H6E6 0076

SAMPLE AUDIT REPORT FORMAT

Water Audit Report:

November, 1988

Major Boston Hospital
Boston, Massachusetts

Prepared By:

Your Name
XYZ Hospital
Boston, Massachusetts 02111

Water Audit Report

Major Boston Hospital
Boston, Massachusetts

SUMMARY

This building consumed 33 million gallons of water in FY'88 at a cost of $110,000. Sixty-four percent of that water is used for cooling compressors. Another four percent cools steam condensate before disposal. Processes (x-ray developers, kitchen, CSR and labs) use fifteen percent. Thirteen percent is used for sanitary and general cleaning.

The following table summarizes the measures we found to be cost effective. They represent water savings of 24 million gallons per year, nearly three quarters of present consumption.

We recommend that the Hospital implement all of these measures.

Water Conservation Measure	Cost	Savings	Payback
Control Compressor Cooling Flow	$ 4,000	$ 28,700	.2 yrs
Use Chilled Water for Compressors	18,000	21,500	.8 yrs
Use Chilled Water for One Koldwave	10,500	11,000	.9 yrs
Control X-O-Mat Flow	14,000	4,400	3.2 yrs
Eliminate Condensate Cooling	1,000	14,900	.1 yrs
	$47,500	$80,500	.6 yrs

WATER UTILIZATION

Water Cost

Water is purchased from the Boston Water and Sewer Commission through a meter common to several buildings on the campus. Applicable parts of the rate schedule, effective April 1, 1988, are:

MCF/Day	$/MCF Water	$/MCF Sewer	$/MCF Total	$/Mgal Total
0-19	12.23	11.93	24.16	3.23
20-39	12.25	12.08	24.33	3.25

Use data indicates that from September, 1987 through August, 1988, 31.4 million gallons of water were purchased. Appendix A summarizes the 21 months of readings. That data is erratic and probably incorrect for the first year; it appears more consistent from September, 1987 on, but remains suspect since there is no basis for the winter peak water use indicated.

The total cost for water for the last year, according to available data, was $104,600 using an average cost of $25/MCF. Based on the current effective BW&SC rate, it would have been $101,800. Projected cost for FY'88 is $106,300.

Sanitary

All toilets are fitted with Sloan standard flushometers. There are 175 toilets, 145 lavatories, 64 shower/tubs, 12 bedpan sterilizers and 17 janitor's sinks.

The daily average population is roughly 600 people weekdays and 400 people on weekends, or 200,000 people-days per year. Using an average of 21 gallons per person-day (3 flushes at 5 gal/flush, .3 shower/baths at 15 gal/use, 1 washup at 1 gal/use), sanitary use amounts to 12,600 gallons/weekday or 4.2 million gal/yr.

Kitchen

Hours of operation are 6:00 a.m. to 8:00 p.m. daily. Approximately 4,000 meals per weekday and 2,500 meals per weekend day are prepared and served in these facilities. Water using equipment includes:

No.	Device	Use Characteristics	Gal/Weekday
3	Steam Tables	2 fills/day x 20 gal/fill	100
2	Dishwasher	Champion 64KB; BetterBuilt 3/4" service, 3 gpm max	2,200
1	Pot Scrubber	cont for 50%; 3/4"svc, 3 gpm	1,000
1	Scullery	cont for 50%; 1" svc, 5 gpm	2,000
12	Steam Kettles	40 gal/fill; 25 fills/day	1,000
			6,300

This inventory implies about 1-1/2 gallons of water are used per meal. Annual use is 2.0 million gallons.

Lab/Glass Washing

The fourth floor has one Betterbuilt 2000 glass washer and (14) double width utility sinks. The sinks use 4 gpm when the faucet is fully open, but they are rarely used. The glass washer consumes between 30 and 40 gallons per cycle; each step (a detergent wash and three rinses) uses 8 to 10 gallons. Water from the final tap water rinse is recycled back to a pre-rinse. There are four cycles per day. Lab use is about 140 gallons/day.

Autoclaves

Water is used to cool steam condensate as it drains. There are six autoclaves in the OR suite which use at least .5 gpm whenever the jacket is being heated. They are "on" 14 hrs/day, 6 days/wk. There are three in CSR which use 1 gpm in the same way; operations there are 10 hrs/day, 6 days/wk. Usage for the nine autoclaves is 4,300 gallons/workday, or 1.3 million gallons/year.

Central Sterile Supply/Washing

CSR has six utility sinks used in batch washing, a Castle cage washer (also a batch operation) and a Pasteurmatic instrument washer rated at 30 gal/fill. The washers are used intermittently during the day shift and occasionally during the evening shift. There are six Pasteurmatic cycles of four fills each per day, two Castle cycles of 3 fills per cycle and 36 gal/fill. Utility sink use is six fills per day at 10 gal/fill.

Estimated CSR use, exclusive of autoclave cooling, is 1,300 gallons/workday or .4 million gallons/year.

Water Cooled Compressors

Medical air, medical vacuum, AC and refrigeration compressors in the sub-basement are water cooled and/or sealed. (Refer to the discussion on pages 8 and 11 for details on this equipment.) Daily use for the (19) compressors is 57,000 gal/day or 21 million gallons/year -- nearly two-thirds of all use in this building.

Radiology/X-O-Mats

There are eight x-ray developing machines (X-O-Mats). The three in the ER are in use for an average of 16 hrs/day, the one in the OR runs about 6 hrs/day, six days/wk and the four in Radiology run 11 hours/day, 5 days/wk. Each have a water bath with a constant flow of tempered water of approximately 1.5 gpm when the unit is on. When off or in standby, an automatic valve stops flow. Daily use is 8,600 gal/day for the eight machines. Annual use is 2.7 million gallons.

WATER CONSERVATION OPPORTUNITIES

EQUIPMENT COOLING

During our survey, the following uses were found and the flows estimated:

Equipment		Total GPM	LWT°F
Refrigeration	- (7) units with Penn Controls	4	92
Refrigeration	- (1) unit with Penn Control	3	70
Vacuum Pump	- (4) units with no control	15	70
Compressor	- (4) units with no control	11	70
		33	73

The 33 gpm accounts for 17 million gal/year. At $3.23/Mgal, cooling for the equipment listed above costs $57,700/year.

Recommendation

Add temperature control valves (Penn regulator, for example) to the compressor cooling water discharge lines and set them at 80°. The refrigeration compressors already have them. The net flow will be reduced to an average of 16 gpm.

$500/valve set will cover all costs so the eight valves can be installed for $4,000.

Circulating pumps and controls in the sub-basement will distribute chilled water from the return main to the compressors and back to the return main a few feet downstream. A small bypass will ensure uninterrupted flow to protect the pumps. City water connections are maintained as backup.

Total cooling loop costs are:

General Conditions	$ 2,000
Pad	400
Water pipe	8,400
Electric Service	1,200
Isolation Valves	800
Duplex pump controller	1,000
(2) 1 hp Pump (24 gpm at 40')	1,000
	$14,800
Engineering	1,800
Contingency, 10%	1,400
	$18,000

Savings

The six temperature controllers will save 17 gpm worth $29,700/year, but valve maintenance will be increased about $1,000/year. Net savings will be $28,700. Simple payback on the control valves is about two months.

The chilled water cooling loop will eliminate the remaining 16 gpm of compressor cooling flow worth $28,000/year. The net annual savings due to the closed loop cooling will be approximately $21,500 due to increased maintenance expense. Simple payback is 10 months.

KOLDWAVES

Two Koldwave units in Radiology consume about 600 gallons per day at an annual cost of about $700. A third Koldwave unit cools the transformer room in the sub-basement. This unit runs with uncontrolled flow at about 7 gpm at 70° LWT; it uses about 10,000 gal/day at an annual cost of $12,000.

Recommendation

Install a 3/4" secondary line from the chilled water supply to the Koldwave and regulate flow with Penn control valve to maintain a discharge temperature of approximately 75°. The city water connection may be maintained as a backup.

The chilled water connection is 200' from the sub-basement Koldwave. Project cost will be $10,500. If the compressor cooling loop is implemented, combining this loop into that one will save installation cost.

Savings

Since virtually all the city water will be conserved, net annual savings will be about $11,000. Simple payback will occur in 11 months.

X-O-MATS

Constant water flow of approximately 1.5 gpm when the unit is on is necessary to remove chemicals and heat. Add a temperature control valve to maintain bath temperature when the unit is idling and be fully opened when developing commences.

Recommendation

Seven Penn regulators at $500 each plus a set of controls at $1,000 each would cost $11,000. Engineering and miscellaneous cost would bring the total to not more than $14,000.

Savings

Assuming half the flow during "on" hours will be conserved with no adverse effect on X-O-Mat operation or productivity, water savings will be 4,000 gal/day or 1.5 million gallons per year. At $3.23/Mgal, net annual savings will be $4,400. Simple payback period is 3.2 years.

CONDENSATE COOLING

There is little reason to continue cooling this condensate. Some investigation will be required, including discussion with AMSCO and verification of drain materials.

Recommendation

Shut off condensate cooling water to sterilizers. The investigation will cost less than $1,000.

Savings

Stopping cooling at the point of use will save all of that and $14,900 annually. Payback is almost immediate.

MON	YR	DYS	(MCF)	(Mgal)	(MGD)
DEC		30	390.13	2918	97
JAN	87	30	-82.50	-617	-21
FEB		30	830.67	6213	207
MAR		30	11.36	85	3
APR		30	11.28	84	3
MAY		30	13.51	101	3
JUN		30	1.97	15	0
JUL		30	5.49	41	1
AUG		30	1.44	11	0
SEP		30	229.76	1719	57
OCT		30	172.32	1289	43
NOV		36	671.40	5022	140
DEC		31	570.49	4267	138
JAN	88	31	543.66	4067	131
FEB		29	508.59	3804	131
MAR		31	370.91	2774	89
APR		30	358.95	2685	89
MAY		29	298.60	2234	77
JUN		27	34.57	259	10
JUL		31	290.94	2176	70
AUG		31	143.83	1076	35
SEP					
FY88		336		29653	88
GSF			311015	.10	

BILLING HISTORY

Appendix A

DEVICE	NUMBER	RATE	UTIL		MGD
X-O-MATS	8	1.5			8.6
STM TBLS	3				.1
DISHWASHING	2	3			2.2
STM KETTLES	12				1
AIR/VAC COMPR	8				37.4
REFR COMPR	8				10
A/C	3				10.6
AUTOCLAVES	9				4.3
SINKS					
SCULLERY	1	5			2
POT SCRUB	1	3			1
UTILITY	32	6			.3
JANITOR	17	5	3		.3
LAB	133	4			.1
LAVATORY	145	1	3		.4
CAGE WASHER	2		6		1.3
CART WASHER	1				
BP STERIL	12	8	4	per day	.4
SHWR/TUB RM	64	15	2.5	" "	2.4
FLUSHOMETER	175	5	10.3	" "	9.0
TOTAL					91

EQUIPMENT INVENTORY

Appendix A