

WATER AUDIT PROCEDURE
FOR
LARGE WATER CONSUMERS

INTRODUCTION

This Water Audit Procedure has been developed by the Department of Environmental Protection, Division of Water Use Planning to guide large water consumers in estimating the water and energy savings that can be realized as a result of installing low flow plumbing fixtures and reducing potable water consumption. The procedure consists of four stages:

Background Information

Savings

Investment

Return on Investment

This Water Audit Procedure is intended to serve as a guide for facility management personnel who wish to conduct their own audit. By completing the calculations on the following pages, facility managers will be able to anticipate the capital and labor costs of a plumbing refit program and predict the monetary savings that will result from water conservation measures. Since water-use characteristics and the types of plumbing fixtures vary, some assumptions are necessary when working through the calculations. The Department has provided water consumption data and other information, based on past experience, that is necessary to complete the audit. However, since these assumptions will result in conservation savings figures, actual data should be incorporated wherever possible to improve the accuracy of the results.

BACKGROUND INFORMATION

Utility Rates

Facility Names: _____

Number of Users: _____

Water Utility: _____

Sewage Utility: _____

Energy Utility: _____

Water Cost per 1000 gallons: \$ _____/1000 gal.

Sewage Cost per 1000 gallons: \$ _____/1000 gal.

Cost to raise 1000 gallons 80°F: \$ _____/1000 gal.

BACKGROUND INFORMATION
Water Heating Energy Costs

Electricity \$/kwh	Cost to Raise 1000 Gallons 80°F
0.07	13.69
0.08	15.65
0.09	17.61
0.10	19.57
0.11	21.53
0.12	23.49

Natural Gas \$/mcf	Cost to Raise 1000 gallons 80°F
4.00	2.67
5.00	3.34
6.00	4.00
7.00	4.67
8.00	5.34
9.00	6.00
10.00	6.48

Fuel Oil \$/gal	Cost to Raise 1000 gallons 80°F
0.50	2.40
0.60	2.89
0.70	3.36
0.80	3.84
0.90	4.32
1.00	4.80

Coal \$/ton	Cost to Raise 1000 Gallons 80°F
40.00	1.03
60.00	1.54
80.00	2.06
100.00	2.57
120.00	3.08
140.00	3.60

BACKGROUND INFORMATION

Determine Plumbing Fixture Flow Rates

Showerheads and Faucets:

To obtain showerhead and faucet flowrates, measure the time necessary for the fixture with both controls open to fill a container. Compare the average of five such test results with the table below:

Time Required to Fill Container (sec)	1 Gallon	Flowrate (gal/min) ½ Gallons	Quart
60	1	0.5	0.25
30	2	1.0	0.5
20	3	1.5	0.75
15	4	2.0	1.0
12	5	2.5	1.25
10	6	3.0	1.5
8.6	7	3.5	1.75
7.5	8	4.0	2.0
6.7	9	4.5	2.25
6	10	5.0	2.5

Since measurements of toilet and urinal flush volumes are difficult to obtain, use the typical flush volumes provided on page 6. However, in all cases, use manufacturer's information if available.

BACKGROUND INFORMATION
Flow Rate Tabulation

Fixture	Number of Fixtures	Average Flow Rate/Flush Volume
Flush Tank Toilets		gal/flush
Flush Valve Toilets		gal/flush
Flush Valve Urinals		gal/flush
Bathroom Faucet		gal/flush
Showerheads		gal/min
Faucets		gal/min

SAVINGS
Water Savings

	WATER USAGE Typical or Measured	WATERUSAGE	=	WATER SAVINGS
Flush Tank Toilet (gal/flush)	3.5 or _____	1.6	=	_____
Flush Valve Toilet (gal/flush)	3.5 or _____	1.6	=	_____
Flush Valve Urinal (gal/flush)	3.5 or _____	1.0	=	_____
Shower (gal/min)	3.5 or _____	2.5	=	_____
Bathroom Faucet (gal/min)	3.5 or _____	0.5	=	_____
Kitchen Faucet (gal/min)	3.5 or _____	2.5	=	_____

*If plumbing equipment was installed prior to 1978, typical water usage may be greater than noted above.

SAVINGS

Water Savings

	Savings (gal/flush)	x	Uses (flushes/day)	=	Water Savings (gal/day)
Flush Tank Toilet		x		=	
Flush Valve Toilet		x		=	
Flush Valve Urinal		x		=	

	Savings (gal/min)	x	Average Time Each Use (min/use)	x	Uses (uses/day)	=	Water Savings (gal/day)
Shower		x		x		=	
Faucet		x		x		=	

Total Water Savings (gal/day) = _____

SAVINGS

Heated Water Savings

$$\begin{array}{rclcl} \text{Shower Water Savings} & \times & 60\% & = & \text{Heated Water Savings} \\ \text{(gal/day)} & \times & (0.60) & = & \text{(gal/day)} \\ \hline & \times & \underline{0} & & \hline \end{array}$$

$$\text{Heated Water Savings:} = \underline{\hspace{2cm}}$$

(gal/day)

INVESTMENT

Estimated Capital Costs and Labor

Water Saving Device	Typical Capital Cost (\$)	Labor (hours)
Low Consumption Flush Tank Toilet	140	2.0
Low Consumption Flush Valve Toilet	180	1.0
Flush Valve Refit Kit	15	0.25
Low Flow Showerhead	15	0.25
Low Flow Aerator	10	0.25

Use actual information if available

INVESTMENT

Capital Costs and Labor Tabulation

Water Saving Device	Capital cost of Device	+	cost of Installation	x	Number of Devices	=	TOTAL COST
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Low Consumption Toilet							
Flush Tank	(_____	+	_____)	x	_____	=	_____
Flush Valve	_____	+	_____)	x	_____	=	_____
Flush Valve Refit Kit	(_____	+	_____)		_____	=	_____
Showerhead	(_____	+	_____)	x	_____	=	_____
Faucet Aerator	_____	+	_____)	x	_____		_____
Total Investment:						=	_____
(\$)							

RETURN ON INVESTMENT

$$\begin{array}{cccccc} \text{Total} & & & & & \\ \text{Investment} & + & \text{Total Savings} & \times & 12 & = & \text{R.O.I.} \\ (\$) & & (\$/\text{year}) & & (\text{months}/\text{year}) & & (\text{months}) \end{array}$$

$$\begin{array}{cccccc} & & & & 12 & & \\ \text{_____} & + & \text{_____} & \times & \text{_____} & = & \text{_____} \end{array}$$

Return on
Investment:
(months)
