air quality related symptoms. This finding should be a concern for the State because of the potential impact on medical insurance costs, disability insurance, workmen's compensation programs, employee productivity, and overall employee morale.

The questionnaire data was separated by floor for comparison purposes. In general, the response rates were very similar floor to floor. Employees in the basement reported the highest rate of symptoms at 83 percent. The lowest rate of reported indoor air quality symptoms was on the first floor with a rate of 73 percent.

A summary of the questionnaire results is presented on the following page. Detailed results are in Appendix C.

State Library
I.A.Q. Questionnaire Results
Summary Table

Location	Number of Respondents	% Sym-0	% Sym-1	% Sym-2	% I.A.Q. Problem	% Temp Hot	% Temp Cold	% Temp H/C	% Smoke
Overall Building	54	20	13	67	94	15	9	61	17
Basement	23	17	22	61	100	13	13	65	17
First Floor	22	27	4	69	91	9	9	59	18
Third Floor	1	0	0	100	100	100	0	0	0
Fourth Floor	1	0	100	0	100	0	0	100	0
All Floors (Works Throughout Building)	6	20	13	67	83	15	9	61	17

NOTES:

1. Sym-0 refers to those who reported no "indoor air quality" symptoms.
2. Sym-1 refers to those who reported one "indoor air quality" symptom.
3. Sym-2 refers to those who reported two or more "indoor air quality" symptoms.
4. "Indoor air quality" symptoms include chest tightness, dizziness, fatigue/drowsiness, sinus congestion, sneezing, eye irritation, headache, and problems wearing contact lenses.
5. % I.A.Q. PROB refers to those who believe there is an air quality problem in the building.
6. TEMP H/C refers to those who believe the temperature in the building was both too hot and too cold.
7. % SMOKE refers to the percentage of smokers.
8. One respondent did not indicate the floor on which he/she worked. This response is reflected in the building total of 54 but is not shown in any of the breakdowns by floor.
9. No questionnaires were returned for the second and forth floors.

APPENDICES

Appendix A - HVAC System Schematics and Sequence of Operation

Appendix B - I.A.Q. Sampling Data

Appendix C - Occupant Questionnaire Data

Appendix D - Custodial Products

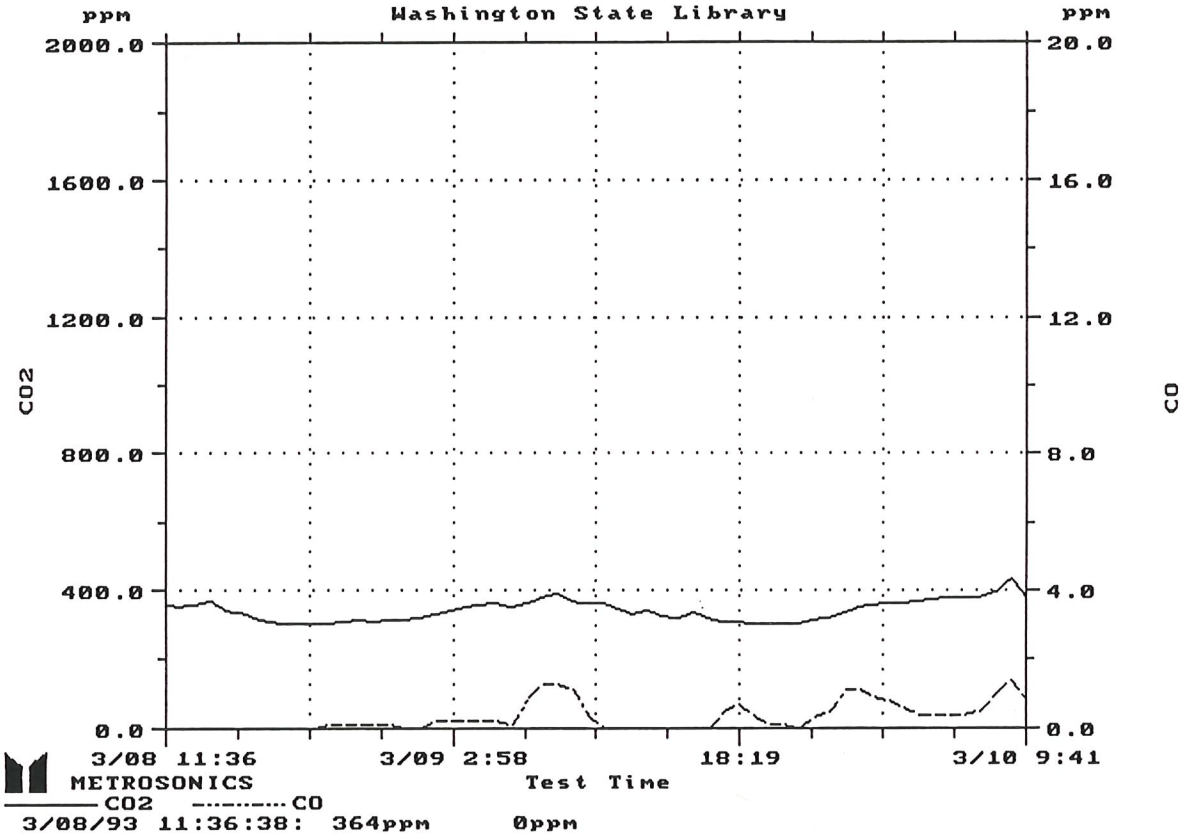
APPENDIX A
HVAC SYSTEM SCHEMATICS & SEQUENCE OF OPERATION

Schematics and sequences of operation for the Library were not available.

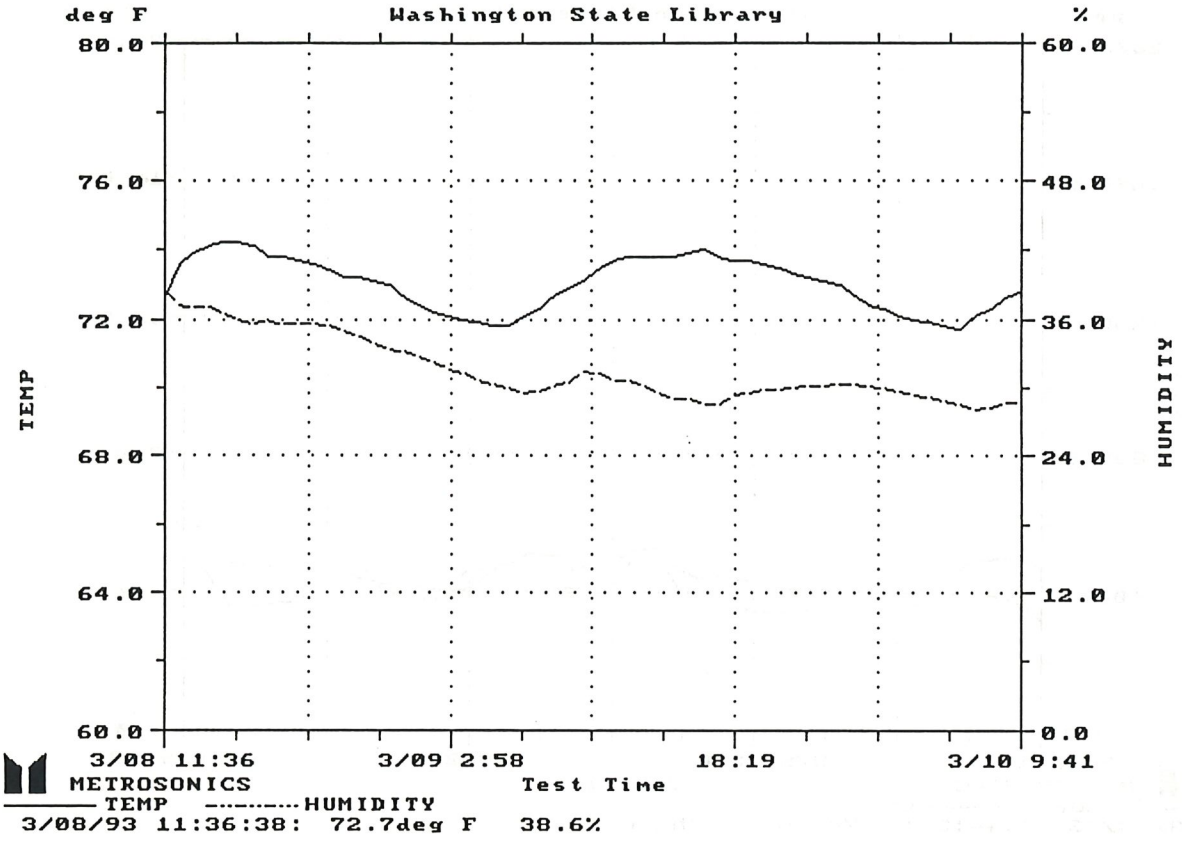
APPENDIX B - I.A.Q. SAMPLING DATA

This appendix presents the air monitoring data in a graphical format. The graphs are arranged in order by floor. Two graphs are provided for each monitoring location. One graph displays the results for carbon dioxide and carbon monoxide. The other graph displays the temperature and relative humidity results.

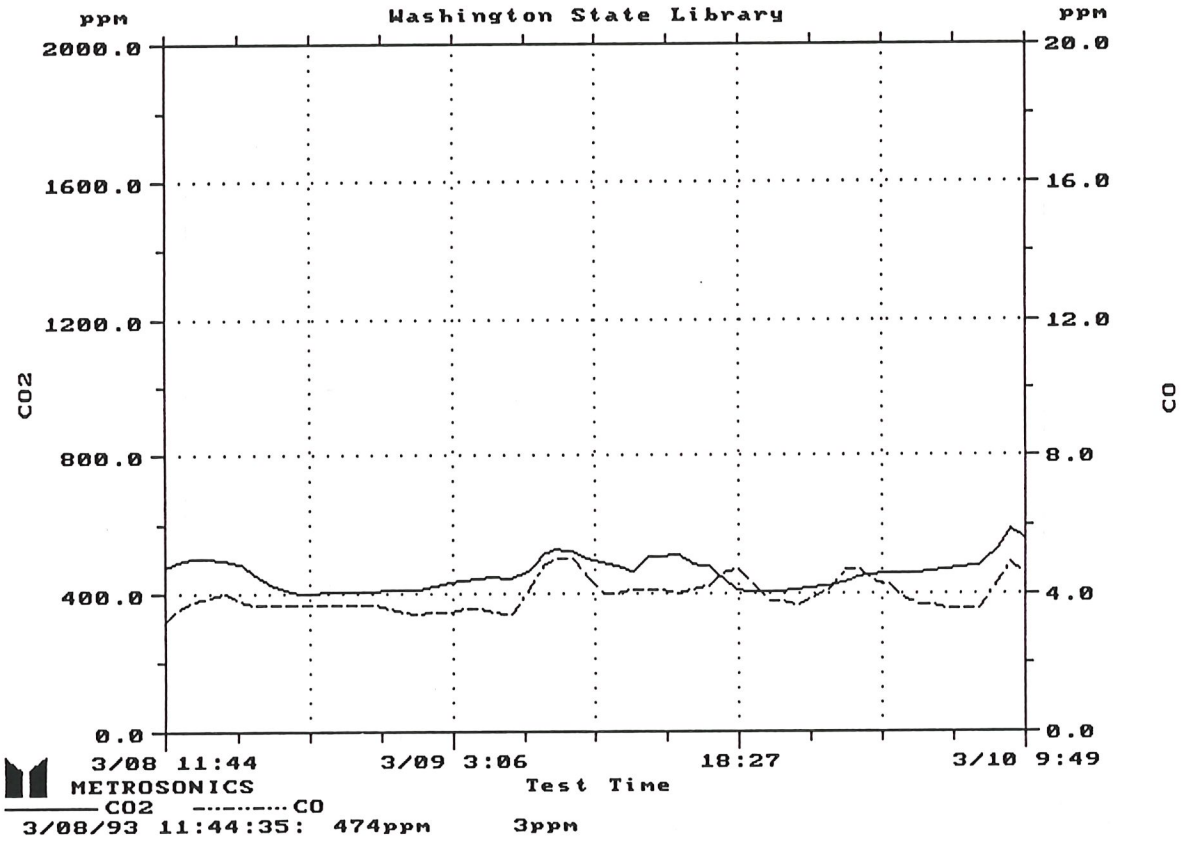
FILENAME.....5012 LOGGER...AQ-501 SN 1199
TEST LOCATION.....WASHINGTON STATE LIBRARY
EMPLOYEE NAME.....BASEMENT LEVEL
EMPLOYEE NUMBER...MICROFILM VIEWING AREA
DEPARTMENT.....
COMMENT FIELD 1...
COMMENT FIELD 2...
NUMERIC CODE #1... #2... #3... #4... #5...



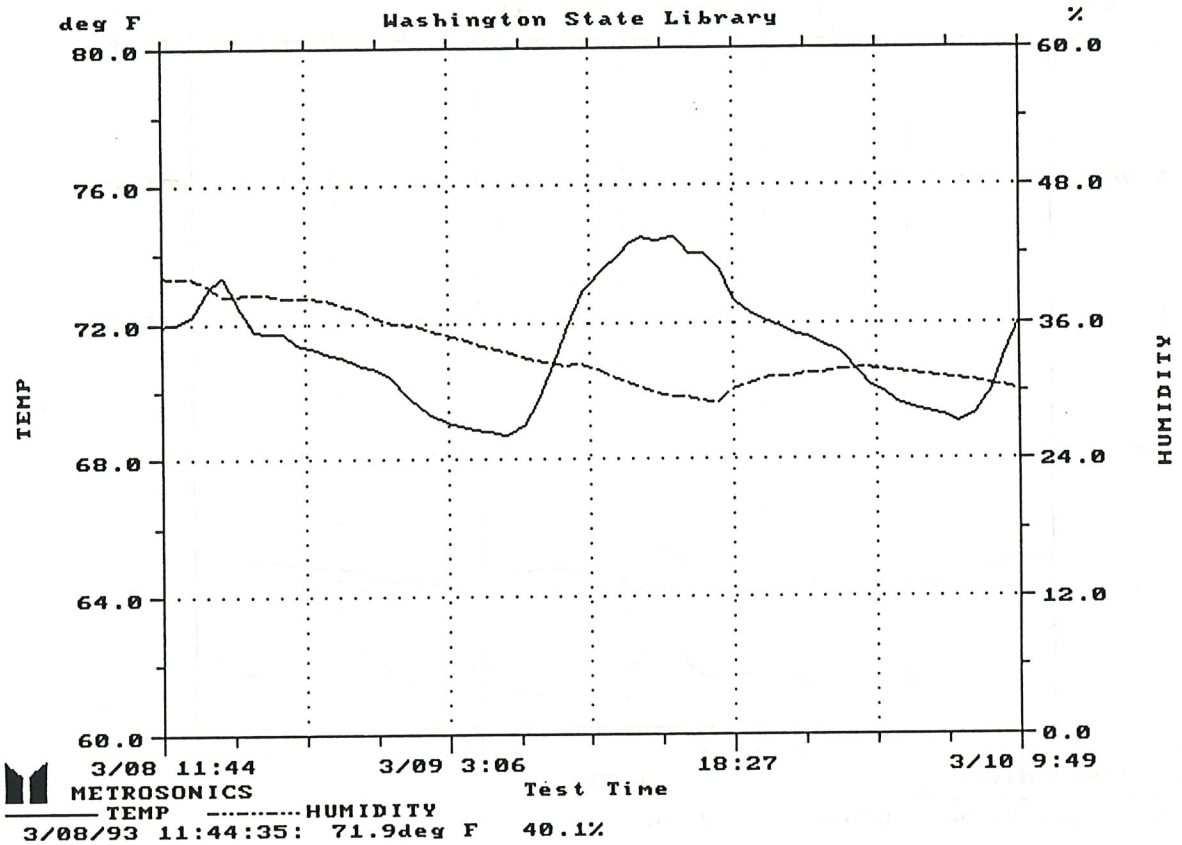
FILENAME.....5012 LOGGER...AQ-501 SN 1199
TEST LOCATION.....WASHINGTON STATE LIBRARY
EMPLOYEE NAME.....BASEMENT LEVEL
EMPLOYEE NUMBER...MICROFILM VIEWING AREA
DEPARTMENT.....
COMMENT FIELD 1...
COMMENT FIELD 2...
NUMERIC CODE #1... #2... #3... #4... #5...



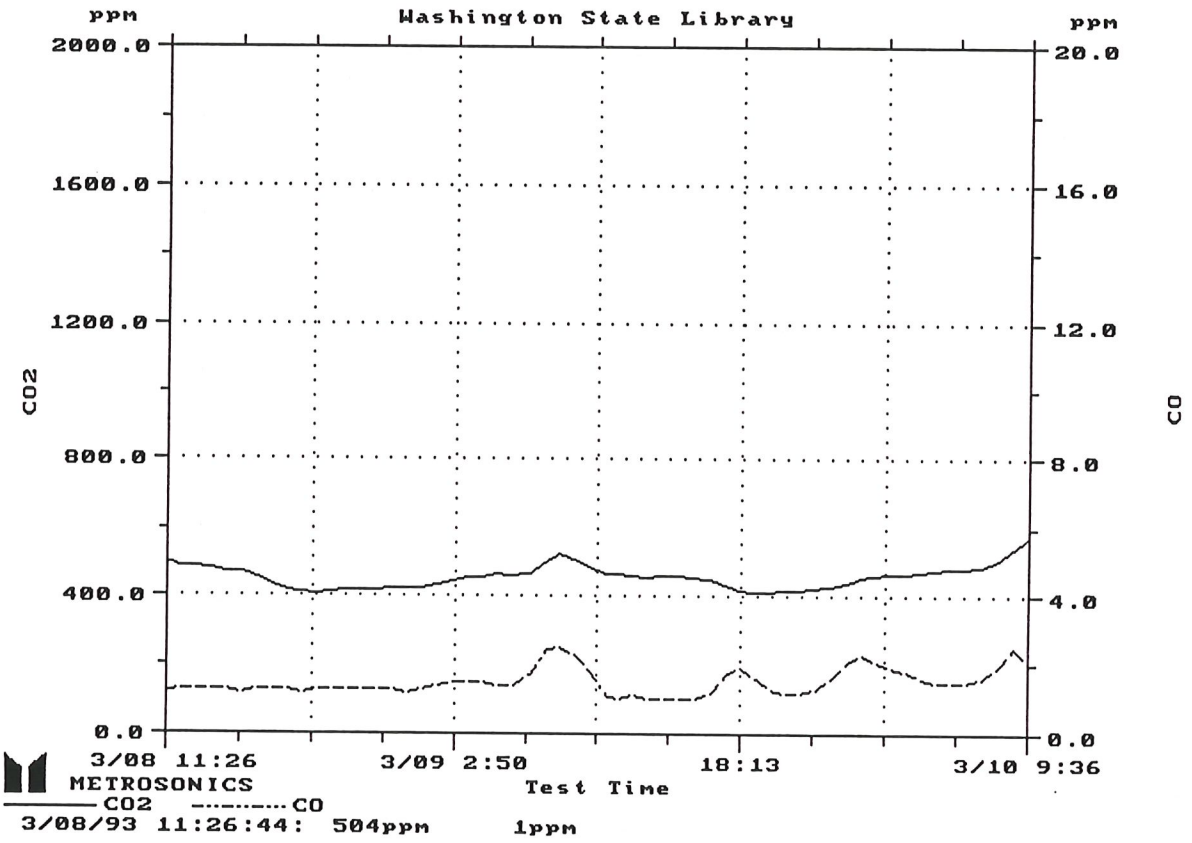
FILENAME.....5013 LOGGER...AQ-501 SN 1483
TEST LOCATION.....WASHINGTON STATE LIBRARY
EMPLOYEE NAME.....1ST FLOOR
EMPLOYEE NUMBER...FISCAL AREA ON NORTHWEST
DEPARTMENT.....SIDE OF BUILDING
COMMENT FIELD 1...
COMMENT FIELD 2...
NUMERIC CODE #1... #2... #3... #4... #5...



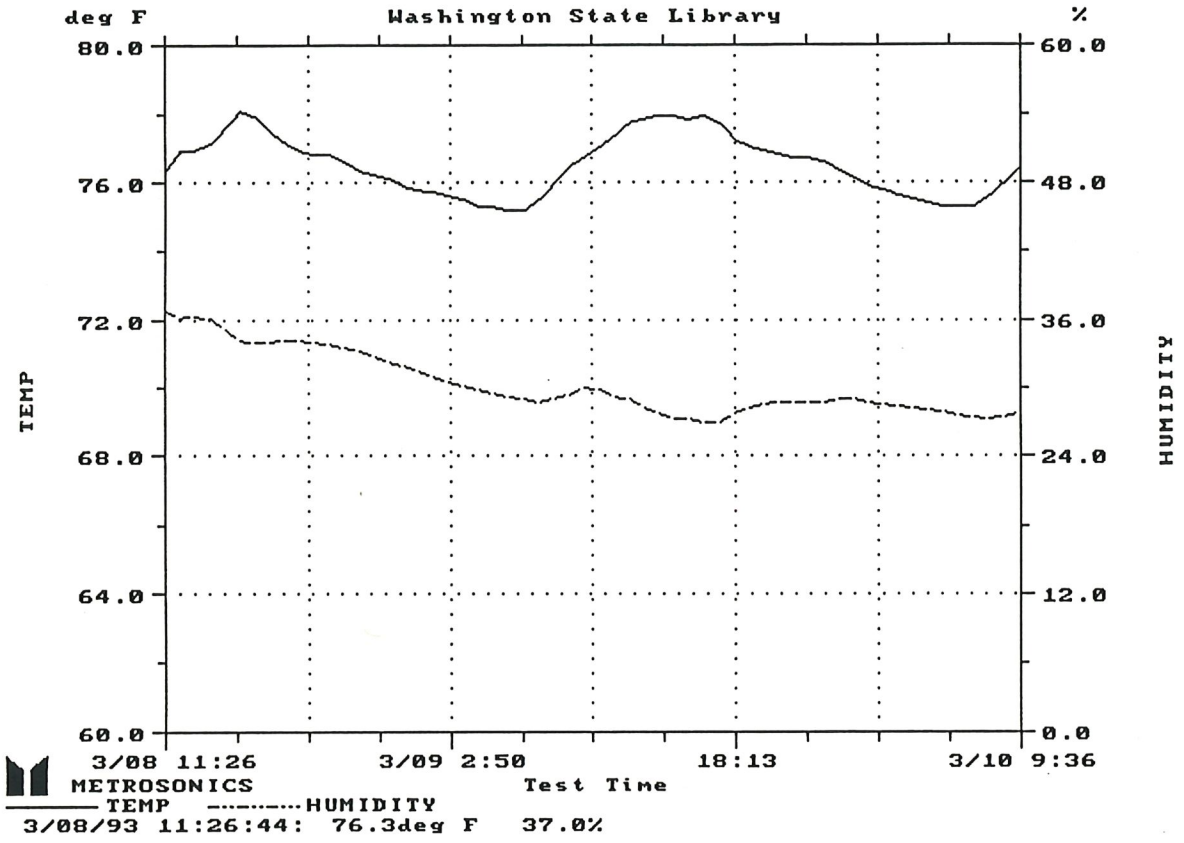
FILENAME.....5013 LOGGER...AQ-501 SN 1483
TEST LOCATION.....WASHINGTON STATE LIBRARY
EMPLOYEE NAME.....1ST FLOOR
EMPLOYEE NUMBER...FISCAL AREA ON NORTHWEST
DEPARTMENT.....SIDE OF BUILDING
COMMENT FIELD 1...
COMMENT FIELD 2...
NUMERIC CODE #1... #2... #3... #4... #5...



FILENAME.....5011 LOGGER...AQ-501 SN 1405
TEST LOCATION.....WASHINGTON STATE LIBRARY
EMPLOYEE NAME.....2ND FLOOR
EMPLOYEE NUMBER...NORTHEAST SIDE OF FLOOR
DEPARTMENT.....
COMMENT FIELD 1...
COMMENT FIELD 2...
NUMERIC CODE #1... #2... #3... #4... #5...



FILENAME.....5011 LOGGER...AQ-501 SN 1405
TEST LOCATION.....WASHINGTON STATE LIBRARY
EMPLOYEE NAME.....2ND FLOOR
EMPLOYEE NUMBER...NORTHEAST SIDE OF FLOOR
DEPARTMENT.....
COMMENT FIELD 1...
COMMENT FIELD 2...
NUMERIC CODE #1... #2... #3... #4... #5...



APPENDIX C - OCCUPANT QUESTIONNAIRE DATA

This appendix presents the survey summaries and comparison reports for the occupant questionnaires. The information is presented in two primary reports. The report titled *Indoor Air Quality Survey Summary*, lists the tabulated results for the number, type, and percentage of responses to the individual questions in the questionnaire. The *Indoor Air Quality Survey Summary* lists the reported information for the entire building and for each individual floor.

The report titled *Indoor Air Quality Survey Comparison Report* lists a number of selected comparisons of the data in the survey database. Again there is a page for the entire building and one for each floor. The *Air Quality Grouping* lists the number of respondents who reported symptoms typical to adverse indoor air quality (listed in report) and is separated by those reporting 0, 1, 2, 3, 4, or greater than 4 symptoms. The *Temperature Grouping* lists the number of respondents reporting adverse temperature conditions (too cold or too hot). The final section in the report lists those respondents who reported experiencing indoor air quality symptoms. This list is divided into the additional categories of:

- Those who smoke
- Those who believed there was an indoor air quality problem
- Those who experienced relief of the symptoms when leaving the building.

INDOOR AIR QUALITY SURVEY SUMMARY
Capitol Campus

BUILDING: # 9 LIBRARY
ALL FLOORS

TOTAL NUMBER OF RESPONDENTS: 54

LOCATED NEAR OFFICE EQUIPMENT

52	96 %	YES
2	3.7 %	NO
	%	NO ANSWER

TYPE OF EQUIPMENT

45	83 %	COMPUTER
14	26 %	COPIER
4	7.4 %	FAX
1	1.9 %	DUPLICATING
35	65 %	OTHER

HEALTH PROBLEMS

45	83 %	YES
6	11 %	NO
3	5.6 %	NO ANSWER

SYMPTOMS

11	20 %	ACHING JOINTS
13	24 %	BACK PAIN
11	20 %	HEARING DISTURBANCE
1	1.9 %	DISCOLORED SKIN
17	31 %	DRY/FLAKING SKIN
6	11 %	NAUSEA
21	39 %	NOTICEABLE ODORS
4	7.4 %	MUSCLE TWITCH
10	19 %	CHEST TIGHTNESS
11	20 %	DIZZINESS
31	57 %	FATIGUE/DROWSY
8	15 %	HEARTBURN
41	76 %	TEMP TOO HOT
31	57 %	SINUS CONGESTION
26	48 %	SNEEZING
22	41 %	EYE IRRITATION
7	13 %	PROBLEMS W/CONTACTS
24	44 %	HEADACHE
38	70 %	TEMP TOO COLD
12	22 %	OTHER

DAYS PER WEEK

16	30 %	INFREQUENTLY
10	19 %	ONE
	%	TWO
	%	THREE
	%	FOUR
28	52 %	FIVE OR MORE

WHEN SYMPTOMS ARE WORSE

7	13 %	MORNING
12	22 %	AFTERNOONS
25	46 %	ALL DAY
5	9.3 %	OTHER

SYMPTOMS RELIEVED ON LEAVING

49	91 %	YES
	%	NO
5	9.3 %	NO ANSWER

PHYSICIAN SEEN

21	39 %	YES
28	52 %	NO
5	9.3 %	NO ANSWER

CONDITIONS

9	17 %	HAY FEVER/POLLEN
17	31 %	SINUS PROBLEM
3	5.6 %	OTHER ALLERGIES
6	11 %	COLD/FLU
6	11 %	SKIN ALLERGY/DERM

SMOKER

9	17 %	YES
41	76 %	NO
4	7.4 %	NO ANSWER

AIR QUALITY PROBLEM

51	94 %	YES
3	5.6 %	NO
	%	NO ANSWER

PROBLEM DESCRIPTION

44	81 %	YES
10	19 %	NO
	%	EXTENSIVE

COMMENTS

26	48 %	YES
25	46 %	NO
3	5.6 %	EXTENSIVE

INDOOR AIR QUALITY SURVEY SUMMARY
Capitol Campus

BUILDING: # 9 LIBRARY
FLOOR:

TOTAL NUMBER OF RESPONDENTS: 1

LOCATED NEAR OFFICE EQUIPMENT

1	100	%	YES
		%	NO
		%	NO ANSWER

TYPE OF EQUIPMENT

1	100	%	COMPUTER
		%	COPIER
		%	FAX
		%	DUPLICATING
1	100	%	OTHER

HEALTH PROBLEMS

1	100	%	YES
		%	NO
		%	NO ANSWER

SYMPTOMS

		%	ACHING JOINTS
		%	BACK PAIN
		%	HEARING DISTURBANCE
		%	DISCOLORED SKIN
		%	DRY/FLAKING SKIN
		%	NAUSEA
		%	NOTICEABLE ODORS
		%	MUSCLE TWITCH
		%	CHEST TIGHTNESS
		%	DIZZINESS
1	100	%	FATIGUE/DROWSY
		%	HEARTBURN
1	100	%	TEMP TOO HOT
1	100	%	SINUS CONGESTION
1	100	%	SNEEZING
1	100	%	EYE IRRITATION
		%	PROBLEMS W/CONTACTS
1	100	%	HEADACHE
1	100	%	TEMP TOO COLD
		%	OTHER

DAYS PER WEEK

		%	INFREQUENTLY
		%	ONE
		%	TWO
		%	THREE
		%	FOUR
1	100	%	FIVE OR MORE

WHEN SYMPTOMS ARE WORSE

		%	MORNING
		%	AFTERNOONS
1	100	%	ALL DAY
		%	OTHER

SYMPTOMS RELIEVED ON LEAVING

1	100	%	YES
		%	NO
		%	NO ANSWER

PHYSICIAN SEEN

1	100	%	YES
		%	NO
		%	NO ANSWER

CONDITIONS

1	100	%	HAY FEVER/POLLEN
1	100	%	SINUS PROBLEM
		%	OTHER ALLERGIES
		%	COLD/FLU
		%	SKIN ALLERGY/DERM

SMOKER

		%	YES
		%	NO
1	100	%	NO ANSWER

AIR QUALITY PROBLEM

1	100	%	YES
		%	NO
		%	NO ANSWER

PROBLEM DESCRIPTION

1	100	%	YES
		%	NO
		%	EXTENSIVE

COMMENTS

		%	YES
1	100	%	NO
		%	EXTENSIVE

INDOOR AIR QUALITY SURVEY SUMMARY
Capitol Campus

BUILDING: # 9 LIBRARY
FLOOR: A

TOTAL NUMBER OF RESPONDENTS: 6

LOCATED NEAR OFFICE EQUIPMENT

6	100 %	YES
	%	NO
	%	NO ANSWER

TYPE OF EQUIPMENT

4	67 %	COMPUTER
3	50 %	COPIER
	%	FAX
	%	DUPLICATING
4	67 %	OTHER

HEALTH PROBLEMS

5	83 %	YES
	%	NO
1	17 %	NO ANSWER

SYMPTOMS

2	33 %	ACHING JOINTS
2	33 %	BACK PAIN
2	33 %	HEARING DISTURBANCE
1	17 %	DISCOLORED SKIN
3	50 %	DRY/FLAKING SKIN
1	17 %	NAUSEA
1	17 %	NOTICEABLE ODORS
2	33 %	MUSCLE TWITCH
3	50 %	CHEST TIGHTNESS
1	17 %	DIZZINESS
3	50 %	FATIGUE/DROWSY
2	33 %	HEARTBURN
5	83 %	TEMP TOO HOT
5	83 %	SINUS CONGESTION
4	67 %	SNEEZING
3	50 %	EYE IRRITATION
1	17 %	PROBLEMS W/CONTACTS
2	33 %	HEADACHE
3	50 %	TEMP TOO COLD
2	33 %	OTHER

DAYS PER WEEK

2	33 %	INFREQUENTLY
2	33 %	ONE
	%	TWO
	%	THREE
	%	FOUR
2	33 %	FIVE OR MORE

WHEN SYMPTOMS ARE WORSE

	%	MORNING
	%	AFTERNOONS
2	33 %	ALL DAY
4	67 %	OTHER

SYMPTOMS RELIEVED ON LEAVING

6	100 %	YES
	%	NO
	%	NO ANSWER

PHYSICIAN SEEN

3	50 %	YES
3	50 %	NO
	%	NO ANSWER

CONDITIONS

1	17 %	HAY FEVER/POLLEN
	%	SINUS PROBLEM
1	17 %	OTHER ALLERGIES
	%	COLD/FLU
1	17 %	SKIN ALLERGY/DERM

SMOKER

1	17 %	YES
5	83 %	NO
	%	NO ANSWER

AIR QUALITY PROBLEM

5	83 %	YES
1	17 %	NO
	%	NO ANSWER

PROBLEM DESCRIPTION

5	83 %	YES
1	17 %	NO
	%	EXTENSIVE

COMMENTS

	%	YES
6	100 %	NO
	%	EXTENSIVE

INDOOR AIR QUALITY SURVEY SUMMARY
Capitol Campus

BUILDING: # 9 LIBRARY
FLOOR: B

TOTAL NUMBER OF RESPONDENTS: 23

LOCATED NEAR OFFICE EQUIPMENT

23	100 %	YES
	%	NO
	%	NO ANSWER

TYPE OF EQUIPMENT

21	91 %	COMPUTER
8	35 %	COPIER
3	13 %	FAX
	%	DUPLICATING
18	78 %	OTHER

HEALTH PROBLEMS

20	87 %	YES
2	8.7 %	NO
1	4.3 %	NO ANSWER

SYMPTOMS

3	13 %	ACHING JOINTS
4	17 %	BACK PAIN
6	26 %	HEARING DISTURBANCE
	%	DISCOLORED SKIN
8	35 %	DRY/FLAKING SKIN
1	4.3 %	NAUSEA
15	65 %	NOTICEABLE ODORS
1	4.3 %	MUSCLE TWITCH
4	17 %	CHEST TIGHTNESS
2	8.7 %	DIZZINESS
16	70 %	FATIGUE/DROWSY
3	13 %	HEARTBURN
18	78 %	TEMP TOO HOT
11	48 %	SINUS CONGESTION
12	52 %	SNEEZING
9	39 %	EYE IRRITATION
2	8.7 %	PROBLEMS W/CONTACTS
10	43 %	HEADACHE
18	78 %	TEMP TOO COLD
3	13 %	OTHER

DAYS PER WEEK

6	26 %	INFREQUENTLY
6	26 %	ONE
	%	TWO
	%	THREE
	%	FOUR
11	48 %	FIVE OR MORE

WHEN SYMPTOMS ARE WORSE

3	13 %	MORNING
6	26 %	AFTERNOONS
12	52 %	ALL DAY
1	4.3 %	OTHER

SYMPTOMS RELIEVED ON LEAVING

21	91 %	YES
	%	NO
2	8.7 %	NO ANSWER

PHYSICIAN SEEN

6	26 %	YES
15	65 %	NO
2	8.7 %	NO ANSWER

CONDITIONS

3	13 %	HAY FEVER/POLLEN
6	26 %	SINUS PROBLEM
1	4.3 %	OTHER ALLERGIES
3	13 %	COLD/FLU
2	8.7 %	SKIN ALLERGY/DERM

SMOKER

4	17 %	YES
18	78 %	NO
1	4.3 %	NO ANSWER

AIR QUALITY PROBLEM

23	100 %	YES
	%	NO
	%	NO ANSWER

PROBLEM DESCRIPTION

20	87 %	YES
3	13 %	NO
	%	EXTENSIVE

COMMENTS

14	61 %	YES
8	35 %	NO
1	4.3 %	EXTENSIVE

INDOOR AIR QUALITY SURVEY SUMMARY
Capitol Campus

BUILDING: # 9 LIBRARY
FLOOR: 1

TOTAL NUMBER OF RESPONDENTS: 22

LOCATED NEAR OFFICE EQUIPMENT

21	95 %	YES
1	4.5 %	NO
	%	NO ANSWER

TYPE OF EQUIPMENT

19	86 %	COMPUTER
3	14 %	COPIER
1	4.5 %	FAX
	%	DUPLICATING
12	55 %	OTHER

HEALTH PROBLEMS

17	77 %	YES
4	18 %	NO
1	4.5 %	NO ANSWER

SYMPTOMS

6	27 %	ACHING JOINTS
7	32 %	BACK PAIN
3	14 %	HEARING DISTURBANCE
	%	DISCOLORED SKIN
6	27 %	DRY/FLAKING SKIN
4	18 %	NAUSEA
5	23 %	NOTICEABLE ODORS
1	4.5 %	MUSCLE TWITCH
3	14 %	CHEST TIGHTNESS
7	32 %	DIZZINESS
11	50 %	FATIGUE/DROWSY
2	9.1 %	HEARTBURN
15	68 %	TEMP TOO HOT
13	59 %	SINUS CONGESTION
9	41 %	SNEEZING
9	41 %	EYE IRRITATION
4	18 %	PROBLEMS W/CONTACTS
10	45 %	HEADACHE
15	68 %	TEMP TOO COLD
6	27 %	OTHER

DAYS PER WEEK

8	36 %	INFREQUENTLY
1	4.5 %	ONE
	%	TWO
	%	THREE
	%	FOUR
13	59 %	FIVE OR MORE

WHEN SYMPTOMS ARE WORSE

4	18 %	MORNING
6	27 %	AFTERNOONS
8	36 %	ALL DAY
	%	OTHER

SYMPTOMS RELIEVED ON LEAVING

19	86 %	YES
	%	NO
3	14 %	NO ANSWER

PHYSICIAN SEEN

11	50 %	YES
8	36 %	NO
3	14 %	NO ANSWER

CONDITIONS

4	18 %	HAY FEVER/POLLEN
9	41 %	SINUS PROBLEM
1	4.5 %	OTHER ALLERGIES
3	14 %	COLD/FLU
3	14 %	SKIN ALLERGY/DERM

SMOKER

4	18 %	YES
16	73 %	NO
2	9.1 %	NO ANSWER

AIR QUALITY PROBLEM

20	91 %	YES
2	9.1 %	NO
	%	NO ANSWER

PROBLEM DESCRIPTION

16	73 %	YES
6	27 %	NO
	%	EXTENSIVE

COMMENTS

11	50 %	YES
9	41 %	NO
2	9.1 %	EXTENSIVE

INDOOR AIR QUALITY SURVEY SUMMARY
Capitol Campus

BUILDING: # 9 LIBRARY
FLOOR: 3

TOTAL NUMBER OF RESPONDENTS: 1

LOCATED NEAR OFFICE EQUIPMENT

1	100	%	YES
		%	NO
		%	NO ANSWER

TYPE OF EQUIPMENT

		%	COMPUTER
		%	COPIER
		%	FAX
1	100	%	DUPLICATING
		%	OTHER

HEALTH PROBLEMS

1	100	%	YES
		%	NO
		%	NO ANSWER

SYMPTOMS

		%	ACHING JOINTS
		%	BACK PAIN
		%	HEARING DISTURBANCE
		%	DISCOLORED SKIN
		%	DRY/FLAKING SKIN
		%	NAUSEA
		%	NOTICEABLE ODORS
		%	MUSCLE TWITCH
		%	CHEST TIGHTNESS
1	100	%	DIZZINESS
		%	FATIGUE/DROWSY
1	100	%	HEARTBURN
1	100	%	TEMP TOO HOT
		%	SINUS CONGESTION
		%	SNEEZING
		%	EYE IRRITATION
		%	PROBLEMS W/CONTACTS
1	100	%	HEADACHE
		%	TEMP TOO COLD
		%	OTHER

DAYS PER WEEK

		%	INFREQUENTLY
		%	ONE
		%	TWO
		%	THREE
		%	FOUR
1	100	%	FIVE OR MORE

WHEN SYMPTOMS ARE WORSE

		%	MORNING
		%	AFTERNOONS
1	100	%	ALL DAY
		%	OTHER

SYMPTOMS RELIEVED ON LEAVING

1	100	%	YES
		%	NO
		%	NO ANSWER

PHYSICIAN SEEN

		%	YES
1	100	%	NO
		%	NO ANSWER

CONDITIONS

		%	HAY FEVER/POLLEN
1	100	%	SINUS PROBLEM
		%	OTHER ALLERGIES
		%	COLD/FLU
		%	SKIN ALLERGY/DERM

SMOKER

		%	YES
1	100	%	NO
		%	NO ANSWER

AIR QUALITY PROBLEM

1	100	%	YES
		%	NO
		%	NO ANSWER

PROBLEM DESCRIPTION

1	100	%	YES
		%	NO
		%	EXTENSIVE

COMMENTS

		%	YES
1	100	%	NO
		%	EXTENSIVE

INDOOR AIR QUALITY SURVEY SUMMARY
Capitol Campus

BUILDING: # 9 LIBRARY
FLOOR: 5

TOTAL NUMBER OF RESPONDENTS: 1

LOCATED NEAR OFFICE EQUIPMENT

		%	YES
1	100	%	NO
		%	NO ANSWER

TYPE OF EQUIPMENT

		%	COMPUTER
		%	COPIER
		%	FAX
		%	DUPLICATING
		%	OTHER

HEALTH PROBLEMS

1	100	%	YES
		%	NO
		%	NO ANSWER

SYMPTOMS

		%	ACHING JOINTS
		%	BACK PAIN
		%	HEARING DISTURBANCE
		%	DISCOLORED SKIN
		%	DRY/FLAKING SKIN
		%	NAUSEA
		%	NOTICEABLE ODORS
		%	MUSCLE TWITCH
		%	CHEST TIGHTNESS
		%	DIZZINESS
		%	FATIGUE/DROWSY
		%	HEARTBURN
1	100	%	TEMP TOO HOT
1	100	%	SINUS CONGESTION
		%	SNEEZING
		%	EYE IRRITATION
		%	PROBLEMS W/CONTACTS
		%	HEADACHE
1	100	%	TEMP TOO COLD
1	100	%	OTHER

DAYS PER WEEK

		%	INFREQUENTLY
1	100	%	ONE
		%	TWO
		%	THREE
		%	FOUR
		%	FIVE OR MORE

WHEN SYMPTOMS ARE WORSE

		%	MORNING
		%	AFTERNOONS
1	100	%	ALL DAY
		%	OTHER

SYMPTOMS RELIEVED ON LEAVING

1	100	%	YES
		%	NO
		%	NO ANSWER

PHYSICIAN SEEN

		%	YES
1	100	%	NO
		%	NO ANSWER

CONDITIONS

		%	HAY FEVER/POLLEN
		%	SINUS PROBLEM
		%	OTHER ALLERGIES
		%	COLD/FLU
		%	SKIN ALLERGY/DERM

SMOKER

		%	YES
1	100	%	NO
		%	NO ANSWER

AIR QUALITY PROBLEM

1	100	%	YES
		%	NO
		%	NO ANSWER

PROBLEM DESCRIPTION

1	100	%	YES
		%	NO
		%	EXTENSIVE

COMMENTS

1	100	%	YES
		%	NO
		%	EXTENSIVE

INDOOR AIR QUALITY SURVEY COMPARISON REPORT
Capitol Campus

BUILDING: # 9 LIBRARY
ALL FLOORS

TOTAL NUMBER OF RESPONDENTS: 54

AIR QUALITY GROUPING: (Chest Tightness, Dizziness, Fatigue/drowsiness, Sinus Congestion, Sneezing, Eye Irritation, Headache, Problems Wearing Contact Lenses)

NUMBER REPORTING 0	11	20 %
NUMBER REPORTING 1	7	13 %
NUMBER REPORTING 2	5	9.3 %
NUMBER REPORTING 3	8	15 %
NUMBER REPORTING 4	7	13 %
NUMBER REPORTING >4	16	30 %

TEMPERATURE GROUPING:

TEMPERATURE TOO HOT	8	15 %
TEMPERATURE TOO COLD	5	9.3 %
TOO HOT AND TOO COLD	33	61 %

COMPARISON TO THOSE THAT REPORTED ANY KIND OF AIR QUALITY SYMPTOM

TOTAL RESPONDENTS REPORTING AIR QUALITY SYMPTOM: 43
AS A PERCENT OF TOTAL RESPONDENTS: 80

	NUMBER OF RESPONDENTS	% OF THOSE W/ AIR QUAL SYMP
SMOKERS		
YES	7	16 %
NO	35	81 %
BELIEVE THERE IS AIR QUALITY PROBLEM		
YES	41	95 %
NO	2	4.7 %
SYMPTOMS RELIEVED ON LEAVING BUILDING		
YES	42	98 %
NO		.0 %

INDOOR AIR QUALITY SURVEY COMPARISON REPORT
Capitol Campus

BUILDING: # 9 LIBRARY
FLOOR #

TOTAL NUMBER OF RESPONDENTS: 1

AIR QUALITY GROUPING: (Chest Tightness, Dizziness, Fatigue/drowsiness, Sinus Congestion, Sneezing, Eye Irritation, Headache, Problems Wearing Contact Lenses)

NUMBER REPORTING 0		%
NUMBER REPORTING 1		%
NUMBER REPORTING 2		%
NUMBER REPORTING 3		%
NUMBER REPORTING 4		%
NUMBER REPORTING >4	1	100 %

TEMPERATURE GROUPING:

TEMPERATURE TOO HOT		%
TEMPERATURE TOO COLD		%
TOO HOT AND TOO COLD	1	100 %

COMPARISON TO THOSE THAT REPORTED ANY KIND OF AIR QUALITY SYMPTOM

TOTAL RESPONDENTS REPORTING AIR QUALITY SYMPTOM: 1
AS A PERCENT OF TOTAL RESPONDENTS: 100

	NUMBER OF RESPONDENTS	% OF THOSE W/ AIR QUAL SYMP
SMOKERS		
YES		.0 %
NO		.0 %
BELIEVE THERE IS AIR QUALITY PROBLEM		
YES	1	100 %
NO		.0 %
SYMPTOMS RELIEVED ON LEAVING BUILDING		
YES	1	100 %
NO		.0 %

INDOOR AIR QUALITY SURVEY COMPARISON REPORT
Capitol Campus

BUILDING: # 9 LIBRARY
FLOOR #A

TOTAL NUMBER OF RESPONDENTS: 6

AIR QUALITY GROUPING: (Chest Tightness, Dizziness, Fatigue/drowsiness, Sinus Congestion, Sneezing, Eye Irritation, Headache, Problems Wearing Contact Lenses)

NUMBER REPORTING 0	1	17 %
NUMBER REPORTING 1		%
NUMBER REPORTING 2		%
NUMBER REPORTING 3	2	33 %
NUMBER REPORTING 4	2	33 %
NUMBER REPORTING >4	1	17 %

TEMPERATURE GROUPING:

TEMPERATURE TOO HOT	2	33 %
TEMPERATURE TOO COLD		%
TOO HOT AND TOO COLD	3	50 %

COMPARISON TO THOSE THAT REPORTED ANY KIND OF AIR QUALITY SYMPTOM

TOTAL RESPONDENTS REPORTING AIR QUALITY SYMPTOM: 5
AS A PERCENT OF TOTAL RESPONDENTS: 83

	NUMBER OF RESPONDENTS	% OF THOSE W/ AIR QUAL SYMP
SMOKERS		
YES	1	20 %
NO	4	80 %
BELIEVE THERE IS AIR QUALITY PROBLEM		
YES	4	80 %
NO	1	20 %
SYMPTOMS RELIEVED ON LEAVING BUILDING		
YES	5	100 %
NO		.0 %

INDOOR AIR QUALITY SURVEY COMPARISON REPORT
Capitol Campus

BUILDING: # 9 LIBRARY
FLOOR #B

TOTAL NUMBER OF RESPONDENTS: 23

AIR QUALITY GROUPING: (Chest Tightness, Dizziness, Fatigue/drowsiness, Sinus Congestion, Sneezing, Eye Irritation, Headache, Problems Wearing Contact Lenses)

NUMBER REPORTING 0	4	17 %
NUMBER REPORTING 1	5	22 %
NUMBER REPORTING 2	1	4.3 %
NUMBER REPORTING 3	4	17 %
NUMBER REPORTING 4	1	4.3 %
NUMBER REPORTING >4	8	35 %

TEMPERATURE GROUPING:

TEMPERATURE TOO HOT	3	13 %
TEMPERATURE TOO COLD	3	13 %
TOO HOT AND TOO COLD	15	65 %

COMPARISON TO THOSE THAT REPORTED ANY KIND OF AIR QUALITY SYMPTOM

TOTAL RESPONDENTS REPORTING AIR QUALITY SYMPTOM: 19
AS A PERCENT OF TOTAL RESPONDENTS: 83

	NUMBER OF RESPONDENTS	% OF THOSE W/ AIR QUAL SYMP
SMOKERS		
YES	4	21 %
NO	15	79 %
BELIEVE THERE IS AIR QUALITY PROBLEM		
YES	19	100 %
NO		.0 %
SYMPTOMS RELIEVED ON LEAVING BUILDING		
YES	18	95 %
NO		.0 %

INDOOR AIR QUALITY SURVEY COMPARISON REPORT
Capitol Campus

BUILDING: # 9 LIBRARY
FLOOR #1

TOTAL NUMBER OF RESPONDENTS: 22

AIR QUALITY GROUPING: (Chest Tightness, Dizziness, Fatigue/drowsiness, Sinus Congestion, Sneezing, Eye Irritation, Headache, Problems Wearing Contact Lenses)

NUMBER REPORTING 0	6	27 %
NUMBER REPORTING 1	1	4.5 %
NUMBER REPORTING 2	3	14 %
NUMBER REPORTING 3	2	9.1 %
NUMBER REPORTING 4	4	18 %
NUMBER REPORTING >4	6	27 %

TEMPERATURE GROUPING:

TEMPERATURE TOO HOT	2	9.1 %
TEMPERATURE TOO COLD	2	9.1 %
TOO HOT AND TOO COLD	13	59 %

COMPARISON TO THOSE THAT REPORTED ANY KIND OF AIR QUALITY SYMPTOM

TOTAL RESPONDENTS REPORTING AIR QUALITY SYMPTOM: 16
AS A PERCENT OF TOTAL RESPONDENTS: 73

	NUMBER OF RESPONDENTS	% OF THOSE W/ AIR QUAL SYMP
SMOKERS		
YES	2	13 %
NO	14	88 %
BELIEVE THERE IS AIR QUALITY PROBLEM		
YES	15	94 %
NO	1	6.3 %
SYMPTOMS RELIEVED ON LEAVING BUILDING		
YES	16	100 %
NO		.0 %

INDOOR AIR QUALITY SURVEY COMPARISON REPORT
Capitol Campus

BUILDING: # 9 LIBRARY
FLOOR #3

TOTAL NUMBER OF RESPONDENTS: 1

AIR QUALITY GROUPING: (Chest Tightness, Dizziness, Fatigue/drowsiness, Sinus Congestion, Sneezing, Eye Irritation, Headache, Problems Wearing Contact Lenses)

NUMBER REPORTING 0		%
NUMBER REPORTING 1		%
NUMBER REPORTING 2	1	100 %
NUMBER REPORTING 3		%
NUMBER REPORTING 4		%
NUMBER REPORTING >4		%

TEMPERATURE GROUPING:

TEMPERATURE TOO HOT	1	100 %
TEMPERATURE TOO COLD		%
TOO HOT AND TOO COLD		%

COMPARISON TO THOSE THAT REPORTED ANY KIND OF AIR QUALITY SYMPTOM

TOTAL RESPONDENTS REPORTING AIR QUALITY SYMPTOM: 1
AS A PERCENT OF TOTAL RESPONDENTS: 100

	NUMBER OF RESPONDENTS	% OF THOSE W/ AIR QUAL SYMP
SMOKERS		
YES		.0 %
NO	1	100 %
BELIEVE THERE IS AIR QUALITY PROBLEM		
YES	1	100 %
NO		.0 %
SYMPTOMS RELIEVED ON LEAVING BUILDING		
YES	1	100 %
NO		.0 %

INDOOR AIR QUALITY SURVEY COMPARISON REPORT
Capitol Campus

BUILDING: # 9 LIBRARY
FLOOR #5

TOTAL NUMBER OF RESPONDENTS: 1

AIR QUALITY GROUPING: (Chest Tightness, Dizziness, Fatigue/drowsiness, Sinus Congestion, Sneezing, Eye Irritation, Headache, Problems Wearing Contact Lenses)

NUMBER REPORTING 0		%
NUMBER REPORTING 1	1	100 %
NUMBER REPORTING 2		%
NUMBER REPORTING 3		%
NUMBER REPORTING 4		%
NUMBER REPORTING >4		%

TEMPERATURE GROUPING:

TEMPERATURE TOO HOT		%
TEMPERATURE TOO COLD		%
TOO HOT AND TOO COLD	1	100 %

COMPARISON TO THOSE THAT REPORTED ANY KIND OF AIR QUALITY SYMPTOM

TOTAL RESPONDENTS REPORTING AIR QUALITY SYMPTOM: 1
AS A PERCENT OF TOTAL RESPONDENTS: 100

	NUMBER OF RESPONDENTS	% OF THOSE W/ AIR QUAL SYMP
SMOKERS		
YES		.0 %
NO	1	100 %
BELIEVE THERE IS AIR QUALITY PROBLEM		
YES	1	100 %
NO		.0 %
SYMPTOMS RELIEVED ON LEAVING BUILDING		
YES	1	100 %
NO		.0 %

APPENDIX D - CUSTODIAL PRODUCTS

This appendix is a summary of the cleaning products used by the custodial staff. The type of cleaning activities and related frequencies are also listed. The information in this appendix was prepared by the State.

PRODUCTS USED

Glass Cleaner -	Narco* Glance*
Disinfectants -	Triad Forward DC NABC Showers & Stuff
General Cleaners -	GP Forward Quick Shine Creame Clean Horizon Neutral Cleaner Cleanser Hair & Body Shampoo Ammonia based glass cleaner
Deodorizers -	Gold Label Mist** Good Sense*
Floor Products -	Showplace Floor Finish Plaza floor sealer Horizon 600 Stripper
Stainless Cleaner -	Misty**
Polishes -	Noxon Metal Polish Pledge**

*Misted on
**Aerosol
***Sprayed with pressure sprayer

PRODUCTS USED Cont.

Carpet Spotters -	ServiceMaster Kit
	Solvent
	Carpet Shampoo
	Urine remover
	Ink remover
Carpet Cleaners -	Ramsey Trailbreak
	Prespray***
	Ramsey Extraction
	Rugbee Carpet Shampoo
	Ramsee Defoamer
Other -	NIX enzyme - odor control

*Misted on
**Aerosol
***Sprayed with pressure sprayer