BIG STONE LAKE STATE PARK

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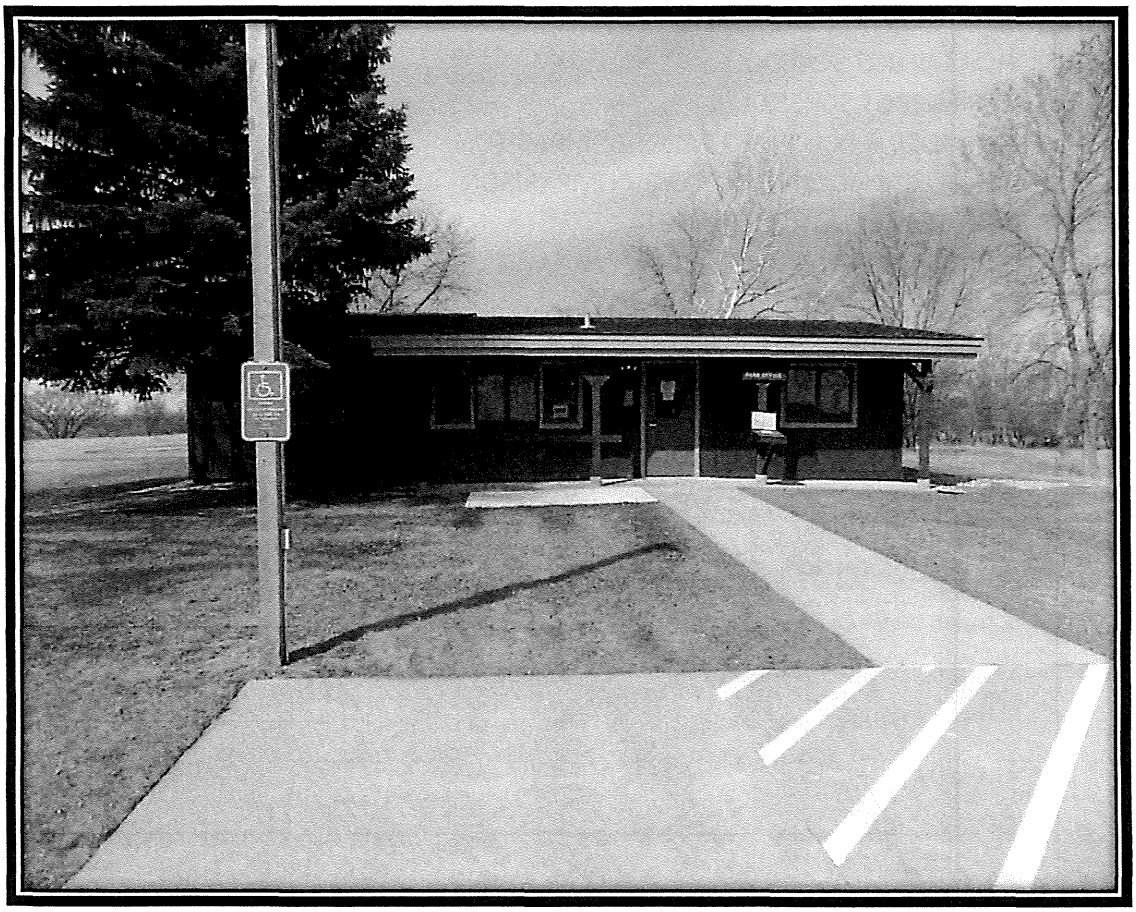

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Consultant's Report

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Furnace
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Lighting

REPAIR SHOP

Building Envelope
Heater
Lighting
Shop Equipment

OFFICE & REPAIR SHOP SUMMARY OF RECOMMENDATIONS

RECOMMENDATIONS	EXISTING MMBTU USAGE	PROPOSED MMBTU USAGE	MMBTU SAVINGS	ENERGY SAVINGS BY GALLON OR KWH	DOLLAR SAVINGS	COST	PAYBACK IN YEARS
Insulate foundation walls	12.31	4.76	7.55	79	$ 129.85	$ 1,400.00	$ 10.78
Insulate attic and ductwork	21.17	6.62	14.55	152	$ 250.20	$ 1,248.00	$ 4.99
Install SEER 14 Air Conditioner	6.53	4.19	2.34	688	$ 82.27	$ 400.00	$ 4.86
Install LED lighting	3.31	1.53	1.78	524	$ 62.68	$ 1,400.00	$ 22.34
Install timer on heater for ATV	4.08	2.72	1.36	400	$ 47.83	$ 20.00	$ 0.42
TOTALS	47.40	19.81	27.59	1,842	$ 572.83	$ 4,468.00	$ 7.80
SAVINGS PERCENT	58%						

Foundation insulation should be 1 1/2" thermax glued airtight to the foundation. Cover with gypsum or leave exposed. Insulation in needed on 3 walls in basement.

The attic ductwork should be insulated with 1 1/2" thermax with the seams and joints taped. This will ensure minimum heat loss in the attic.

The urethane spray insulation between the top chord of the trusses is not sufficient and a danger of condensation is present in the area between roof deck and the attic floor. I would recommend 14" blown cellulose on the attic floor to create the thermal barrier at the ceiling. This will eliminate the possibility of a "cold ceiling" effect which could create a drafty feeling in the building in the heating months.

Upon replacement of the air conditioner unit, a SEER 14 air conditioner will save operation costs. The $400 is the typical cost increase for the upgrade.

LED lighting will be a permanent replacement lamp. They are energy efficient and very long lasting. Their life expectancy will not be diminished with motion sensors which are a good idea where ever they can be effectively located. The garage lights brings up the payback years. I would suggest not installing new LED in the garage.

A timer should be installed on the ATV, or any vehicle that has a engine heater used in the winter. This will reduce the runtime on the heater.

INTERPRETIVE CENTER SUMMARY OF RECOMMENDATIONS

RECOMMENDATIONS	EXISTING MMBTU USAGE	PROPOSED MMBTU USAGE	MMBTU SAVINGS	ENERGY SAVINGS BY GALLON OR KWH	DOLLAR SAVINGS	COST	PAYBACK IN YEARS
Insulate foundation	81.76	25.55	56.21	585	$ 966.21	$ 7,600.00	$ 7.87
Install LED lighting	4.90	1.23	3.67	1,079	$ 129.02	$ 2,100.00	$ 16.28
Install Vari Speed Fan furnace	2.18	1.31	0.87	256	$ 30.61	$ 400.00	$ 13.07
Install point of source water heater.	3.06	1.28	1.79	525	$ 62.78	$ 500.00	$ 7.96
TOTALS	91.89	29.36	62.53	2,445	$ 1,188.62	$ 10,600.00	$ 8.92
SAVINGS PERCENT	68%						

Foundation insulation should be 1 1/2" thermax glued airtight to the foundation. Cover with gypsum or leave exposed. If installed properly, the molding in the basement will be eliminated.

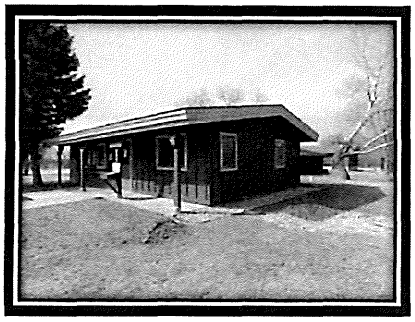
LED lighting will be a permanent replacement lamp. They are energy efficient and very long lasting. Their life expectancy will not be diminished with motion sensors which are a good idea where ever they can be effectively located. Payback will be better if the facility is used more hours annually.

The furnace needs a combustion air source. The furnace that is not working looks like it was producing carbon monoxide from one of the burners. The replacement furnace should be a variable speed modulating furnace which will reduce the electrical and gas consumption needed to heat the facility.

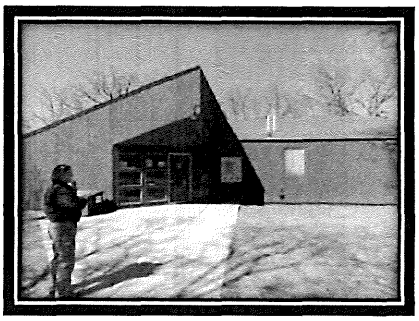
Installation of a point of source water heat for the bathrooms makes sense. A large amount of stand by loss occurs from the tank and the lines to the bathrooms. Insulating the hot water supply lines would be a good measure as well.

Weather stripping and sealing air infiltration would also save energy. It appears some air infiltration is occurring through the vent. I am not sure where the vent in the hall is ducted.

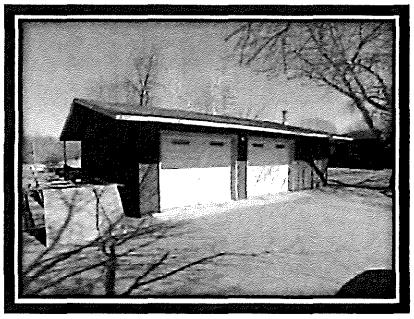
BUILDING ENVELOPES



Office



Interpretive Center



Repair Shop

Big Stone Lake State Park is located in Ortonville, MN. The park buildings audited include the contact station, the interpretive center and the repair shop.

The contact station is a 1248 sq foot building. The building has recently been remodeled, and . included the replacement of the windows and doors. The attic was insulated with spray foam between the rafters just below the roof deck. The basement is 16'x26' Landscaping and grading was also done around the perimeter exterior. The building is used for offices, and information center for the campground.

The shop is a cold storage area 24'x32' with (2) 9'x7' overhead doors on the south. The shop is used for parking and maintenance of park vehicles. The shop energy usage is included in the contact station.

The interpretive center was built in 1971. The building is roughly 2600 sq foot with a vaulted ceiling that reaches a height of 16' in the center to the main area. There is a full, non insulated basement with 9' clearance to the floor joists. The building is used as an nature information and education center.

INTERPRETIVE CENTER HEAT LOSS CALCULATIONS

LOCATION	SAVINGS IN HEATING MMBTUS	SAVINGS IN COOLING MMBTUS	SAVING IN DOLLARS HEATING	SAVINGS IN DOLLARS COOLING
PERIMETER BASEMENT FOUNDATION WALLS	53.53	2.68	$ 920.17	$ 94.18
TOTAL	53.53	2.68	$ 920.17	$ 94.18

OFFICE HEAT LOSS CALCULATIONS

LOCATION	SAVINGS IN HEATING MMBTUS	SAVINGS IN COOLING MMBTUS	SAVING IN DOLLARS HEATING	SAVINGS IN DOLLARS COOLING
PERIMETER EXTERIOR FOUNDATION WALLS	7.55	0.38	$ 129.85	$ 13.29
INSULATE ATTIC FLOORS	20.16	1.01	$ 346.58	$ 35.47
TOTAL	27.72	1.39	$ 476.44	$ 48.77

ENERGY PROFILE

TYPE OF FUEL	COST PER UNIT	DOLLARS PER MMBTU
Electrical Rate	0.12	35.17
Propane Gas Rate	1.65	17.19

OFFICE & REPAIR SHOP FUEL USAGE	ANNUAL MMBTU	ANNUAL PERCENT	USAGE EQUIPMENT
Electrical Usage	22.52	35%	Lighting, Office Equipment, Well Pump, Air Conditioner, Furnace Fan, Domestic Water Heater, ATV Heater in shop, & Appliances.
Gas Usage	42.57	65%	Propane Furnace
TOTAL	**65.09**	100%	

INTERPRETIVE CENTER FUEL USAGE	ANNUAL MMBTU	ANNUAL PERCENT	USAGE EQUIPMENT
Electrical Usage	0.00	#DIV/0!	Lighting, Furnace Fan, & Domestic Water Heater
Gas Usage	0.00	#DIV/0!	Propane Furnace
TOTAL	**0.00**	#DIV/0!	

OFFICE & REPAIR SHOP ENERGY SCHEDULES

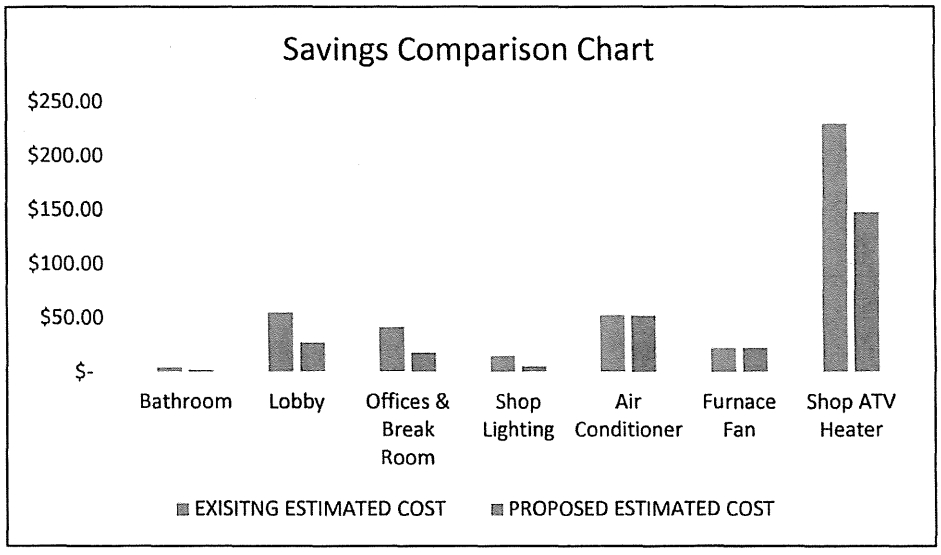
	EXISTING						PROPOSED			
LOCATION	LAMP	QUANT	EXIST KW	HRS PER YEAR	ANNUAL TOTAL KWH EXISTING	RETRO FIT TYPE	MOTION SENSOR	TOTAL KWH PROPOSED	HOURS PER YEAR PROPOSED	ANNUAL TOTAL KWH PROPOSED	ANNUAL SAVINGS KWH
BATHROOM	4'-T8	4	0.032	300	38.4	LED	YES	0.016	260	16.64	21.76
LOBBY	4'-T8	8	0.032	1800	460.8	LED	NO	0.016	1800	230.4	230.4
OFFICES & BREAK ROOM	4'-T8	6	0.032	1800	345.6	LED	YES	0.016	1600	153.6	192
SHOP LIGHTING	4'-T8	10	0.032	400	128	LED	YES	0.016	300	48	80
COMPUTERS	1	1	0.2	2200	440	NA	NO	0.2	2200	440	0
WELL PUMP	1	1	0.32	600	192	NA	NO	0.32	600	192	0
AIR CONDITIONER	2 TON	1	2.4	800	1920	SEER 14	NO	1.54	800	1232	688
FURNACE FAN	CARRIER	1	0.36	2800	1008	REDUCE STATIC PRESSURE	NO	0.32	2800	896	112
WATER HEATER	4 GALLON	1	1.5	300	450	NA	NO	1.5	300	450	0
ATV HEATER IN SHOP	1000 WATT	1	1	1200	1200	TIMER	NO	1	800	800	400
MISC	REFRIGERATOR, APPLIANCES	2	0.32	800	512	NA	NO	0.32	800	512	0
TOTALS			**6.228**	**13000**	**6694.8**			**5.264**		**4970.64**	**1724.16**

INTERPRETIVE CENTER ENERGY SCHEDULES

EXISTING						PROPOSED					
LOCATION	LAMP	QUANT	EXIST KW	HRS PER YEAR	ANNUAL TOTAL KWH EXISTING	RETRO FIT TYPE	MOTION SENSOR	TOTAL KWH PROPOSED	HOURS PER YEAR PROPOSED	ANNUAL TOTAL KWH PROPOSED	ANNUAL SAVINGS KWH
BATHROOMS	4'-T12	4	0.036	300	43.2	LED	YES	0.016	250	16	27.2
MAIN FLOOR	4'-T12	22	0.036	400	316.8	LED	PARTIAL	0.016	390	137.28	179.52
BASEMENT R LAMPS	75 W REFLECTOR	21	0.075	400	630	LED	PARTIAL	0.013	380	103.74	526.26
EXTERIOR LIGHTING	75 W REFLECTOR	2	0.075	3000	450	LED	YES	0.013	4000	104	346
FURNACE FAN	HEATING ONLY	1	0.4	1600	640	VARI SPEED	NEW FURNACE	0.24	1600	384	256
WATER HEATER	50 GALLON	1	4.5	200	900	INSTALL 4 GALLON	POINT OF SOURCE UNIT	1.5	250	375	525
TOTALS			**5.122**		**2980**			**1.798**		**1120.02**	**1859.98**

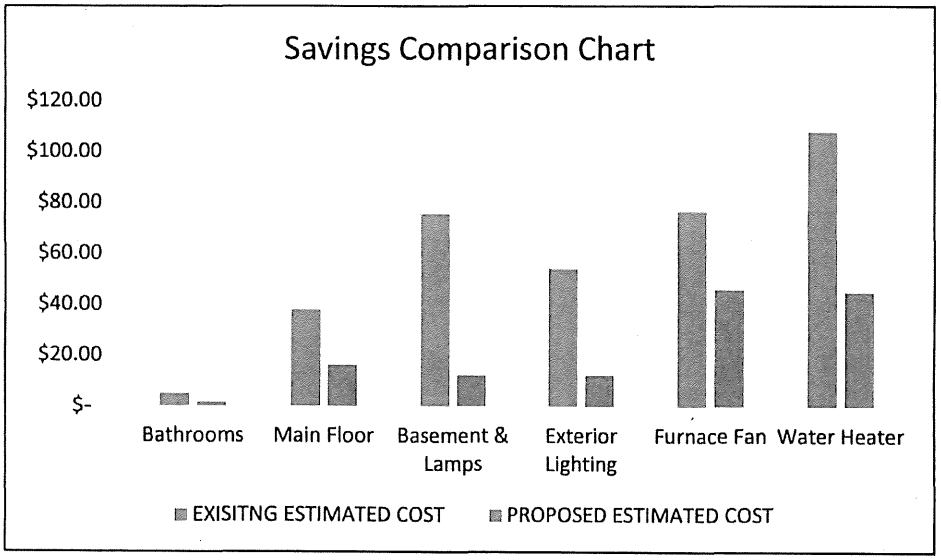
OFFICE & REPAIR SHOP FUEL & EQUIPMENT COST COMPARISON

ENERGY SOURCE	EXISITNG ESTIMATED COST	EXISTING PERCENT OF COST	PROPOSED ESTIMATED COST	PROPOSED PERCENT OF COST
Bathroom	$ 4.61	1%	$ 2.00	1%
Lobby	$ 55.30	13%	$ 27.65	10%
Offices & Break Room	$ 41.47	10%	$ 18.43	7%
Shop Lighting	$ 15.36	4%	$ 5.76	2%
Air Conditioner	$ 52.80	12%	$ 52.80	19%
Furnace Fan	$ 23.04	5%	$ 23.04	8%
Shop ATV Heater	$ 230.40	54%	$ 147.84	53%
TOTAL	**$ 422.98**	**100%**	**$ 277.52**	**100%**



INTERPRETIVE CENTER FUEL & EQUIPMENT COST COMPARISON

ENERGY SOURCE	EXISITNG ESTIMATED COST	EXISTING PERCENT OF COST	PROPOSED ESTIMATED COST	PROPOSED PERCENT OF COST
Bathrooms	$ 5.18	1%	$ 1.92	1%
Main Floor	$ 38.02	11%	$ 16.47	12%
Basement & Lamps	$ 75.60	21%	$ 12.45	9%
Exterior Lighting	$ 54.00	15%	$ 12.48	9%
Furnace Fan	$ 76.80	21%	$ 46.08	34%
Water Heater	$ 108.00	30%	$ 45.00	33%
TOTAL	**$ 357.60**	**100%**	**$ 134.40**	**100%**



OFFICE & REPAIR SHOP USAGE DATA 2013 & 2014

2013	HDD (MN45)	CDD (MN45)	KWH USAGE	ENERGY COST	PROPANE GALLON USAGE	PROPANE COST
January	1,578	0	433	$ 82.18	60	$ 81.97
February	1,435	0	323	$ 71.23	31	$ 38.37
March	1,443	0	349	$ 73.95	34	$ 42.48
April	941	0	362	$ 75.10	33	$ 41.11
May	313	25	366	$ 75.85	34	$ 42.48
June	69	116	540	$ 99.51	33	$ 47.40
July	26	206	863	$ 136.29	34	$ 50.61
August	23	188	936	$ 141.66	34	$ 50.61
September	97	90	710	$ 108.95	35	$ 53.57
October	632	0	689	$ 107.08	100	$ 193.13
November	1,054	0	457	$ 86.86	96	$ 186.90
December	1,734	0	493	$ 87.66	90	$ 175.21
2013 TOTALS	**9,345**	**625**	**6,519**	**$ 1,146.31**	**613**	**$ 1,003.84**

2014	HDD (MN45)	CDD (MN45)	KWH USAGE	ENERGY COST	PROPANE GALLON USAGE	PROPANE COST
January	1,693	0	451	$ 81.63	41	$ 82.02
February	1,552	0	358	$ 74.70	37	$ 74.09
March	1,202	0	354	$ 74.52	41	$ 82.02
April	728	0	503	$ 90.01	277	$ 488.42
May	310	61	644	$ 101.73	10	$ 17.14
June	35	88	657	$ 112.33	10	$ 16.59
July	20	130	847	$ 133.31	10	$ 17.14
August	17	121	743	$ 121.67	10	$ 17.14
September	166	42	573	$ 95.66	5	$ 8.85
October	506	0	619	$ 100.22	0	$ -
November	1,277	0	482	$ 86.81	0	$ -
December	1,329	0	370	$ 74.66	0	$ -
2014 TOTALS	**8,835**	**442**	**6,601**	**$ 1,147.23**	**443**	**$ 803.42**

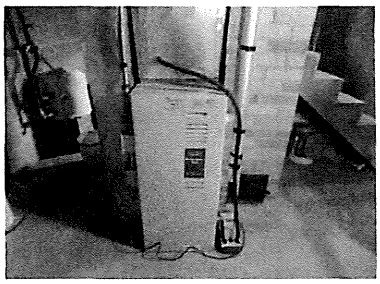
INTERPRETIVE CENTER USAGE DATA 2013 & 2014

2013	HDD (MN45)	CDD (MN45)	KWH USAGE	ENERGY COST	PROPANE GALLON USAGE	PROPANE COST
January	1,578	0				
February	1,435	0				
March	1,443	0				
April	941	0				
	313	25				
June	69	116				
July	26	206				
August	23	188				
September	97	90				
October	632	0				
November	1,054	0				
December	1,734	0				
2013 TOTALS	**9,345**	**625**	**0**	**$ -**	**0**	**$ -**

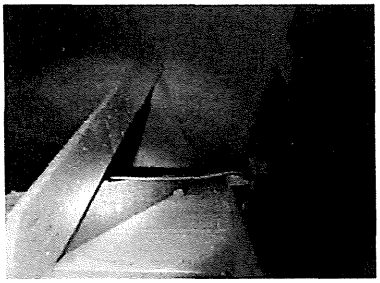
2014	HDD (MN45)	CDD (MN45)	KWH USAGE	ENERGY COST	PROPANE GALLON USAGE	PROPANE COST
January	1,693	0				
February	1,552	0				
March	1,202	0				
April	728	0				
May	310	61				
June	35	88				
July	20	130				
August	17	121				
September	166	42				
October	506	0				
November	1,277	0				
December	1,329	0				
2014 TOTALS	**8,835**	**442**	**0**	**$ -**	**0**	**$ -**

OFFICE PHOTOGRAPHS

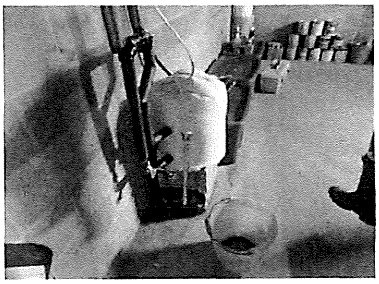
This is the service counter in the contact station.



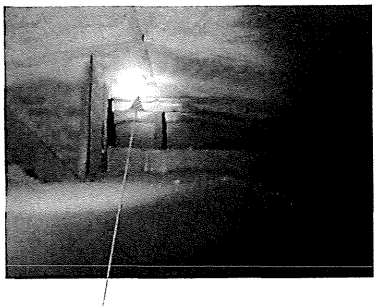
The propane furnace is located in basement.



The attic thermal barrier is spray foam to the roof decking.

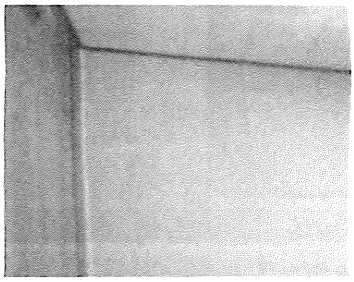


The domestic water heater in basement.

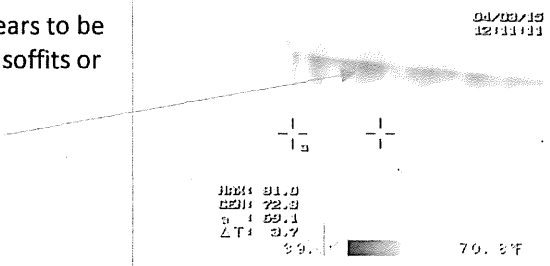


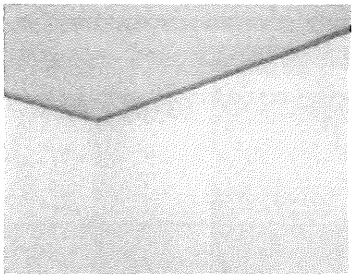
This is blown spray foam for attic insulation.

OFFICE INFRARED PHOTOGRAPHS

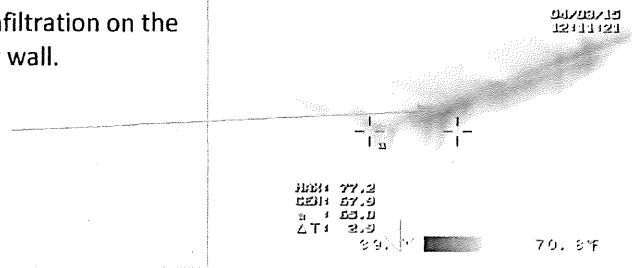


This air flow appears to be coming from the soffits or the exterior wall.

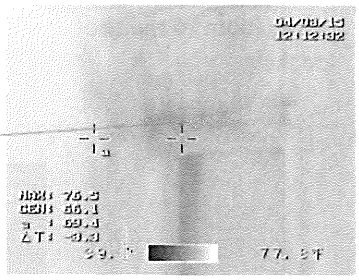




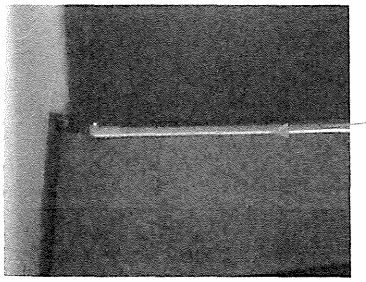
Note air infiltration on the east lobby wall.



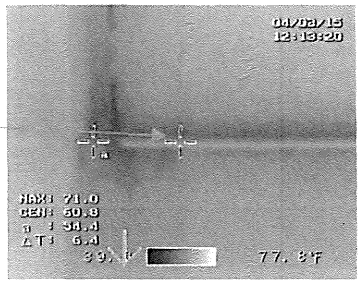
Air flow around the bathroom window frame.

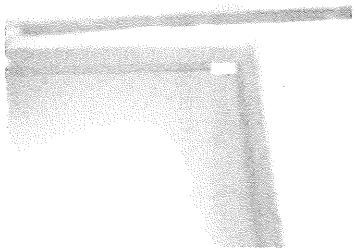


OFFICE INFRARED PHOTOGRAPHS #2

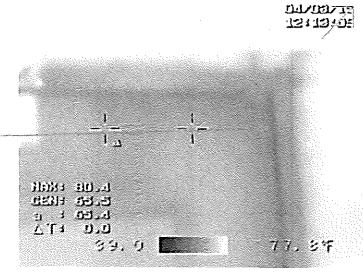


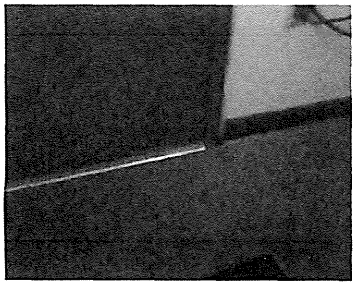
Their is air infiltrate at the bottom of the door frame.



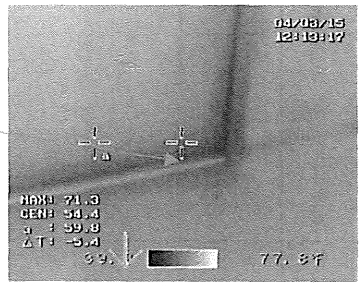


There is air flow around the west entry door frame.

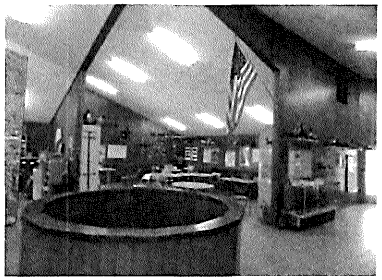




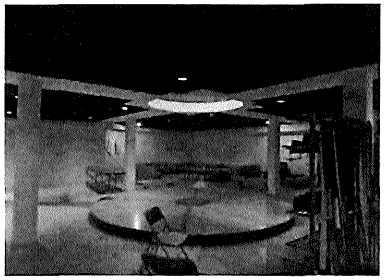
Air infiltration at the bottom of the west door.



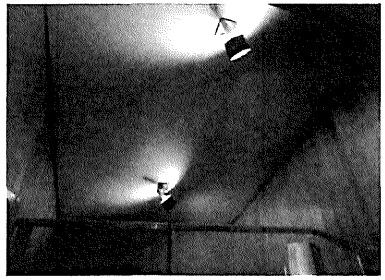
INTERPRETIVE CENTER PHOTOGRAPHS



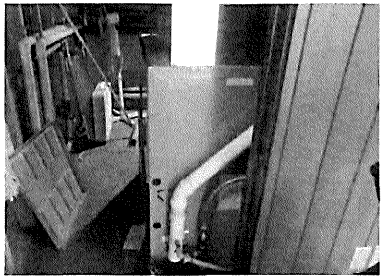
This is a main floor view of the interpretive center. A ceiling fan in this area is recommended for reduce stratification of air in this



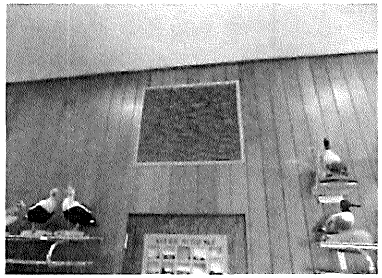
The basement area is used for classes and the walls could be insulated as well as the installation of new lighting.



Lighting such as this can be easily replaced with screw in LED lamps.

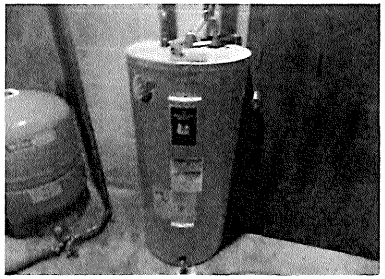


Space heating is provided by (2) Goodman 200,000 btu forced air furnaces. No source of combustion air could be located.



The Air intake vent also brings in some fresh air from the outside.

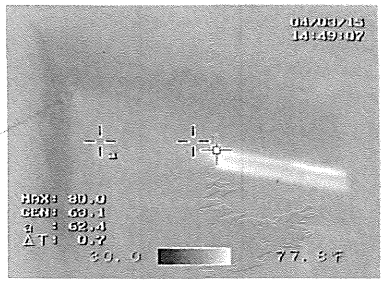
Storage area in the basement.



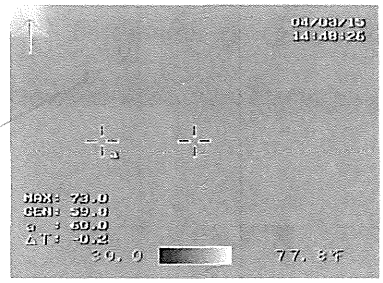
Replace 50 gallon domestic water heater with point of source water heater under cabinet of sink in bathroom.

INTERPRETIVE CENTER INFRARED PHOTOGRAPHS

Note the air infiltration from the vent. This may be duct leakage from the attic.

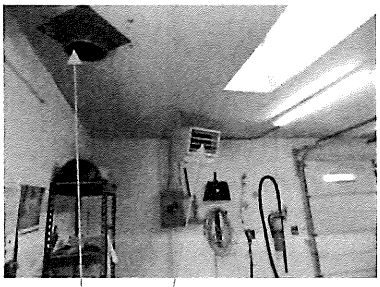


The ceiling joists are likely not covered with insulation in the attic. No access was located to see above this area.



REPAIR SHOP PHOTOGRAPHS

Storage garage is unheated.



If heater is used, the chimney should be sealed off.