

# FACILITY EVALUATION

## FOREST HEALTH PROTECTION LABORATORY 3911 Fish Hatchery Road Fitchburg, WI 53711

DSF Project # 07J2Q  
Architecture Madlson Project # 0801

May 14, 2009

**FINAL**

Original Construction: 1958

Major Greenhouse Replacement: 2008

### Building Square Footage

Laboratory – 1 <sup>st</sup> Floor	2,665	sf
Laboratory – Basement	885	sf

TOTAL LABORATORY 3,550 sf

Greenhouse (New Replacement) 1,410 sf

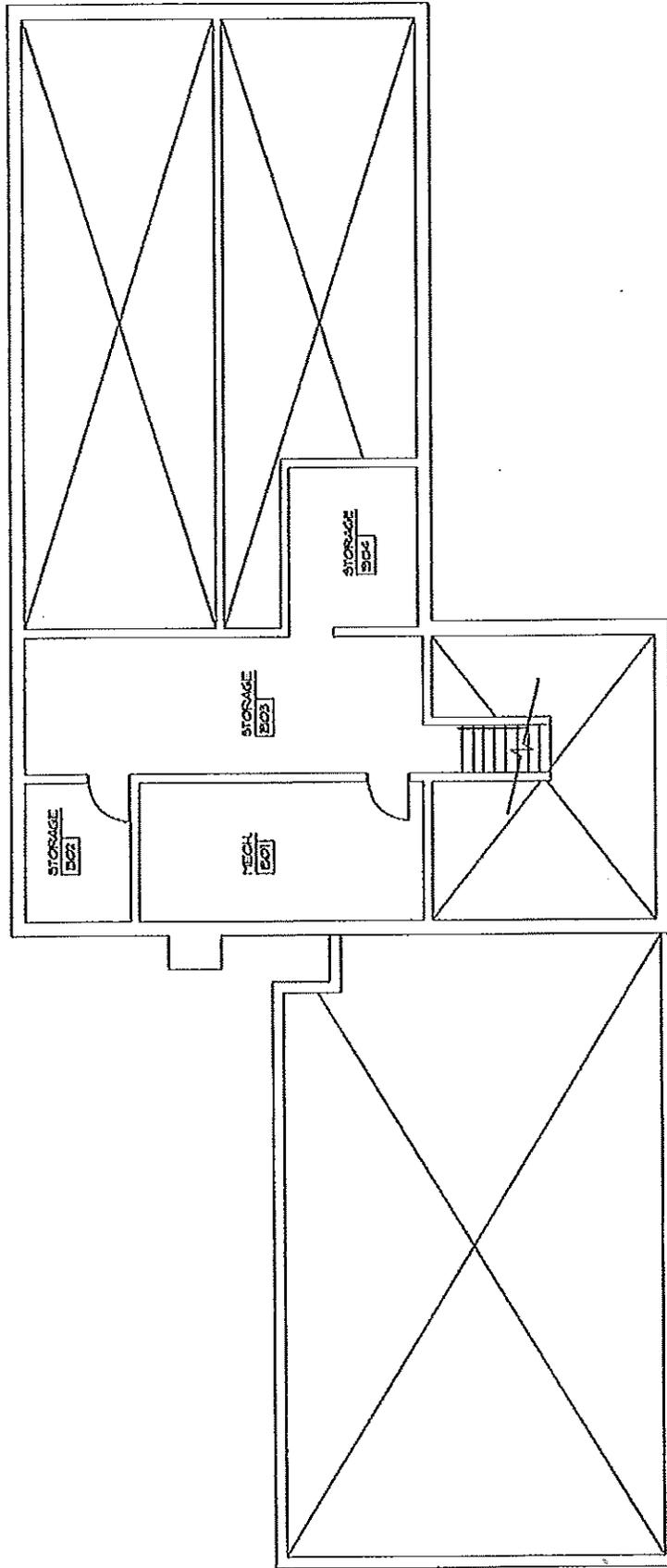
TOTAL BUILDING 4,960 sf

### Building Occupancy

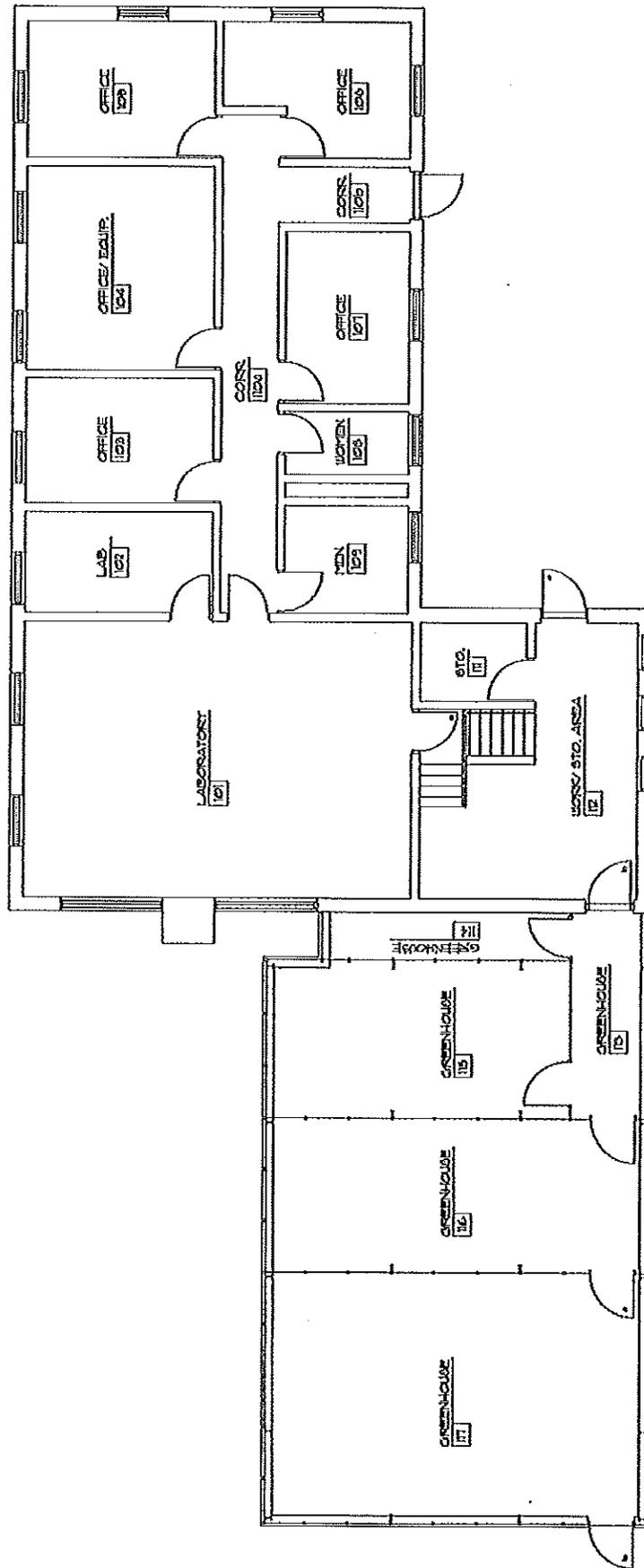
Laboratory	Type "B" - Business Occupancy
Greenhouse	Type "U" - Miscellaneous Occupancy

### Construction Type

Laboratory & Greenhouse Type IIIB



① EXISTING BASEMENT FLOOR PLAN



① EXISTING FIRST FLOOR PLAN

## Existing Building Field Inspection & Evaluation

The building was visited and inspected on February 8, 2008 and April 15, 2008. Field notes and pictures were taken during the April 15th site visit.

Site personnel Jane Cummings Carlson and Timothy E. Fox were present for February 8<sup>th</sup> visit. Jane was present for the April 15<sup>th</sup> site visit.

At both site visits there was a discussion of the building, its uses and deficiencies, and the staff's proposed future alterations to the facility.

In addition, a preliminary draft of this report was reviewed by DSF and DNR staff, and their comments were incorporated.

### Building Systems:

The building foundations and general structure appeared to be in very good condition. The exterior walls were also in very good shape. The masonry exterior, including the steel lintels, was in excellent shape, especially for a building of this age. The newer replacement windows were also in good shape. The roof was not directly observed, but it has been reported to have some leaking issues because the roof drains over the edge of the overhangs. A more positive roof drainage system should be considered.

There were some cracks on the interior CMU, but nothing that would be considered unusual for a building of this age and design. Generally, the interior of the building was in serviceable, but dated, condition. Because of the age of the structure, it is probable that all of the interior floor tile is vinyl asbestos, and should be replaced if any remodeling projects are undertaken.

The existing walls consist of 8" lightweight concrete block with an air space and face brick for an R-value of approximately 4.2. The roof system consists of roofing on 1" roof sheathing on 1x10 and 1x2 roof joists @ 12" o.c. with 2x6 outlooks. The underside has acoustical tile over fiber sheathing and 4" of batt insulation for an R-value of 16.0. The operable windows have been replaced with new low-e aluminum operable windows, but the glass block windows remain as original. The original drawings indicate rigid insulation under the perimeter slab, but this cannot be verified. The envelope is substandard in terms of insulating value, except for the replacement low-e windows, and should be upgraded in conjunction with any mechanical improvements to reduce the envelope loads.

The exterior walkways to the front and rear doors were also in reasonable condition.

### ADA Compliance:

No changes will be required by the code unless specific areas are remodeled. Even then, using the "disproportionally" exclusion clause of the code would limit ADA-related changes that would be required. Generally, the building accessibility routes are in ADA compliance. The corridors are 48", which is 6" wider than required by ADA. There is a 5' turning radius at the intersection of the two corridors which satisfies the need for a turning space. All doors comply with ADA 404.2.3 required "Clear Width". All doors comply with ADA 404.2.4 required "Maneuvering Clearances at Doors", except doors 108, 109, 110a, & 110b. Women 108 and Men 109 are out of compliance with ADA concerning required circulation, fixture clearances, and fixture heights.

There is no direct ADA access to the Greenhouse. Nor is there ADA access between the Laboratory/ Office level and the new Greenhouse level. A variance that was sought and granted was partially dependent on the provision of access between these two levels.

### Plumbing Systems:

The current 2" water service enters the building lower level from the west off of the municipal water service along Fish Hatchery Road. The original 1-1/2" water supply was fed from other buildings from the southeast, and apparently was revised at sometime later. The current arrangement appears to feed through the FHP lab to other buildings from the 2" meter located in the lower level Storage B03.

A 3/4" water softener(Hellenbrand 85) for the hot water service is located in Mech B01, along with a gas-fired 30-gallon water heater(Ruud RP 308-37). Hot and cold water are a combination of galvanized(original) and copper piping(remodeling) with insulation missing on significant lengths of the exposed piping. No hot water recirculation system is provided.

The lower level mechanical and storage rooms floor drains are served by a sanitary simplex sump pump located in Mech B01 which lifts the drainage to the building drain. Originally, the building drain exited the building south to a septic drain field, but that system has been abandoned and converted to a municipal or site sewer connection. The drainage piping consists of a combination of cast iron soil pipe with galvanized branch piping and cast iron p-trap fittings.

The public toilets consist of tank-type water closets, floor-mounted urinals and wall-mounted lavatories and all appear to be original and at the end of their useful life. Lab sinks, emergency shower and head house sinks all appear to be original as well.

Gas service to building is provided on the south side and serves the boiler, water heater, incinerator and gas distribution for lab outlets in Lab 101.

Storm water drainage from the roof appears to be drained from scuppers at the perimeter without any provisions for site storm drainage.

### Heating, Ventilating and Air Conditioning(HVAC) Systems:

The heating system consists of a zoned low-pressure steam heat system with five zones of control: Lab 101, west offices, east office/toilet, head house and greenhouse. Two steam boilers(Burnham 409) serving the steam heating system appear to have been replaced in 1983 and are rated at 196 MBH output and 225 MBH input each with an automatic flue dampers.

The piping is distributed along the outside wall of the main level with finned-tube radiation above. All piping appears to be black steel threaded fittings and insulated for the most part. Asbestos insulation at fittings may be present. The greenhouse section is currently abandoned, but plans are in place to provide steam heat to a greenhouse remodeling project.

The original facility provided for toilet and fume hood exhaust at the roof, the toilet have added newer ceiling exhaust fans interlocked with the light switch. No mechanical ventilation was provided in the original documents other than operable windows. Sometime later, a split-system fan coil cooling system was added to the Lab 101 for space cooling, but is no longer used. In 1998, a packaged rooftop unit was added at the southwest corner of the building to provide a ducted overhead ventilation system to the main level with central return air, air conditioning and gas-fired heating. The packaged unit serves as one zone for cooling and ventilation controlled from the Lab 101.

### Electrical Systems:

The original electrical service to the building is a 1-phase 200 amp 120/240 volt with meter in the lower level north wall of Storage B03. The service is original for the most part except for an auxiliary subpanel added due to lack of breaker space. A new 3-phase electric service is planned with the greenhouse remodeling project.

Lighting throughout the facility consists of stem or surface mounted light fixtures. The fixture ballasts and lamps have been retrofitted with T-8 lamps and electronic ballasts. Exterior lighting has been added for security and appears to be operated with a photocell. Emergency egress lighting and exit lighting are lacking from the original design and remodeling work. Light switching does not meet the current energy standards, as well.

Receptacles for office electrification is lacking in general with only one receptacle per office. All exterior walls and interior walls are CMU and adding devices has been accomplished with surface raceways for the most part.

Fiber optic cables enter the building at the west of Lab 101 and terminate at a wall-mounted server along the south wall of Lab 102. Voice and data cabling to the server from offices is through surface mounted raceways(plastic) or bundled open air cabling at the ceiling.

### Engineer's Commentary:

The mechanical/electrical systems in place at the FHP Lab are either outdated by today's standards, at the end of their useful life or inadequate for the current use. The current IBC, IMC and Wisconsin Plumbing codes applicable to this facility are not satisfied by the MEP systems currently in place, and any remodeling project for the facility would bring into play upgrading the MEP systems.

We would recommend the water service metering arrangement be modified to provide separate water metering for this facility. Consideration should be given to upgrade the water and waste piping for life of the intended facility, along with new insulation, valves and labeling. The plumbing fixtures should be replaced with new vitreous china fixtures and faucets/flush valves for maintenance and to meet applicable ADA standards. Emergency shower/eye wash should be added to the Lab 101. Storm water collection and drainage needs to be addressed to control water damage and potential icing of sidewalks. Interior roof drainage should be considered with any new roofing and remodeling project.

The steam system should be replaced with either a hot water heating system or an all air system, if the envelope improvements are completed. The greenhouse addition will require radiation heating, which could be accomplished with a dedicated high-efficiency condensing boiler.

The controls and ventilation improvements are necessary from a life safety and comfort standpoint. The lab areas should be serviced with a separate air handler from the office wing for preventing the spread of potential hazardous airborne contaminants from the lab. A new fume hood should be provided for the lab work dealing with hazardous contaminants. The office wing requires ducted return air system because the corridor cannot be used for a return air plenum -- requiring new ductwork chases at the roof or raising the existing roof to accommodate with reasonable head room space. Improved efficiency heating and cooling equipment, new temperature controls and higher quality air filters should be part of the new HVAC system plan. A geothermal HVAC system is a green building option for reducing the heating and cooling costs by 30-40% based on a conventional 90% efficient heating system and SEER 13 cooling system.

A new 3-phase 400-amp electrical service should be provided to handle future electrical power needs. The lighting and lighting controls should be upgraded to provide aesthetic and efficient lighting system with

multiple levels of control. Occupancy sensors and daylight harvesting controls should be incorporated in the new lighting plan. Emergency egress and exist lights with battery back-up need to be added throughout the facility.

A new plan should be provided for adding receptacles and distribution space throughout the facility. If the exterior walls are furred out the new devices can be added recessed in the exterior wall. Additional devices on the interior walls could be added by dual-channel raceways for voice/data and power. Planning for laboratory power and equipment should be reviewed with any laboratory remodeling. A dedicated server closet and cabling distribution for voice and data should be considered.

Building Energy Use: Based on 2007 usage and 3,550 SF building area.

Electrical Energy:	13,133 KWH/yr	13,134 MBtu/SF/yr	\$ 1,824/yr	\$ 0.51/SF/yr
Natural Gas Energy:	4,024 Therms/yr	<u>113,350 MBtu/SF/yr</u>	<u>\$ 4,136/yr</u>	<u>\$ 1.16/SF/yr</u>
Total Building Annual Energy Usage		126,484 MBtu/SF/yr	\$ 5,960/yr	\$ 1.67/SF/yr

The steam system is contributing to very high heating costs per year, as well as, high maintenance costs. A hot water heating system or geothermal system should reduce heating overall costs by 30%-40%. The electrical system appears to be very reasonable energy users, reflecting the T8 lamp/electronic ballast retrofit. The greenhouse addition is not reflected in this evaluation.

## Building Deficiency and Maintenance Items To Be Addressed

1. **Items that present a life safety hazard and/ or could cause personal injury:**
  - a. The floor tile throughout appears to be part of the original construction of the building. Given the age of the building, it is probable that it is vinyl asbestos tile. While it is acceptable if it is not disturbed, it should be replaced if there is remodeling that affects this flooring.
  - b. Lack of emergency egress lighting and exit lights.
  - c. Lack of emergency shower/eye wash at Lab 101.
  - d. New fume hood and exhaust fan at Lab 102.
  - e. Separate air handling system for the lab and office wings.
  
2. **Items that are general violations under the current code:**

*The current building is "grand-fathered" for compliance to the current code, and therefore is acceptable as it is. Any remodeling or addition projects, however, would require compliance with the new code for all of the new work, and possibly for some existing areas. Before this could be determined, a scope of the project would have to be established.*
  
3. **Items that require immediate attention:**
  - a. Replace plumbing piping, valves and insulation.
  - b. Replace water heater with high-efficiency water heater with hot water recirculation.
  - c. Replace steam heating system with high-efficiency heating system.
  - d. Replace heating, ventilation and air conditioning systems.
  - e. Replace temperature controls.
  - f. Upgrade electrical service and distribution.
  - g. Upgrade electrical receptacle distribution and device wiring.
  - h. Replace lighting systems and controls.
  - i. Provide interior storm drains and site storm drainage.
  
4. **ADA compliance:**

*The current building is "grand-fathered" for compliance to the current ADA code, and is therefore acceptable as it is. Any remodeling or addition projects, however, would require compliance with the new code for all of the new work, and for some existing areas based upon the magnitude of other improvements.*

**Choose either a or b:**

  - a. Add to and remodel existing bathrooms to ADA compliance.
  - OR
  - b. Convert existing bathrooms to some other use, like storage, and provide new ADA compliant bathrooms in conjunction with other new construction listed under Group #6.
  - c. Provide ADA access between the Lab/ Office and Greenhouse levels.
  
5. **Items that are general maintenance issues:**
  - a. Replace roofing, add insulation, and provide new roof drainage.
  - b. Water metering arrangement for multiple buildings.
  - c. Backflow preventer for boiler water make-up.
  - d. Lighting dual level controls or occupancy sensors.
  - e. Upgrade voice/data cabling and server arrangement.

6. **Items where action is not required, but modification may improve facility functionality:**
- a. There is no evidence of insulation in the exterior walls. If there was any installed during the original construction, it was probably a poured-in type installed in the CMU cavity. This system is very sub-standard by today's standards, and is notorious for settling over time and leaving the upper portion of the wall unprotected. It is recommended that a metal stud furring system with 5/8" GWB, vapor barrier, and full-batt insulation be added to the inside of the exterior walls.
  - b. The existing glass block under the newer replacement windows in Laboratory 101 is very energy inefficient. It should be replaced with an insulated exterior panel on the outside. The inside could be covered by the wall furring noted in item "a" above.
  - c. Staff suggested that the existing Lab 101 be remodeled and updated to current laboratory and OSHA standards by providing a new ADA-compliant lab island, shelves and incubator, and emergency eye wash/ shower.
  - d. Staff suggested that the existing Lab 102 be remodeled and updated for the "Gypsy Moth Program" by replacing the existing lab benches and fume hood.
  - e. Staff suggested that a new clean laboratory be added.
  - f. Staff suggested that a new public meeting room with a capacity of 20 people be provided. A counter and sink should be included.
  - g. Eliminate common corridor return air path per current IBC code requirements.
  - h. Upgrade HVAC system with vertical-bore ground-coupled geothermal system (6 bore holes @ 150 ft deep) instead of hot water boiler and air-cooled cooling system for energy savings and maintenance savings.

## Recommended Remedial Actions

It is recommended that the most efficient and thorough way to address all of the following categories of action items would be to incorporate them in to an overall project that includes expanding the building to address several program needs that have been identified.

The following list is meant to be a "smorgasbord" of options to address the deficiencies and maintenance items listed in the previous section.

### 1. Life Safety Hazard Actions:

<i>May 2012</i> 1a.	<del>Remove existing VAT &amp; base &amp; replace with VGT and vinyl base in labs and corridors, carpet and vinyl base in offices.</del>	<del>\$20,000</del>
1b.	Add emergency egress lighting and exit lights.	\$3,000
1c.	Add emergency shower/eye wash at Lab 101.	\$2,000
<i>Feb 2010</i> 1d.	<del>Add new fume hood and exhaust fan at Lab 102.</del>	<del>\$6,000</del>
1e.	Separate air handling system for the lab and office wings.	\$20,000

### 2. General Code Compliance Actions:

None.

### Items that Require Immediate Attention Actions:

3a.	Replace plumbing piping, valves and insulation.	\$20,000
3b.	Replace water heater with high-efficiency heater and recirculation pump.	\$3,000
3c.	Replace steam heating system with high efficiency system including piping.	\$35,000
3d.	Replace ventilation and air conditioning systems.	\$45,000
3e.	Replace and upgrade Temperature Controls.	\$8,000
3f.	Upgrade electrical service and distribution.	\$16,000
3g.	Upgrade electrical receptacle distribution and device wiring.	\$20,000
3h.	Replace lighting systems and controls.	\$18,000
3i.	Add interior roof drainage and site storm drainage.	\$20,000

4. ADA Compliance Actions:

- 4a. or 4b. Replace existing non-ADA compliant Women 108 & Men 109 by EITHER:
- a. Gutting the existing bathrooms, adding new additional space to the east, and providing new ADA bathrooms. \$45,000
- OR
- b. Converting existing bathrooms to storage and providing new bathrooms near existing front entrance. (To be combined with new meeting room and front entrance below.) \$50,000
- 4c. Provide an internal ADA accessibility lift between the Lab/ Office and Greenhouse levels. \$25,000

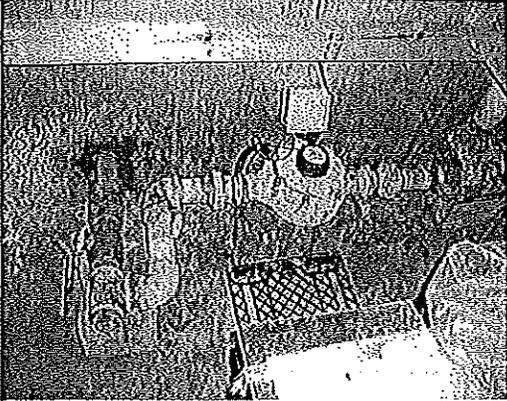
5. General Maintenance Actions:

- Oct 2012 5a. ~~Remove and existing roof and replace with new single-ply ESR, add 3' tapered insulation, and provide new gutters and roof edging:~~ <sup>Additional pest screen is needed on the upper level roof</sup> \$1,000  
~~\$30,000~~
- 5b. Modify water metering arrangement. \$3,000
  - 5c. Add backflow preventer for boiler water make-up. \$1,000
  - 5d. Add dual level lighting controls and occupancy sensors. \$5,000
  - 5e. Upgrade voice/ data cabling and relocate server.. \$10,000

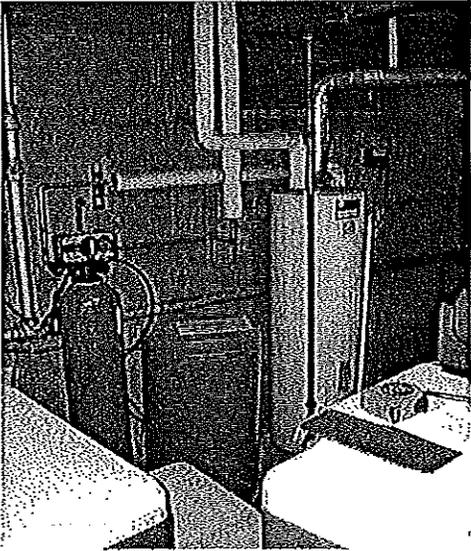
6. Facility Improvement Actions:

- 6a. Provide new metal stud furring with GWB & insulation on all exterior walls. \$20,000
- 6b. Remove glass block and provide exterior insulated panel. (Inside furring covered above.) \$10,000
- 6c. Remodel Lab 101 per staff recommendations. \$60,000
- 6d. Remodel Lab 102 per staff recommendations. \$30,000
- 6e. Add a new 175 sf Clean Lab per staff recommendations. \$90,000
- 6f. Add a new 16' x 20' public meeting room and new front entrance for staff and public. \$110,000
- 6g. Eliminate common corridor return air path. \$16,000
- 6h. Upgrade HVAC system with vertical-bore geothermal system. \$18,000

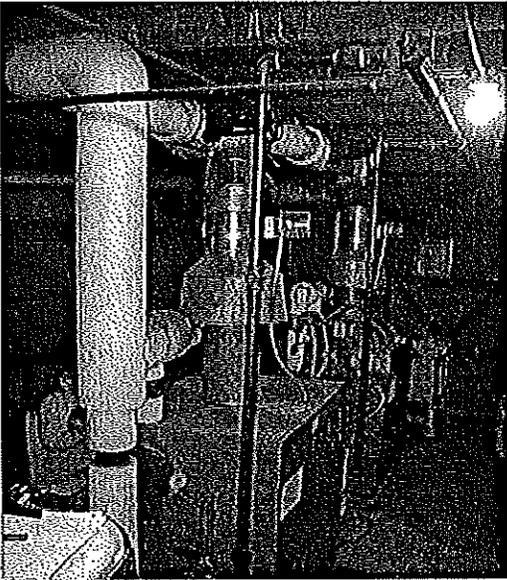
Supplemental Information



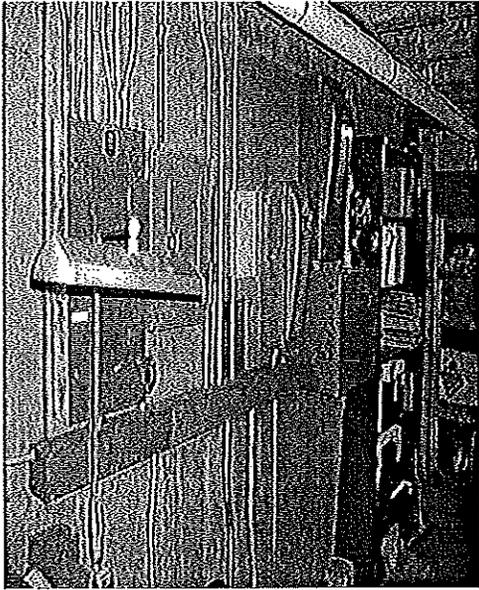
WATER SERVICE & METER



WATER SOFTENER AND HEATER



STEAM BOILERS



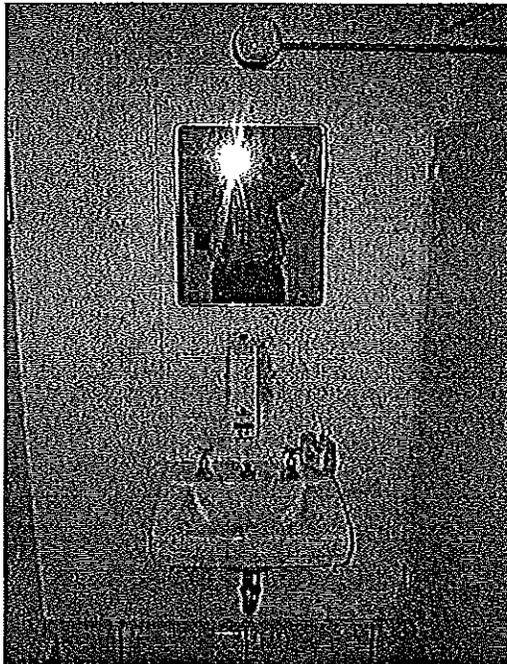
ELECTRICAL SERVICE AND DISTRIBUTION



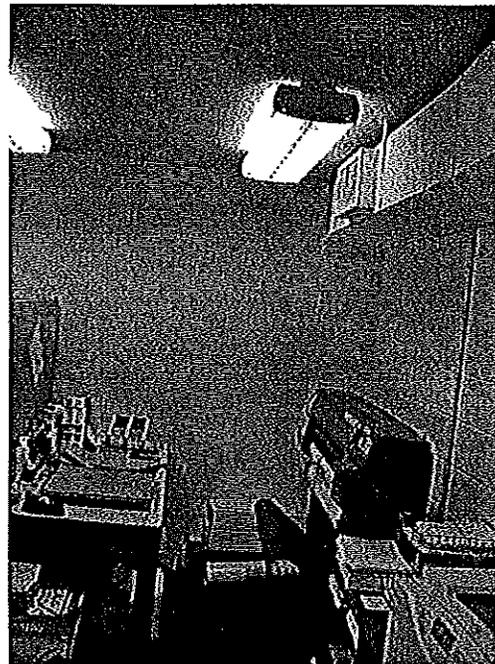
EXISTING URINAL



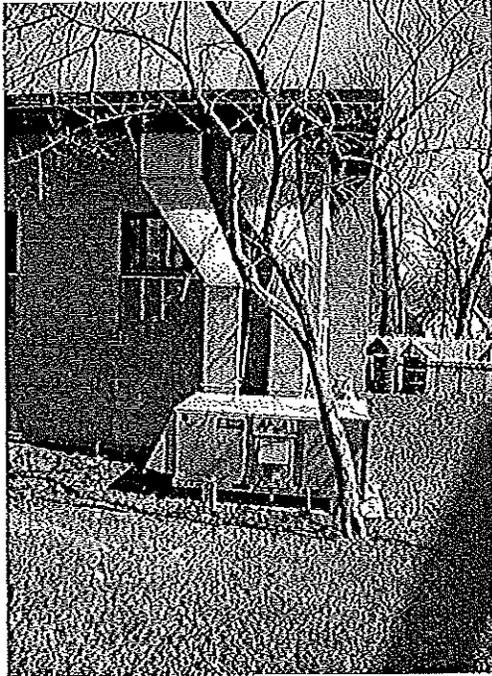
EXISTING WATER CLOSET



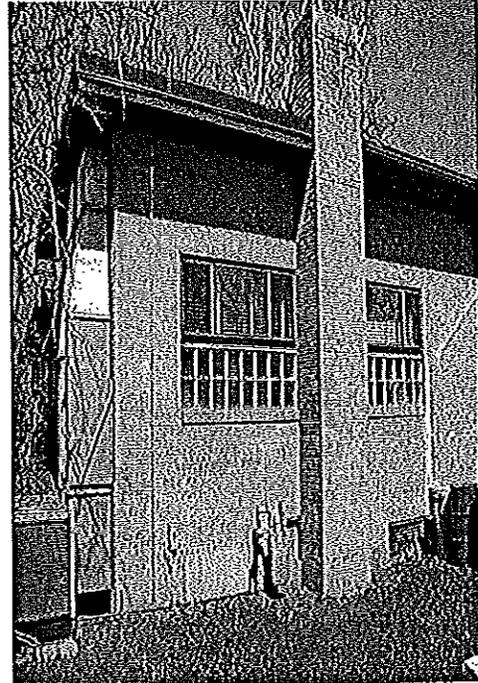
EXISTING LAVATORY



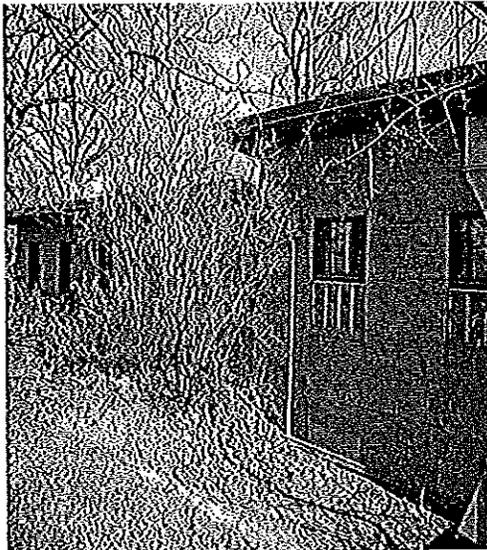
TYPICAL OFFICE LIGHTING AND DUCTWORK



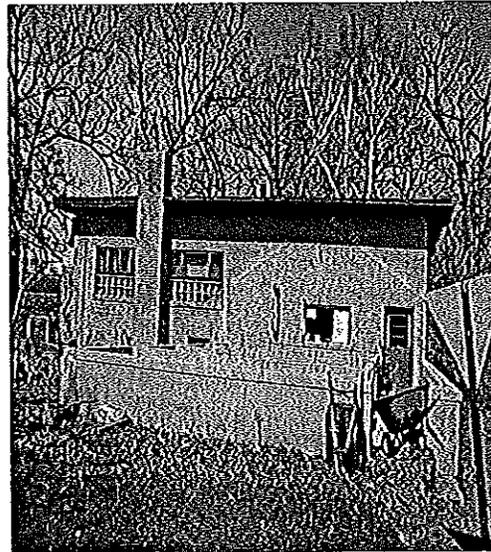
PACKAGED HEAT/COOL UNIT



SOUTH EXPOSURE AND GAS SERVICE



WEST EXPOSURE WITH FIBER OPTIC ENTRY



SOUTH EXPOSURE WITH GREENHOUSE ADDITION

## Air System Sizing Summary for Block Load

Project Name: FIP Lab  
Prepared by:

10/08/2008  
09:53AM

### Air System Information

Air System Name Block Load  
Equipment Class SPLY AHU  
Air System Type SZCAV

Number of zones 1  
Floor Area 3267.0 SF  
Location Madison, Wisconsin

### Sizing Calculation Information

Zone and Space Sizing Method:  
Zone CFM Sum of space airflow rates  
Space CFM Individual peak space loads

Calculation Month Jan to Dec  
Sizing Date Calculated

### Central Cooling Coil Sizing Data

Total coil load 53 Tons  
Total coil load 64.1 MBH  
Sensible coil load 59.3 MBH  
Coil CFM at Jul 1600 3220 CFM  
Max block CFM 3220 CFM  
Sum of peak zone CFM 3220 CFM  
Sensible heat ratio 0.925  
BTU/(hr-ft<sup>2</sup>) 609.8  
BTU/(hr-ft<sup>2</sup>) 19.7  
Water flow @ 10.0 °F rise N/A

Load occurs at Jul 1600  
OA DB / WB 88.3 / 72.8 °F  
Enthalpy DB / WB 77.6 / 65.6 °F  
Leaving DB / WB 60.3 / 59.1 °F  
Coil ADP 68.4 °F  
Bypass Factor 0.100  
Resulting RH 53 %  
Design supply temp 58.0 °F  
Zone Total Check 1 of 1 OK  
Max zone temperature deviation 0.0 °F

### Central Heating Coil Sizing Data

Max coil load 98.1 MBH  
Coil CFM at Des 11g 3220 CFM  
Max coil CFM 3220 CFM  
Water flow @ 20.0 °F drop N/A

Load occurs at Des 11g  
BTU/(hr-ft<sup>2</sup>) 30.1  
Ent. DG / LG DB 64.7 / 93.9 °F

### Supply Fan Sizing Data

Ach/N max CFM 3220 CFM  
Standard CFM 3121 CFM  
Ach/N max CFM/M<sup>2</sup> 0.99 CFM/M<sup>2</sup>

Fan motor BHP 0.00 BHP  
Fan motor kW 0.00 kW  
Fan static 0.00 in wg

### Outdoor Ventilation Air Data

Design airflow CFM 135 CFM  
CFM/M<sup>2</sup> 0.04 CFM/M<sup>2</sup>

CFM/person 15.00 CFM/person

### Air System Design Load Summary for Block Load

Project Name: FHP Lab  
Prepared by:

10/06/2003  
09:53AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1600			HEATING DATA AT DES HYG		
	COOLING OA DB / WB 89.3 °F / 72.8 °F			HEATING OA DB / WB -15.0 °F / -15.5 °F		
ZONE LOADS	Detailed	Sensible (BTU/hr)	Latent (BTU/hr)	Detailed	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	344 ft²	14577	-	344 ft²	-	-
Wall Transmission	1881 ft²	6270	-	1881 ft²	36038	-
Roof Transmission	2397 ft²	11728	-	2397 ft²	12767	-
Window Transmission	344 ft²	2063	-	344 ft²	16110	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	42 ft²	556	-	42 ft²	1357	-
Floor Transmission	2369 ft²	0	-	2369 ft²	7458	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	4164 W	12754	-	0	0	-
Tack Lighting	0 W	0	-	0	0	-
Electrical Equipment	2186 W	6845	-	0	0	-
People	9	1693	1845	0	0	0
Infiltration	-	1026	936	-	12168	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	-	56648	2831	-	87688	0
Zone Conditioning	-	57621	2831	-	86353	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	3220 CFM	0	-	3220 CFM	0	-
Ventilation Load	135 CFM	1687	1847	135 CFM	11761	0
Supply Fan Load	3220 CFM	0	-	3220 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	-	59308	4778	-	98114	0
Central Cooling Coil	-	59308	4783	-	0	0
Central Heating Coil	-	0	-	-	98114	-
>> Total Conditioning	-	59308	4783	-	98114	0
Key:	Positive values are ckg loads Negative values are hkg loads			Positive values are hkg loads Negative values are ckg loads		