



Department of Energy

Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208-3621

PUBLIC AFFAIRS

January 27, 2009

In reply refer to: DK-7

Ms. Carol Gardner
Gardner Resource Management Services
2043 NW Kearney St. #3
Portland, OR 97209

RE: FOIA #09-022

Dear Ms. Gardner:

This is your final response to your request for information that you made to the Bonneville Power Administration (BPA), under the Freedom of Information Act (FOIA), 5 U.S.C. 552.

You requested the following:

A copy of the water conservation study that was compiled and submitted to Tim Steele, BPA, from Enertia Energy, Inc. that was performed at BPA HQ and at the Ross Complex.

Response:

BPA has provided a copy of the responsive document in its entirety.

If you are dissatisfied with this determination, you may make an appeal within thirty (30) days of receipt of this letter to the Director, Office of Hearings and Appeals, Department of Energy, 1000 Independence Avenue. SW, Washington, D.C. 20585. Both the envelope and letter must be clearly marked "Freedom of Information Act Appeal." There is no charge for this request.

I appreciate the opportunity to assist you with this matter. If you have any questions about this letter, please contact Laura M. Atterbury, FOIA/Privacy Act Specialist, at 503-230-7305.

Sincerely,

/s/ *Christina J. Brannon*

Christina J. Brannon
Freedom of Information Act/Privacy Act Officer

Enclosure: "Water Conservation Initiative Report"

Water Conservation Initiative Report

BPA Headquarters Building

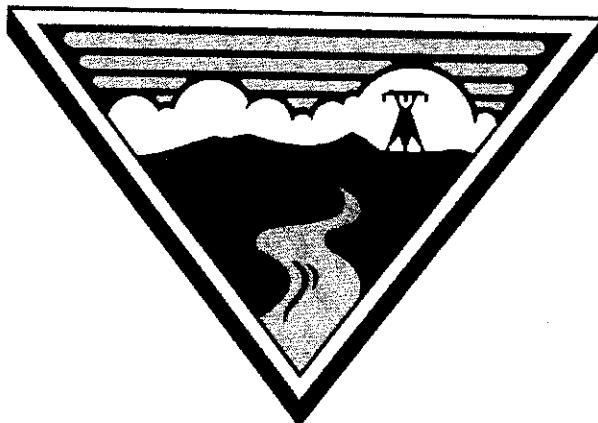
Portland, Oregon

and

Ross Complex

Vancouver, Washington

BONNEVILLE
POWER ADMINISTRATION



Presented to

Bonneville Power Administration

905 NE 11th Avenue

Portland, Oregon 97232

Submitted By:



Enertia Energy Inc.

December 12, 2008.

Disclaimer

The intent of this Water Conservation Initiative Report is to estimate water savings associated with potential upgrades to existing plumbing fixtures, cooling towers, and irrigation systems at the 905 Headquarters Buildings and at the Ross Complex. Appropriate detail is included in this report to assess the existing water use of these systems and to estimate the initial cost and savings of the various water conservation measures identified. However, this report is not intended to serve as a detailed engineering design document as the description of the improvements are diagrammatic in nature only in order to document the basis of cost estimates and savings and to demonstrate the feasibility to construct the improvements. It should be noted that detailed design efforts may be required in order to implement several of the improvements evaluated as part of this water conservation analysis; and if required, costs for those design efforts are included as part of the cost estimate for each measure.

While the recommendations in this report have been reviewed for technical accuracy and are believed to be reasonably accurate, the findings are estimates and actual results may vary. As a result, Bonneville Power Administration and/or Enertia Energy Inc. are not liable if projected estimated savings or economics are not actually achieved. All savings and cost estimates in the report are for informational purposes and are not to be construed as a design document or as guarantees.

BPA should independently evaluate any advice or direction provided in this report. In no event will Enertia Energy Inc. be liable for the failure of the customer to achieve a specified amount of water savings, the operation of customer's facilities, or any incidental or consequential damages of any kind in connection with this report or the installation of recommended measures.

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INTRODUCTION

Purpose

The Bonneville Power Administration's (BPA) Water Reduction Initiative was undertaken to help BPA comply with Executive Orders 13123 & 13423. These Executive Orders mandates that Federal agencies, by 2010, reduce their energy use by 35% compared to energy use in 1985.

These Executive Orders, along with other related executive orders and the Energy Policy Act of 1992 also require Federal facilities to initiate comprehensive water conservation programs within their own facilities. Federal facilities must assess their water use, examine available and appropriate water conservation products, and retrofit or replace existing equipment to make it more efficient.

Executive Order 13123 requires the following acts specifically related to water conservation: *Through life-cycle cost effective measures, agencies shall reduce water consumption and associated energy use in their facilities to reach goals set under section 503(f) of this order.* As part of this requirement, agencies must establish a reliable baseline of water use. BPA's goal is to reduce water usage by 2% per year through 2016.

Executive Order 13423 is summarized below; (Taken from
http://www.ofee.gov/eo/eo13423_main.asp)

On January 24th, 2007, President George W. Bush signed Executive Order 13423, "Strengthening Federal Environmental, Energy, and Transportation Management." The order sets goals in the areas of energy efficiency, acquisition, renewable energy, toxics reductions, recycling, renewable energy, sustainable buildings, electronics stewardship, fleets, and water conservation. In addition the order requires more widespread use of Environmental Management Systems as the framework in which to manage and continually improve these sustainable practices.

Authorization

This Water Reduction Initiative Report was authorized under Contract No. 35741 between Bonneville Power Administration and Enertia Energy, Inc.

Scope

The scope of this project included estimating baseline water use, potential water savings from practical conservation measures, and the costs of such measures. The work is focused on plumbing fixture, irrigation, and cooling tower water use at the Headquarters Building in Portland, Oregon and at the Ross Complex in Vancouver Washington.

EXECUTIVE SUMMARY

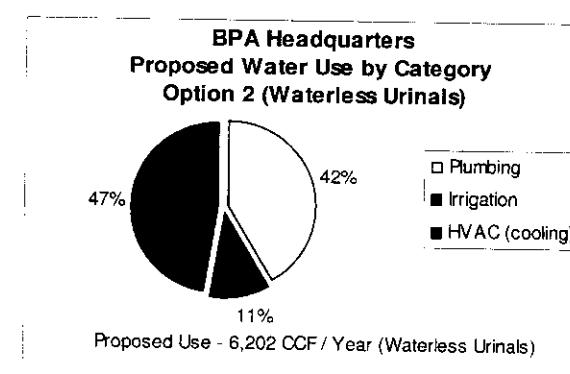
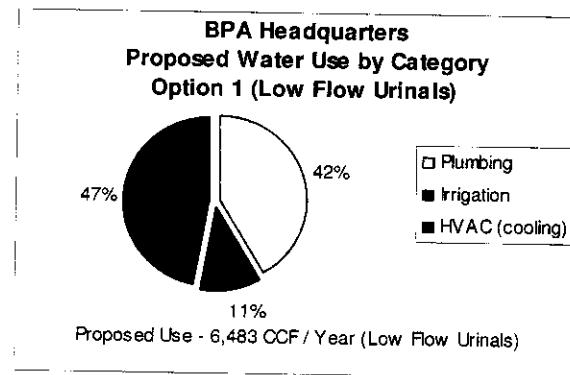
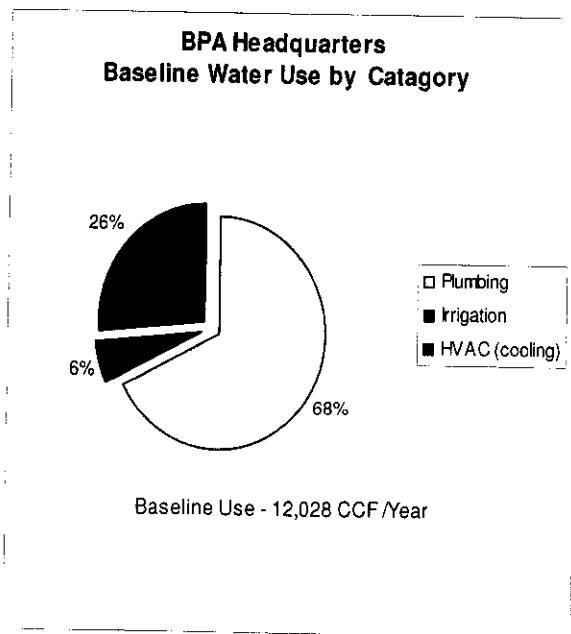
BPA Headquarters Building

The Bonneville Power Administration Headquarters Building, located at 905 N.E. 11th Avenue, Portland, Oregon, is a 7-story 440,000 square foot building occupying a half block area. The building was completed in 1989 and includes a library, cafeteria, first floor lobby with a small retail store, as well as office spaces and underground parking.

Water use in the Headquarters Building has been fairly consistent in recent years averaging 12,000 hundred cubic feet (CCF) per year (which is 9 million gallons). Water and sewer utilities are provided by the City of Portland. These utility rates have increased steadily over recent years rising from \$6.61 / CCF (includes \$1.44 for water + \$5.17 for sewer) in 2000 to the latest rate of \$8.27 / CCF (includes \$2.07 / for water + \$6.26 / for sewer) in July of 2008. At the current utility rates and consumption levels, BPA will spend about \$100,000 per year for water and sewer services.

The targeted water reduction of 2 percent per year through 2016 can easily be met with improvements to the plumbing fixtures. If all recommended water savings measures were implemented, total building water use would be reduced by 45%. An investment of \$176,000 would be required for complete implementation.

Baseline and proposed water use for the headquarters building is summarized below:



Reductions in use for irrigation or cooling tower use are not practical at this facility. Irrigation use is very small and all done manually and the cooling tower makeup is very well controlled.

The following table summarizes the savings and simple paybacks for the proposed measures at the BPA Main Headquarters.

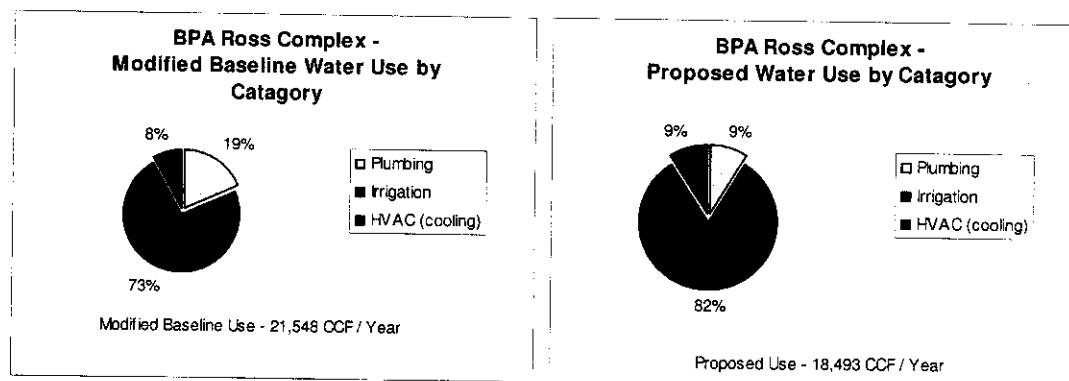
Water Efficiency Measure Savings Summary - Plumbing (BPA - HQ)					
BPA Main Headquarters		Calculated Savings (CCF)	Annual Cost Savings	Installed Cost	Simple Payback
WSM 1	Upgrade Water Closets - Valves (Sloan Solis Dual Flush - 1.6/1.1 gpf)	3,195	\$26,611	\$105,616	4
WSM 2A	Upgrade Urinal - Low Flow (Sloan WEUS-1002.1401)	1,283	\$10,687	\$42,180	4
WSM 2B	Upgrade Urinal - Waterless (ZeroFlush Waterless Urinal)	1,540	\$12,824	\$22,180	2
WSM 3	Upgrade Lavatory - Low Flow (Sloan EAF-275)	276	\$2,301	\$26,270	11
WSM 4	Upgrade Showers - Low Flow (Delta #RP46384)	252	\$2,097	\$2,830	1

Ross Complex

The Ross Complex is a 235 acre site located off Highway 99 in Vancouver Washington. There are 75 buildings totaling 778,000 square feet. About two-thirds of the building space is industrial in nature and the remainder is office.

Water and sewer utilities are provided by the City of Vancouver. The current rate for these utilities is \$3.41 / CCF (1.04 / for water + 2.37 for sewer). Bonneville paid \$128,000 for water and sewer services during the twelve month period ending June 2008. However, the historical billing data at Ross does not accurately portray the actual water use (see specifics on page 19).

So, for the purpose of this report, we have included historical billing data along with suggested modifications (modified baseline) which we think more accurately reflects the actual water used at the Ross Complex.



The targeted water reduction of 2 percent per year through 2016 can easily be met with improvements to the plumbing fixtures and the irrigation system (see recommendations on page 36). An investment of \$271,253 would be required for complete implementation.

The following table summarizes the savings and simple paybacks for the proposed measures at the BPA Ross Complex.

Water Efficiency Measure Savings Summary - Plumbing (Ross Complex)					
		Calculated Savings (CCF)	Annual Cost Savings	Installed Cost	Simple Payback
WSM 1	Upgrade Water Closets - Valves (Caroma Caravelle - 1.6/0.8 gpf)	1,158	\$3,949	\$60,996	15
WSM 2	Upgrade Urinal - Waterless (WES-1000)	320	\$1,091	\$23,390	21
WSM 3	Upgrade Lavatory - (Sloan EAF-275)	328	\$1,118	\$76,680	69
WSM 4	Upgrade Showers (Delta #RP46384)	143	\$487	\$3,537	7
WSM 5	Upgrade Kitchen Sinks - 1.5 gpm low flow aerators	60	\$203	\$1,650	8

Water Efficiency Measure Savings Summary - Irrigation (Ross Complex)					
		Calculated Savings (CCF)	Annual Cost Savings	Installed Cost	Simple Payback
WSM 6*	Replace 1,000 ft of Galvanized Piping	500	\$520	\$10,000	19
WSM 7*	Replace Ineffective Sprinkler Heads	1,900	\$1,976	\$10,000	5
WSM 8*	Install New Irrigation Controls	4,600	\$4,784	\$85,000	18

* Cost Savings assume water charge only (\$1.04 / CCF)

BPA HEADQUARTERS – WATER SYSTEM DETAILS

Building Overview

The Bonneville Power Administration Headquarters Building is located at 905 N.E. 11th Avenue, Portland, Oregon. The building was completed in 1989; it is a 7-story 440,000 square foot square foot building. In addition to the seven floors above grade, there are three basement levels. Level B3 and B2 are underground parking areas; B1 includes the facilities areas, a fitness center, and offices.

Water consuming systems include plumbing fixtures, cooling towers, and irrigation. Details on these systems and their water use are presented in the following paragraphs.

Existing Water Use / Cost:

Water is supplied to the Headquarters Building by the City of Portland Water Bureau. It enters the site at one location and is metered by meter number 20026005. Water and sewer charges are applied under rate schedule type “Commercial/Monthly” at a rate of \$2.07 per CCF for water plus \$6.26 per CCF for sewer.

Total water use at the Headquarters Building averaged 12,000 CCF (which is 9 million gallons) per year at an average cost of \$76,000 over the two years of billing history (May 2006 to June 2008) provided to us. The latest water/sewer rate went into effect in July 2008. If water use continues at the historical level, the annual cost of water/sewer services will be \$100,000.

In addition to the one main incoming meter, there are eleven water sub meters installed in the building to record the usage for the cooling towers and irrigation usage. These meters combine to create a deduct to the sewer charges for water that flows through the main water meter but which does not end up in the sewer. These meters are listed below.

Sub Meter	Serving	Description	Meter #
#1	CT-1	Cooling Tower Room Make Up	12011442
#2	CT-1	Penthouse Bleed	1233578
#3	CT-2	Penthouse Make Up	12011396
#4	CT-2	Penthouse Bleed	1233576
#5	CCC-3	Penthouse Make Up	6001368
#6	CCC-3	Penthouse Bleed	1233579
#7	CCC-2	Penthouse Make Up	10010800
#8	CCC-2	Penthouse Bleed	1233580
#9	CCC-1	Penthouse Make Up	10010801
#10	CCC-1	Penthouse Bleed	1233577
#12	B-1	Mechanical Room Irrigation	201561

There are ten meters for the five cooling towers (or closed circuit coolers). Five meters are described as Tower Make Up and five are described as Bleed. This configuration has been required in the past because all the water passing through the Make Up meter is credited on the sewer bill. However, the water being blown down from the towers (called

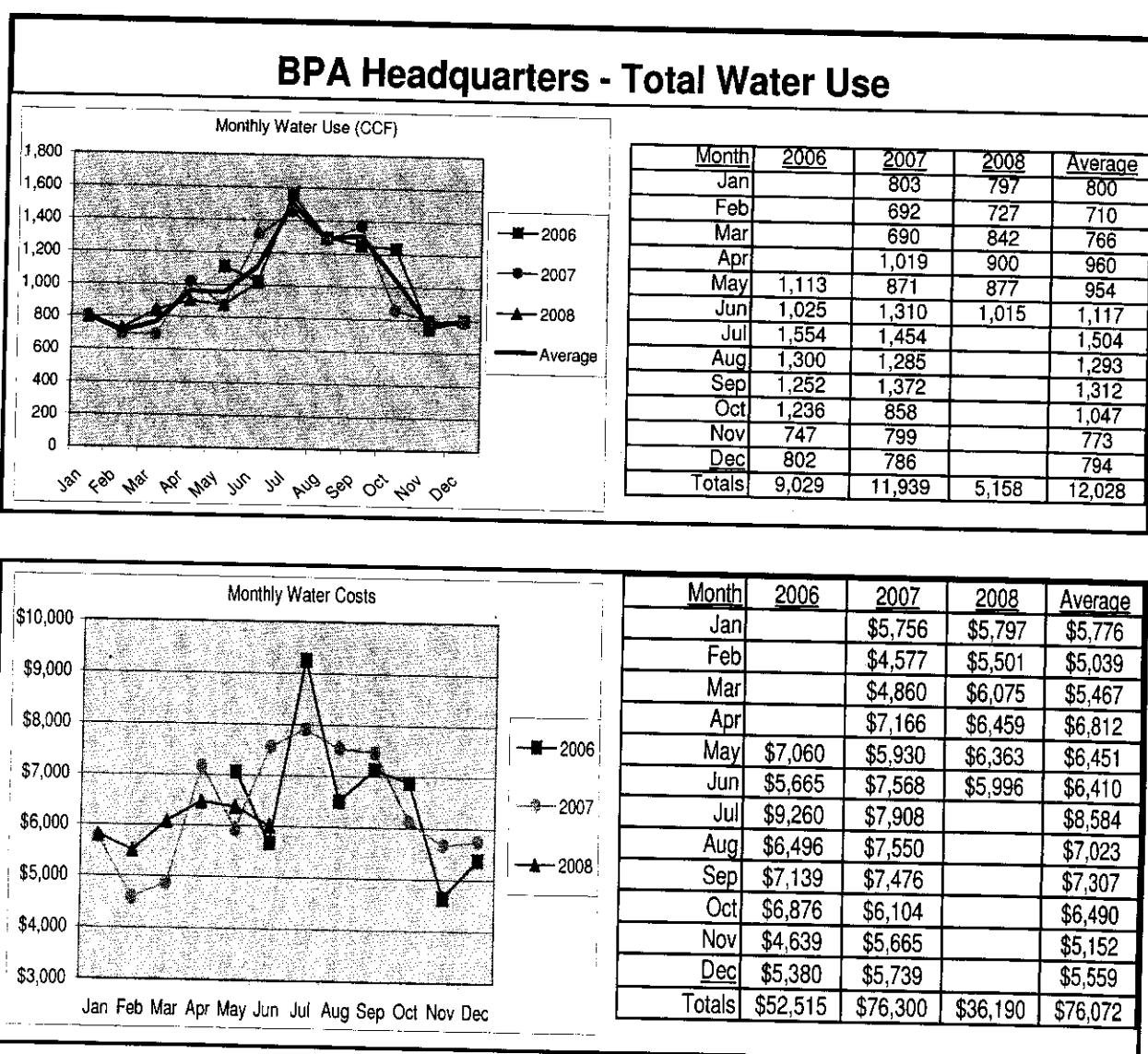
Bleed) ends up in the sewer so it is billed back under this submeter. In the future, BPA and the City have agreed to delete the Bleed meters and credit the sewer charges by a fixed 80 percent of the metered Tower Make Up. This should provide a fair approximation of the amount of water not entering the sewer.

The eleventh deduct submeter is for irrigation use.

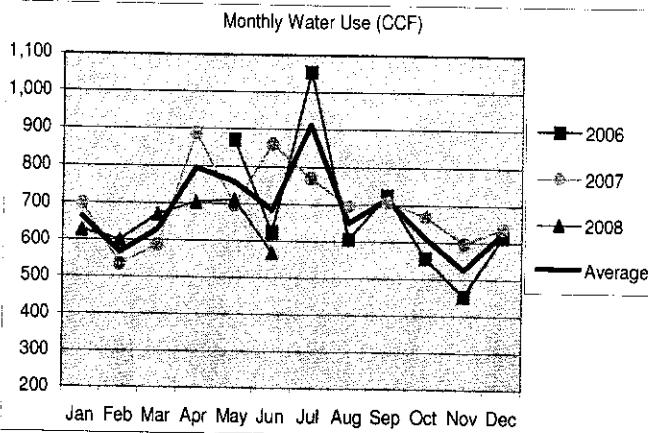
These submeters are read by BPA personnel and the data is sent to the City for use in billing.

The submeters allowed for the direct tabulation of water use for irrigation and for cooling towers. The balance of water use went to plumbing fixtures.

Facility total water use and cost, along with our estimates of the various uses for irrigation, plumbing fixtures, and cooling towers follow.

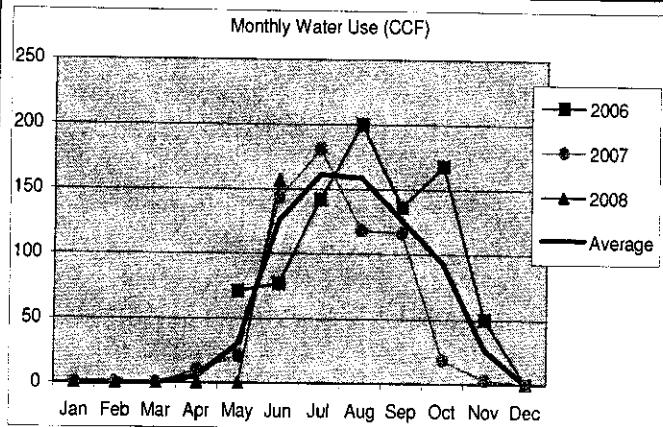


BPA Headquarters - Plumbing Use



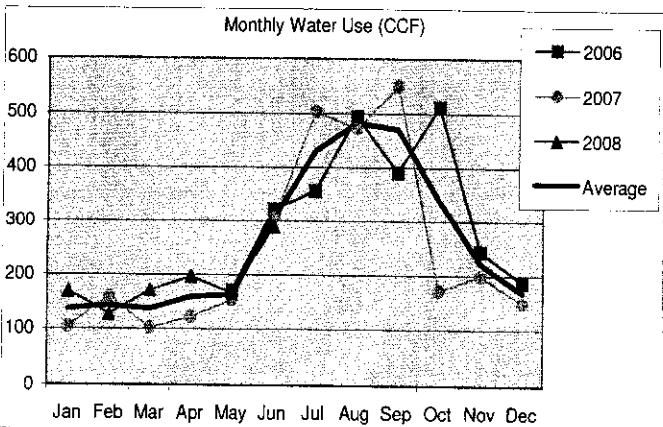
Month	2006	2007	2008	Average
Jan	698	628	663	
Feb	533	600	567	
Mar	588	671	630	
Apr	887	704	796	
May	871	696	711	759
Jun	624	860	568	684
Jul	1,054	770		912
Aug	606	696		651
Sep	725	706		716
Oct	556	669		613
Nov	453	597		525
Dec	615	637		626
Totals	5,504	8,337	3,882	8,140

BPA Headquarters - Irrigation Water Use



Month	2006	2007	2008	Average
Jan	0	0	0	0
Feb	0	0	0	0
Mar	0	0	0	0
Apr	10	0	0	5
May	71	21	0	31
Jun	77	143	157	126
Jul	142	181		162
Aug	200	118		159
Sep	136	116		126
Oct	168	18		93
Nov	50	3		27
Dec	0	0		0

BPA Headquarters - Cooling Water Use



Month	2006	2007	2008	Average
Jan	105	169	137	
Feb	159	127	143	
Mar	102	171	137	
Apr	122	196	159	
May	171	154	166	164
Jun	324	307	290	307
Jul	358	503		431
Aug	494	471		483
Sep	391	550		471
Oct	512	171		342
Nov	244	199		222
Dec	187	149		168

Plumbing Fixture Details:

The facility was constructed prior to the Energy Policy Act of 1992 which addressed energy and water use in commercial, industrial and residential facilities. Because of this, the existing plumbing fixtures are not considered efficient and in turn the water use associated with the plumbing systems is higher than a similar facility with updated low flow plumbing fixtures. For example, the existing water closets consume 4.5 gallons per flush versus modern fixtures using 1.35 gallons; existing urinals use 3.0 gallons per flush versus modern urinals use anywhere from no water (waterless urinals) to 1.5 gallons per flush; several of the existing lavatory faucets use 2.2 gallons per minute versus modern use of 0.5 gallons per minute; and the existing showers use 2.5 gallons per minute versus modern use of 0.5 gallons per minute. With plumbing fixtures accounting for 68 percent of the total water use, significant reductions in water use are possible by changing the existing plumbing fixtures.

In order to estimate the cost and savings of plumbing fixture changes, we constructed a spreadsheet of all existing fixtures. This spreadsheet not only tabularizes the types and location of the fixtures, but estimates the water use by fixture type. The spreadsheet matches billed data within three percent.

BPA Water Initiative - BPA Headquarters Existing Fixture Summary							
Floor	Fixture Symbol	Fixture Description	Number of People	Fixture Usage & (Source)	Total Fixtures / Floor	# of Floors	Total Fixtures
Plumbing							
B1 Core	L-1 L-2 SH-1 U-2 All Star	Lavatory Lavatory Shower Urinal WC-1		0.5 gpm 0.5 gpm 2.5 gpm 3.0 gpf 4.5 gpf	4 4 2 4 9	1 1 1 1 1	4 4 2 4 9
West Core Floors 1-4 & 7	L-1 L-4 U-1 WC-1	Lavatory Lavatory Urinal Water Closet		0.5 gpm 2.2 gpm 3.0 gpf 4.5 gpf	4 2 2 6	5 5 5 5	20 10 10 30
West Core Floors 5 & 6	L-1 L-4 U-1 WC-1	Lavatory Lavatory Urinal Water Closet		0.5 gpm 2.2 gpm 3.0 gpf 4.5 gpf	4 2 2 6	2 2 2 2	8 4 4 12
East Core 1-4 & 7	L-1 L-2 L-3 U-1 WC-1	Lavatory Lavatory Lavatory Urinal Water Closet		0.5 gpm 0.5 gpm 2.2 gpm 3.0 gpf 4.5 gpf	2 2 2 3 8	5 5 5 5 5	10 10 10 15 40
East Core 5 & 6	L-1 L-2 L-3 SS-1 U-1 WC-1	Lavatory Lavatory Lavatory Break Room Sink Urinal Water Closet		0.5 gpm 0.5 gpf 2.2 gpf 2.2 gpm 3.0 gpf 4.5 gpf	2 2 2 1 3 8	2 2 2 1 2 2	4 4 4 1 6 16

Fitness Locker Room	DF-1 L-1 L-2 SH-1 SHD-1 U-2 WC-1	Drinking Fountain Lavatory Lavatory Shower Shower Urinal Water Closet		8 gph 0.5 gpm 0.5 gpm 2.5 gpm 2.5 gpm 3.0 gpf 4.5 gpf	2 2 2 12 2 1 3	1 1 1 1 1 1 1	2 2 2 12 2 1 3
Cafeteria / Kitchen	CRS-86A L-5 PS SW WC-1	Dishwasher Kitchen Sink Pot Sink Steam Wells Water Closet		126 gal / hour 2.2 gpm 5.3 gpm 3 gal/day 4.5 gpf	1 2 6 1 2	1 1 1 1 1	1 2 6 0 2
Building Custodian Closet Sink	DF SS-1	Drinking Fountain Mop Sink		8 GPH 2.2 gpm	1 1	8 8	8 8

BPA Headquarters - Baseline Plumbing Water Usage

Baseline Usage Summary

	Average From Bills	Calculated Baseline (CCF)	Difference	% Difference
Water Closet Usage		4,564		
Urinal Usage		1,540		
Lavatory / Sink Usage		652		
Shower Usage		629		
Misc Kitchen Usage		351		
Other Water Use		187		
Yearly (Total Plumbing)	8,140	7,923	216	3%

Baseline Water Usage Calculation

Full Time Employees

Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day	Days / Person*	Gallons / Year	CCF / Year
Water Closet (Normal)	1402	1	4.5 GPF	1 Flush	2	260	3,280,680	4,386
Water Closet (24/7)	33	1	4.5 GPF	1 Flush	2	365	108,405	145
Total							4,531	
Urinal (Normal)	701	1	3 GPF	1 Flush	2	260	1,093,560	1,462
Urinal (24/7)	16.5	1	3 GPF	1 Flush	2	365	36,135	48
Total							1,510	
Lavatory (Normal)	1402	1	0.996 GPM	0.25 Minutes	3	260	272,251	364
Lavatory (24/7)	33	1	0.996 GPM	0.25 Minutes	3	365	8,996	12
Total							376	
Shower (Normal)	1402	1	2.5 GPM	5 Minutes	0.1	260	455,650	609
Shower (24/7)	33	1	2.5 GPM	5 Minutes	0.1	365	15,056	20
Total							629	
Drinking Fountain (Normal)	1402	1	8 GPH****	0.5 Minute	2	260	48,603	65
Drinking Fountain (24/7)	33	1	8 GPH****	0.5 Minute	2	365	1,606	2
Total							67	
Custodian Sinks (1 / Floor)	7	1	2.2 GPM	10 Minutes	2	260	80,080	107
Total							107	
Dishwasher (25 runs / hour / 8 hours / day)	1	1	126 GPH	8 Hours / Day	1	260	262,080	350
Steam Wells	1	1	3 GPD	1 Fill	1	260	780	1
Pot Sink (3 Sink)	2	1	16 GPU	3 Uses / Day	1	260	24,879	33
Kitchen Sink	1413	1	2.2 GPM	0.25 Minutes	1	260	202,043	270
Total							655	

Visitor Usage								
Fixture Type	# of Visitors (assumed daily Average)****	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet (Normal)	140.2	1	4.5 GPF	1 Flush	0.15	260	24,605	33
Total								33
Urinal (Normal)	70.1	1	3 GPF	1 Flush	0.4	260	21,871	29
Total								29
Lavatory (Normal)	140.2	1	0.996 GPM	0.25 Minutes	0.5	260	4,538	6
Total								6
Drinking Fountain (assumed U)	140.2	1	8 GPH	1 Minute	2	260	9,721	13
Total								13

* Average assuming 50% Men & 50% Woman Using Fixture - Usage Values from LEED NC 2.2
 ** For normal schedule (5*52=260 days) & for 24/7 (365 days)
 **** Assumed Average Visitor Occupancy is 10% of Normal Occupancy
 ***** Assumed Usage & Capacity (Elkay 8 GPH Capacity)

With baseline water use by fixture type established, we then constructed savings estimates based on various practical retrofit solutions that have been proven effective.

For water closets, the savings estimates are based on replacing the existing bowl and flush valve with a new dual flush valve (1.6 gpf & 1.1 gpf) along with matching bowl. A lower flow flush valve would not work effectively with the existing bowl.

For urinals, we estimated savings two ways. The first would replace the existing bowl and flush valve with a new low flow flush valve (0.5 gpf) and china. A lower flow flush valve would not work effectively with the existing bowl. The second would replace the existing urinal with a waterless type urinal and the cold water service would be capped off.

For those lavatory faucets **not** already replaced, the savings estimates are based on retrofitting the existing 2.2 gpm faucets with new low flow 0.5 gpm faucets.

For showers, the savings estimates are based on retrofitting the existing showers with new low flow shower heads (0.5 gpm).

The resulting savings of these potential retrofits are summarized below. If all recommended measures were implemented, the plumbing fixture use would be reduced by 65 percent with low flow urinals - 69 percent with waterless urinals and the total building water use would be reduced by 45 with low flow urinals - 47 percent with waterless urinals.

Water Efficiency Measure Savings Summary - Plumbing (BPA - HQ)					
BPA Main Headquarters		Calculated Savings (CCF)	Annual Cost Savings	Installed Cost	Simple Payback
WSM 1	Upgrade Water Closets - Valves (Sloan Solis Dual Flush - 1.6/1.1 gpf)	3,195	\$26,611	\$105,616	4
WSM 2A	Upgrade Urinal - Low Flow (Sloan WEUS-1002.1401)	1,283	\$10,687	\$42,180	4
WSM 2B	Upgrade Urinal - Waterless (ZeroFlush Waterless Urinal)	1,540	\$12,824	\$22,180	2
WSM 3	Upgrade Lavatory - Low Flow (Sloan EAF-275)	276	\$2,301	\$26,270	11
WSM 4	Upgrade Showers - Low Flow (Delta #RP46384)	252	\$2,097	\$2,830	1

Proposed Upgrade Savings Summary - Low Flow Urinals				
	Baseline Water Use (CCF)	Proposed Water Use (CCF)	Calculated Savings (CCF)	Calculated Savings
WSM-1 - Water Closet Upgrade	4,564	1,369	3,195	70%
WSM-2A - Urinal Upgrade	1,540	257	1,283	83%
WSM-3 - Lavatory / Sink Upgrade	652	376	276	42%
WSM - 4 Shower Upgrade	629	378	252	40%
Kitchen Usage	351	351	0	0%
Yearly Usage (Total Plumbing)	7,923	2,764	5,159	65%

Proposed Upgrade Savings Summary - Waterless Urinals				
	Baseline Water Use (CCF)	Proposed Water Use (CCF)	Calculated Savings (CCF)	Calculated Savings
WSM-1 - Water Closet Upgrade	4,564	1,369	3,195	70%
WSM-2B - Urinal Upgrade	1,540	0	1,540	100%
WSM-3 - Lavatory / Sink Upgrade	652	376	276	42%
WSM - 4 Shower Upgrade	629	378	252	40%
Kitchen Usage	351	351	0	0%
Yearly Usage (Total Plumbing)	7,923	2,474	5,449	69%

Irrigation System Details:

Based on submetered data, irrigation water use at the Headquarters Building averaged 700 CCF (544,000 gallons) of water per year over the past two years. This use is only six percent of the building total use as landscaping is minimal at this building.

The facility does not utilize an automatic irrigation system; instead all the irrigation needs are preformed manually using hose bibs located on the exterior of the building.

There were no water conservation measures identified for the irrigation system.

Cooling Tower Details:

Based on submetered data, cooling tower water use (including the closed circuit evaporative coolers) at the Headquarters Building averaged 3,150 CCF (2,356,000 gallons) per year over the past two years. This use is 26 percent of the building total use.

General building air conditioning is provided seasonally (April – October) via a water cooled chilled water plant located in the rooftop penthouse. Heat rejection from the chillers is provided by two 325 ton Evapco (model # AT19-811) cooling towers. Each tower is dedicated to one of the chillers. Blow down from the towers is automatically controlled based on a continuous measurement of total dissolved solids.

By looking at the submeters, makeup water to these towers is about 820 CCF per year. This is consistent with an estimated annual cooling load of around 300,000 ton hours which would require about 600 CCF of evaporation. The remaining 220 CCF would go to blow down and drift.

Measured blow down from the towers is only about 30 CCF. This seems unrealistically low. The blow down should be at least 20 percent of the evaporation and could be as much as 30 percent. The setup on the blow down controller should produce a cycle rate of around 5 which is excellent for water conservation. This cycle rate would also suggest annual blow down at the towers would be around 250 CCF. So, we conclude the blow down meters do not report the correct blow down. Also, we note that BPA and the City have agreed to discontinue reading these meters and use a fixed ratio for blow down equal to 20 percent of tower makeup.

Because the overall makeup to the towers is reasonable for the estimated cooling load, and the setup on the tower blow down control is efficient, we recommend no changes to the tower system or water treatment.

Year round process cooling loads are met with water cooled computer room cooling units in various locations in the building. Heat rejection is provided by three 120 ton evaporative closed circuit coolers (Evapco Model LSW29C). Blow down from the closed circuit coolers is automatically controlled based on a continuous measurement of total dissolved solids.

Based on the metered data, makeup to the closed circuit coolers is about 2,330 CCF per year. This is consistent with an estimated annual process cooling load of around 120 tons continuous which would require about 2,000 CCF of evaporation.

Measured blow down from the closed circuit coolers is only about 100 CCF. This seems unrealistically low. The blow down should be at least 20 percent of the evaporation and could be as much as 30 percent. The setup on the blow down controller should produce a cycle rate of around 5 which is excellent for water conservation. This cycle rate would also suggest annual blow down at the closed circuit coolers would be around 400 CCF. So, we conclude the blow down meters do not report the correct blow down. Also, we note that BPA and the City have agreed to discontinue reading these meters and use a fixed ratio for blow down equal to 20 percent of closed circuit cooler makeup.

Because the overall makeup to the closed circuit coolers is reasonable for the estimated cooling load, and the setup on the blow down control is efficient, we recommend no changes to the closed circuit cooler system or water treatment.

Other Water Using Systems:

The facility has other water using systems, such as water coolers, ice machines, janitor sinks and other miscellaneous kitchen equipment. These units are listed in the facility fixture list located in Appendix A, but there were no WSMs identified for these miscellaneous water using systems.

ROSS BUILDING COMPLEX CAMPUS – WATER SYSTEM DETAILS

Facility Overview

The Bonneville Power Administration Ross Complex is located at 5411 NE Hwy 99, Vancouver, Oregon. The facility has been owned and operated by the BPA since 1939; the site is approximately 235 acres. The facility is made up of 75 buildings, these buildings range in function from office to testing labs to storage areas. The total area of all buildings on the site total 778,000 square feet. For this study Enertia Energy, Inc. was tasked with conducting water use analysis of only 17 buildings comprising 626,143 square feet. Below is a list of building which were studied in detail for this report;

Ross Complex - Details					
Building Included in Enertia Energy, Inc. Analysis					
Z Number	Asset - Name	Number of Occupant	Hours of Operation	Square Footage	
610	Construction Services Bldg	257	6A-6P X 5	53,320	
669	Storage Warehouse	2	6A-6P X 5	62,857	
671	Plant Services Building	74	6A-6P X 5	63,200	
695	Control Center/Dittmer	27	24/7 (27)	126,867	
695	Control Center/Dittmer	308	6A-6P X 5	126,867	
759	Ross Warehouse	45	6A-6P X 5	111,700	
760	High Voltage Lab	0	6A-6P X 5	7,406	
761	Investment Recovery Center	6	6A-6P X 5	15,800	
989	Ampere Bldg North	62	6A-6P X 5	54,231	
991	Ampere Bldg South	37	6A-6P X 5	46,395	
992	Communications Building	21	6A-6P X 5	11,226	
993	DOB 1	13	6A-6P X 5	11,533	
995 & 996	Ampere Annex	6	6A-6P X 5	3,333	
1255	Hazardous Material Bldg	8	6A-6P X 5	37,035	
1305	Warehouse Modular	63	6A-6P X 5	8,000	
1306	Apprentice Training Center	12	6A-6P X 5	6,700	
1333	Emergency Scheduling Center	3	6A-6P X 5	4,449	
1334	PCB Annex Modular	2	6A-6P X 5	2,073	

Water consuming systems include plumbing fixtures, cooling towers, and irrigation systems were analyzed. Details on these systems and their water use are presented in the following paragraphs.

Existing Water Use / Cost:

Water is supplied to the Ross Complex by the City of Vancouver Water Bureau. It enters the secure site at two locations; the city considers the 10-inch meter vault located at 5100 NE Saint James Road to be the primary water meter. The vault contains three meter numbers 6837D1, 6837D2 & 6837D3 to accurately measure low, medium and high flows. Water and sewer charges for this meter are applied under rate schedule type "Government" at a rate of \$1.04 per CCF for water plus \$2.37 per CCF for sewer.

There is another 8-inch main entering the secure site with a meter vault at 5100 NE 15th street. This vault contains meter numbers 8432D1 and 8432D2. The city considers this to be the fire service line and there is seldom any metered flow at this location. However, based on site utility maps, this line is connected to the 10-inch main entering from St James Road. There is not a separate fire loop routed around the site. There are however, separate connections to the main at each building for domestic and fire water service. In addition to these two main lines, there is a separate small service to the Apprentice Training Center. This water meter is also billed to 5100 NE 15th Ave. The usage is metered by meter number 06-3075. Water and sewer charges for this meter are applied under rate schedule type "Commercial" at a rate of \$1.04 per CCF for water plus \$3.88 per CCF for sewer.

A summary table of the accounts with current water rates is listed below;

Water Rate Schedules Charged at Ross Complex (10/08)		
0014078900-00	Accounts	0014078800-00
Commercial	Rate Type	Govt
\$1.04	\$ / CCF	\$1.04
Usage (CCF) x \$3.88	Sewer Charge	(Usage (CCF) - Deduct Meter) x \$2.37 / CCF
No charge on Bills	Storm water Runoff	\$6.38 / 2,500 Square Feet of impervious service

Additionally there are four water sub meters installed around the facility to record the irrigation system water usage. These meters combine to create a deduct to the sewer charges for water that flows through the main compound water meter but which does not end up in the sewer. These meters are listed below.

Deduct Meters			
00-6837S1	Irrigation Deduct Meter		Dittmer Building - North Side - Possible leak
00-6837S2	Irrigation Deduct Meter		CSB - Rear of Building, by parking lot <3" Meter
00-6837S3	Irrigation Deduct Meter	Appears to not be working	Near Transformer Yard, Not working - Needs to be Replaced
00-6837S4	Irrigation Deduct Meter		CSB - East Side of Building <3" Meter

These submeters are read by City of Vancouver personnel and the data is reviewed by the City for use in billing.

Not related to, but concurrent with this water conservation initiative, the City has been reviewing discrepancies in billing at the Ross Complex. An example of the issues concerning the City is found on the June 2008 bill where the amount of water metered onto the site (1,943 CCF) was less than the amount subsequently metered at the irrigation deduct meters (2,701 CCF). The result was BPA received a negative bill (or credit) for sewer charges during that month. We know it is not practical that no water went into the sewer and totally impossible for a negative amount of water to enter the sewer. These types of irregularities appear throughout the two year metering period used in this study.

The City has determined that certain meters are likely defective and are suggesting they be replaced. The City's opinion is that water entering the site has been under billed for some time. They plan to replace the main service meter near St. James Road. This is expected to cause billed water (and sewer) use to increase. They also suspect that deduct meters used to measure irrigation use have been reading low. These meters would have to be replaced by BPA but this would be in BPA's interest as these meters generate a sewer bill credit. It is the intent of the City and BPA to have these meters replaced by January 2009.

We also believe there are metering issues surrounding the 8-inch meter on 15th street. If this line is not connected to a dedicated fire line, then it stands to reason that flow through this meter could be quite large. We do not know the pressure in the main at St. James road or at 15th street but their elevations are similar.

Because of all the metering discrepancies, for the purpose of this report, we have included historical billing data along with a suggested modified baseline which we think more accurately reflects the actual water used at the Ross Complex. *However, it may be prudent to collect metered data for a year after the meters are replaced in order to validate these engineering assumptions.*

Total billed water use at the Ross Complex averaged 15,815 CCF (11,829,495 gallons) per year at an average cost of \$34,949 (not including storm and surface water management charge ~ \$93,000 / year) per year over the two years of billing history (May 2006 to June 2008) provided to us.

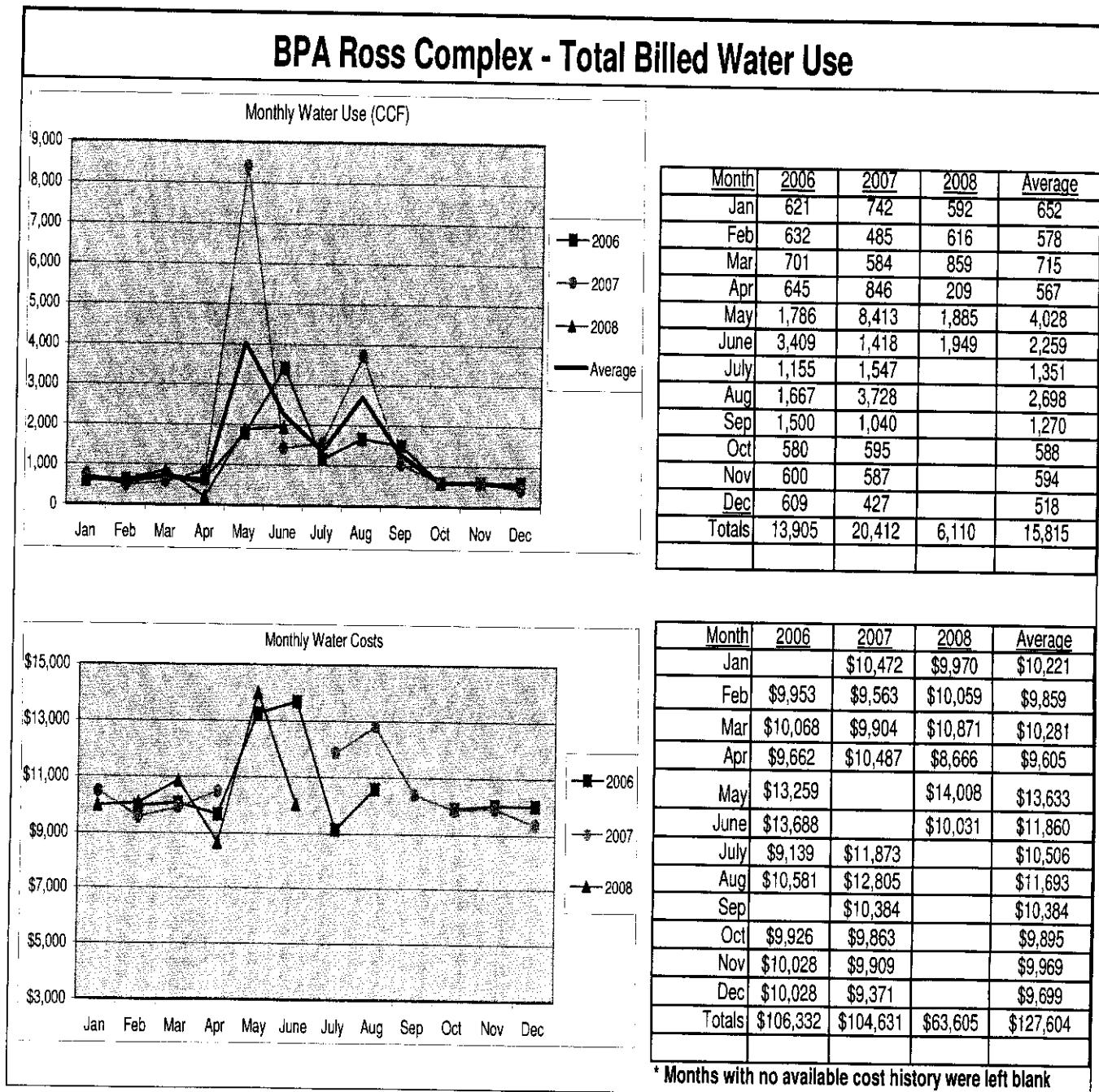
Enertia Energy, Inc. created a modified baseline water use estimate which we feel more accurately reflects the facility water usage. This modified baseline resulted in an increase for water use at the Ross Complex to 21,700 CCF (16,231,600 gallons) per year at a cost of \$73,997. This represents an increase of 34 percent above the metered data.

Storm and surface water management is a significant portion of the combined utility bill for the Ross Complex. The City of Vancouver charges industrial customers \$6.38 per 2,500 square feet of impervious surface each month. This rate has consistently risen from \$4.00 per 2,500 square feet, during 2004, to the current rate of \$6.38 (a sixty percent increase in just four years). In 2008, the cost of storm and surface water management at Ross will total \$93,116. BPA should expect this charge to increase in 2009 both due to the City updating their map of impervious surface area and possible further increase in the rate.

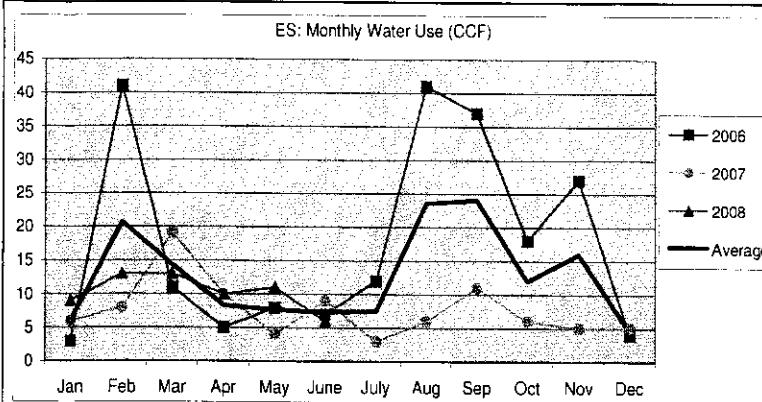
Although it is not directly related to water conservation, we felt it appropriate to address the potential to improve storm and surface water management at the Ross Complex. The City allows a credit in the charge for storm water management of fifty percent provided the site meets or exceeds certain water quantity and quality standards. For the Ross Complex, this would likely mean adding storm water retention and one of several acceptable treatment methods (such as biofiltration swales or underground filtration pipes).

Without conducting a detailed civil engineering survey of the complete site (which is outside the scope of this water conservation study) it is not possible to estimate a cost for meeting such water quality standards. However, the potential to reduce the annual cost for storm and surface water management by \$46,000 might be cause for further investigation.

Facility billed total water use and cost, along with our modified baseline estimates of the various uses for irrigation, plumbing fixtures, and cooling towers follow.



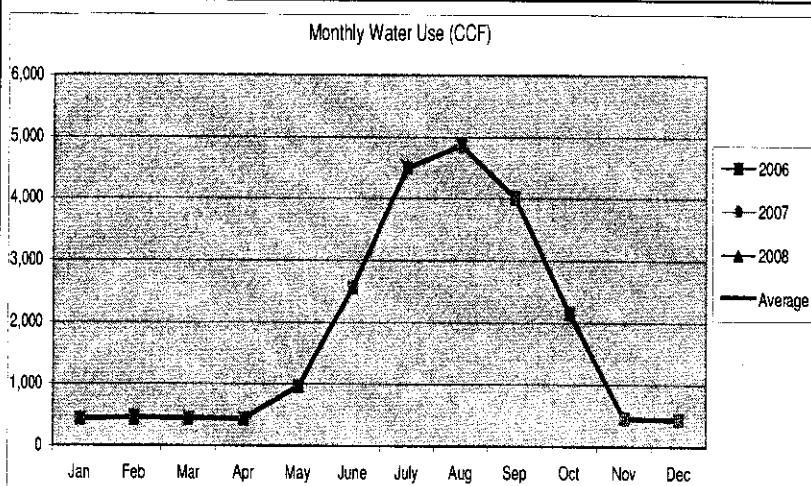
BPA ROSS COMPLEX - APPRENTICE TRAINING CENTER BILLED WATER USE



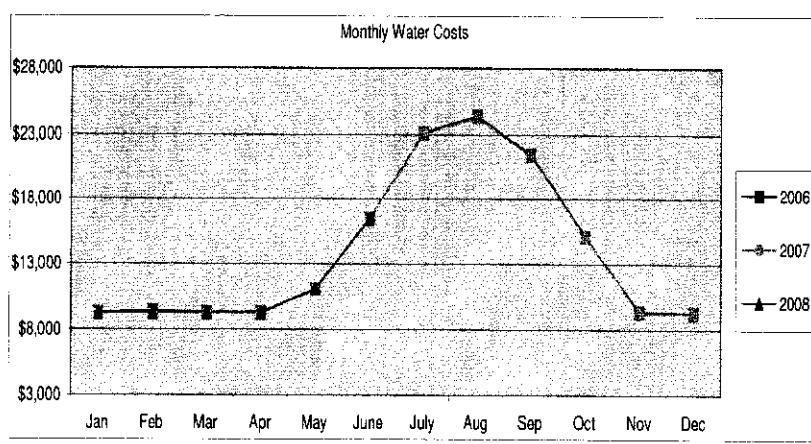
Month	2006	2007	2008	Average
Jan	3	6	9	6
Feb	41	8	13	21
Mar	11	19	13	14
Apr	5	10	10	8
May	8	4	11	8
Jun	7	9	6	7
Jul	12	3		8
Aug	41	6		24
Sep	37	11		24
Oct	18	6		12
Nov	27	5		16
Dec	4	5		5
Totals	214	92	62	152

Below is the Enertia Energy, Inc. modified baseline water use

BPA Ross Complex - Modified Baseline Total Water Use*

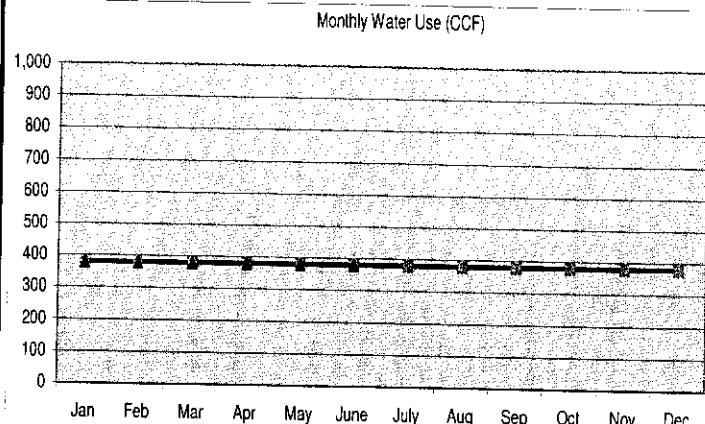


* Water use Adjusted for actual usage



Month	2006	2007	2008	Average
Jan	\$9,245	\$9,255	\$9,266	\$9,255
Feb	\$9,375	\$9,262	\$9,279	\$9,305
Mar	\$9,273	\$9,300	\$9,279	\$9,284
Apr	\$9,252	\$9,269	\$9,269	\$9,263
May	\$11,037	\$11,023	\$11,047	\$11,035
June	\$16,489	\$16,496	\$16,486	\$16,490
July	\$23,100	\$23,069		\$23,085
Aug	\$24,404	\$24,285		\$24,345
Sep	\$21,480	\$21,392		\$21,436
Oct	\$15,093	\$15,052		\$15,073
Nov	\$9,327	\$9,252		\$9,290
Dec	\$9,249	\$9,252		\$9,250
Totals	\$167,324	\$166,908	\$64,626	\$167,112

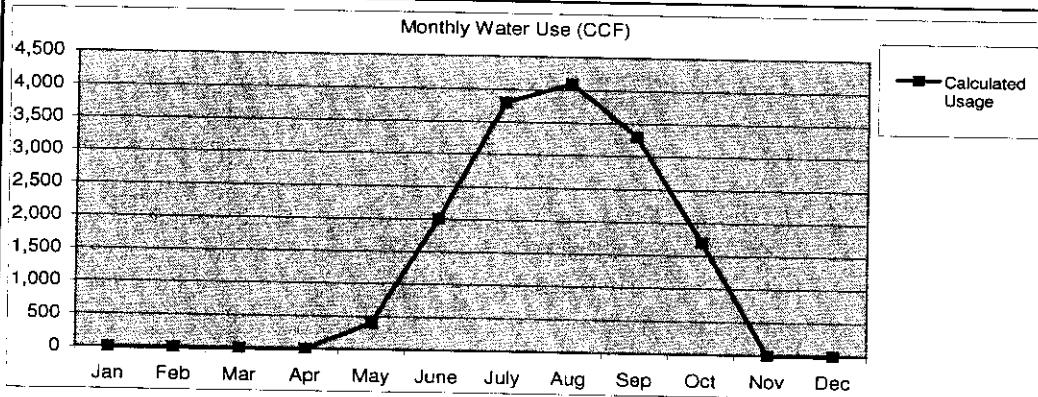
BPA Ross Complex - Plumbing Use*



Month	2006	2007	2008	Average
Jan	379	379	379	379
Feb	379	379	379	379
Mar	379	379	379	379
Apr	379	379	379	379
May	379	379	379	379
Jun	379	379	379	379
Jul	379	379	379	379
Aug	379	379	379	379
Sep	379	379	379	379
Oct	379	379	379	379
Nov	379	379	379	379
Dec	379	379	379	379
Totals	3,792	4,550	2,275	4,550

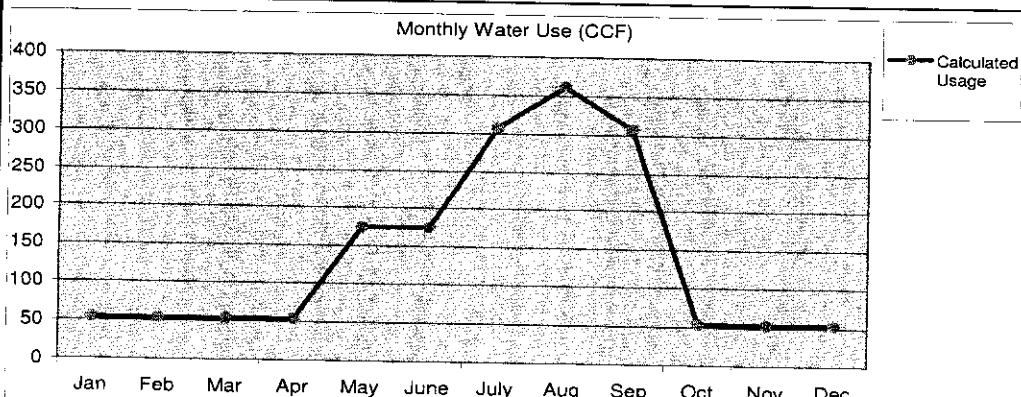
* Baseline Water Use Determined from Baseline Plumbing Use Calculation

BPA Ross Complex - Modified Baseline Calculated Irrigation Water Use



* Baseline was determined using engineering calculations

BPA Ross Complex - Modified Baseline Cooling Water Use*



* Values are calculated using engineering calculations - No Meter Data Available

Plumbing Fixture Details:

The majority of the facility was constructed prior to the Energy Policy Act of 1992 which addressed energy and water use in commercial, industrial and residential facilities. Because of this, the majority of the existing plumbing fixtures are not considered efficient and in turn the water use associated with the plumbing systems is higher than a similar facility with updated low flow plumbing fixtures. For example, the existing water closets consume 3.5 gallons per flush versus modern fixtures using as low as 1.2 gallons; existing urinals use 1.5 gallons per flush versus modern urinals use anywhere from no water (waterless urinals) to 1.5 gallons per flush; several of the existing lavatory faucets use 2.2 gallons per minute versus modern fixtures using only 0.5 gallons per minute; and the existing showers use 2.5 gallons per minute versus modern use 0.5 gallons per minute.

Like at the Headquarters Building, there are still some old high flow plumbing fixtures however many dual flush water closets, waterless urinals & low flow lavatory faucets have been installed throughout the facility. The occupancy and frequency of fixture use at Ross is about the same at the Headquarters Building yet plumbing fixture use at Ross is only 50 percent of that at Headquarters. This is evidence that the low flow fixtures save water. However, many plumbing fixtures are yet to be retrofitted.

In order to estimate the cost and savings of further plumbing fixture changes, we constructed a spreadsheet of all existing fixtures. These spreadsheets not only tabularize the types and location of the fixtures, but estimate the water use by fixture type.

BPA Ross Complex Fixture Summary

Fixture Code	Fixture Type	Flow Rate	Fixture MFG
U1	Urinal	1.5 gpf	Sloan
U7	Urinal	0 gpf	Zero Flush
U8	Urinal	1 gpf	Kohler
U9	Urinal	1 gpf	Kohler
U10	Urinal	0 gpf	Sloan
WC1	Water Closet	3.5 gpf	Sloan
WC2	Water Closet	1.6 gpf	Gerber
WC4	Water Closet	1.6 gpf	Kohler
WC5	Water Closet	1.2 gpf	Kohler
WC6	Water Closet	1.2 gpf*	Caravelle
WC8	Water Closet	1.6 gpf	Crane
WC9	Water Closet	1.6 gpf	No MFG Data
L1	Lavatory	2.2 gpm	Multiple
L2	Lavatory	2.2 gpm	Delta
L3	Lavatory	2.2 gpm	Chicago
L4	Lavatory	2.2 gpm	Delta
L8	Lavatory	2.2 gpm	American STD
L13	Lavatory	1.06 gpm	Toto
L14	Lavatory	0.5 gpm	Delta
L15	Lavatory	2 gpm	Delat
L16	Lavatory	2.2 gpm	Moen
L17	Lavatory	N/A gpm	Group Sink
SS1	Service Sink - Custodian	2.5 gpm	Multiple
SS2	Service Sink - Kitchen	2.5 gpm	Multiple
SS3	Service Sink - Custodial	2.5 gpm	Chicago
SS4	Service Sink - Kitchen	2.2 gpm	Delta
SS5	Service Sink - Misc	2.5 gpm	Multiple
SH1	Shower	2.5 gpm	Multiple
SH2	Group Shower		
DW1	Dishwasher	126 gph	Hobart
DF	Water Cooler	8 gph	Multiple

BPA Ross Complex Fixture Inventory

Building	Z #	Existing Fixture Code	# of Fixtures	Fixture Type	Fixture MFG.	Fixture Flow Rate
Construction Services Bldg	610	WC1	10	Water Closet	Sloan	3.5 gpf
		WC6	8	Water Closet	Caravelle	1.2 gpf*
		U1	4	Urinal	Sloan	1.5 gpf
		U7	2	Urinal	Zero Flush	0 gpf
		L3	2	Lavatory	Chicago	2.2 gpm
		L4	7	Lavatory	Delta	2.2 gpm
		L14	6	Lavatory	Delta	0.5 gpm
		SH1	2	Shower	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		SS3	1	Service Sink - Custodial	Chicago	2.5 gpm
		DF	2	Water Cooler	Multiple	8 gph
Storage Warehouse	669	WC8	2	Water Closet	Crane	1.6 gpf
		L2	2	Lavatory	Delta	2.2 gpm
		DF	1	Water Cooler	Multiple	8 gph
Plant Services Building	671	WC1	11	Water Closet	Sloan	3.5 gpf
		WC4	1	Water Closet	Kohler	1.6 gpf
		U1	2	Urinal	Sloan	1.5 gpf
		U7	2	Urinal	Zero Flush	0 gpf
		U10	1	Urinal	Sloan	0 gpf
		L2	2	Lavatory	Delta	2.2 gpm
		L16	7	Lavatory	Moen	2.2 gpm
		L17	2	Lavatory	Group Sink	N/A gpm
		SH1	4	Shower	Multiple	2.5 gpm
		SS1	9	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		SS5	1	Service Sink - Misc	Multiple	2.5 gpm
		DF	6	Water Cooler	Multiple	8 gph
Control Center/Dittmer	695	WC1	24	Water Closet	Sloan	3.5 gpf
		U1	6	Urinal	Sloan	1.5 gpf
		L2	3	Lavatory	Delta	2.2 gpm
		L3	8	Lavatory	Chicago	2.2 gpm
		L4	7	Lavatory	Delta	2.2 gpm
		L13	10	Lavatory	Toto	1.06 gpm
		SH1	2	Shower	Multiple	2.5 gpm
		SS1	3	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	2	Service Sink - Kitchen	Multiple	2.5 gpm
		SS5	1	Service Sink - Misc	Multiple	2.5 gpm
		DF	5	Water Cooler	Multiple	8 gph
Ross Warehouse	759	WC6	7	Water Closet	Caravelle	1.2 gpf*
		U7	2	Urinal	Zero Flush	0 gpf
		L13	1	Lavatory	Toto	1.06 gpm
		L14	3	Lavatory	Delta	0.5 gpm
		SS1	2	Service Sink - Custodian	Multiple	2.5 gpm
		SS4	1	Service Sink - Kitchen	Delta	2.2 gpm
		DF	1	Water Cooler	Multiple	8 gph
High Voltage Lab	760	WC4	2	Water Closet	Kohler	1.6 gpf
		U1	1	Urinal	Sloan	1.5 gpf
		L1	2	Lavatory	Multiple	2.2 gpm
		SS1	1	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		DF	2	Water Cooler	Multiple	8 gph
Investment Recovery Center	761	WC1	4	Water Closet	Sloan	3.5 gpf
		U1	2	Urinal	Sloan	1.5 gpf
		L1	4	Lavatory	Multiple	2.2 gpm
		SH1	1	Shower	Multiple	2.5 gpm
		DF	1	Water Cooler	Multiple	8 gph

Ampere Bldg North	989	WC1	15	Water Closet	Sloan	3.5 gpf
		U1	8	Urinal	Sloan	1.5 gpf
		L1	2	Lavatory	Multiple	2.2 gpm
		L3	2	Lavatory	Chicago	2.2 gpm
		L4	11	Lavatory	Delta	2.2 gpm
		SH1	3	Shower	Multiple	2.5 gpm
		SS1	3	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		SS4	1	Service Sink - Kitchen	Delta	2.2 gpm
		DW1	1	Dishwasher	Hobart	126 gph
Ampere Bldg South	991	WC1	4	Water Closet	Sloan	3.5 gpf
		WC4	6	Water Closet	Kohler	1.6 gpf
		U1	2	Urinal	Sloan	1.5 gpf
		U9	2	Urinal	Kohler	1 gpf
		L1	3	Lavatory	Multiple	2.2 gpm
		L4	8	Lavatory	Delta	2.2 gpm
		L16	1	Lavatory	Moen	2.2 gpm
		SS1	2	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		SH1	2	Shower	Multiple	2.5 gpm
		DF	3	Water Cooler	Multiple	8 gph
Communications Building	992	WC5	1	Water Closet	Kohler	1.2 gpf
		WC6	2	Water Closet	Caravelle	1.2 gpf*
		WC9	2	Water Closet	No MFG Data	1.6 gpf
		L13	3	Lavatory	Toto	1.06 gpm
		L14	2	Lavatory	Delta	0.5 gpm
		SS1	1	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
DOB 1	993	WC1	4	Water Closet	Sloan	3.5 gpf
		U1	2	Urinal	Sloan	1.5 gpf
		L13	4	Lavatory	Toto	1.06 gpm
		SH1	6	Shower	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		DF	3	Water Cooler	Multiple	8 gph
Ampere Annex	995 & 996	WC6	2	Water Closet	Caravelle	1.2 gpf*
		L3	1	Lavatory	Chicago	2.2 gpm
		L13	1	Lavatory	Toto	1.06 gpm
		L14	1	Lavatory	Delta	0.5 gpm
Hazardous Material Bldg	1255	WC1	2	Water Closet	Sloan	3.5 gpf
		U8	1	Urinal	Kohler	1 gpf
		L8	2	Lavatory	American STD	2.2 gpm
		SS1	1	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		DF	1	Water Cooler	Multiple	8 gph
Warehouse Modular	1305	WC2	5	Water Closet	Gerber	1.6 gpf
		UB	1	Urinal	Kohler	1 gpf
		L15	4	Lavatory	Delat	2 gpm
		SS1	1	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
Apprentice Training Center	1306	WC2	2	Water Closet	Gerber	1.6 gpf
		WC6	2	Water Closet	Caravelle	1.2 gpf*
		WC8	4	Water Closet	Crane	1.6 gpf
		L2	4	Lavatory	Delta	2.2 gpm
		L13	2	Lavatory	Toto	1.06 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
Emergency Scheduling Center	1333	WC2	2	Water Closet	Gerber	1.6 gpf
		L2	2	Lavatory	Delta	2.2 gpm
		SS1	1	Service Sink - Custodian	Multiple	2.5 gpm
		SS5	1	Service Sink - Misc	Multiple	2.5 gpm
PCB Annex Modular	1334	WC8	1	Water Closet	Crane	1.6 gpf
		L15	1	Lavatory	Delat	2 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		SS5	2	Service Sink - Misc	Multiple	2.5 gpm

BPA Ross Complex - Baseline Plumbing Water Usage

Baseline Usage Summary

Calculated Baseline (CCF)	
Water Closet	2,034
Urinal	320
Lavatory	460
Shower	365
Service Sink - Kitchen	153
Service Sink - Custodial	82
Service Sink - Misc	92
Drinking Fountain	82
Dishwasher	22
Baseline Yearly Usage (Total Plumbing)	3,609

Assumptions

Facility Usage

	Days / Year	Total Facility Occupants	Total Study Occupants	Total CCF / Person / Year
Normal	260	1003	920	3.9
24/7	365	27		

For Fixture Usage Assumptions (see fixture table)

Fixture Type (assumptions taken from LEED NC 2.2)	Daily Uses	Duration (time or use factor)	
Water Closet	2	1	flush
Water Closet (Female)	3		
Water Closet (Male)	1		
Urinal	2	1	flush
Urinal (Male)	2		
Urinal (Female)	0		
Lavatory	3	0.25	min
Shower	0.1	5	min
Service Sink - Kitchen	1	0.25	min
Taken from LEED 2.2 pg 131			

Fixture Type (Enertia Energy, Inc. Assumptions)

Drinking Fountain	2	1	min
Dishwasher	1	0.5	hour
Service Sink - Custodial	2	2.5	min
Service Sink - Misc	1	0.25	min

Gallons / CCF

748

Baseline Plumbing Usage by Building

Building Name Construction Services Building	Z Number 610	Occupants 257	Days of Operation 260	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use***	Duration	1 Flush	260
Water Closet	WC1 & WC6	257	1	2.5 gpf	1	1 Flush	260
Urinal	U1 & U7	128.5	1	0.67 gpf	1	1 Flush	260
Lavatory	L3, L4, L14	257	1	1.52 gpm	0.25 Minutes	3	22,273
Shower	SH1	257	1	2.5 gpm	5 Minutes	0.1	76,175
Service Sink - Kitchen	SS2	257	1	2.5 gpm	0.25 Minute	1	83,525
Service Sink - Custodial	SS3	1	1	2.5 gpm	2.5 Minutes	1	696
Drinking Fountain	DF	257	1	2.5 gpm	1 Minutes	2	3,250
Total				8 gph		2	17,819
*** Flow rates averaged to actual fixture counts							
Building Name Covered Storage Addition	Z Number 669	Occupants 2	Days of Operation 260	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	1 Flush	260
Water Closet	WC8	2	1	1.6 gpf	0.25 Minutes	3	1,664
Lavatory	L2	2	1	2.2 gpm	1 Minutes	2	2
Drinking Fountain	DF	2	1	8 gph		260	858
Total						260	0
4							
Building Name Plant Services Building	Z Number 671	Occupants 74	Days of Operation 260	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	1 Flush	260
Water Closet	WC1 & WC4	74	1	3.3 gpf	1	1 Flush	260
Urinal	U1, U7, U10	37	1	0.4 gpf	1	1 Flush	260
Lavatory	L2, L16, L17	74	1	2.2 gpm	0.25 Minutes	3	31,746
Shower	SH1	74	1	2.5 gpm	5 Minutes	0.1	24,050
Service Sink - Custodial	SS1	1	1	2.5 gpm	2.5 Minutes	2	3,250
Service Sink - Kitchen	SS2	74	1	2.5 gpm	0.25 Minutes	1	12,025
Service Sink - Misc	SS5	74	1	2.5 gpm	0.25 Minutes	1	16
Drinking Fountain	DF	74	1	8 gph	1 Minutes	2	260
Total						260	5,131
300							

Building Name Control Center / Dittmer		Z Number 695	Occupants 308	Days of Operation 260	Average Uses / Day / Person*						Gallons / Year	
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Days / Year**	Days / Year**	Days / Year**	Days / Year**	GCF / Year		
Water Closet	WC1	308	1	3.5 gpf	1 Flush	2	260	560	560	749		
Urinal	U1	154	1	1.5 gpf	1 Flush	2	260	120	120	161		
Lavatory	L2, L3, L4, L13	308	1	1.8 gpm	0.25 Minutes	3	260	107	679	144		
Shower	SH1	308	1	2.5 gpm	5 Minutes	0.1	260	100	100	134		
Service Sink - Custodial	SS1	2	1	2.5 gpm	2.5 Minutes	2	260	6,500	6,500	9		
Service Sink - Kitchen	SS2	308	1	2.5 gpm	0.25 Minutes	1	260	50,050	50,050	67		
Service Sink - Misc	SS5	308	1	2.5 gpm	0.25 Minutes	1	260	50,050	50,050	67		
Drinking Fountain	DF	308	1	8 gph	1 Minutes	2	260	21,355	21,355	29		
Total											1,359	
Building Name Control Center / Dittmer		Z Number 695	Occupants 27	Days of Operation 365	Average Uses / Day / Person* <th data-kind="ghost"></th> <th data-kind="ghost"></th> <th data-kind="ghost"></th> <th data-kind="ghost"></th> <th data-kind="ghost"></th> <th data-cs="2" data-kind="parent">Gallons / Year</th> <th data-kind="ghost"></th>						Gallons / Year	
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Days / Year**	Days / Year**	Days / Year**	Days / Year**	GCF / Year		
Water Closet	WC1	27	1	3.5 gpf	1 Flush	2	365	68,985	68,985	92		
Urinal	U1	13.5	1	1.5 gpf	1 Flush	2	365	14,783	14,783	20		
Lavatory	L2, L3, L4, L13	27	1	1.8 gpm	0.25 Minutes	3	365	13,251	13,251	18		
Shower	SH1	27	1	2.5 gpm	5 Minutes	0.1	365	12,319	12,319	16		
Service Sink - Custodial	SS1	2	1	2.5 gpm	2.5 Minutes	2	365	9,125	9,125	12		
Service Sink - Kitchen	SS2	27	1	2.5 gpm	0.25 Minutes	1	365	6,159	6,159	8		
Service Sink - Misc	SS5	27	1	2.5 gpm	0.25 Minutes	1	365	6,159	6,159	8		
Drinking Fountain	DF	27	1	8 gph	1 Minutes	2	365	2,628	2,628	4		
Total											178	
Building Name Ross Warehouse		Z Number 759	Occupants 45	Days of Operation 260	Average Uses / Day / Person* <th data-kind="ghost"></th> <th data-kind="ghost"></th> <th data-kind="ghost"></th> <th data-kind="ghost"></th> <th data-kind="ghost"></th> <th data-cs="2" data-kind="parent">Gallons / Year</th> <th data-kind="ghost"></th>						Gallons / Year	
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Days / Year**	Days / Year**	Days / Year**	Days / Year**	GCF / Year		
Water Closet	WC6	45	1	1.2 gpf*	1 Flush	2	260	28,080	28,080	38		
Urinal	U7	22.5	1	0 gpf	1 Flush	2	260	0	0	0		
Lavatory	L13, L14	45	1	0.64 gpm	0.25 Minutes	3	260	5,616	5,616	8		
Service Sink - Custodial	SS1	2	1	2.5 gpm	2.5 Minutes	2	260	6,500	6,500	9		
Service Sink - Kitchen	SS4	45	1	2.2 gpm	0.25 Minutes	1	260	6,435	6,435	9		
Drinking Fountain	DF	45	1	8 gph	1 Minutes	2	260	3,120	3,120	4		
Total											67	

Building Name	Z Number	Occupants	Operation					
High Voltage Lab	760	1	260					
Fixture Type	Existing Fixture Type	Occupants*	Equivalent	Flow Rate / Use	Duration	Users / Day /	Year**	Year
Water Closet	WC4	1	1	1.6 gpf	1 Flush	2	260	832
Urinal	U1	0.5	1	1.5 gpf	1 Flush	2	260	390
Lavatory	L1	1	1	2.2 gpm	0.25 Minutes	3	260	429
Service Sink - Custodial	SS1	1	1	2.5 gpm	2.5 Minutes	2	260	3,250
Service Sink - Kitchen	SS2	1	1	2.5 gpm	0.25 Minutes	1	260	163
Drinking Fountain	DF	1	1	8 gph	1 Minutes	2	260	69
Total						7		0
Building Name	Z Number	Occupants	Operation					
High Voltage Lab	761	6	260					
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Person*	Days / Year**	Gallons / CCF / Year
Water Closet	WC1	6	1	3.5 gpf	1 Flush	2	260	10,920
Urinal	U1	3	1	1.5 gpf	1 Flush	2	260	2,340
Lavatory	L1	6	1	2.2 gpm	0.25 Minutes	3	260	2,574
Shower	SH1	1	1	2.5 gpm	5 Minutes	0.1	260	325
Drinking Fountain	DF	6	1	8 gph	1 Minutes	2	260	416
Total						22		
Building Name	Z Number	Occupants	Days of Operation					
Ampere Building North	989	62	260					
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Person*	Days / Year**	Gallons / CCF / Year
Water Closet	WC1	62	1	3.5 gpf	1 Flush	2	260	112,840
Urinal	U1	31	1	1.5 gpf	1 Flush	2	260	24,180
L1, L3, L4	L1	62	1	2.2 gpm	0.25 Minutes	3	260	26,598
Shower	SH1	62	1	2.5 gpm	5 Minutes	0.1	260	20,150
Service Sink - Custodial	SS1	3	1	2.5 gpm	2.5 Minutes	2	260	9,750
Service Sink - Kitchen	SS2	62	1	2.5 gpm	0.25 Minutes	1	260	10,075
Service Sink - Kitchen	SS4	62	1	2.2 gpm	0.25 Minutes	1	260	8,866
Dishwasher	DW1	1	1	126 gph	0.5 Hours / Day	1	260	16,380
Total							306	

Building Name		Z Number	Occupants	Days of Operation							
Ampere Building South		991	37	37	260						
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year		
Water Closet	WC1, WC4	37	1	2.36 gpf	1 Flush	2	260	45,406	61		
Urinal	U1, U9	18.5	1	1 gpf	1 Flush	2	260	9,620	13		
Lavatory	L1, L4, L16	37	1	2.2 gpf	0.25 Minutes	3	260	15,873	21		
Shower	SH1	37	1	2.5 gpm	5 Minutes	0.1	260	12,025	16		
Service Sink - Custodial	SS1	2	1	2.5 gpm	2.5 Minutes	2	260	6,500	9		
Service Sink - Kitchen	SS2	37	1	2.5 gpm	0.25 Minutes	1	260	6,013	8		
Drinking Fountain	DF	37	1	8 gph	1 Minutes	2	260	2,565	3		
Total							131				

Building Name		Z Number	Occupants	Days of Operation							
Communications Building		992	21	21	260						
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year		
Water Closet	WC5, WC6, WC9	21	1	1.36 gpf	1 Flush	2	260	14,851	20		
Lavatory	L13, L14	21	1	0.84 gpm	0.25 Minutes	3	260	3,423	5		
Service Sink - Custodial	SS1	1	1	2.5 gpm	2.5 Minutes	2	260	3,250	4		
Service Sink - Kitchen	SS2	21	1	2.5 gpm	0.25 Minutes	1	260	3,413	5		
Total							33				

Building Name		Z Number	Occupants	Days of Operation							
DOB-1		993	13	13	260						
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year		
Water Closet	WC1	13	1	3.5 gpf	1 Flush	2	260	23,660	32		
Urinal	U1	6.5	1	1.5 gpf	1 Flush	2	260	5,070	7		
Lavatory	L13	13	1	1.06 gpm	0.25 Minutes	3	260	2,687	4		
Shower	SH1	13	1	2.5 gpm	5 Minutes	0.1	260	4,225	6		
Service Sink - Kitchen	SS2	13	1	2.5 gpm	0.25 Minutes	1	260	2,113	3		
Drinking Fountain	DF	13	1	8 gph	1 Minutes	2	260	901	1		
Total							52				

Building Name	Z Number	Occupants	Days of Operation						
Ampere Annex	995 & 996	6	260						
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet	WC6	6	1	1.2 gpf*	1 Flush	2	260	3,744	5
Lavatory	L3, L13, L14	6	1	1.25 gpm	0.25 Minutes	3	260	1,466	2
Total									7

Building Name	Z Number	Occupants	Days of Operation						
Hazardous Material Building	1255	8	260						
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet	WC1	8	1	3.5 gpf	1 Flush	2	260	14,560	19
Urinal	U8	4	1	1 gpf	1 Flush	2	260	2,080	3
Lavatory	L8	2	1	2.2 gpm	0.25 Flush	3	260	858	1
Service Sink - Custodial	SS1	1	1	2.5 gpm	2.5 Minutes	2	260	3,250	4
Service Sink - Kitchen	SS2	8	1	2.5 gpm	0.25 Minutes	1	260	1,300	2
Drinking Fountain	DF	8	1	8 gpm	1 Minutes	2	260	555	1
Total									30

Building Name	Z Number	Occupants	Days of Operation						
Warehouse Modular	1305	63	260						
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet	WC2	63	1	1.6 gpf	1 Flush	2	260	52,416	70
Lavatory	U8	31.5	1	1 gpf	0.25 Flush	3	260	6,143	8
Shower	L15	63	1	2 gpm	5 Minutes	0.1	260	16,380	22
Service Sink - Custodial	SS1	1	1	2.5 gpm	2.5 Minutes	2	260	3,250	4
Service Sink - Kitchen	SS2	31.5	1	2.5 gpm	0.25 Minutes	1	260	5,119	7
Total									111

Building Name Emergency Scheduling Center	Z Number 1333	Occupants 3	Days of Operation 260	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration		
Water Closet	WC2	3	1.5	1.6 gpf	1 Flush	2	260
Lavatory	L2	1	1	2.2 gpm	0.25 Minutes	3	2,496
Service Sink - Custodial	SS1	1	1	2.5 gpm	0.25 Minutes	2	644
Service Sink - Misc	SS5	1	1	2.5 gpm	0.25 Minutes	2	3,250
Total						1	163
Building Name PCB Annex Module	Z Number 1334	Occupants 2	Days of Operation 260	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration		
Water Closet	WC8	2	1	1.6 gpf	1 Flush	2	1,664
Lavatory	L15	2	1	2 gpm	0.25 Minutes	3	780
Service Sink - Kitchen	SS2	2	1	2.5 gpm	0.25 Minutes	1	325
Service Sink - Misc	SS5	2	1	2.5 gpm	0.25 Minutes	1	325
Total						1	0
Building Name Apprentice Training Center	Z Number 1306	Occupants 12	Days of Operation 260	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration		
Water Closet	WC2, WC6, WC8	12	1	1.5 gpf	1 Flush	2	260
Lavatory	L2, L13	12	1	1.82 gpm	0.25 Minutes	3	9,360
Service Sink - Kitchen	SS2	12	1	2.5 gpm	0.25 Minutes	1	4,259
Total						1	13
Visitor Usage	Z Number All Buildings	Occupants 92	Days of Operation 260	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration		
Water Closet	WC1	92	1	2.3 gpf	1 Flush	2	109,580
Urinal	U1	46.0	1	1.3 gpf	1 Minutes	260	146
Lavatory	L1	92	1	2.4 gpm	0.25 Minutes	3	30,781
Drinking Fountain	DF	92	1	8 gpm	1 Minutes	260	42,846
Total						2	57
Total Water Use (CCF)						260	253
* Average assuming 50% Men & 50% Woman Using Fixture - Usage Values from LEED NC 2.2							
** For normal schedule (5/52=260 days) & for 24/7 (365 days)							
**** Assumed Average Visitor Occupancy is 10% of Normal Occupancy							
***** Assumed Usage & Capacity (Elkay 8 GPH Capacity)							

With baseline water use by fixture type established, we then constructed savings estimates based on various practical retrofit solutions that have been proven effective.

For water closets, the savings estimates are based on replacing the existing bowl and flush valve with a new dual flush valve (1.6 gpf & 0.8 gpf) along with matching bowl. A lower flow flush valve would not work effectively with the existing bowl.

For those urinals not already replaced, we estimated savings by replacing the existing urinals with a waterless type urinal. We assume the cold water service would be capped off.

For those lavatory faucets not already replaced, the savings estimates are based on retrofitting the existing 2.2 gpm faucets with new low flow 0.5 gpm faucets.

For showers, the savings estimates are based on retrofitting the existing showers with new low flow shower heads (1.5 gpm). Below is a table showing the upgrade assumptions used for the proposed water use calculations.

Proposed Fixture Assumptions				
Proposed Fixture Code	Proposed Fixture Type	Recommended Measures	Proposed Flow Rate	Proposed Fixture Description
PWC	Water Closet	Install Low Flow Water Closets	1.2 GPF	Caravelle 88 Dual Flush
PU	Urinals	Install Waterless Urinals	0 GPF	Zero Flush - Waterless Urinals
PL	Low Flow Faucets	Install Low flow Faucets	0.5 gpm	Low Flow Faucet (0.5 gpm)
PSH	Low Flow Shower Heads	Install Low Flow Shower Heads	1.5 GPM	Delta Low Flow Shower Head (# RP46384)
PDF	Drinking Fountain	No upgrade Recommended	8 GPH	Leave Existing Fixtures
PSS1	Service Sink - Custodial	No upgrade Recommended	2.5 GPM	Leave Existing Fixtures
PSS2	Service Sink - Kitchen	Install Low flow aerators on existing faucets	1.5 GPM	Install New Low Flow Faucets (1.5 gpm)

The resulting savings of these potential retrofits are summarized below. If all recommended measures were implemented, the plumbing fixture use would be reduced by 56 percent and the total facility water use would be reduced by 11 percent compared to the modified baseline usage.

Water Efficiency Measure Savings Summary - Plumbing (Ross Complex)					
		Calculated Savings (CCF)	Annual Cost Savings	Installed Cost	Simple Payback
WSM 1	Upgrade Water Closets - Valves (Caroma Caravelle - 1.6/0.8 gpf)	1,158	\$3,949	\$60,996	15
WSM 2	Upgrade Urinal - Waterless (WES-1000)	320	\$1,091	\$23,390	21
WSM 3	Upgrade Lavatory - (Sloan EAF-275)	328	\$1,118	\$76,680	69
WSM 4	Upgrade Showers (Delta #RP46384)	143	\$487	\$3,537	7
WSM 5	Upgrade Kitchen Sinks - 1.5 gpm low flow aerators	60	\$203	\$1,650	8

Proposed Plumbing Upgrade Summary					
		Calculated Baseline (CCF)	Proposed Water Use after Upgrade (CCF)	Difference (CCF)	% Difference
WSM 1	Water Closet	2,034	876	1,158	57%
WSM 2	Urinal	320	0	320	100%
WSM 3	Lavatory	460	132	328	71%
WSM 4	Shower	365	222	143	39%
WSM 5	Service Sink - Kitchen	153	94	60	39%
N/A	Service Sink - Custodial	82	82	0	0%
N/A	Service Sink - Misc	92	92	0	0%
N/A	Drinking Fountain	82	82	0	0%
N/A	Dishwasher	22	22	0	0%
Yearly Plumbing Usage (Total Plumbing)		3,609	1,601	2,008	56%

Irrigation System Details:

There are an estimated 20 acres of irrigated area at Ross Complex. The main irrigated area is around Dittmer Building. Other irrigated areas included Construction Services, Ampere, and Plant Services Buildings, the embankment around the sub-station, and areas outside the secured site down towards the park and ride lot. During peak irrigation season, the controls are set to water five days per week for 40 minutes. This is estimated to result in $\frac{1}{4}$ -inch of watering per day over 20 acres which ends up being 181 CCF (or 136,000 gallons) per day. Using this peak day estimate a monthly profile was estimated as follows:

Baseline Irrigation Water Use			
Month	Days of Irrigation	Average Daily Irrigation (CCF)	Monthly Irrigation (CCF)
May	5	80	400
June	17	120	2,000
July	21	180	3,800
Aug	23	180	4,100
Sept	18	180	3,300
Oct	14	120	1,700
Total			15,300

Based on discussions with Ed Ausmus of PHC landscaping (the on-site contractor), several conservation opportunities exist. These include:

- Replace 1,000 feet of old galvanized steel piping mains to reduce breaks. This would save an estimated 500 CCF and would cost an estimated \$10,000.
- Replace ineffective sprinkler heads to allow shorter cycle times for equivalent coverage. This would save an estimated 12% of baseline use or 1,900 CCF. Assuming it would require 1,000 heads, the cost is estimated at \$10,000.

- Install new master control system with weather station and soil moisture sensing, upgrade local control stations (clocks) and zone valves. This measure would save and estimated 30% of baseline use or 4,600 CCF. The cost is estimated to be \$85,000.

This combination of water saving measures would reduce irrigation water use by 7,000 CCF (or 45 percent) and total facility water use by 32 percent.

Water Efficiency Measure Savings Summary - Irrigation (Ross Complex)					
		Measure Cost	Estimated Savings Associated With Measure (%)	Total Savings / Year (CCF)	Savings / Year (\$*)
WSM 6*	Replace 1,000 ft of Galvanized Piping	\$10,000	3%	500	\$520
WSM 7*	Replace Ineffective Sprinkler Heads	\$10,000	12%	1,900	\$1,976
WSM 8*	Install New Irrigation Controls	\$85,000	30%	4,600	\$4,784
Total		\$105,000		7,000	\$7,280

* Cost Savings assume water charge only (\$1.04 / CCF)

Cooling Tower Details:

There are two water-cooled air conditioning systems at the Ross Complex. Seasonal cooling loads (general building air-conditioning) and year round process loads (command center) are met by a common chilled water plant located in the basement of the Dittmer Building. Heat rejection is provided by two 230 ton cooling towers. A chilled water plant is also located in the basement of the Construction Services Building. Heat rejection is provided by a single 300 ton cooling tower. The load at CSB is seasonal for general building air conditioning only.

There are no separate water meters installed on the tower makeup lines so cooling water use was estimated as follows:

Month	Cooling Load (Ton-Hours)	Required	Blow Down		Total (CCF)
		Evaporation (Gallons)	& Drift (Gallons)	Total (Gallons)	
Jan	36,000	30,000	10,000	40,000	53
Feb	36,000	30,000	10,000	40,000	53
Mar	36,000	30,000	10,000	40,000	53
Apr	36,000	30,000	10,000	40,000	53
May	115,000	100,000	30,000	130,000	174
Jun	115,000	100,000	30,000	130,000	174
Jul	195,000	170,000	60,000	230,000	307
Aug	230,000	200,000	70,000	270,000	361
Sep	195,000	170,000	60,000	230,000	307
Oct	36,000	30,000	10,000	40,000	53
Nov	36,000	30,000	10,000	40,000	53
Dec	36,000	30,000	10,000	40,000	53
Total	1,102,000	950,000	320,000	1,270,000	1,698

Cooling water use is eight percent of total site water use.

Cooling tower water treatment is similar to that at Headquarters Building. Cycle rates approach five so there are not any improvements recommended.

However, considerable leakage was observed at CSB. Piping connections and the sump level control should be checked.

Industrial Water Using Systems:

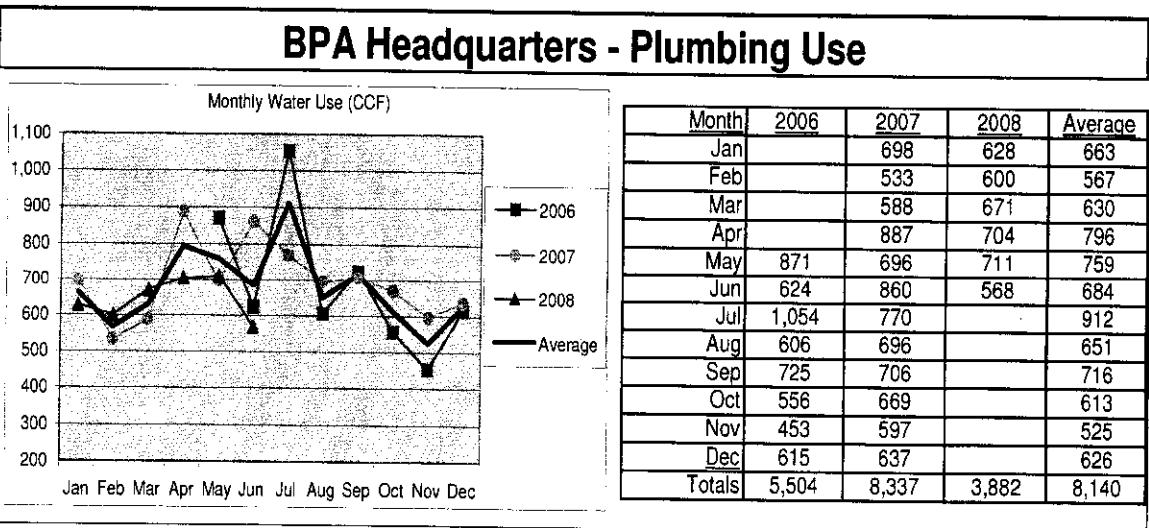
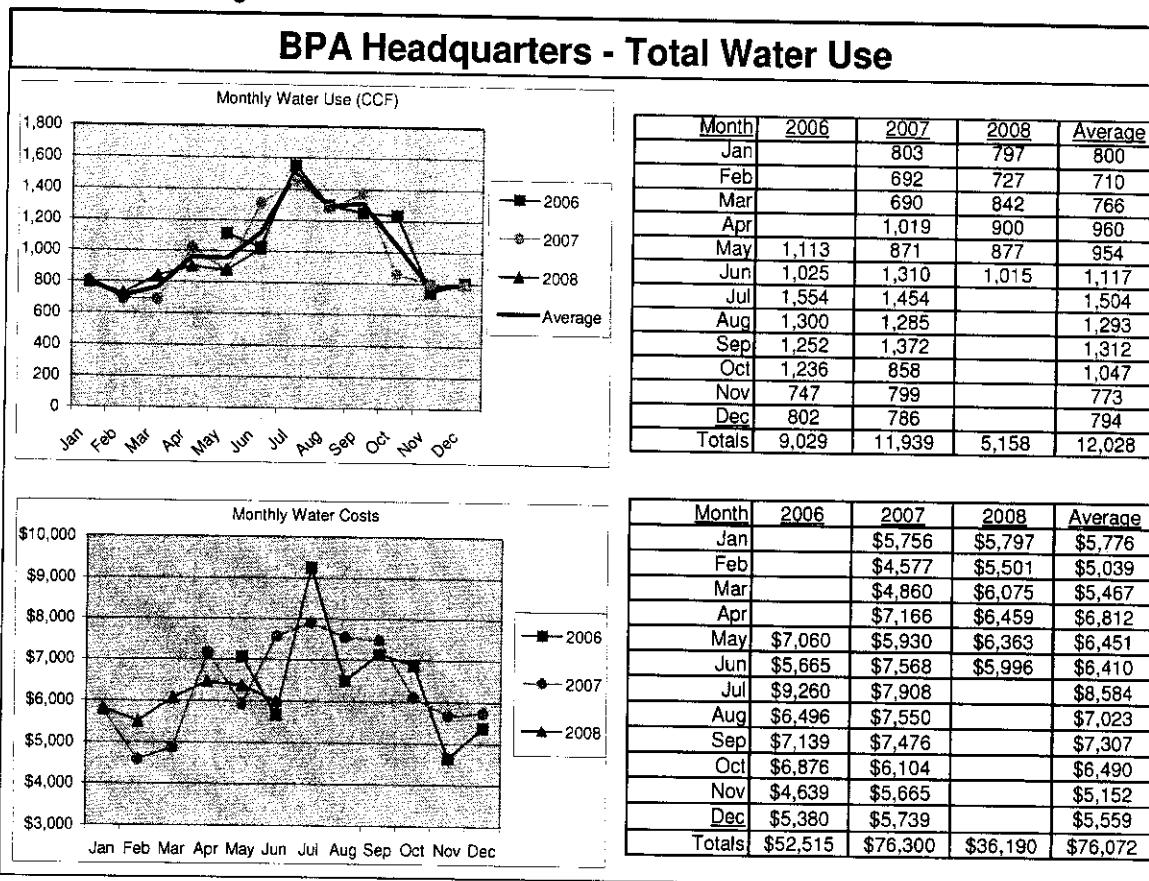
The facility uses water for industrial uses. There is a truck washing station that utilizes a pressure washer to assist with vehicle cleaning. The painting crew utilizes a 500 gallon tank truck to assist with prepping areas to be painted. These and other uses, which were not identified, are not accounted for in the calculations due to the varying pattern in which they are used. No WSMs were identified for these industrial water using systems.

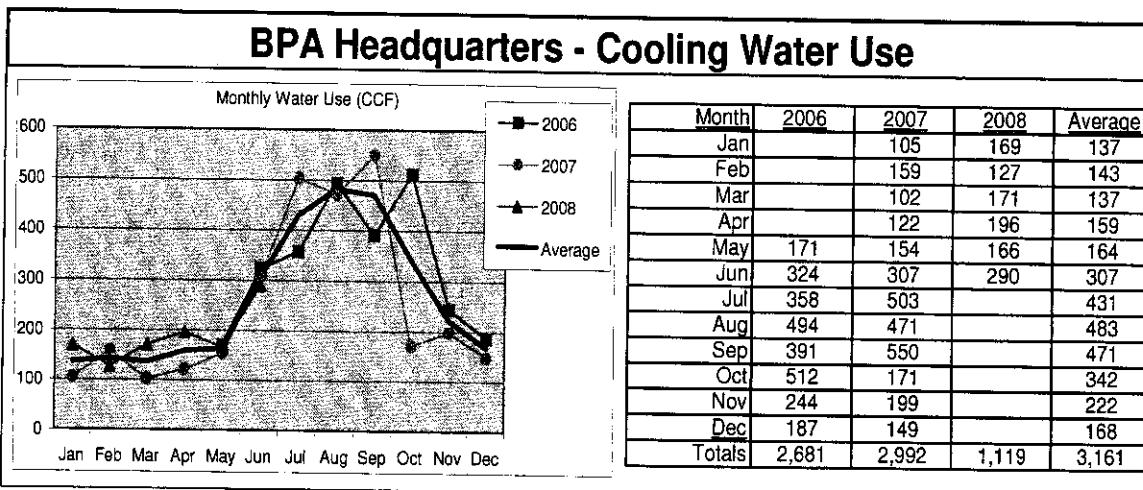
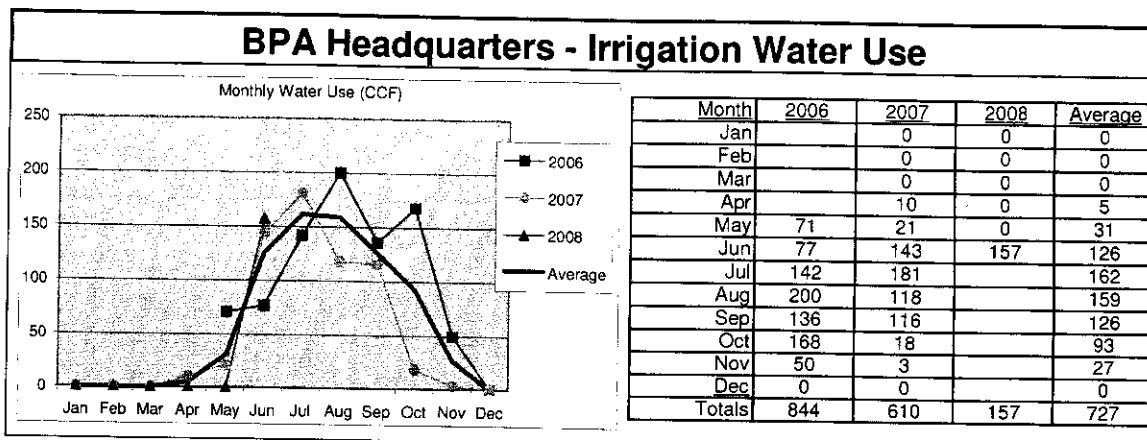
Other Water Using Systems:

The facility has other water using systems, such as water coolers, ice machines, janitor sinks and other miscellaneous kitchen equipment. These units are listed in the facility fixture list located in Appendix A, but there were no WSMs identified for these miscellaneous water using systems.

APPENDIX A - BPA MAIN HEADQUARTERS

A.1 Detailed Billing Data





Below is a detailed list of the facilities sub meters which were used to determine the facilities water end uses. A detailed usage history for each meter is listed on the following pages.

Sub Meter	Serving	Description	Meter #
#1	CT-1	Cooling Tower Room Make Up	12011442
#2	CT-1	Penthouse Bleed	1233578
#3	CT-2	Penthouse Make Up	12011396
#4	CT-2	Penthouse Bleed	1233576
#5	CCC-3	Penthouse Make Up	6001368
#6	CCC-3	Penthouse Bleed	1233579
#7	CCC-2	Penthouse Make Up	10010800
#8	CCC-2	Penthouse Bleed	1233580
#9	CCC-1	Penthouse Make Up	10010801
#10	CCC-1	Penthouse Bleed	1233577
#12	B-1	Mechanical Room Irrigation	201561

In the future, BPA and the City have agreed to delete the Bleed meters and credit the sewer charges by a fixed 80 percent of the metered Tower Make Up. This should provide a fair approximation of the amount of water not entering the sewer.

Sub Meter	B1233579
CCC-3 Penthouse Bleed	
Month	CCF
May-06	7
June-06	10
July-06	12
August-06	14
September-06	19
October-06	59
November-06	29
December-06	0
January-07	0
February-07	0
March-07	0
April-07	0
May-07	0
June-07	0
July-07	0
August-07	0
September-07	0
October-07	0
November-07	0
December-07	0
January-08	0
February-08	0
March-08	0
April-08	0
May-08	0
June-08	4

Sub Meter	B1233580
CCC-2 Penthouse Bleed	
Month	CCF
May-06	1
June-06	1
July-06	1
August-06	0
September-06	0
October-06	13
November-06	9
December-06	12
January-07	4
February-07	0
March-07	0
April-07	1
May-07	4
June-07	2
July-07	11
August-07	12
September-07	6
October-07	0
November-07	0
December-07	0
January-08	0
February-08	0
March-08	0
April-08	0
May-08	0
June-08	31

Sub Meter	B1233577
CCC-1 Penthouse Bleed	
Month	CCF
May-06	71
June-06	77
July-06	142
August-06	200
September-06	136
October-06	168
November-06	50
December-06	0
January-07	0
February-07	0
March-07	0
April-07	10
May-07	21
June-07	143
July-07	181
August-07	118
September-07	116
October-07	18
November-07	3
December-07	0
January-08	0
February-08	0
March-08	0
April-08	0
May-08	0
June-08	157

Irrigation Water Use	Sub Meter # 201561
B-1 Mechanical Room Irrigation	
Month	CCF
May-06	71
June-06	77
July-06	142
August-06	200
September-06	136
October-06	168
November-06	50
December-06	0
January-07	0
February-08	0
March-08	0
April-08	0
May-08	0
June-08	157

Sub Meter	M10010801
CCC-1 Penthouse Bleed	
Month	CCF
May-06	4
June-06	10
July-06	13
August-06	17
September-06	19
October-06	29
November-06	0
December-06	0
January-07	0
February-07	0
March-07	3
April-07	0
May-07	2
June-07	2
July-07	5
August-07	20
September-07	1
October-07	0
November-07	0
December-07	0
January-08	0
February-08	0
March-08	0
April-08	0
May-08	0
June-08	2
Month	CCF
May-06	33
June-06	92
July-06	128
August-06	188
September-06	139
October-06	114
November-06	7
December-06	0
January-07	0
February-07	1
March-07	3
April-07	6
May-07	8
June-07	35
July-07	90
August-07	121
September-07	118
October-07	0
November-07	0
December-07	0
January-08	0
February-08	0
March-08	0
April-08	1
May-08	1
June-08	36

Sub Meter	M12011396
CT-2 Penthouse Make up	
Month	CCF
May-06	4
June-06	10
July-06	13
August-06	17
September-06	19
October-06	29
November-06	0
December-06	0
January-07	0
February-07	0
March-07	3
April-07	0
May-07	2
June-07	2
July-07	5
August-07	20
September-07	1
October-07	0
November-07	0
December-07	0
January-08	0
February-08	0
March-08	0
April-08	0
May-08	1
June-08	36
Month	CCF
May-06	33
June-06	92
July-06	128
August-06	188
September-06	139
October-06	114
November-06	7
December-06	0
January-07	0
February-07	1
March-07	3
April-07	6
May-07	8
June-07	35
July-07	90
August-07	121
September-07	118
October-07	0
November-07	0
December-07	0
January-08	0
February-08	0
March-08	0
April-08	1
May-08	1
June-08	36

Sub Meter	B1233576
CT-1 Penthouse Bleed	
Month	CCF
May-06	1
June-06	1
July-06	2
August-06	6
September-06	4
October-06	6
November-06	1
December-06	0
January-07	0
February-07	0
March-07	0
April-07	0
May-07	0
June-07	0
July-07	1
August-07	0
September-07	0
October-07	0
November-07	0
December-07	0
January-08	0
February-08	0
March-08	0
April-08	0
May-08	2
June-08	0
Month	CCF
May-06	4
June-06	10
July-06	13
August-06	17
September-06	19
October-06	29
November-06	0
December-06	0
January-07	0
February-07	0
March-07	3
April-07	0
May-07	2
June-07	2
July-07	5
August-07	20
September-07	1
October-07	0
November-07	0
December-07	0
January-08	0
February-08	0
March-08	0
April-08	0
May-08	1
June-08	2

Sub Meter	M100010800
CCC-2 Penthouse Bleed	
Month	CCF
May-06	2
June-06	12
July-06	14
August-06	42
September-06	14
October-06	17
November-06	6
December-06	0
January-07	0
February-07	1
March-07	2
April-07	0
May-07	8
June-07	83
July-07	122
August-07	61
September-07	101
October-07	25
November-07	10
December-07	0
January-08	0
February-08	0
March-08	0
April-08	1
May-08	3
June-08	18
May-06	90
June-06	133
July-06	142
August-06	164
September-06	144
October-06	216
November-06	143
December-06	97
January-07	0
February-07	110
March-07	93
April-07	46
May-07	1
June-07	100
July-07	26
August-07	0
September-07	31
October-07	42
November-07	4
December-07	5
January-08	49
February-08	74
March-08	49
April-08	62
May-08	27
June-08	54
May-06	8
June-06	13
July-06	23
August-06	0
September-06	0
October-06	50
November-06	49
December-06	57
January-07	84
February-07	1
March-07	0
April-07	0
May-07	48
June-07	60
July-07	163
August-07	89
September-07	142
October-07	15
November-07	58
December-07	94
January-08	20
February-08	36
March-08	45
April-08	59
May-08	45
June-08	145

Sub Meter	M06001368
CCC-3 Penthouse Make Up	
Month	CCF
May-06	2
June-06	12
July-06	14
August-06	42
September-06	14
October-06	17
November-06	6
December-06	0
January-07	0
February-07	1
March-07	2
April-07	0
May-07	8
June-07	83
July-07	122
August-07	61
September-07	101
October-07	25
November-07	10
December-07	0
January-08	0
February-08	0
March-08	0
April-08	1
May-08	3
June-08	18
May-06	90
June-06	133
July-06	142
August-06	164
September-06	144
October-06	216
November-06	143
December-06	97
January-07	0
February-07	110
March-07	93
April-07	46
May-07	1
June-07	100
July-07	26
August-07	0
September-07	31
October-07	42
November-07	4
December-07	5
January-08	49
February-08	74
March-08	49
April-08	62
May-08	27
June-08	54

Sub Meter	M12011442
CT-1 Cooling Tower Room Make Up	
Month	CCF
May-06	2
June-06	12
July-06	14
August-06	42
September-06	14
October-06	17
November-06	6
December-06	0
January-07	0
February-07	1
March-07	2
April-07	0
May-07	8
June-07	83
July-07	122
August-07	61
September-07	101
October-07	25
November-07	10
December-07	0
January-08	0
February-08	0
March-08	0
April-08	1
May-08	3
June-08	18
May-06	90
June-06	133
July-06	142
August-06	164
September-06	144
October-06	216
November-06	143
December-06	97
January-07	0
February-07	110
March-07	93
April-07	46
May-07	1
June-07	100
July-07	26
August-07	0
September-07	31
October-07	42
November-07	4
December-07	5
January-08	49
February-08	74
March-08	49
April-08	62
May-08	27
June-08	54

A.2 Water Use Baseline

Plumbing Baseline: The plumbing baseline water use was determined by subtracting the sum of irrigation and HVAC (cooling) usage from the total water usage, this information was found on the water bills.

Plumbing Use	
Month	CCF
May-06	871
June-06	624
July-06	1,054
August-06	606
September-06	725
October-06	556
November-06	453
December-06	615
January-07	698
February-07	533
March-07	588
April-07	887
May-07	696
June-07	860
July-07	770
August-07	696
September-07	706
October-07	669
November-07	597
December-07	637
January-08	628
February-08	600
March-08	671
April-08	704
May-08	711
June-08	568

Irrigation Baseline: Irrigation baseline water usage was determined using sub meter #0201561.

Irrigation Water Use	Sub Meter #
	201561
B-1 Mechanical Room Irrigation	
Month	CCF
May-06	71
June-06	77
July-06	142
August-06	200
September-06	136
October-06	168
November-06	50
December-06	0
January-07	0
February-07	0
March-07	0
April-07	10
May-07	21
June-07	143
July-07	181
August-07	118
September-07	116
October-07	18
November-07	3
December-07	0
January-08	0
February-08	0
March-08	0
April-08	0
May-08	0
June-08	157

HVAC (cooling) Baseline: HVAC (cooling) baseline water usage was determined by adding the cooling sub meters #'s B1233577, B1233580, B1233579, B1233578, B1233576, M12011396, M10010801, M12011442, M05001368, & M1001080.

Total Cooling Tower Usage	
Month	CCF
May-06	171
June-06	324
July-06	358
August-06	494
September-06	391
October-06	512
November-06	244
December-06	187
January-07	105
February-07	159
March-07	102
April-07	122
May-07	154
June-07	307
July-07	503
August-07	471
September-07	550
October-07	171
November-07	199
December-07	149
January-08	169
February-08	127
March-08	171
April-08	196
May-08	166
June-08	290

A.3 BPA Headquarters Fixture Survey

BPA Water Initiative - BPA Headquarters Existing Fixture Summary							
Floor	Fixture Symbol	Fixture Description	Number of People	Fixture Usage & Units (Source)	Total Fixtures / Floor	# of Floors Total Fixtures	
Plumbing							
B1 Core	L-1 L-2 SH-1 U-2 WC-1	Lavatory Lavatory Shower Urinal Water Closet		0.5 gpm 0.5 gpm 2.5 gpm 3.0 gpf 4.5 gpf	4 4 2 4 9	1 1 1 1 1	4 4 2 4 9
All Star							
West Core Floors 1-4 & 7	L-1 L-4 U-1 WC-1	Lavatory Lavatory Urinal Water Closet		0.5 gpm 2.2 gpm 3.0 gpf 4.5 gpf	4 2 2 6	5 5 5 5	20 10 10 30
West Core Floors 5 & 6	L-1 L-4 U-1 WC-1	Lavatory Lavatory Urinal Water Closet		0.5 gpm 2.2 gpm 3.0 gpf 4.5 gpf	4 2 2 6	2 2 2 2	8 4 4 12
East Core 1-4 & 7	L-1 L-2 L-3 U-1 WC-1	Lavatory Lavatory Lavatory Urinal Water Closet		0.5 gpm 0.5 gpm 2.2 gpm 3.0 gpf 4.5 gpf	2 2 2 3 8	5 5 5 5 5	10 10 10 15 40
East Core 5 & 6	L-1 L-2 L-3 SS-1 U-1 WC-1	Lavatory Lavatory Lavatory Break Room Sink Urinal Water Closet		0.5 gpm 0.5 gpf 2.2 gpf 2.2 gpm 3.0 gpf 4.5 gpf	2 2 2 1 3 8	2 2 2 1 2 2	4 4 4 1 6 16
Fitness Locker Room	DF-1 L-1 L-2 SH-1 SHD-1 U-2 WC-1	Drinking Fountain Lavatory Lavatory Shower Shower Urinal Water Closet		8 gph 0.5 gpm 0.5 gpm 2.5 gpm 2.5 gpm 3.0 gpf 4.5 gpf	2 2 2 12 2 1 3	1 1 1 1 1 1 1	2 2 2 12 2 1 3
Cafeteria / Kitchen	CRS-86A L-5 PS SW WC-1	Dishwasher Kitchen Sink Pot Sink Steam Wells Water Closet		126 gal / hour 2.2 gpm 5.3 gpm 3 gal/day 4.5 gpf	1 2 6 1 2	1 1 1 1 1	1 2 6 0 2
Building Custodian Closet Sink	DF SS-1	Drinking Fountain Mop Sink		8 GPH 2.2 gpm	1 1	8 8	8 8
Irrigation							
Building	HB	Hose Bibb		16 10 Gpm		1	7
HVAC (Cooling)							
Building	CT1 CT2 CCC1 CCC2 CCC3	Cooling Tower Cooling Tower Closed Circuit Cooling Closed Circuit Cooling Closed Circuit Cooling	MFG	Model			
			Evapco	AT19-811			
			Evapco	AT19-811			
			Evapco	LSW29C			
			Evapco	LSW29C			
			Evapco	LSW29C			

A.4 Water Savings Measures (WSMs)

Plumbing Upgrade

BPA Headquarters - Water Saving Measures					
Water Efficiency Measure Savings Summary - Plumbing (BPA - HQ)					
	BPA Main Headquarters	Calculated Savings (CCF)	Annual Cost Savings	Installed Cost	Simple Payback
WSM 1	Upgrade Water Closets - Valves (Sloan Solis Dual Flush - 1.6/1.1 gpf)	3,195	\$26,611	\$105,616	4
WSM 2A	Upgrade Urinal - Low Flow (Sloan WEUS-1002.1401)	1,283	\$10,687	\$42,180	4
WSM 2B	Upgrade Urinal - Waterless (ZeroFlush Waterless Urinal)	1,540	\$12,824	\$22,180	2
WSM 3	Upgrade Lavatory - Low Flow (Sloan EAF-275)	276	\$2,301	\$26,270	11
WSM 4	Upgrade Showers - Low Flow (Delta #RP46384)	252	\$2,097	\$2,830	1

Cost savings based on Water Rate:	Commercial Rate
cost per CCF:	\$8.3300

IMPLEMENTATION COSTS		Unit Qty	Unit Cost	Labor Cost / Unit	Total Cost	Source of Cost Estimate
WSM-1	Upgrade Water Closets - Valves (Sloan Solis Dual Flush - 1.6/1.1 gpf)	112	\$355	\$163	\$57,960	Fixt - Vendor Quote / Labor - Means 2008 - 22 42 13.40.3100 / 22 42 39.10.0860
WSM-1	Upgrade Water Closets - China (Kohler K4330)	112	\$121	\$224	\$38,640	Fixt - Vendor Quote / Labor - Engineer Estimate
WSM-1	Remove existing Water Closets	112	\$0	\$81	\$9,016	Means 2008 - 22 05 05 10.1420
WSM-2A	Upgrade Urinal - Low Flow (Sloan WEUS-1002.1401)	40	\$750	\$224	\$38,960	Fixt - Vendor Quote / Labor - 22 42 13.30.3100
WSM-2A	Remove existing Urinals	40	\$0	\$81	\$3,220	Means 2008 - 22 05 05 10.1520
WSM-2B	Upgrade Urinal - Waterless (ZeroFlush Waterless Urinal)	40	\$250	\$224	\$18,960	Fixt - Vendor Quote / Labor - 22 42 13.30.3100
WSM-2B	Remove existing Urinals	40	\$0	\$81	\$3,220	Means 2008 - 22 05 05 10.1520
WSM-3	Upgrade Lavatory - Low Flow (Sloan EAF-275)	37	\$530	\$180	\$26,270	Fixt - Vendor Quote / Labor - Engineer Estimate
WSM-4	Upgrade Showers - Low Flow (Delta #RP46384)	16	\$57	\$120	\$2,830	Fixt - Delta Website (Model # RP46384) / Labor - Engineer Estimate

BPA Headquarters - Baseline Plumbing Water Usage

Baseline Usage Summary

	Average From Bills	Calculated Baseline (CCF)	Difference	% Difference
Water Closet Usage		4,564		
Urinal Usage		1,540		
Lavatory / Sink Usage		652		
Shower Usage		629		
Misc Kitchen Usage		351		
Other Water Use		187		
Yearly (Total Plumbing)	8,140	7,923	216	3%

Assumptions

Facility Usage

	Days / Year	Occupancy
Normal	260	1402
24/7	365	33

Fixture Assumptions

	Baseline	Notes
Water Closet	4.5 GPF	Confirmed by Onsite Maintenance Staff
Urinal	3 GPF	Onsite Maintenance Staff measured flow
Lavatory (weighted Average)*	0.996 GPM	
Shower	2.5 GPM	
Drinking Fountain	8 GPH	
Custodian Closet Sinks	2.2 GPM	
Dishwasher	120 GPH	
Steam Wells	3 GPD	
Kitchen Sink	2.2 GPM	

*Weighted Average Calculation / Assumptions for Lavatory

Lav Type	# of Fixtures	gpm	total gpm
L-1	48	0.5	24
L-2	20	0.5	10
L-3	14	2.2	30.8
L-4	14	2.2	30.8
	96	95.6	
		0.996 GPM (Weighted Average)	

Fixture Type	Daily Uses
Water Closet (Male)	1
Water Closet (Female)	3
Urinal (Male)	2
Urinal (Female)	0
Shower	0.1
Kitchen Sink	1

Taken from LEED 2.2 pg 131

Gallons / CCF
748

Baseline Water Usage Calculation
Full Time Employees

Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet (Normal)	1402	1	4.5 GPF	1 Flush	2	260	3,280,680	4,386
Water Closet (24/7)	33	1	4.5 GPF	1 Flush	2	365	108,405	145
Total								4,531
Urinal (Normal)	701	1	3 GPF	1 Flush	2	260	1,093,560	1,462
Urinal (24/7)	16.5	1	3 GPF	1 Flush	2	365	36,135	48
Total								1,510
Lavatory (Normal)	1402	1	0.996 GPM	0.25 Minutes	3	260	272,251	364
Lavatory (24/7)	33	1	0.996 GPM	0.25 Minutes	3	365	8,996	12
Total								376
Shower (Normal)	1402	1	2.5 GPM	5 Minutes	0.1	260	455,650	609
Shower (24/7)	33	1	2.5 GPM	5 Minutes	0.1	365	15,056	20
Total								629
Drinking Fountain (Normal)	1402	1	8 GPH****	0.5 Minute	2	260	48,603	65
Drinking Fountain (24/7)	33	1	8 GPH****	0.5 Minute	2	365	1,606	2
Total								67
Custodian Sinks (1 / Floor)	7	1	2.2 GPM	10 Minutes	2	260	80,080	107
Total								107
Dishwasher (25 runs / hour / 8 hours / day)	1	1	126 GPH	8 Hours / Day	1	260	262,080	350
Steam Wells	1	1	3 GPD	1 Fill	1	260	780	1
Pot Sink (3 Sink)	2	1	16 GPU	3 Uses / Day	1	260	24,879	33
Kitchen Sink	1413	1	2.2 GPM	0.25 Minutes	1	260	202,043	270
Total								655
Visitor Usage								
Fixture Type	# of Visitors (assumed daily Average)****	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet (Normal)	140.2	1	4.5 GPF	1 Flush	0.15	260	24,605	33
Total								33
Urinal (Normal)	70.1	1	3 GPF	1 Flush	0.4	260	21,871	29
Total								29
Lavatory (Normal)	140.2	1	0.996 GPM	0.25 Minutes	0.5	260	4,538	6
Total								6
Drinking Fountain (assumed U)	140.2	1	8 GPH	1 Minute	2	260	9,721	13
Total								13

* Average assuming 50% Men & 50% Woman Using Fixture - Usage Values from LEED NC 2.2

** For normal schedule (5*52=260 days) & for 24/7 (365 days)

**** Assumed Average Visitor Occupancy is 10% of Normal Occupancy

***** Assumed Usage & Capacity (Elkay 8 GPH Capacity)

BPA Headquarters - Proposed Plumbing Water Usage (Low Flow Urinals)

Proposed Upgrade Savings Summary - Low Flow Urinals

	Proposed Baseline Water Use (CCF)	Calculated Water Use (CCF)	Savings (CCF)	Savings
WSM-1 - Water Closet Upgrade	4,564	1,369	3,195	70%
WSM-2A - Urinal Upgrade	1,540	257	1,283	83%
WSM-3 - Lavatory / Sink Upgrade	652	376	276	42%
WSM - 4 Shower Upgrade	629	378	252	40%
Kitchen Usage	351	351	0	0%
Yearly Usage (Total Plumbing)	7,923	2,764	5,159	65%

Assumptions

Facility Usage

	Days / Year	Occupancy
Normal	260	1,402
24/7	365	33

Fixture Assumptions

	Baseline	Proposed	% Reduction vs. Base
Water Closet	4.5 GPF	1.35 GPF	70%
Urinal	3 GPF	0.5 GPF	83%
Lavatory	1.00 GPM	0.5 GPM	50%
Shower	2.5 GPM	1.5 GPM	40%
Drinking Fountain	8 GPH	8 GPH	0%
Custodian Closet Sinks	2.2 GPM	2.2 GPM	0%
Dishwasher	120 GPU	0.5 GPU	100%
Steam Wells	3 GPD	3 GPD	0%
Kitchen Sink (SS-1)	2.2 GPM	1.5 GPM	32%

Fixture Type	Daily Uses
Water Closet (Male)	1
Water Closet (Female)	3
Urinal (Male)	2
Urinal (Female)	0
Shower	0.1
Kitchen Sink	1

Taken from LEED 2.2 pg 131

Gallons / CCF
748

Proposed Water Usage Calculation (Low Flow Urinals)								
Full Time Employees								
Fixture Type	# of Occupants / Uses per Day*	Full Time Equivalent	Flow Rate / Use****	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet (Normal)	1402	1	1.35 GPF	1 Flush	2	260	984,204	1,316
Water Closet (24/7)	33	1	1.35 GPF	1 Flush	2	365	32,522	43
Total								1,359
Urinal (Normal)	701	1	0.5 GPF	1 Flush	2	260	182,260	244
Urinal (24/7)	16.5	1	0.5 GPF	1 Flush	2	365	6,023	8
Total								252
Lavatory (Normal)	1402	1	0.5 GPM	0.25 Minutes	3	260	136,695	183
Lavatory (24/7)	33	1	0.5 GPM	0.25 Minutes	3	365	4,517	6
Total								189
Shower (Normal)	1402	1	1.5 GPM	5 Minutes	0.1	260	273,390	365
Shower (24/7)	33	1	1.5 GPM	5 Minutes	0.1	365	9,034	12
Total								378
Drinking Fountain (Normal)	1,402	1	8 GPH*****	1 Minute	2	260	97,205	130
Drinking Fountain (24/7)	33	1	8 GPH*****	1 Minute	2	365	3,212	4
Total								134
Custodian Sinks (1 sink / Floor)	7	1	2.2 GPM	10 Minutes	2	260	80,080	107
Total								107
Kitchen								
Dishwasher (25 runs / hour / 8 hours / day)	1	1	126 GPH	8 Hours / Day	1	260	262,080	350
Steam Wells	1	1	3 GPD	1 Fill	1	260	780	1
Pot Sink	2	1	16 GPU	3 Uses / Day	1	260	24,879	33
Kitchen Sink	1413	1	1.5 GPM	0.25 Minutes	1	260	137,757	184
Total								569
Visitor Usage								
Fixture Type	# of Visitors (assumed daily Average)****	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet (Normal)	140.2	1	1.35 GPF	1 Flush	0.15	260	7,382	10
Total								10
Urinal (Normal)	70.1	1	0.5 GPF	1 Flush	0.4	260	3,645	5
Total								5
Lavatory (Normal)	140.2	1	0.5 GPM	0.25 Minutes	0.5	260	2,278	3
Total								3
Drinking Fountain (assumed Usage)	140.2	1	8 GPH	1 Minute	2	260	9,721	13
Total								13

* Average assuming 50% Men & 50% Woman Using Fixture

** For normal schedule (5*52=260 days) & for 24/7 (365 days)

**** Assumed Average Visitor Occupancy is 10% of Normal Occupancy

***** Assumed Capacity from Internet search (Elkay 8 GPH Capacity)

***** Baseline lavatory usage value determined by weighted average of all facility lavatories

BPA Headquarters - Proposed Plumbing Water Usage (Waterless Urinals)

Proposed Upgrade Savings Summary - Waterless Urinals

	Baseline Water Use (CCF)	Proposed Water Use (CCF)	Calculated Savings (CCF)	Savings
WSM-1 - Water Closet Upgrade	4,564	1,369	3,195	70%
WSM-2B - Urinal Upgrade	1,540	0	1,540	100%
WSM-3 - Lavatory / Sink Upgrade	652	376	276	42%
WSM - 4 Shower Upgrade	629	378	252	40%
Kitchen Usage	351	351	0	0%
Yearly Usage (Total Plumbing)	7,923	2,474	5,449	69%

Assumptions

Facility Usage

	Days / Year	Occupancy
Normal	260	1,402
24/7	365	33

Fixture Assumptions

	Baseline	Proposed	% Reduction vs. Base
Water Closet	4.5 GPF	1.35 GPF	70%
Urinal	3 GPF	0 GPF	100%
Lavatory	1.00 GPM	0.5 GPM	50%
Shower	2.5 GPM	1.5 GPM	40%
Drinking Fountain	8 GPH	8 GPH	0%
Custodian Closet Sinks	2.2 GPM	2.2 GPM	0%
Dishwasher	120 GPU	0.5 GPU	100%
Steam Wells	3 GPD	3 GPD	0%
Kitchen Sink	2.2 GPM	1.5 GPM	32%

Fixture Type	Daily Uses
Water Closet (Male)	1
Water Closet (Female)	3
Urinal (Male)	2
Urinal (Female)	0
Shower	0.1
Kitchen Sink	1

Taken from LEED 2.2 pg 131

Gallons / CCF

748

Proposed Water Usage Calculation (Waterless Urinals)

Full Time Employees

Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet (Normal)	1402	1	1.35 GPF	1 Flush	2	260	984,204	1,316
Water Closet (24/7)	33	1	1.35 GPF	1 Flush	2	365	32,522	43
Total								1,359
Urinal (Normal)	701	1	0 GPF	1 Flush	2	260	0	0
Urinal (24/7)	16.5	1	0 GPF	1 Flush	2	365	0	0
Total								0
Lavatory (Normal)	1402	1	0.5 GPM	0.25 Minutes	3	260	136,695	183
Lavatory (24/7)	33	1	0.5 GPM	0.25 Minutes	3	365	4,517	6
Total								189
Shower (Normal)	1402	1	1.5 GPM	5 Minutes	0.1	260	273,390	365
Shower (24/7)	33	1	1.5 GPM	5 Minutes	0.1	365	9,034	12
Total								378
Drinking Fountain (Normal)	1,402	1	8 GPH*****	1 Minute	2	260	97,205	130
Drinking Fountain (24/7)	33	1	8 GPH*****	1 Minute	2	365	3,212	4
Total								134
Custodian Sinks (1 sink / Floor)	7	1	2.2 GPM	10 Minutes	2	260	80,080	107
Total								107
Kitchen								
Dishwasher (25 runs / hour / 8 hours / day)	1	1	126 GPH	8 Hours / Day	1	260	262,080	350
Steam Wells	1	1	3 GPD	1 Fill	1	260	780	1
Pot Sinks	2	1	16 GPU	3 Uses / Day	1	260	24,879	33
Kitchen Sink	1413	1	1.5 GPM	0.25 Minutes	1	260	137,757	184
Total								569
Visitor Usage								
Fixture Type	# of Visitors (assumed daily Average)****	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet (Normal)	140.2	1	1.35 GPF	1 Flush	0.15	260	7,382	10
Total								10
Urinal (Normal)	70.1	1	0 GPF	1 Flush	0.4	260	0	0
Total								0
Lavatory (Normal)	140.2	1	0.5 GPM	0.25 Minutes	0.5	260	2,278	3
Total								3
Drinking Fountain (assumed Usage)	140.2	1	8 GPH	1 Minute	2	260	9,721	13
Total								13

* Average assuming 50% Men & 50% Woman Using Fixture

** For normal schedule (5*52=260 days) & for 24/7 (365 days)

**** Assumed Average Visitor Occupancy is 10% of Normal Occupancy

***** Assumed Capacity from Internet search (Elkay 8 GPH Capacity)

A.5 Existing Fixture Cutsheets

*USE Repair kit
A - 36-A
which USEs
4.5 gpf*

Gem-2® Model Flushometer

110 111

Description
Exposed, Water Closet Flushometer for floor mounted or wall hung top spud bowls.

Flush Cycle 4.5 gpf (V.M. Maint. Staff)
 Model 110 Water Saver (4.5 gpf/13.2 Lpf)
 Model 111 Low Consumption (1.6 gpf/6.0 Lpf)

Specifications
Quiet, Exposed, Piston Type, Chrome Plated Closet Flushometer with the following features:

- Fixed Volume Piston with Filtered O-ring Bypass
- ADA Compliant Metal Oscillating Non-Hold-Open Handle
- 1" IPS. Screwdriver Bak-Chek® Angle Stop
- Locking Vandal Resistant Stop Cap
- Adjustable Tailpiece
- Vacuum Breaker Flush Connection
- Spud Coupling Wall and Spud Flanges for 1 1/2" Top Spud
- High Copper, Low Zinc Brass Castings for Deziniculation Resistance
- Non-Hold-Open Handle and No External Volume Adjustment to Ensure Water Conservation
- Handle Packing, Stop Seat and Vacuum Breaker Molded from PERMEX™ Rubber Compound for Chloramine Resistance

Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi-Red Brass. Valve shall be in compliance to the applicable sections of ASSE 1037, ANSI/ASME A112.19.2, and Military Specification V-29193.

Variations

<input type="checkbox"/> U	1 1/4" Flush Connection and Spud Coupling
<input type="checkbox"/> TP	Trap Primer
<input type="checkbox"/> XV	Less Vacuum Breaker
<input type="checkbox"/> YB	Sweat Solder Adapter Kit
<input type="checkbox"/> YBYC	Sweat Solder Adapter & Cast Wall Flange with Set Screw
<input type="checkbox"/> YG	Extended Bumper on Angle Stop (for seat with cover)
<input type="checkbox"/> YJ	Solid Ring Pipe Support
<input type="checkbox"/> YK	Solid Ring Pipe Support
<input type="checkbox"/> YO	Bumper on Angle Stop

NOTE: Bak-Chek® Angle Stop available with 1" Whitworth Thread (please specify).

See Accessories Section of the Sloan catalog for details on these and other Flushometer variations.

This space for Architect/Engineer approval

Job Name _____ Date _____

Model Specified _____ Quantity _____

Variations Specified _____

Customer/Wholesaler _____

Contactor _____

Architect _____

The information contained in this document is subject to change without notice.

SLOAN.

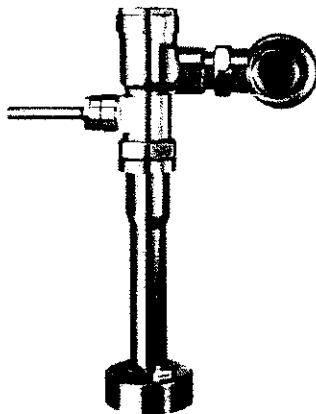
SLOAN VALVE COMPANY • 10500 SEYMOUR AVE. • FRANKLIN PARK, IL 60131
Ph: 1-800-9-VALVE-0 or 1-847-671-4300 • Fax: 1-800-447-8329 or 1-847-671-4380
Made in the U.S.A. www.sloanvalve.com

Bonneville Power Administration – Water Conservation Initiative Report
Headquarters Building and Ross Complex

page 56 of 108

Gem•2® Model Flushometer

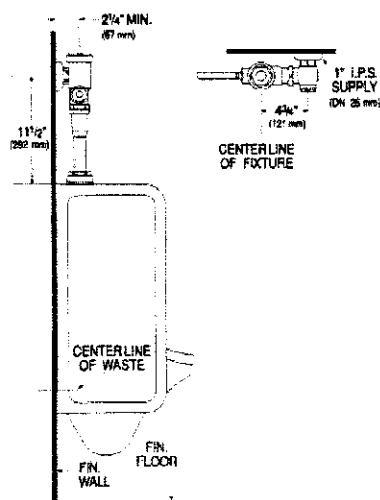
180



Certified



Listed by I.A.P.M.O.



Gem•2 180 G.S. — Rev. 2 (04/07)
Copyright © 2007 SLOAN VALVE COMPANY Printed in the U.S.A.

► Description

Exposed Urinal Flushometer for 1½" top spud urinals.

► Flush Cycle

- Model 180 (3.0 gpf/11.0 Lpf)
- Model 190-1.5 Water Saver (1.5 gpf/5.7 Lpf)
- Model 180-1.0 Low Consumption (1.0 gpf/3.8 Lpf)

► Specifications

Quiet, Exposed, Piston Type, Chrome Plated Urinal Flushometer with the following features:

- Fixed Volume Piston with Filtered O-ring Bypass
- ADA Compliant Metal Oscillating Non-Hold-Open Handle
- 1" IPS Screwdriver Bak-Chek® Angle Stop
- Locking Vandal Resistant Stop Cap
- Adjustable Tailpiece
- Vacuum Breaker Flush Connection
- Spud Coupling, Wall and Spud Flanges for 1½" Top Spud
- High Copper, Low Zinc Brass Castings for Dezinification Resistance
- Non-Hold-Open Handle and No External Volume Adjustment to Ensure Water Conservation
- Handle Packing, Stop Seat and Vacuum Breaker Molded from PERMEX™ Rubber Compound for Chloramine Resistance

Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi-Red Brass. Valve shall be in compliance to the applicable sections of ASSE 1037, ANSI/ASME A112.19.2, and Military Specification V-29193.

► Variations

- T 1½" Flush Connection and Spud Coupling

- XV Less Vacuum Breaker

- YB Sweat Solder Adapter Kit

- YBYC Sweat Solder Adapter & Cast Wall Flange with Set Screw

Note: Bak-Chek® Angle Stop available with 1" Whitworth Thread (please specify).

See Accessories Section of the Sloan catalog for details on these and other Flushometer variations.

This space for Architect/Engineer approval

Job Name	Date
Model Specified	Quantity
Variations Specified	
Customer/Wholesaler	
Comments	
Architect	

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SLOAN.



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SYMMONS®
the smart choice®

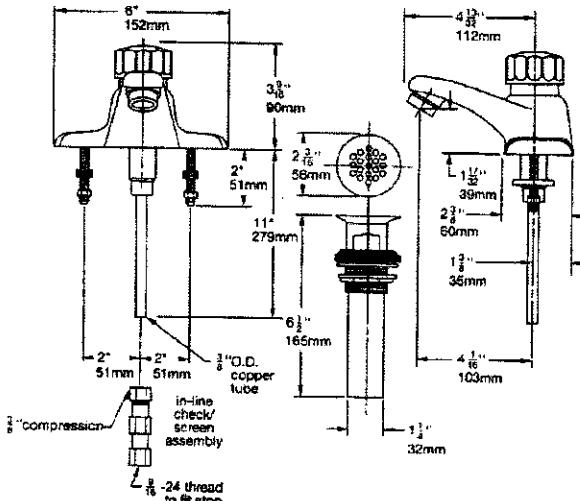
S-61 Slow-Closing Metering Lavatory Faucet

Slow Closing metering lavatory faucet to meter a single tempered water supply. Cast brass 4" centerset with time limit stop to adjust flow time, includes an inline check/screen assembly. Spray outlet with 0.5 gpm flow rate. Vandal resistant.

- S-61: **Faucet only**
- S-61-P: **With pop-up drain assembly**
- S-61-1: **With lift rod only**

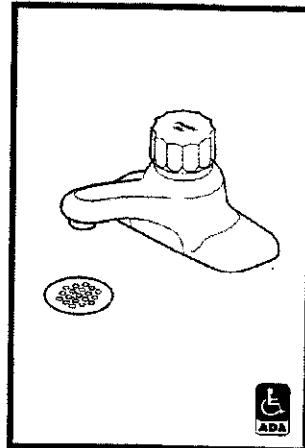
Modifications: Add suffix to model number:

- Suffix G:** Grid strainer drain assembly
- Suffix A:** Vandal resistant aerator in place of 0.5 gpm spray outlet (1.25 GPM at 50 PSI)
- Suffix 1.5:** Flow rate restrictors, 1.5 gpm (5.7 L/min)
- Suffix NA:** Non-aerated laminar flow outlet
- Suffix IPS:** 1/2" IPS connector
- Suffix DP:** Adaptor plate for 8" center installations
- Suffix OFG:** Offset grid strainer



Symmons Industries, Inc. • 31 Brooks Drive • Braintree, MA 02184
(800) 798-6667, (781) 848-2250 • Fax (800) 961-9621, (781) 843-3849
Website: www.symmons.com • Email: customerservice@symmons.com

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**SYMMONS PRODUCTS MEET
ANSI A112.18.1M, EPA '92
AND ALL KNOWN FLOW RATE
REQUIREMENTS.
Metering Faucets
0.25 gallons per cycle (1.0 L/cycle)**

Job/Location
.....
.....

Engineer
.....
.....

Contractor
.....
.....

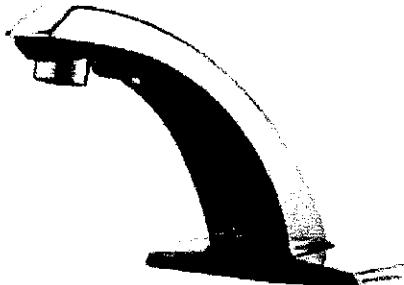
For ADA compliance (Americans with Disabilities Act) consult ADAAG or your state regulations for proper product choice and mounting locations.

SYMMONS®
the smart choice®



ETF-80

Sensor Operated Electronic Hand Washing Faucet



- **Description**
Sensor Operated Electronic Hand Washing Faucet for tempered or non-tempered water operation.
- **Flow Rate**
 0.5 gpm/1.9 Lpm Vandal Resistant Spray Head
(See Accessories for other Spray Head options)
- **Specifications**
ADA Compliant, Sensor Activated, 24 VAC, Chrome Plated Brass, Hand Washing Faucet with the following features:
 - Splash-proof Circuit Control Module
 - Sensor Range Adjustment Screw
 - Troubleshooting LED Indicator Lights
 - User Friendly Variable Time Out Settings
 - Filtered Solenoid valve with serviceable "Y" Strainer Filter
 - Bak-Chik Tee for Hot/Cold Supply
 - Trim Plate with Anti-Rotation Pin (specify 4" or 8")
 - 120 VAC/24 VAC Transformer (specify Plug-in or Box Mount)
 - Vandal Resistant Spray Head with Pressure Compensating Flow Control
 - Metal Jacketed Wire Protection for Sensor and Solenoid Leads
 - Modular Quick-Release Sensor and Solenoid Connections
- **Variations**
(Add suffix to Model Number for inclusion with Faucet)
 - Trim Plate (must be specified)
 - 4 Trim Plate for 4" Center-Set Sink
 - 8 Trim Plate for 8" Center-Set Sink
 - Transformer Type (must be specified)
 - P Plug-in Transformer (furnished with ETF-233)
 - B Box Mount (furnished with EL-248-40)
 - LT Less Transformer (specify Transformer separately - See Accessories)
 - Temperature Mixing Valves (optional)
 - ADM Above Deck Mechanical Mixing Valve
 - BDM Below Deck Mechanical Mixing Valve
 - BDT Below Deck Thermostatic Mixing ValveBak-Chik Tee not required or provided when a Temperature Mixing Valve is included with the faucet.
- **Consult Factory for Finish Variations**
- **Accessories** (Specify separately)
 - **Transformers**
 - ETF-233 120 VAC/24 VAC, 50/60 Hz (35 VA) - Plug-in (will operate up to 2 faucets)
 - EL-248-40 120 VAC/24 VAC, 50/60 Hz (40 VA) - Box Mount (will operate up to 2 faucets)
 - EL-154 120 VAC/24 VAC, 50/60 Hz (50 VA) - Box Mount (will operate up to 3 faucets)
 - EL-379 120 VAC/24 VAC, 50/60 Hz (100 VA) - Foot Mount (will operate up to 6 faucets)
 - EL-342 240 VAC/24 VAC, 50/60 Hz (50 VA) - Box Mount (will operate up to 3 faucets)
 - **Vandal Resistant Spray Heads**
 - ETF-1028-A 1.5 gpm/5.7 Lpm (laminar Flow Spray Head (recommended for medical applications))
 - **Grid Strainer**
 - ETF-450-A Chrome Plated Brass Grid Strainer with 1/4" Outlet Tube

See OPTIMA Accessories Section of the Sloan Catalog for a complete listing of OPTIMA Faucet Accessories and Variations.

Sloan ETF 80 S.S. — Rev. 1a (01/02)

► ADA Compliant

► Automatic

The Sloan OPTIMA® ETF-80 Electronic Hand Washing Faucet operates by means of an infrared sensor. Once the user enters the sensor's effective range, the Solenoid activates the water flow. Tempered water flows from the Faucet until hands are moved away. The Faucet then automatically shuts off.

► Hygienic

The ultimate in sanitary protection — there are no handles to turn or buttons to push. Helps to control the spread of infectious diseases. High style design makes the ETF-80 ideal for upscale public rest rooms.

► Economical

Automatic operation provides water usage savings over other faucet devices. Reduces maintenance and operation costs.

► Warranty

3 year (limited)

► Made in the U.S.A.

► ASME A112.18.1M



This space for Architect/Engineer approval

Job Name _____ Date _____

Model Specified _____ Quantity _____

Variations Specified _____

Customer/Wholesaler _____

Contractor _____

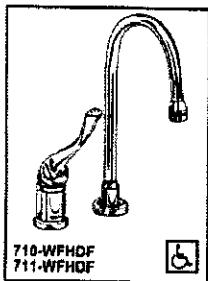
Architect _____

The information contained in this document is subject to change without notice.

E restrooms L-3
all floors

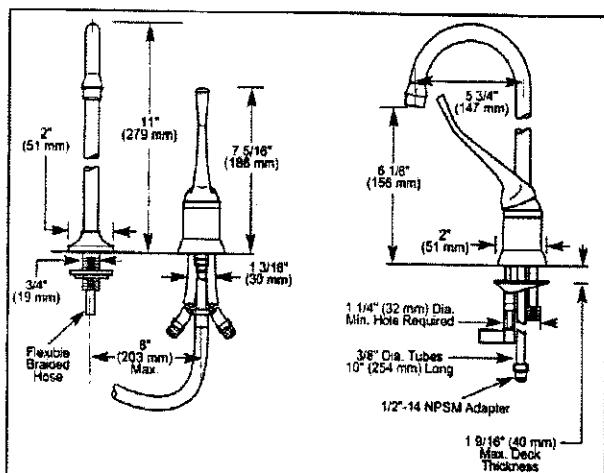
Specialty Faucets

HDF®



Submitted Model No.:

Specific Features:



- Single Handle
- Utility Faucet
- Deck Mount
- 2 Hole Sink Applications
- 8" (203 mm) Maximum Centers

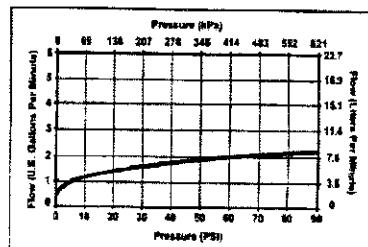
STANDARD SPECIFICATIONS:

- Single handle utility deck faucet for exposed mounting on two hole sinks.
- 8" (203 mm) maximum centers.
- Solid brass fabricated body.
- 5 3/4" (147 mm) long, 1" (27 mm) high gooseneck spout. Rigid (710), 360° swing (711).
- Vandal resistant 6" (152 mm) elbow handle. Red/blue colored graphics indicate hot/cold temperature.
- Control mechanism shall be of the rotating stainless steel ball type with replaceable non-metallic seats operating in stainless steel lined sockets.
- Control handle returns to the neutral position when valve is turned off.
- Adjustable handle limit stop.
- 2.2 gpm (8.3 L/min) laminar flow outlet.
- Models have 3/8" O.D. copper supply tubes with 1/2"-14 NPSM adapters.



COMPLIES WITH:

- ASME A112.18.1
- CSA B125
- Indicates ADA compliance to CABO/ANSI A117.1
- APMO Listed
- CSA Certified



Delta reserves the right (1) to make changes in specifications and materials, and (2) to change or discontinue models, both without notice or obligation. Dimensions are for reference only. See current full-line price book or www.specselectonline.com for finish options and product availability.

Page 1.C.9

DSP-710-HDF Rev. D

ROUGHING IN DIMENSIONS MAY VARY AND ARE SUBJECT TO CHANGE. NO RESPONSIBILITY IS ASSUMED FOR USE OF SUPERCEDED OR VOIDED DATA.



Last As Long As The Building

2100 SOUTH CLEARWATER DRIVE
DES PLAINES, ILLINOIS 60018-5999

FITTING NO.
895-317GN2AE3

SUBMITTED MODEL NO.

JOB NAME

ITEM NO.

SUBMITTED AS SHOWN

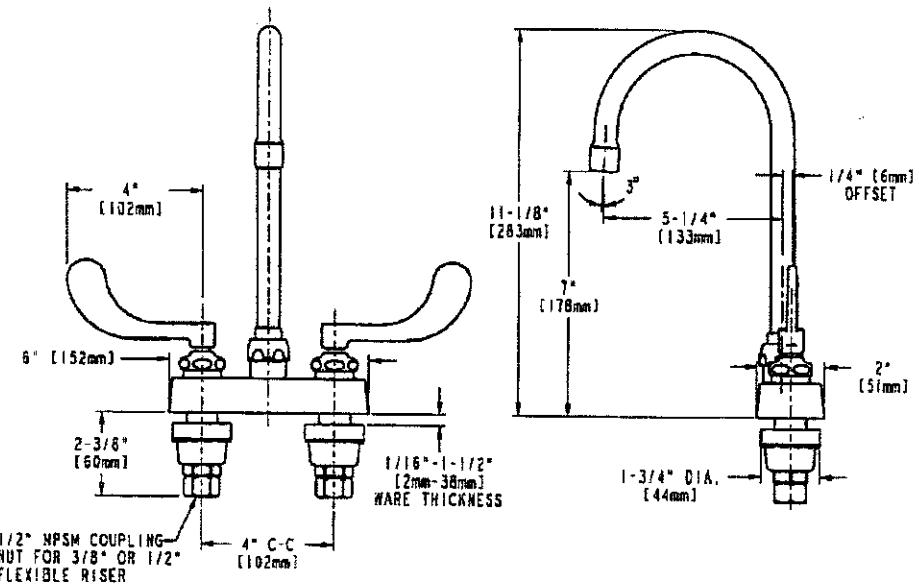
SUBMITTED AS NOTED

SEE ATTACHED FOR
SUBMITTED MODIFICATION



ADA COMPLIANT

2.2 GPM



DIMENSIONS IN INCHES AND [MILLIMETERS].

TECHNICAL DATA

- DECK MOUNTED LAVATORY FAUCET
- GR2A RIGID/SWING GOOSENECK SPOUT
- 317 INDEXED WRISTBLADE HANDLES
- QUATURN OPERATING CARTRIDGES
- FINISH: CHROME PLATE

- E3 SOFTFLO AERATOR
- 2.2 GPM (8.3 L/min.) MAXIMUM FLOW RATE
- ASME A112.18.1N COMPLIANT
- CSA B125 COMPLIANT
- NSF 61 COMPLIANT

DATE: 12-9-02

BY: JAR

CHK'D: *17*

APP'D:

REV: A

895-317GN2AE3

*Fitness center
Showers*



Shower-Ware® 480 Series
Eco-Rain Apex Type 8 Surface-Mounted Showers



*All Star Locker rooms
Logan Wizard
Acorn
Same
8pm*

482-W

Fixture May Show Some Available Options

Please visit www.acorneng.com for most current specifications.

Eco-Rain Apex Type 8 Surface-Mounted Showers

Housing is 18 gage, type 304 stainless steel with satin finish.

Control Valve type is indicated by selected Apex model number. Safti-Trol® Hot & Cold Pressure Balancing valve has a replaceable cartridge which contains all wearing parts and comes standard with checkstops. Safti-Trol® valve is tamper-resistant with an easy close mechanism. Air-Control Single Temperature valve is a pneumatically operated, pushbutton valve using atmospheric air. Pushbutton is vandal-resistant and requires less than 5 pounds to activate. Air-Control valve is metering type with non-hold open feature having adjustable timing from 5 to 60 seconds.

Shower Head is solid brass, chrome-plated and includes built-in 2.5 GPM flow restrictor. The Acorn Logan Wizard Shower Head design provides self-cleaning with every use, and has an adjustable spray pattern from a coarse stream to a fine mist.

Fasteners. Acorn furnishes all exposed tamper-resistant fasteners necessary to complete the on-site shower assembly; however, concealed wall fasteners or anchor shields are not furnished.

Regularly furnished Items include a Rigid Shower Head, Flexible Supply Connectors and a Recessed Soap Dish.

GUIDE SPECIFICATION

Provide and install Acorn Eco-Rain Apex Surface-Mounted Showers (specify model number and options). Housing shall be 18 gage, type 304 stainless steel with satin finish. Fixture shall be supplied with a recessed soap dish. Shower head shall be Acorn Logan Wizard with adjustable spray from a coarse stream to a fine mist. Shower shall be provided with the following optional equipment: (example -P Penal Shower Head). Installation shall be made in accordance with manufacturer's recommendations and details.

Page # **S.480** Revised: 1/1/01

Acorn Engineering Co. • 15125 Proctor Ave. • P.O. Box 3527 • City of Industry, CA 91744-0527 U.S.A.
Tel: (800)488-8999 • (626) 336-4561 • (626) 961-2200 • www.acorneng.com • E-mail: info@acorneng.com

BH
ADA version



Shower-Ware® 450ADAWH-A Series
Apex Type 5, Surface-Mounted Showers - ADA Compliant - Wide Housing



452-ADA-WH-A-W

Fixture May Show Some Available Options

Please visit www.acorneng.com for most current specifications.

Apex Type 5, Surface-Mounted Showers - ADA Compliant - Wide Housing

Shower includes an ADA compliant control valve with lever handle or pushbutton, a fixed upper shower head, a lever handle diverter valve, a quick disconnect hand shower with vacuum breaker and flow control, valve supply flexible hose connectors, a recessed soap dish, a two-wall stainless steel grab bar, a 1103 series padded vinyl folding seat and a curtain with headrail for a 36" opening. Unit conforms with ANSI, UFAS and ADA requirements for accessibility. Compliance is subject to the interpretation and requirements of the local code authority.

Shower Housing is 16 gage, type 304 stainless steel with satin finish. Top and Bottom of housing have 30 degree slope.

Reach. All controls, soap dish, etc., must be 38" to 48" from the finished floor to be within reach of a seated bather with limited arm movement.

Shower Heads. A shower head on a five foot hose (hand shower) is provided for seated bathers. A conventional fixed shower head is also provided at 6'-0" discharge height. Shower head is solid brass, triple chrome-plated and includes a built-in 2.5 GPM flow restrictor. The Acorn Logan Wizard Shower Head design provides self-cleaning with every use, and has an adjustable spray pattern from coarse stream to a fine mist.

Valves. Disabled bathers should be provided with protection against sudden hot or cold "shock". Pressure balancing valves such as our Safti-Trol™ are often required and are strongly recommended. Indicate valve by selection of appropriate Shower-Ware® figure numbers.

Seat and Privacy Compartments. Disabled bathers understandably should be given privacy while bathing. In addition, there is the requirement to provide a seat opposite the controls. This suggests constructing an alcove, partial wall or providing a reinforced privacy panel for mounting the seat (suffix option -RP).

Fasteners. Acorn furnishes all exposed tamper-resistant fasteners necessary to complete the on-site shower assembly; however, concealed wall fasteners or anchor shields are not furnished.

GUIDE SPECIFICATION

Provide and install Acorn Apex Surface-Mounted, ADA Compliant Wall Shower with Wide Housing (specify model number and options). Shower housing shall be fabricated from 16 gage, type 304 stainless steel and shall have a satin finish. Housing top and bottom shall have a 30 degree slope. Exposed trim shall be chrome-plated brass. Fixture shall be furnished with an ADA compliant control valve with lever handle or pushbutton, a fixed upper shower head, a lever handle diverter valve, a quick disconnect hand shower with vacuum breaker and flow control, valve supply flexible hose connectors, a recessed soap dish, a two-wall stainless steel grab bar, a 1103 series padded vinyl folding seat and a curtain and headrail for a 36" opening. Units to conform with ANSI, UFAS and ADA requirements for accessibility. Shower shall be provided with the following optional equipment: (example -Y Universal Ball Joint). Installation shall be made in accordance with manufacturer's recommendations and details.

Page # S.450ADAWH-A

Revised: 9/19/06

Acorn Engineering Company • 15125 Proctor Avenue • P.O. Box 3527 • City of Industry, CA 91744-0527 U.S.A.
Tel: (800) 488-8999 • (626) 336-4561 • Fax: (626) 961-2200 • www.acorneng.com • E-mail: info@acorneng.com

A.6 Proposed Fixture Cutsheets

Proposed WC

SLOAN SOLIS™

MODEL RESS-C-1.6/1.1

Solar Powered Dual Flush

Description
Exposed Solar Powered, Sensor Activated Sloan SOLIS™ Dual Flush Model Retrofit Conversion Kit for Exposed Closet Flushometers.

Flush Cycle

<input type="checkbox"/> Full Flush (Large Button) / 1.6 gpf/6.0 Lpf <input type="checkbox"/> Reduced Flush (Small Button) / 1.1 gpf/4.2 Lpf	Avg ↙ 1.35 Proposed ↙ 1.1 gpf ↘ 0.85 Lpf ↘ 0.32 gpf
---	--

Specifications

Quiet, Exposed, Sloan SOLIS™ Dual Flush, Solar Powered, Sensor Activated Closet Flushometer Retrofit Conversion Kit for Sloan Royal®, Regal Pro® and Regal® Flushometers with the following features:

- Solar Powered: The sensor assembly is powered by a solar cell that will harvest power from artificial indoor light, either incandescent or fluorescent light, and use it as the energy source. The solar cell can provide approximately 100% power with 650 lumens (lux).
- Four (4) Size AA Battery Back-up Power Source
- "Low Battery" Flashing LED
- If the user is present for less than one minute and leaves the sensing zone or chooses the small override button, a reduced flush initiates (1.1 gpf/4.2 Lpf) eliminating liquid and paper waste, saving 1/2 gallon of water
- If the user is present for greater than one minute and leaves the zone or chooses the large override button, the full flush initiates (1.6 gpf/6.0 Lpf) eliminating solid waste and paper
- Reduces water volume by up to 50% when a reduced flush occurs
- PERMEX™ Synthetic Rubber Diaphragm with twin linear filtered bypass and vortex cleansing action
- Flex Tube Diaphragm designed for improved life and reduced maintenance
- ADA Compliant Sloan SOLIS™ Electronic Dual Flush Solar Powered Infrared Sensor for automatic "No Hands" operation
- Infrared Sensor with Multiple-focused, Lobular Sensing Fields for high and low target detection
- Latching Solenoid Operator
- Engineered Metal Cover with replaceable Lens Window
- User friendly three (3) second Flush Delay
- Courtesy Flush™ Override Buttons
- Infrared Sensor Range Adjustment Screw
- CP Handle Cap
- Initial Set-up Range Indicator Light (first 10 minutes)
- Fixed Metering Bypass and No External Volume Adjustment to Ensure Water Conservation
- Installation Tools provided
- Diaphragm, made from PERMEX™ Rubber Compound for Chloramine resistance
- 100% of the energy used in manufacturing is offset with Renewable Energy Sources - Wind Energy

Special Finishes

<input type="checkbox"/>	PB Polished Brass (PVD Finish)
<input type="checkbox"/>	GP Gold Plate (PVD Finish)
<input type="checkbox"/>	BN Brushed Nickel (PVD Finish)
<input type="checkbox"/>	SF Satin Chrome

See Accessories Section and Sloan SOLIS™ Dual Flush Accessories Section of the Sloan catalog for details on these and other Sloan SOLIS™ Dual Flush Flushometer variations.



\$ 350.°

ADA Compliant

Automatic Operation
Sloan SOLIS™ Solar powered, Dual Flush Flushometers can also be activated via multilobular infrared sensor. By detecting user presence and duration, the Sloan SOLIS™ Smart Sense Technology™ will determine the proper flush volume for unequalled water efficiency.

Manual Operation
Sloan SOLIS™ Solar powered, Dual Flush Flushometers incorporate intuitive Split-button design for easy manual activation. The small button controls the reduced flush cycle (1.1 gpf/4.2 Lpf), the large button controls the full flush cycle (1.6 gpf/6.0 Lpf). Straightforward graphics alert user to proper activation. Reduced flush for liquid waste, full flush for solid waste. To further educate the user, two (2) instructional wall plates are included with each Sloan SOLIS™ Flushometer.

Functional & Hygienic
Touchless, sensor operation eliminates the need for user contact to help control the spread of infectious diseases. The Sloan SOLIS™ Solar powered, Dual Flush Flushometers are provided with Reduced or Full Flush Override Buttons to allow a "courtesy flush" for individual user comfort.

Warranty
3 year (limited)

This space for Architect/Engineer approval:

Job Name _____	Date _____
Model Specified _____	Quantity _____
Variations Specified _____	
Customer/Wholesaler _____	
Contractor _____	
Architect _____	

The information contained in this document is subject to change without notice.

SLOAN.

Sloan Valve Company is a long-time member of the SEPA Green Power Partner Program. We encourage our customers to purchase green power.

Sloan SOLIS™ Dual Flush RESS-C S.S. — Rev. Xb (05/08)

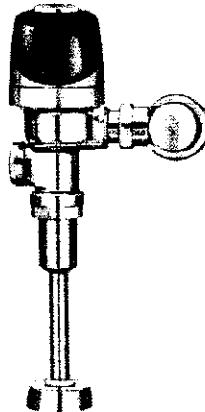
Bonneville Power Administration – Water Conservation Initiative Report
Headquarters Building and Ross Complex

page 64 of 108

SLOAN®
OPTIMA SYSTEMS
Battery Powered Flushometers

G2 OPTIMA plus®

Proprietary
Information
Original Model
8186



► **Description**

Exposed Battery Powered Sensor Operated G2™ Model Urinal Flushometer.

► **Flush Cycle**

- Model 8186-0.5 (0.5 gpf/1.9 Lpf)
- Model 8186-1.0 Low Consumption (1.0 gpf/3.8 Lpf)
- Model 8186 Water Saver (1.5 gpf/5.7 Lpf)

► **Specifications**

Quiet Exposed Diaphragm Type, Chrome Plated Urinal Flushometer for either left or right hand supply with the following features:

- PERMEX™ Synthetic Rubber Diaphragm with Dual Filtered Fixed Bypass
- Flex Tube Diaphragm designed for improved life and reduced maintenance
- ADA Compliant OPTIMA Plus® Battery Powered Infrared Sensor for automatic "No Hands" operation
- Infrared Sensor with Multiple-focused, Lobular Sensing Fields for high and low target detection
- Latching Solenoid Operator
- Engineered Metal Cover with replaceable Lens Window
- Courtesy Flush™ Override Button
- Four (4) Size AA Batteries factory installed
- "Low Battery" Flashing LED
- Infrared Sensor Range Adjustment Screw
- Initial Set-up Range Indicator Light (first 10 minutes)
- Chrome Plated Metal Handle Cap
- ¾" IPS Threaded Bak-Chek® Angle Stop
- Free Spinning, Vandal Resistant Stop Cap
- Adjustable Tailpiece
- High Back Pressure Vacuum Breaker Flush Connection with One-piece Bottom Hex Coupling Nut
- Soud Coupling and Flange for ¾" Top Spud
- Sweat Solder Adapter with Cover Tube and Cast Set Screw Wall Flange
- High Copper, Low Zinc Brass Castings for Dezincification Resistance
- Fixed Metering Bypass and No External Volume Adjustment to Ensure Water Conservation
- Flush Accuracy Controlled by CID™ Technology
- Diaphragm, Stop Seal and Vacuum Breaker to be molded from PERMEX™ Rubber Compound for Chloramine resistance

Valve Body Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi-Prec Brass. Valve shall be in compliance with the applicable sections of ASSE 1037, ANSI/ASME A112.19.2 and Military Specification V-29193. Installation conforms to ADA requirements.

► **Variations**

- LH Valve Body Supplied Less Handle/Ceiling

► **Special Finishes**

- PB Polished Brass (PVD Finish)
- GP Gold Plate (PVD Finish)
- BN Brushed Nickel (PVD Finish)
- SF Satin Chrome

See Accessories Section and OPTIMA Accessories Section of the Sloan catalog for details on these and other OPTIMA Plus® Flushometer variations.

G2 Optima Plus 8186 - S.S. - Rev. 1 (09/06)

► **ADA Compliant**

► **Automatic**

Sloan G2 Optima Plus® Flushometers activate via multi-lobular sensor detection to provide the ultimate in sanitary protection and automatic operation. A battery powered infrared sensor sets the flushing mechanism after the user is detected and completes the flush when the user steps away.

► **Functional & Hygienic**

Touchless, sensor operation eliminates the need for user contact to help control the spread of infectious diseases. The G2 Optima Plus Flushometer is provided with an Override Button to allow a "courtesy flush" for individual user comfort.

► **Economical**

Sloan installed batteries speed installation and provide years of metered flushing to control the use of water and energy. Batteries can be changed without turning off the water.

► **Warranty**

3 year (limited)



This space for Architect/Engineer approval

Job Name	Date
Model Specified	Quantity
Variations Specified	
Customer/Architect	
Contractor	
Architect	

This information contained in this document is subject to change without notice.

Proposed

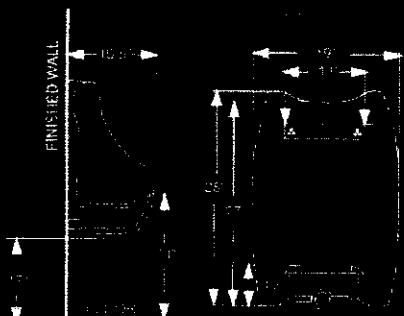
*No less
URINAL*

ZERO FLUSH

ZERO WATER URINALS

MODEL ZF - 101

DES:
Plumbing Hardware
100% Recyclable



ZF - 101

Corporate Headquarters: 3008-3016 Lions Court, Kissimmee, Florida 34744

EMAIL: SALES@ZEROFLUSH.COM PHONE: 1.888.785.9376 PHONE: 407.935.1180 FAX: 407.935.1103

WWW.ZEROFLUSH.COM

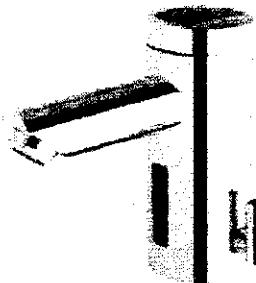


EAF-275

\$ 530



Solar Powered, Electronic Hand Washing Faucet



EAF-275-ISM

Description

Solar Powered, Sensor Activated Electronic Hand Washing Faucet for pre-tempered or hot and cold water operation.

Models

- EAF-275 Single Supply Faucet
(For pre-mixed water only)
- EAF-275-ISM With Integral Spout Temperature Mixer
(For Hot and Cold water supply connections)

Flow Rate

- 0.5 gpm/1.9 Lpm Aerator Spray Head

Specifications

Solar Powered, Sensor Activated, Electronic, Chrome Plated Constructed Metal, Hand Washing Faucet with the following features:

- Modular One-piece Construction with all Concealed Components above deck
- Double Infrared Sensors with Automatic Setting Feature
- Automatic Self-adapting Sensor Technology
- Solar Powered
- Magnetic Solenoid Valve
- Water Supply Connection with Flexible High-pressure Hose and Strainer
- Appropriate Mounting Hardware included
- Includes 6 VDC Lithium Battery Back-up Power Source

Variations

- ISM Integral Spout Mixer

Accessories

Trim Plates

- ETF-312-A Trim Plate for 4" (102 mm) Centerset Sink
- ETF-510-A Trim Plate for 8" (203 mm) Centerset Sink

Trim Plates must be specified and ordered separately.

Aerators

- EAF-10 2.2 gpm/8.3 Lpm Aerator Spray Head
- EAF-13 2.2 gpm/5.3 Lpm Laminar Flow Spray Head

Faucet Extension Kits

- EAF-35-A Faucet Extension Kit
- EAF-30-A Faucet Extension Kit (International Version - has 1/2G net connections)

Warranty

3 year (initial)

ADA Compliant



The new Optima solar powered faucet — Bringing intelligence to water

The first solar powered electronic faucet integrated power plant transforms light into electrical energy. Optimal performance anywhere, any time; in sunlight or even artificial light. The unique "Solar Energy Module" utilizes any light source efficiently.

Sloan's new Optima EAF-275 Series electronic hand washing faucets operate by means of a dual infrared sensor and microprocessor based logic. The modular design incorporates all of the operating components of the faucet, including the sensor, solenoid, circuitry and solar energy module above the sink within a die-cast metal spout.

ISM models feature an integral temperature control lever which allows the user to adjust the water temperature. This adjustment can also be converted to a fixed setting. EAF faucets ordered without the ISM variation must be connected to a single, pre-tempered water supply.

This space for Architect/Engineer approval:

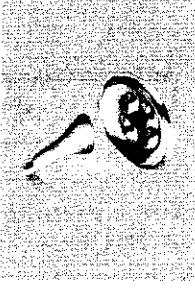
Job Name	Date
Model Specified	Grade
Comments Specified	
Customer/Architect	
Contractor	
Architect	

Optima Solis EAF-275 S.S. — Rev. 0d 10/9/01

The information contained in this document is subject to change without notice

Proposed
Low flow
Shower
Head

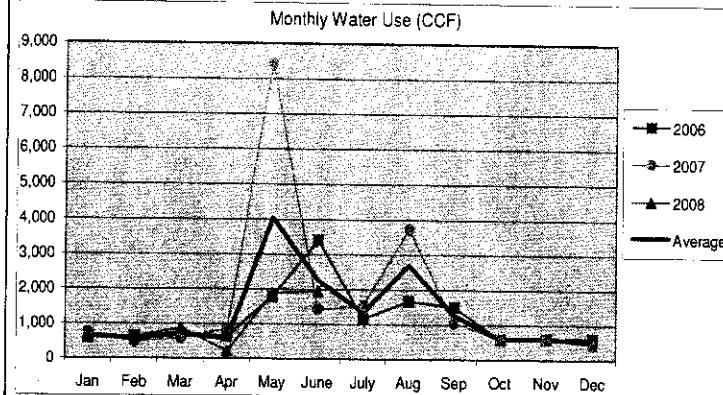
10/16/2008 1:12 PM

Delta Water-efficient Showerhead : Bath Products : Delta Faucet		http://www.deltafaucet.com/bath/15/RP46584.htm	
 Delta Delta Water-efficient Showerhead			
<p>List Price as Shown (US \$) Glossing Components RP46584 \$15.83 Total \$15.83</p>		<p>Smart Features Water-efficient Showerhead Model # RP46584 Flow Rate (gpm): 1.50 Flow Rate (l/min): 56 Flow Rate (gpm): 1.75 Flow Rate (l/min): 67 Lifetime Faucet and Shower Warranty</p>	
<p>1. The manufacturer's list price (U.S. dollars) is shown for comparison only. The actual retail price may be lower than the price shown.</p>			
<p>©2008 Delta Faucet Company.</p>			

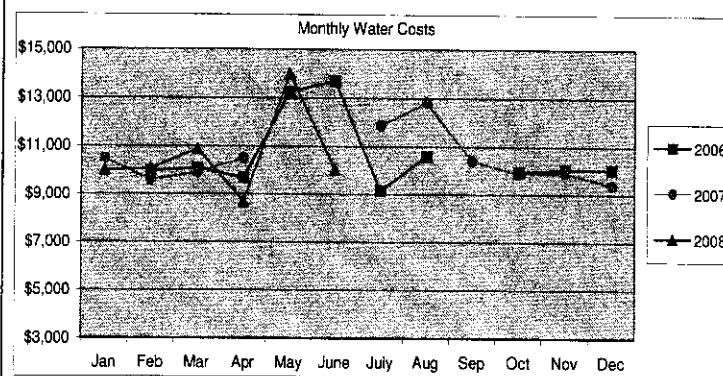
APPENDIX B – ROSS BUILDING COMPLEX CAMPUS

B.1 Detailed Billing Data

BPA Ross Complex - Total Billed Water Use



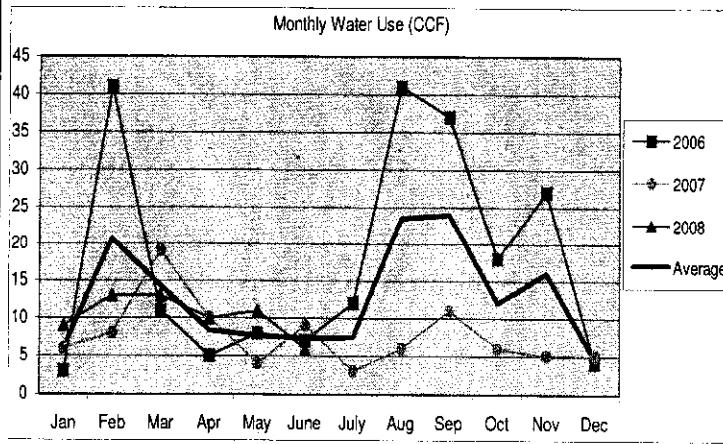
Month	2006	2007	2008	Average
Jan	621	742	592	652
Feb	632	485	616	578
Mar	701	584	859	715
Apr	645	846	209	567
May	1,786	8,413	1,885	4,028
June	3,409	1,418	1,949	2,259
July	1,155	1,547		1,351
Aug	1,667	3,728		2,698
Sep	1,500	1,040		1,270
Oct	580	595		588
Nov	600	587		594
Dec	609	427		518
Totals	13,905	20,412	6,110	15,815



Month	2006	2007	2008	Average
Jan	\$10,472	\$9,970	\$10,221	
Feb	\$9,953	\$9,563	\$10,059	\$9,859
Mar	\$10,068	\$9,904	\$10,871	\$10,281
Apr	\$9,662	\$10,487	\$8,666	\$9,605
May	\$13,259		\$14,008	\$13,633
June	\$13,688		\$10,031	\$11,860
July	\$9,139	\$11,873		\$10,506
Aug	\$10,581	\$12,805		\$11,693
Sep		\$10,384		\$10,384
Oct	\$9,926	\$9,863		\$9,895
Nov	\$10,028	\$9,909		\$9,969
Dec	\$10,028	\$9,371		\$9,699
Totals	\$106,332	\$104,631	\$63,605	\$127,604

* Months with no available cost history were left blank

BPA ROSS COMPLEX - APPRENTICE TRAINING CENTER BILLED WATER USE

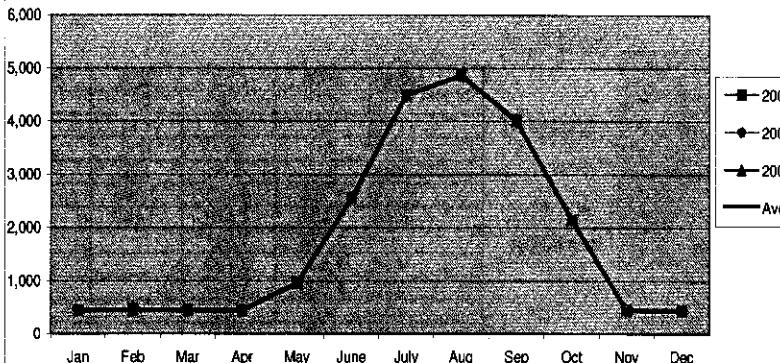


Month	2006	2007	2008	Average
Jan	3	6	9	6
Feb	41	8	13	21
Mar	11	19	13	14
Apr	5	10	10	8
May	8	4	11	8
Jun	7	9	6	7
Jul	12	3		8
Aug	41	6		24
Sep	37	11		24
Oct	18	6		12
Nov	27	5		16
Dec	4	5		5
Totals	214	92	62	152

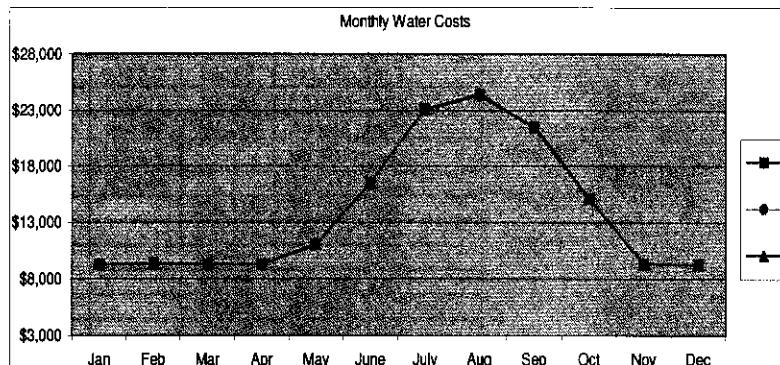
Below is the Enertia Energy, Inc. modified baseline water use

BPA Ross Complex - Modified Baseline Total Water Use*

Monthly Water Use (CCF)

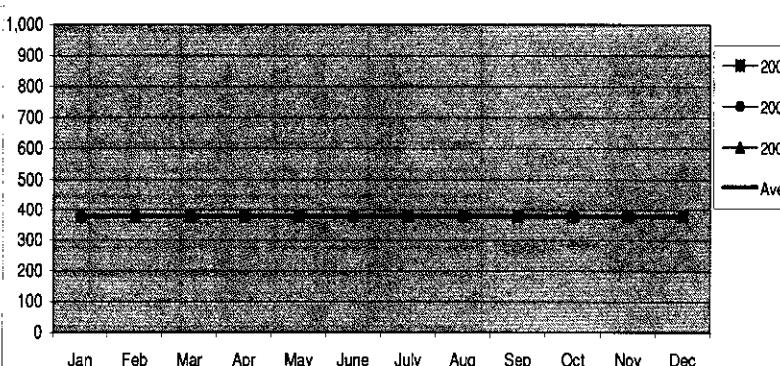


* Water use Adjusted for actual usage



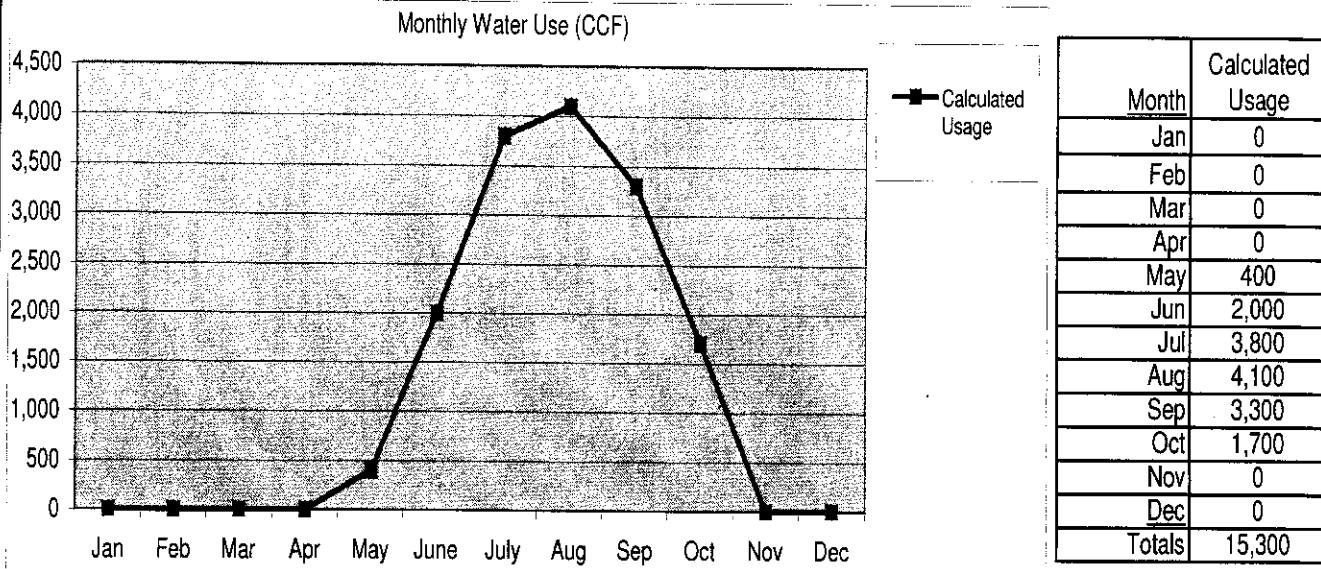
BPA Ross Complex - Plumbing Use*

Monthly Water Use (CCF)



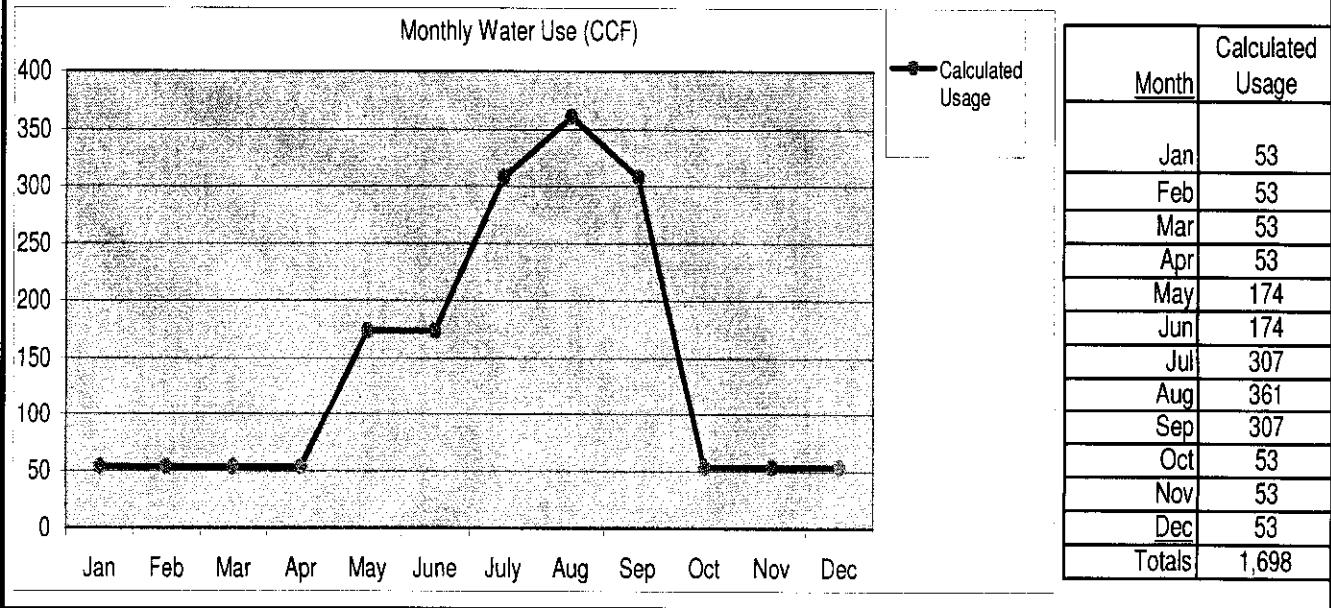
* Baseline Water Use Determined from Baseline Plumbing Use Calculation

BPA Ross Complex - Modified Baseline Calculated Irrigation Water Use



* Baseline was determined using engineering calculations

BPA Ross Complex - Modified Baseline Cooling Water Use*



* Values are calculated using engineering calculations - No Meter Data Available

B.2 Water Use Baseline

Plumbing Baseline: The plumbing baseline water use was determined by calculating the individual building usage.

Calculated Plumbing Use	
Baseline Usage adjusted by 10% to account for other Misc Buildings	
Month	CCF
January-06	379
February-06	379
March-06	379
April-06	379
May-06	379
June-06	379
July-06	379
August-06	379
September-06	379
October-06	379
November-06	379
December-06	379
January-07	379
February-07	379
March-07	379
April-07	379
May-07	379
June-07	379
July-07	379
August-07	379
September-07	379
October-07	379
November-07	379
December-07	379
January-08	379
February-08	379
March-08	379
April-08	379
May-08	379
June-08	379

Irrigation Baseline: Irrigation baseline water usage was determined using engineering calculations.

Calculated Irrigation Use	
Month	CCF
January-06	0
February-06	0
March-06	0
April-06	0
May-06	400
June-06	2,000
July-06	3,800
August-06	4,100
September-06	3,300
October-06	1,700
November-06	0
December-06	0
January-07	0
February-07	0
March-07	0
April-07	0
May-07	400
June-07	2,000
July-07	3,800
August-07	4,100
September-07	3,300
October-07	1,700
November-07	0
December-07	0
January-08	0
February-08	0
March-08	0
April-08	0
May-08	400
June-08	2,000

HVAC (cooling) Baseline: HVAC (cooling) baseline water usage was determined using engineering calculations.

Calculated Cooling Water Use	
Month	CCF
January-06	53
February-06	53
March-06	53
April-06	53
May-06	174
June-06	174
July-06	307
August-06	361
September-06	307
October-06	53
November-06	53
December-06	53
January-07	53
February-07	53
March-07	53
April-07	53
May-07	174
June-07	174
July-07	307
August-07	361
September-07	307
October-07	53
November-07	53
December-07	53
January-08	53
February-08	53
March-08	53
April-08	53
May-08	174
June-08	174

B.3 BPA Ross Complex Fixture Survey

The Ross Complex fixture summary and fixture inventory are listed below.

BPA Ross Complex Fixture Summary			
Fixture Code	Fixture Type	Flow Rate	Fixture MFG
U1	Urinal	1.5 gpf	Sloan
U7	Urinal	0 gpf	Zero Flush
U8	Urinal	1 gpf	Kohler
U9	Urinal	1 gpf	Kohler
U10	Urinal	0 gpf	Sloan
WC1	Water Closet	3.5 gpf	Sloan
WC2	Water Closet	1.6 gpf	Gerber
WC4	Water Closet	1.6 gpf	Kohler
WC5	Water Closet	1.2 gpf	Kohler
WC6	Water Closet	1.2 gpf*	Caravelle
WC8	Water Closet	1.6 gpf	Crane
WC9	Water Closet	1.6 gpf	No MFG Data
L1	Lavatory	2.2 gpm	Multiple
L2	Lavatory	2.2 gpm	Delta
L3	Lavatory	2.2 gpm	Chicago
L4	Lavatory	2.2 gpm	Delta
L8	Lavatory	2.2 gpm	American STD
L13	Lavatory	1.06 gpm	Toto
L14	Lavatory	0.5 gpm	Delta
L15	Lavatory	2 gpm	Delat
L16	Lavatory	2.2 gpm	Moen
L17	Lavatory	N/A gpm	Group Sink
SS1	Service Sink - Custodian	2.5 gpm	Multiple
SS2	Service Sink - Kitchen	2.5 gpm	Multiple
SS3	Service Sink - Custodial	2.5 gpm	Chicago
SS4	Service Sink - Kitchen	2.2 gpm	Delta
SS5	Service Sink - Misc	2.5 gpm	Multiple
SH1	Shower	2.5 gpm	Multiple
SH2	Group Shower		
DW1	Dishwasher	126 gph	Hobart
DF	Water Cooler	8 gph	Multiple

BPA Ross Complex Fixture Inventory

Building	Z #	Existing Fixture Code	# of Fixtures	Fixture Type	Fixture MFG.	Fixture Flow Rate
Construction Services Bldg	610	WC1	10	Water Closet	Sloan	3.5 gpf
		WC6	8	Water Closet	Caravelle	1.2 gpf*
		U1	4	Urinal	Sloan	1.5 gpf
		U7	2	Urinal	Zero Flush	0 gpf
		L3	2	Lavatory	Chicago	2.2 gpm
		L4	7	Lavatory	Delta	2.2 gpm
		L14	6	Lavatory	Delta	0.5 gpm
		SH1	2	Shower	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		SS3	1	Service Sink - Custodial	Chicago	2.5 gpm
		DF	2	Water Cooler	Multiple	8 gph
Storage Warehouse	669	WC8	2	Water Closet	Crane	1.6 gpf
		L2	2	Lavatory	Delta	2.2 gpm
		DF	1	Water Cooler	Multiple	8 gph
Plant Services Building	671	WC1	11	Water Closet	Sloan	3.5 gpf
		WC4	1	Water Closet	Kohler	1.6 gpf
		U1	2	Urinal	Sloan	1.5 gpf
		U7	2	Urinal	Zero Flush	0 gpf
		U10	1	Urinal	Sloan	0 gpf
		L2	2	Lavatory	Delta	2.2 gpm
		L16	7	Lavatory	Moen	2.2 gpm
		L17	2	Lavatory	Group Sink	N/A gpm
		SH1	4	Shower	Multiple	2.5 gpm
		SS1	9	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		SS5	1	Service Sink - Misc	Multiple	2.5 gpm
		DF	6	Water Cooler	Multiple	8 gph
		WC1	24	Water Closet	Sloan	3.5 gpf
Control Center/Dittmer	695	U1	6	Urinal	Sloan	1.5 gpf
		L2	3	Lavatory	Delta	2.2 gpm
		L3	8	Lavatory	Chicago	2.2 gpm
		L4	7	Lavatory	Delta	2.2 gpm
		L13	10	Lavatory	Toto	1.06 gpm
		SH1	2	Shower	Multiple	2.5 gpm
		SS1	3	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	2	Service Sink - Kitchen	Multiple	2.5 gpm
		SS5	1	Service Sink - Misc	Multiple	2.5 gpm
		DF	5	Water Cooler	Multiple	8 gph
		WC6	7	Water Closet	Caravelle	1.2 gpf*
		U7	2	Urinal	Zero Flush	0 gpf
Ross Warehouse	759	L13	1	Lavatory	Toto	1.06 gpm
		L14	3	Lavatory	Delta	0.5 gpm
		SS1	2	Service Sink - Custodian	Multiple	2.5 gpm
		SS4	1	Service Sink - Kitchen	Delta	2.2 gpm
		DF	1	Water Cooler	Multiple	8 gph
		WC4	2	Water Closet	Kohler	1.6 gpf
High Voltage Lab	760	U1	1	Urinal	Sloan	1.5 gpf
		L1	2	Lavatory	Multiple	2.2 gpm
		SS1	1	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		DF	2	Water Cooler	Multiple	8 gph
Investment Recovery Center	761	WC1	4	Water Closet	Sloan	3.5 gpf
		U1	2	Urinal	Sloan	1.5 gpf
		L1	4	Lavatory	Multiple	2.2 gpm
		SH1	1	Shower	Multiple	2.5 gpm
		DF	1	Water Cooler	Multiple	8 gph

Building	Z #	Existing Fixture Code	# of Fixtures	Fixture Type	Fixture MFG.	Fixture Flow Rate
Ampere Bldg North	989	WC1	15	Water Closet	Sloan	3.5 gpf
		U1	8	Urinal	Sloan	1.5 gpf
		L1	2	Lavatory	Multiple	2.2 gpm
		L3	2	Lavatory	Chicago	2.2 gpm
		L4	11	Lavatory	Delta	2.2 gpm
		SH1	3	Shower	Multiple	2.5 gpm
		SS1	3	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		SS4	1	Service Sink - Kitchen	Delta	2.2 gpm
		DW1	1	Dishwasher	Hobart	126 gph
Ampere Bldg South	991	WC1	4	Water Closet	Sloan	3.5 gpf
		WC4	6	Water Closet	Kohler	1.6 gpf
		U1	2	Urinal	Sloan	1.5 gpf
		U9	2	Urinal	Kohler	1 gpf
		L1	3	Lavatory	Multiple	2.2 gpm
		L4	8	Lavatory	Delta	2.2 gpm
		L16	1	Lavatory	Moen	2.2 gpm
		SS1	2	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		SH1	2	Shower	Multiple	2.5 gpm
Communications Building	992	DF	3	Water Cooler	Multiple	8 gph
		WC5	1	Water Closet	Kohler	1.2 gpf
		WC6	2	Water Closet	Caravelle	1.2 gpf*
		WC9	2	Water Closet	No MFG Data	1.6 gpf
		L13	3	Lavatory	Toto	1.06 gpm
		L14	2	Lavatory	Delta	0.5 gpm
		SS1	1	Service Sink - Custodian	Multiple	2.5 gpm
DOB 1	993	SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		WC1	4	Water Closet	Sloan	3.5 gpf
		U1	2	Urinal	Sloan	1.5 gpf
		L13	4	Lavatory	Toto	1.06 gpm
		SH1	6	Shower	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
Ampere Annex	995 & 996	DF	3	Water Cooler	Multiple	8 gph
		WC6	2	Water Closet	Caravelle	1.2 gpf*
		L3	1	Lavatory	Chicago	2.2 gpm
		L13	1	Lavatory	Toto	1.06 gpm
		L14	1	Lavatory	Delta	0.5 gpm
Hazardous Material Bldg	1255	WC1	2	Water Closet	Sloan	3.5 gpf
		U8	1	Urinal	Kohler	1 gpf
		L8	2	Lavatory	American STD	2.2 gpm
		SS1	1	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		DF	1	Water Cooler	Multiple	8 gph
Warehouse Modular	1305	WC2	5	Water Closet	Gerber	1.6 gpf
		U8	1	Urinal	Kohler	1 gpf
		L15	4	Lavatory	Delat	2 gpm
		SS1	1	Service Sink - Custodian	Multiple	2.5 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
Apprentice Training Center	1306	WC2	2	Water Closet	Gerber	1.6 gpf
		WC6	2	Water Closet	Caravelle	1.2 gpf*
		WC8	4	Water Closet	Crane	1.6 gpf
		L2	4	Lavatory	Delta	2.2 gpm
		L13	2	Lavatory	Toto	1.06 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
Emergency Scheduling Center	1333	WC2	2	Water Closet	Gerber	1.6 gpf
		L2	2	Lavatory	Delta	2.2 gpm
		SS1	1	Service Sink - Custodian	Multiple	2.5 gpm
		SS5	1	Service Sink - Misc	Multiple	2.5 gpm
PCB Annex Modular	1334	WC8	1	Water Closet	Crane	1.6 gpf
		L15	1	Lavatory	Delat	2 gpm
		SS2	1	Service Sink - Kitchen	Multiple	2.5 gpm
		SS5	2	Service Sink - Misc	Multiple	2.5 gpm

B.4 Water Savings Measures (WSMs)

Plumbing Upgrade

BPA Ross Complex - Water Saving Measures					
Water Efficiency Measure Savings Summary - Irrigation (Ross Complex)					
		Calculated Savings (CCF)	Annual Cost Savings	Installed Cost	Simple Payback
WSM 1	Upgrade Water Closets - Valves (Caroma Caravelle - 1.6/0.8 gpf)	1,158	\$3,949	\$60,996	15
WSM 2	Upgrade Urinal - Waterless (WES-1000)	320	\$1,091	\$23,390	21
WSM 3	Upgrade Lavatory - (Sloan EAF-275)	328	\$1,118	\$76,680	69
WSM 4	Upgrade Showers (Delta #RP46384)	143	\$487	\$3,537	7
WSM 5	Upgrade Kitchen Sinks - 1.5 gpm low flow aerators	60	\$203	\$1,650	8

Cost savings based on Water Rate:

Government Rate
cost per CCF: \$3.4100

IMPLEMENTATION COSTS		Unit Qty	Unit Cost	Labor Cost / Unit	Total Cost	Source of Cost Estimate
WSM-1	Upgrade Water Closets - Valves (Caroma Caravelle - 1.6/0.8 gpf)	102	\$355	\$163	\$52,785	Fixt - Vendor Quote / Labor - Means 2008 - 22 42 13.40.3100 / 22 42 39.10.0860
WSM-1	Remove existing Water Closets	102	\$0	\$81	\$8,211	Means 2008 - 22 05 05 10.1420
WSM-2	Upgrade Urinal - Waterless (WES-1000)	31	\$450	\$224	\$20,894	Fixt - Vendor Quote / Labor - 22 42 13.30.3100
WSM-2	Remove existing Urinals	31	\$0	\$81	\$2,496	Means 2008 - 22 05 05 10.1520
WSM-3	Upgrade Lavatory - (Sloan EAF-275)	108	\$530	\$180	\$76,680	Fixt - Vendor Quote / Labor - Engineer Estimate
WSM-4	Upgrade Showers (Delta #RP46384)	20	\$57	\$120	\$3,537	Fixt - Delta Website (Model # RP46384) / Labor - Engineer Estimate
WSM-5	Upgrade Kitchen Sinks - 1.5 gpm low flow aerators	15	\$50	\$60	\$1,650	Fixt - Engineer Estimate / Labor - Engineer Estimate

BPA Ross Complex - Baseline Plumbing Water Usage

Baseline Usage Summary

Calculated Baseline (CCF)	
Water Closet	2,034
Urinal	320
Lavatory	460
Shower	365
Service Sink - Kitchen	153
Service Sink - Custodial	82
Service Sink - Misc	92
Drinking Fountain	82
Dishwasher	22
Baseline Yearly Usage (Total Plumbing)	3,609

Assumptions

Facility Usage

	Days / Year	Total Facility Occupants	Total Study Occupants	Total CCF / Person / Year
Normal	260	1003	920	3.9
24/7	365	27		

For Fixture Usage Assumptions (see fixture table)

Fixture Type (assumptions taken from LEED NC 2.2)	Daily Uses	Duration (time or use factor)	
Water Closet	2	1	flush
Water Closet (Female)	3		
Water Closet (Male)	1		
Urinal	2	1	flush
Urinal (Male)	2		
Urinal (Female)	0		
Lavatory	3	0.25	min
Shower	0.1	5	min
Service Sink - Kitchen	1	0.25	min
Taken from LEED 2.2 pg 131			

Fixture Type (Enertia Energy, Inc. Assumptions)

Drinking Fountain	2	1	min
Dishwasher	1	0.5	hour
Service Sink - Custodial	2	2.5	min
Service Sink - Misc	1	0.25	min

Gallons / CCF

748

Baseline Plumbing Usage by Building

Building Name Construction Services Building		Z Number 610	Occupants 257	Days of Operation 250						
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use***	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year	
Water Closet	WC1 & WC6	257	1	2.5 gpf	1 Flush	2	260	331,130	443	
Urinal	U1 & U7	128.5	1	0.67 gpf	1 Flush	1	260	22,273	30	
Lavatory	L3, L4, L14	257	1	1.52 gpm	0.25 Minutes	3	260	76,175	102	
Shower	SH1	257	1	2.5 gpm	5 Minutes	0.1	260	83,525	112	
Service Sink - Kitchen	SS2	257	1	2.5 gpm	0.25 Minute	1	260	696	1	
Service Sink - Custodial	SS3	1	1	2.5 gpm	2.5 Minutes	2	260	3,250	4	
Drinking Fountain	DF	257	1	8 gph	1 Minutes	2	260	17,819	24	
Total								715		
*** Flow rates averaged to actual fixture counts										
Building Name Covered Storage Addition		Z Number 669	Occupants 2	Days of Operation 260						
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year	
Water Closet	WC8	2	1	1.6 gpf	1 Flush	2	260	1,664	2	
Lavatory	L2	2	1	2.2 gpm	0.25 Minutes	3	260	858	1	
Drinking Fountain	DF	2	1	8 gph	1 Minutes	2	260	139	0	
Total								4		
Building Name Plant Services Building		Z Number 671	Occupants 74	Days of Operation 260						
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year	
Water Closet	WC1 & WC4	74	1	3.3 gpf	1 Flush	2	260	128,587	172	
Urinal	U1, U7, U10	37	1	0.4 gpf	1 Flush	2	260	7,696	10	
Lavatory	L2, L16, L17	74	1	2.2 gpm	0.25 Minutes	3	260	31,746	42	
Shower	SH1	74	1	2.5 gpm	5 Minutes	0.1	260	24,050	32	
Service Sink - Kitchen	SS1	1	1	2.5 gpm	2.5 Minutes	2	260	3,250	4	
Service Sink - Custodial	SS2	74	1	2.5 gpm	0.25 Minutes	1	260	12,025	16	
Service Sink - Misc	SS5	74	1	2.5 gpm	0.25 Minutes	1	260	12,025	16	
Drinking Fountain	DF	74	1	8 gph	1 Minutes	2	260	5,131	7	
Total								300		

Building Name		Z Number	Occupants	Days of Operation	Average Uses / Day / Person*						Gallons / Year	CCF / Year		
Control Center / Dittmer		695	308	260	Full Time Equivalent						Duration	260	560,560	749
Fixture Type	Existing Fixture Type		# of Occupants*		Flow Rate / Use				Average Uses / Day / Person*	Year**	Days / Year	Gallons / Year	CCF / Year	
Water Closet	WC1		308	1	3.5 gpf		1 Flush		2	260	560,560	749		
Urinal	U1	154	1		1.5 gpf		1 Flush		2	260	120,120	161		
Lavatory	L2, L3, L4, L13	308	1		1.8 gpm		0.25 Minutes		3	260	107,679	144		
Shower	SH1	308	1		2.5 gpm		5 Minutes		0.1	260	100,100	134		
Service Sink - Custodial	SS1	2	1		2.5 gpm		2.5 Minutes		2	260	6,500	9		
Service Sink - Kitchen	SS2	308	1		2.5 gpm		0.25 Minutes		1	260	50,050	67		
Service Sink - Misc	SS5	308	1		2.5 gpm		0.25 Minutes		1	260	50,050	67		
Drinking Fountain	DF	308	1		8 gpm		1 Minutes		2	260	21,355	29		
Total												1,359		
Building Name		Z Number	Occupants	Days of Operation	Average Uses / Day / Person*						Gallons / Year	CCF / Year		
Control Center / Dittmer		695	27	365	Full Time Equivalent						Duration	260	68,985	92
Fixture Type	Existing Fixture Type		# of Occupants*		Flow Rate / Use				Average Uses / Day / Person*	Year**	Days / Year	Gallons / Year	CCF / Year	
Water Closet	WC1		27	1	3.5 gpf		1 Flush		2	365	68,985	92		
Urinal	U1	13.5	1		1.5 gpf		1 Flush		2	365	14,783	20		
Lavatory	L2, L3, L4, L13	27	1		1.8 gpm		0.25 Minutes		3	365	13,251	18		
Shower	SH1	27	1		2.5 gpm		5 Minutes		0.1	365	12,319	16		
Service Sink - Custodial	SS1	2	1		2.5 gpm		2.5 Minutes		2	365	9,125	12		
Service Sink - Kitchen	SS2	27	1		2.5 gpm		0.25 Minutes		1	365	6,159	8		
Service Sink - Misc	SS5	27	1		2.5 gpm		0.25 Minutes		1	365	6,159	8		
Drinking Fountain	DF	27	1		8 gpm		1 Minutes		2	365	2,628	4		
Total												178		
Building Name		Z Number	Occupants	Days of Operation	Average Uses / Day / Person*						Gallons / Year	CCF / Year		
Ross Warehouse		759	45	260	Full Time Equivalent						Duration	260	28,080	38
Fixture Type	Existing Fixture Type		# of Occupants*		Flow Rate / Use				Average Uses / Day / Person*	Year**	Days / Year	Gallons / Year	CCF / Year	
Water Closet	WC6		45	1	1.2 gpf*		1 Flush		2	260	28,080	38		
Urinal	U7	22.5	1		0 gpf		1 Flush		2	260	0	0		
Lavatory	L13, L14	45	1		0.64 gpm		0.25 Minutes		3	260	5,616	8		
Service Sink - Custodial	SS1	2	1		2.5 gpm		2.5 Minutes		2	260	6,500	9		
Service Sink - Kitchen	SS4	45	1		2.2 gpm		0.25 Minutes		1	260	6,435	9		
Drinking Fountain	DF	45	1		8 gpm		1 Minutes		2	260	3,120	4		
Total												67		

Building Name	Z Number	Occupants	Operation					
High Voltage Lab	760	1	260					
Fixture Type	Existing Fixture Type	Occupants*	Equivalent	Flow Rate / Use	Duration	Uses / Day /	Year**	Year
Water Closet	WC4	1	1	1.6 gpf	1 Flush	2	260	832
Urinal	U1	0.5	1	1.5 gpf	1 Flush	2	260	390
Lavatory	L1	1	1	2.2 gpm	0.25 Minutes	3	260	429
Service Sink - Custodial	SS1	1	1	2.5 gpm	2.5 Minutes	2	260	3,250
Service Sink - Kitchen	SS2	1	1	2.5 gpm	0.25 Minutes	1	260	163
Drinking Fountain	DF	1	1	8 gph	1 Minutes	2	260	69
Total								7

Building Name	Z Number	Occupants	Operation					
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year
Water Closet	WC1	6	1	3.5 gpf	1 Flush	2	260	10,920
Urinal	U1	3	1	1.5 gpf	1 Flush	2	260	2,340
Lavatory	L1	6	1	2.2 gpm	0.25 Minutes	3	260	2,574
Shower	SH1	1	1	2.5 gpm	5 Minutes	0.1	260	325
Drinking Fountain	DF	6	1	8 gph	1 Minutes	2	260	416
Total								22

Building Name	Z Number	Occupants	Operation					
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year
Water Closet	WC1	62	1	3.5 gpf	1 Flush	2	260	112,840
Urinal	U1	31	1	1.5 gpf	1 Flush	2	260	24,180
Lavatory	L1, L3, L4	62	1	2.2 gpm	0.25 Minutes	3	260	26,598
Shower	SH1	62	1	2.5 gpm	5 Minutes	0.1	260	36
Service Sink - Custodial	SS1	3	1	2.5 gpm	2.5 Minutes	2	260	20,150
Service Sink - Kitchen	SS2	62	1	2.5 gpm	0.25 Minutes	1	260	9,750
Service Sink - Kitchen	SS4	62	1	2.2 gpm	0.25 Minutes	1	260	10,075
Dishwasher	DW1	1	1	126 gph	0.5 Hours / Day	1	260	8,866
Total								316

Building Name		Z Number	Occupants	Days of Operation								
Ampere Building South		991	37	260	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet	WC1, WC4	37	1	2,36 gpf	1	1 Flush	2	260	45,406	61		
Urinal	U1, U9	18.5	1	1 gpf	1	1 Flush	2	260	9,620	13		
Lavatory	L1, L4, L16	37	1	2.2 gpf	0.25 Minutes	3	260	15,873	21			
Shower	SH1	37	1	2.5 gpm	5 Minutes	0.1	260	12,025	16			
Service Sink - Custodial	SS1	2	1	2.5 gpm	2.5 Minutes	2	260	6,500	9			
Service Sink - Kitchen	SS2	37	1	2.5 gpm	0.25 Minutes	1	260	6,013	8			
Drinking Fountain	DF	37	1	8 gph	1 Minutes	2	260	2,565	3			
Total												131
Building Name		Z Number	Occupants	Days of Operation								
Communications Building		992	21	280	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet	WC5, WC6, WC9	21	1	1.36 gpf	1	1 Flush	2	260	14,851	20		
Lavatory	L13, L14	21	1	0.84 gpm	0.25 Minutes	3	260	3,423	5			
Service Sink - Custodial	SS1	1	1	2.5 gpm	2.5 Minutes	2	260	3,250	4			
Service Sink - Kitchen	SS2	21	1	2.5 gpm	0.25 Minutes	1	260	3,413	5			
Total												33
Building Name		Z Number	Occupants	Days of Operation								
DOB-1		993	13	260	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet	WC1	13	1	3.5 gpf	1	1 Flush	2	260	23,660	32		
Urinal	U1	6.5	1	1.5 gpf	1	1 Flush	2	260	5,070	7		
Lavatory	L13	13	1	1.06 gpm	0.25 Minutes	3	260	2,687	4			
Shower	SH1	13	1	2.5 gpm	5 Minutes	0.1	260	4,225	6			
Service Sink - Kitchen	SS2	13	1	2.5 gpm	0.25 Minutes	1	260	2,113	3			
Drinking Fountain	DF	13	1	8 gph	1 Minutes	2	260	901	1			
Total												52

Building Name		Z Number	Occupants	Days of Operation					
Ampere Annex		935 & 936	6	260					
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet	WC6	6	1	1.2 gpf*	1 Flush	2	260	3,744	5
Lavatory	L3, L13, L14	6	1	1.25 gpm	0.25 Minutes	3	260	1,466	2
Total									7
Building Name		Z Number	Occupants	Days of Operation					
Hazardous Material Building		1255	8	260					
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet	WC1	8	1	3.5 gpf	1 Flush	2	260	14,560	19
Urinal	U8	4	1	1 gpf	1 Flush	2	260	2,080	3
Lavatory	L8	2	1	2.25 gpm	0.25 Flush	3	260	858	1
Service Sink - Custodial	SS1	1	1	2.5 gpm	2.5 Minutes	2	260	3,250	4
Service Sink - Kitchen	SS2	8	1	2.5 gpm	0.25 Minutes	1	260	1,300	2
Drinking Fountain	DF	8	1	81 gph	1 Minutes	2	260	555	1
Total									30
Building Name		Z Number	Occupants	Days of Operation					
Warehouse Modular		1305	63	260					
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet	WC2	63	1	1.6 gpf	1 Flush	2	260	52,416	70
Lavatory	U8	31.5	1	1 gpf	0.25 Flush	3	260	6,143	8
Shower	L15	63	1	2 gpm	5 Minutes	0.1	260	16,380	22
Service Sink - Custodial	SS1	1	1	2.5 gpm	2.5 Minutes	2	260	3,250	4
Service Sink - Kitchen	SS2	315	1	2.5 gpm	0.25 Minutes	1	260	5,119	7
Total									111

Building Name	Z Number	Occupants	Days of Operation						
Emergency Scheduling Center	1333	3	260						
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet	WC2	3	1	1.6 gpf	1 Flush	2	260	2,496	3
Lavatory	L2	1.5	1	2.2 gpm	0.25 Minutes	3	260	644	1
Service Sink - Custodial	SS1	1	1	2.5 gpm	0.25 Minutes	2	260	3,250	4
Service Sink - Misc	SS5	1	1	2.5 gpm	0.25 Minutes	1	260	163	0
Total									9
Building Name	Z Number	Occupants	Days of Operation						
PCB Annex Module	1334	2	260						
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet	WC8	2	1	1.6 gpf	1 Flush	2	260	1,664	2
Lavatory	L15	2	1	2.5 gpm	0.25 Minutes	3	260	780	1
Service Sink - Kitchen	SS2	2	1	2.5 gpm	0.25 Minutes	1	260	325	0
Service Sink - Misc	SS5	2	1	2.5 gpm	0.25 Minutes	1	260	325	0
Total									4
Building Name	Z Number	Occupants	Days of Operation						
Apprentice Training Center	1306	12	260						
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet	WC2, WC6, WC8	12	1	1.5 gpf	1 Flush	2	260	9,360	13
Lavatory	L2, L13	12	1	1.82 gpf	0.25 Minutes	3	260	4,259	6
Service Sink - Kitchen	SS2	12	1	2.5 gpm	0.25 Minutes	1	260	1,950	3
Total									21
Visitor Usage	Z Number	Occupants	Days of Operation						
Visitor Usage	All Buildings	92	260						
Fixture Type	Existing Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day / Person*	Days / Year**	Gallons / Year	CCF / Year
Water Closet	WC1	92	1	2.3 gpf	1 Flush	2	260	109,590	146
Urinal	U1	46.0	1	1.3 gpf	1 Minutes	2	260	30,781	41
Lavatory	L1	92	1	2.4 gpm	0.25 Minutes	3	260	42,846	57
Drinking Fountain	DF	92	1	8 gph	1 Minutes	2	260	6,379	9
Total									253
Total Water Use (CCF)								3,609	

* Average assuming 50% Men & 50% Woman Using Fixture - Usage Values from LEED NC 2.2

** For normal schedule (5/52=260 days) & for 24/7 (365 days)

**** Assumed Average Visitor Occupancy is 10% of Normal Occupancy

***** Assumed Usage & Capacity (Elkay 8 GPH Capacity)

BPA Ross Complex - Proposed Plumbing Water Usage

Proposed Plumbing Upgrade Summary

		Calculated Baseline (CCF)	Proposed Water Use after Upgrade (CCF)	Difference (CCF)	% Difference
WSM 1	Water Closet	2,034	876	1,158	57%
WSM 2	Urinal	320	0	320	100%
WSM 3	Lavatory	460	132	328	71%
WSM 4	Shower	365	222	143	39%
WSM 5	Service Sink - Kitchen	153	94	60	39%
N/A	Service Sink - Custodial	82	82	0	0%
N/A	Service Sink - Misc	92	92	0	0%
N/A	Drinking Fountain	82	82	0	0%
N/A	Dishwasher	22	22	0	0%
Yearly Plumbing Usage (Total Plumbing)		3,609	1,601	2,008	56%

Assumptions

Facility Usage

	Days / Year	Total Facility Occupants	Total Study Occupants	Total CCF / Person /
Normal	260	694	920	1.7
24/7	365	336		

Proposed Fixture Assumptions

Proposed Fixture Code	Proposed Fixture Type	Recommended Measure	Proposed Flow Rate	Proposed Fixture Description
PWC	Water Closet	Install Low Flow Water Closets	1.2 GPF	Caravelle 88 Dual Flush
PU	Urinals	Install Waterless Urinals	0 GPF	Zero Flush - Waterless Urinals
PL	Low Flow Faucets	Install Low flow Faucets	0.5 gpm	Low Flow Faucet (0.5 gpm)
PSH	Low Flow Shower Heads	Install Low Flow Shower Heads	1.5 GPM	Delta Low Flow Shower Head (# RP46384)
PDF	Drinking Fountain	No upgrade Recommended	8 GPH	Leave Existing Fixtures
PSS1	Service Sink - Custodial	No upgrade Recommended	2.5 GPM	Leave Existing Fixtures
PSS2	Service Sink - Kitchen	Install Low flow aerators on existing faucets	1.5 GPM	Install New Low Flow Faucets (1.5 gpm)

Proposed Usage Assumptions*

Fixture Type (assumptions taken from LEED NC 2.2)	Daily Uses	Duration (time or use factor)	
Water Closet (Female)	3	1	flush
Water Closet (Male)	1	1	flush
Urinal (Male)	2	1	flush
Urinal (Female)	0	1	flush
Lavatory	3	0.25	min
Shower	0.1	5	min
Service Sink - Kitchen	1	0.25	min

*Taken from LEED 2.2 pg 131

Proposed Usage Assumptions**

Drinking Fountain	2	1	min
Dishwasher	1	0.5	hour
Service Sink - Custodial	2	2.5	min
Service Sink - Misc	1	0.25	min

** Engineer Estimate

Gallons / CCF

748

Proposed Plumbing Usage by Building

Building Name Construction Services Build	Z Number 610	Occupants 257	Days of Operation 260	Proposed Fixture Type	Proposed Fixture Type	# of Occupants*	Full Time Equivalent	Proposed Flow Rate / Use***	Duration	Average Uses / Day / Person**	Days / Year**	Gallons / Year	Proposed CCF / Year	Baseline CCF / Year	Calculated Savings	% Savings
Water Closet	WC1 & WC6	PWC	257	1	1.2 gpf	1	1.2 gpf	1 Flush	2	260	160,368	214	443	228.3	52%	
Urinal	U1 & U7	PU	128.5	1	0.0 gpf	1	0.0 gpf	1 Flush	1	260	0	0	30	29.8	100%	
Lavatory	L3, L4, L14	PL	257	1	0.5 gpm	0.25 Minutes	0.5 gpm	0.25 Minutes	3	260	25,058	33	102	68.3	67%	
Shower	SH1	PSH	257	1	1.5 gpm	5 Minutes	1.5 gpm	5 Minutes	0.1	260	50,115	67	112	44.7	40%	
Service Sink - Kitchen	SS2	PSS2	257	1	1.5 gpm	0.25 Minute	1.5 gpm	0.25 Minute	1	260	418..	1	1	0.4	40%	
Service Sink - Custodial	SS3	PSS1	1	1	2.5 gpm	2.5 Minutes	2.5 gpm	2.5 Minutes	2	260	3,250	4	4	0.0	0%	
Drinking Fountain	DF	PDF	257	1	8.0 gph	1 Minutes	8.0 gph	1 Minutes	2	260	17,819	24	24	0.0	0%	
Total												344	691	347.6	50%	

*** Flow rates averaged to actual fixture counts

Building Name Covered Storage Addition	Z Number 669	Occupants 2	Days of Operation 260	Proposed Fixture Type	Proposed Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person**	Days / Year**	Gallons / Year	Proposed CCF / Year	Baseline CCF / Year	Calculated Savings	% Savings
Water Closet	WC8	PWC	2	1	1.2 gpf	1	1.2 gpf	1 Flush	2	260	1,248	2	2	0.6	25%	
Lavatory	L2	PL	2	1	0.5 gpm	0.25 Minutes	0.5 gpm	0.25 Minutes	3	260	195	0	1	0.9	77%	
Drinking Fountain	DF	PDF	2	1	8.0 gph	1 Minutes	8.0 gph	1 Minutes	2	260	139	0	0	0.0	0%	
Total												2	4	1.4	41%	

Building Name Plant Services Building	Z Number 671	Occupants 74	Days of Operation 260	Proposed Fixture Type	Proposed Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person**	Days / Year**	Gallons / Year	Proposed CCF / Year	Baseline CCF / Year	Calculated Savings	% Savings
Water Closet	WC1 & WC4	PWC	74	1	1.2 gpf	1	1.2 gpf	1 Flush	2	260	46,176	62	172	110.2	64%	
Urinal	U1, U7, U10	PU	37	1	0.0 gpf	1	0.0 gpf	1 Flush	2	260	0	0	10	10.3	100%	
Lavatory	L2, L16, L17	PL	74	1	0.5 gpm	0.25 Minutes	0.5 gpm	0.25 Minutes	3	260	7,215	10	42	32.8	7%	
Shower	SH1	PSH	74	1	1.5 gpm	5 Minutes	1.5 gpm	5 Minutes	0.1	260	14,430	19	32	12.9	40%	
Service Sink - Kitchen	SS1	PSS1	1	1	2.5 gpm	2.5 Minutes	2.5 gpm	2.5 Minutes	2	260	3,250	4	4	0.0	0%	
Service Sink - Custodial	SS2	PSS2	74	1	1.5 gpm	0.25 Minutes	1.5 gpm	0.25 Minutes	1	260	7,215	10	16	6.4	40%	
Service Sink - Misc	SS5	PSS1	74	1	2.5 gpm	0.25 Minutes	2.5 gpm	0.25 Minutes	1	260	12,025	16	16	0.0	0%	
Drinking Fountain	DF	PDF	74	1	8.0 gph	1 Minutes	8.0 gph	1 Minutes	2	260	5,131	7	7	0.0	0%	
Total												128	300	57%		

Building Name		Z Number	Occupants	Days of Operation				Proposed				Baseline				
Control Center / Dittmer		695	308	260	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day	Days / Year**	Gallons / Person*	Year	CCF / Year	Calculated Savings	% Savings	
Fixture Type	Existing Fixture Type	Proposed Fixture Type	Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	1 Flush	2	260	192,192	257	749	492.5	66%	
Water Closet	WC1	PWC	PU	308	1	1.2 gpf	1	0.0 gpf	1 Flush	2	260	0	0	161	160.6	100%
Urinal	U1	PL	PL	154	1	0.0 gpf	1	0.5 gpm	0.25 Minutes	3	260	30,030	40	144	103.8	72%
Lavatory	L2, L3, L4, L13	PSH	PSH	308	1	0.5 gpm	1	1.5 gpm	5 Minutes	0.1	260	60,060	80	134	53.5	40%
Shower	SH1	PSS1	PSH	2	1	2.5 gpm	1	2.5 gpm	2.5 Minutes	2	260	6,500	9	9	0.0	0%
Service Sink - Custodial	SS1	PSS2	PSH	308	1	1.5 gpm	0.25 Minutes	1	260	30,030	40	67	26.8	40%		
Service Sink - Kitchen	SS2	PSS1	PSH	308	1	2.5 gpm	0.25 Minutes	1	260	30,050	67	67	0.0	0%		
Service Sink - Misc	SS5	PDF	PSH	308	1	2.5 gpm	0.25 Minutes	1	260	50,050	67	67	0.0	0%		
Drinking Fountain	DF	PDF	PSH	308	1	8.0 gph	1 Minutes	2	260	21,355	29	29	0.0	0%		
Total										522	1,359					62%
Building Name		Z Number	Occupants	Days of Operation				Proposed				Baseline				
Control Center / Dittmer		695	27	365	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	1 Flush	2	365	23,632	32	92	60.6	66%
Fixture Type	Existing Fixture Type	Proposed Fixture Type	Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	1 Flush	2	365	0	0	20	19.8	100%	
Water Closet	WC1	PWC	PU	13.5	1	1.2 gpf	1	0.0 gpf	1 Flush	2	365	3,696	5	18	12.8	72%
Urinal	U1	PL	PL	27	1	0.5 gpm	0.25 Minutes	3	365	7,391	10	16	6.6	4.6%		
Lavatory	L2, L3, L4, L13	PSH	PSH	27	1	1.5 gpm	5 Minutes	0.1	365	9,125	12	12	0.0	0%		
Shower	SH1	PSS1	PSH	2	1	2.5 gpm	2.5 Minutes	2	365	3,696	5	8	3.3	4.0%		
Service Sink - Custodial	SS1	PSS2	PSH	27	1	1.5 gpm	0.25 Minutes	1	365	6,159	8	8	0.0	0%		
Service Sink - Kitchen	SS2	PSS1	PSH	27	1	2.5 gpm	0.25 Minutes	1	365	2,628	4	4	0.0	0%		
Service Sink - Misc	SS5	PDF	PSH	27	1	8.0 gph	1 Minutes	2	365	75	178					
Drinking Fountain	DF	PDF	PSH	Total												
Building Name		Z Number	Occupants	Days of Operation				Proposed				Baseline				
Ross Warehouse		759	45	260	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	1 Flush	2	260	28,080	38	38	0.0	0%
Fixture Type	Existing Fixture Type	Proposed Fixture Type	Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	1 Flush	2	260	0	0	0	0.0	0%	
Water Closet	WC6	PWC	PU	45	1	1.2 gpf*	1	0.0 gpf	1 Flush	2	260	0	0	0	0.0	
Urinal	U7	PL	PL	22.5	1	0.5 gpm	0.25 Minutes	3	260	4,388	6	8	1.6	2.2%		
Lavatory	L13, L14	PSS1	PSH	45	1	1.5 gpm	2.5 Minutes	2	260	6,500	9	9	0.0	0%		
Service Sink - Custodial	SS1	PSS2	PSH	2	1	2.5 gpm	0.25 Minutes	1	260	4,388	6	6	2.7	3.6%		
Service Sink - Kitchen	SS4	PDF	PSH	45	1	1.5 gpm	1 Minutes	2	260	3,120	4	4	0.0	0%		
Drinking Fountain	DF	PDF	PSH	Total												7%

Building Name		Z Number	Occupants	Days of Operation									
			1	260									
Fixture Type	Existing Fixture Type	Proposed Fixture Type	# of Occupants*	Full Time Equivalent	Proposed Flow Rate / Use	Duration	Average Uses / Day / Person**	Gallons / Year*	CCF / Year	Proposed CCF / Year	Baseline CCF / Year	Calculated Savings %	
Water Closet	WC4	PWC	1	1	1.2 gpf	1 Flush	2	260	624	1	1	25%	
Urinal	U1	PU	0.5	1	0.0 gpf	1 Flush	2	260	0	0	1	0.5	
Lavatory	L1	PL	1	1	0.5 gpm	0.25 Minutes	3	260	98	0	1	100%	
Service Sink - Custodial	SS1	PSS1	1	1	2.5 gpm	2.5 Minutes	2	260	3250	4	4	77%	
Service Sink - Kitchen	SS2	PSS2	1	1	1.5 gpm	0.25 Minutes	1	260	98	0	0	0%	
Drinking Fountain	DF	PDF	1	1	8.0 gph	1 Minutes	2	260	69	0	0	40%	
Total										6	7	1.3	
Building Name		Z Number	Occupants	Days of Operation									
			6	260									
Fixture Type	Existing Fixture Type	Proposed Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person**	Gallons / Year*	CCF / Year	Proposed CCF / Year	Baseline CCF / Year	Calculated Savings %	
Water Closet	WC1	PWC	6	1	1.2 gpf	1 Flush	2	280	3744	5	15	9.6	
Urinal	U1	PU	3	1	0.0 gpf	1 Flush	2	280	0	0	3	3.1	
Lavatory	L1	PL	6	1	0.5 gpm	0.25 Minutes	3	280	585	1	3	100%	
Shower	SH1	PSH	1	1	1.5 gpm	5 Minutes	0.1	280	195	0	0	2.7	
Drinking Fountain	DF	PDF	6	1	8.0 gph	1 Minutes	2	280	416	1	1	40%	
Total										7	22	15.6	
Building Name		Z Number	Occupants	Days of Operation									
			62	260									
Fixture Type	Existing Fixture Type	Proposed Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day / Person**	Gallons / Year*	CCF / Year	Proposed CCF / Year	Baseline CCF / Year	Calculated Savings %	
Water Closet	WC1	PWC	62	1	1.2 gpf	1 Flush	2	260	38688	52	151	99.1	
Urinal	U1	PU	31	1	0.0 gpf	1 Flush	2	260	0	0	32	32.3	
Lavatory	L1, L3, L4	PL	62	1	0.5 gpm	0.25 Minutes	3	260	6045	8	36	27.5	
Shower	SH1	PSH	62	1	1.5 gpm	5 Minutes	0.1	260	12080	16	27	77%	
Service Sink - Custodial	SS1	PSS1	3	1	2.5 gpm	2.5 Minutes	2	260	9750	13	13	40%	
Service Sink - Kitchen	SS2	PSS2	62	1	1.5 gpm	0.25 Minutes	1	260	6045	8	13	5.4	
Service Sink - Kitchen	SS4	PSS4	62	1	1.5 gpm	0.25 Minutes	1	260	6045	8	12	32%	
Dishwasher	DW1	PDW	1	1	126 gph	0.5 Uses / D	1	260	16380	22	22	0%	
Total										127	306	178.9	

Building Name		Z Number	Occupants	Days of Operation			Average						Proposed		
Fixture Type	Existing Fixture Type	Proposed Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day / Person*	Year**	Gallons / Year	CCF / Year	Baseline Year	CCF / Calculated	Savings	% Savings	
Water Closet	WC1, WC4	PWC	37	1	1.2 gpf	1 Flush	2	260	23,088	31	61	29.8	49%		
Urinal	U1, U9	PU	18.5	1	0.0 gpf	1 Flush	2	260	0	0	13	12.9	100%		
Lavatory	L1, L4, L16	PL	37	1	0.5 gpf	0.25 Minutes	3	260	3,608	5	21	16.4	77%		
Shower	SH1	PSH	37	1	1.5 gpm	5 Minutes	0.1	260	7,215	10	16	6.4	40%		
Service Sink - Custodial	SS1	PSS1	2	1	2.5 gpm	2.5 Minutes	2	260	6,350	9	9	0.0	0%		
Service Sink - Kitchen	SS2	PSS2	37	1	1.5 gpm	0.25 Minutes	1	260	3,608	5	8	3.2	40%		
Drinking Fountain	DF	PDF	37	1	8.0 gph	1 Minutes	2	260	2,565	3	3	0.0	0%		
Total										62	131	68.7	52%		
Building Name		Z Number	Occupants	Days of Operation			Average						Proposed		
Fixture Type	Existing Fixture Type	Proposed Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day / Person*	Year**	Gallons / Year	CCF / Year	Baseline Year	CCF / Calculated	Savings	% Savings	
Water Closet	WC5, WC6, WC9	PWC	21	1	1.2 gpf	1 Flush	2	260	13,104	18	20	2.3	12%		
Lavatory	L13, L14	PL	21	1	0.5 gpm	0.25 Minutes	3	260	2,048	3	5	1.8	40%		
Service Sink - Custodial	SS1	PSS1	1	1	2.5 gpm	2.5 Minutes	2	260	3,250	4	4	0.0	0%		
Service Sink - Kitchen	SS2	PSS2	21	1	1.5 gpm	0.25 Minutes	1	260	2,048	3	5	1.8	40%		
Total										27	33	6.0	18%		
Building Name		Z Number	Occupants	Days of Operation			Average						Proposed		
Fixture Type	Existing Fixture Type	Proposed Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day / Person*	Year**	Gallons / Year	CCF / Year	Baseline Year	CCF / Calculated	Savings	% Savings	
Water Closet	WC1	PWC	13	1	1.2 gpf	1 Flush	2	260	8,112	11	32	20.8	68%		
Urinal	U1	PU	6.5	1	0.0 gpf	1 Flush	2	260	0	0	7	6.8	100%		
Lavatory	L13	PL	13	1	0.5 gpm	0.25 Minutes	3	260	1,268	2	4	1.9	53%		
Shower	SH1	PSH	13	1	1.5 gpm	5 Minutes	0.1	260	2,335	3	6	2.3	40%		
Service Sink - Kitchen	SS2	PSS2	13	1	1.5 gpm	0.25 Minutes	1	260	1,268	2	3	1.1	40%		
Drinking Fountain	DF	PDF	13	1	8.0 gph	1 Minutes	2	260	901	1	1	0.0	0%		
Total										19	52	32.9	64%		

Building Name		Z Number	Occupants	Days of Operation											
			6	260											
Fixture Type	Existing Fixture Type	Proposed Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day	Days / Person*	Gallons / Year**	Proposed CCF / Year	Baseline CCF / Year	Calculated Savings	% Savings		
Water Closet	WC6	PWC	6	1	1.2 gpf*	1 Flush	2	260	3,744	5	5	0.0	0%		
Lavatory	L3, L13, L14	PL	6	1	0.5 gpm	0.25 Minutes	3	260	585	1	2	1.2	60%		
Total										6	7	1.2	17%		
Building Name		Z Number	Occupants	Days of Operation											
			8	260											
Fixture Type	Existing Fixture Type	Proposed Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day	Days / Person*	Gallons / Year**	Proposed CCF / Year	Baseline CCF / Year	Calculated Savings	% Savings		
Water Closet	WC1	PWC	8	1	1.2 gpf	1 Flush	2	260	4,952	7	19	12.8	66%		
Urinal	U8	PU	4	1	0.0 gpf	1 Flush	2	260	0	0	3	2.8	100%		
Lavatory	L8	PL	2	1	0.5 gpm	0.25 Flush	3	260	195	0	1	0.9	77%		
Service Sink - Custodial	SS1	PSS1	1	1	2.5 gpm	2.5 Minutes	2	260	3,250	4	4	0.0	0%		
Service Sink - Kitchen	SS2	PSS2	8	1	1.5 gpm	0.25 Minutes	1	260	780	1	2	0.7	40%		
Drinking Fountain	DF	PDF	8	1	8.0 gph	1 Minutes	2	260	555	1	1	0.0	0%		
Total										13	30	17.2	57%		
Building Name		Z Number	Occupants	Days of Operation											
			63	260											
Fixture Type	Existing Fixture Type	Proposed Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Average Uses / Day	Days / Person*	Gallons / Year**	Proposed CCF / Year	Baseline CCF / Year	Calculated Savings	% Savings		
Water Closet	WC2	PWC	63	1	1.2 gpf	1 Flush	2	260	39,312	53	70	17.5	25%		
Lavatory	LB	PL	31.5	1	0.5 gpf	0.25 Flush	3	260	3,071	4	8	4.1	50%		
Shower	L15	PSH	63	1	1.5 gpm	5 Minutes	0.1	260	12,285	16	22	5.5	25%		
Service Sink - Custodial	SS1	PSS1	1	1	2.5 gpm	2.5 Minutes	2	260	3,250	4	4	0.0	0%		
Service Sink - Kitchen	SS2	PSS2	31.5	1	1.5 gpm	0.25 Minutes	1	260	3,071	4	7	2.7	40%		
Total										82	111	29.8	27%		

Building Name		Z Number	Occupants	Days of Operation			Average Uses / Day / Person*			Gallons / Year**			Proposed CCF / Year			Baseline CCF / Year			
Fixture Type	Existing Fixture Type	Proposed Fixture Type	# of Occupants*	Full Time Equivalent	Flow Rate / Use	Duration	Uses / Day / Person*	Year**	Days / Year	Gallons / Year	Proposed CCF / Year	Calculated Savings	Baseline CCF / Year	Calculated Savings	Proposed CCF / Year	Calculated Savings			
Water Closet	WC2	PWC	3	1	1.2 gpf	1 Flush	2	260	1,672	3	3	0.8	25%						
Lavatory	L2	PL	1.5	1	0.5 gpm	0.25 Minutes	3	260	146	0	1	0.7	77%						
Service Sink - Custodial	SS1	PSS1	1	1	2.5 gpm	0.25 Minutes	2	260	350	4	4	0.0	0%						
Service Sink - Misc	SS5	PSS1	1	1	2.5 gpm	0.25 Minutes	1	260	163	0	0	0.0	0%						
Total											7	9	1.5	17%					
Building Name		Z Number	Occupants	Days of Operation			Average Uses / Day / Person*			Gallons / Year**			Proposed CCF / Year			Baseline CCF / Year			
PCB Annex Module		1334	2	Days of Operation			Average Uses / Day / Person*			Gallons / Year**			Proposed CCF / Year			Baseline CCF / Year			
Water Closet	WC8	PWC	2	1	1.2 gpf	1 Flush	2	260	1,248	2	2	0.6	25%						
Lavatory	L15	PL	2	1	0.5 gpm	0.25 Minutes	3	260	195	0	1	0.8	75%						
Service Sink - Kitchen	SS2	PSS2	2	1	1.5 gpm	0.25 Minutes	1	260	185	0	0	0.2	40%						
Service Sink - Misc	SS5	PSS1	2	1	2.5 gpm	0.25 Minutes	1	260	325	0	0	0.0	0%						
Total											3	4	1.5	37%					
Building Name		Z Number	Occupants	Days of Operation			Average Uses / Day / Person*			Gallons / Year**			Proposed CCF / Year			Baseline CCF / Year			
Apprentice Training Center		1306	12	Days of Operation			Average Uses / Day / Person*			Gallons / Year**			Proposed CCF / Year			Baseline CCF / Year			
Water Closet	WC2, WC6, WC8	PWC	12	1	1.2 gpf	1 Flush	2	260	7,488	10	13		20%						
Lavatory	L2, L13	PL	12	1	0.5 gpm	0.25 Minutes	3	260	1,170	2	6		73%						
Service Sink - Kitchen	SS2	PSS2	12	1	1.5 gpm	0.25 Minutes	1	260	1,170	2	3		40%						
Total											13	21	37%						
Visitor Usage		Z Number	Occupants	Days of Operation			Average Uses / Day / Person*			Gallons / Year**			Proposed CCF / Year			Baseline CCF / Year			
Visitor Usage		All Buildings	92	Days of Operation			Average Uses / Day / Person*			Gallons / Year**			Proposed CCF / Year			Baseline CCF / Year			
Water Closet	WC1	PWC	92	1	1.2 gpf	1 Flush	2	260	57,408	77	146		48%						
Urinal	U1	PU	46.0	1	0.0 gpf	1 Minutes	2	260	0	0	41		10%						
Lavatory	L1	PL	92	1	0.5 gpm	0.25 Minutes	3	260	8,970	12	57		73%						
Drinking Fountain	DF	PDF	92	1	8.0 gph	1 Minutes	2	260	6,379	9	9		0%						
Total											97	253	62%						

* Average assuming 50% Men & 50% Woman Using Fixture - Usage Values from LEED NC 2.2

** For normal schedule (5/152=260 days) & for 24/7 (365 days)

*** Assumed Average Visitor Occupancy is 10% of Normal Occupancy

**** Assumed Usage & Capacity (Elkay 8 GPH Capacity)

Irrigation Upgrade

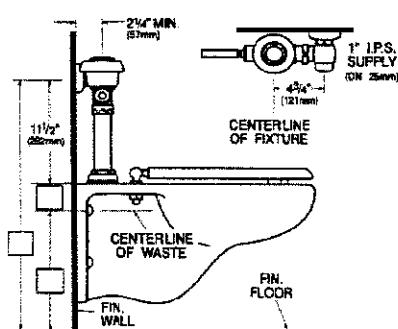
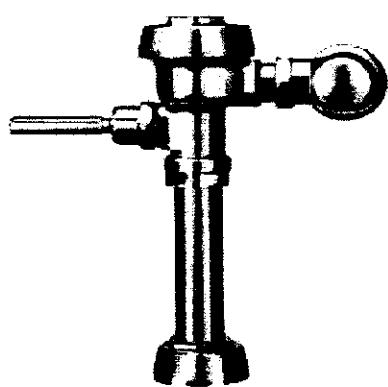
Baseline Irrigation Water Use			
Month	Days of Irrigation	Average Daily Irrigation (CCF)	Monthly Irrigation (CCF)
May	5	80	400
June	17	120	2,000
July	21	180	3,800
Aug	23	180	4,100
Sept	18	180	3,300
Oct	14	120	1,700
Total			15,300

Water Efficiency Measure Savings Summary - Irrigation (Ross Complex)						
Estimated Savings						
	Measure	Associated With Cost	Measure (%)	Total Savings / Year (CCF)	Savings / Year (\$)*	
WSM 6*	Replace 1,000 ft of Galvanized Piping	\$10,000	3%	500	\$520	
WSM 7*	Replace Ineffective Sprinkler Heads	\$10,000	12%	1,900	\$1,976	
WSM 8*	Install New Irrigation Controls	\$85,000	30%	4,600	\$4,784	
Total		\$105,000		7,000	\$7,280	

* Cost Savings assume water charge only (\$1.04 / CCF)

B.5 Existing Fixture Cutsheets

For the existing plumbing fixtures Entertia Energy, Inc. has attempted to obtain all relevant manufacture data sheets. Entertia Energy, Inc. was able to find a majority of the manufacturer data sheets, although some were unavailable, please see the fixture summary (Appendix B - B.3) for fixture manufacture & flow rates of fixtures not included in this section.



Royal 110 S.S. — Rev. 1 (12/01)
Copyright © 2001 SLOAN VALVE COMPANY Printed in the U.S.A.

Royal® Model Flushometer

110
111

- **Description**
Exposed Water Closet Flushometer, for floor mounted or wall hung top spud bowls.

- **Flush Cycle**

- Model 110 Water Saver (3.5 gpt/13.2 Lpf)
- Model 111 Low Consumption (1.6 gpt/6.0 Lpf)

- **Specifications**

Quiet, Exposed, Diaphragm Type, Chrome Plated Closet Flushometer with the following features:

- PERMEX™ Synthetic Rubber Diaphragm with Dual Filtered Fixed Bypass
- ADA Compliant Metal Oscillating Non-Hold-Open Handle with Triple Seal Handle Packing
- 1" I.P.S. Screwdrive Bak-Chek™ Angle Stop
- Free Spinning Vandal Resistant Stop Cap
- Adjustable Tailpiece
- High Back Pressure Vacuum Breaker Flush Connection with One-piece Bottom Hex Coupling Nut
- Spud Coupling and Flange for 1 1/4" Top Spud
- Sweat Solder Adapter with Cover Tube and Cast Set Screw Wall Flange
- High Copper, Low Zinc Brass Castings for Dezinification Resistance
- Non-Hold-Open Handle, Fixed Metering Bypass and No External Volume Adjustment to Ensure Water Conservation
- Flush Accuracy Controlled by CID™ Technology
- Diaphragm, Handle Packing, Stop Seat and Vacuum Breaker to be machined from PERMEX™ Rubber Compound for Chloramine Resistance

Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi-Red Brass. Valve shall be in compliance to the applicable sections of ASSE 1037 ANSI/ASME 112.19.6, and Military Specification V-29193.

- **Variations**

- HL-3 3" Metal Oscillating Push Button on Front of Valve (does not meet ADA requirements)
- TP Trap Primer
- YG Extended Bumper on Angle Stop (for seat with cover)
- YO Bumper on Angle Stop (for open front seal without cover)

See Accessories Section of the Sloan catalog for details on these and other Flushometer variations.



® Certified



® Listed by I.A.P.M.O.

This space for Architect/Engineer approval

SLOAN.

Made in the U.S.A.

SLOAN VALVE COMPANY • 10500 SEYMORE AVE. • FRANKLIN PARK, IL 60131
Ph: 1-800-9-VALVE-9 or 1-847-671-4300 • Fax: 1-800-447-8229 or 1-847-671-4380
<http://www.sloanvalve.com>

GERBER

VITREOUS CHINA

WC-2

TOILET
21-012

MAURICE™ ULTRA FLUSH®
Pressure-Assist One-Piece Toilet
Elongated

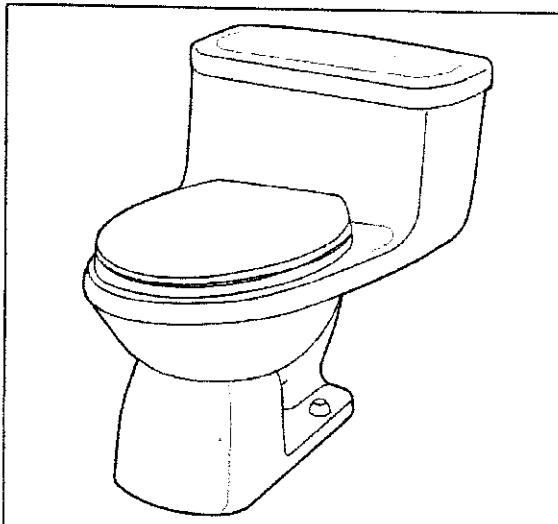
12" Rough-in

Features:

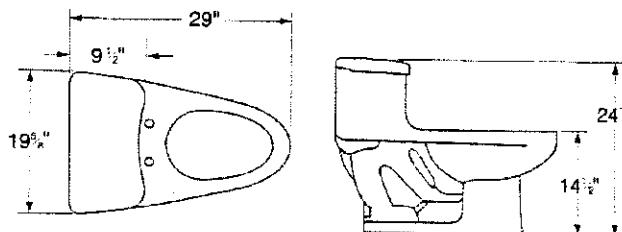
- Low Consumption 1.6 gpf (6.0 Lpf)
- Elongated Front
- Pressurized Flushing Action
- Siphon Jet
- Side Tank Lever
- 2 Bolt Caps
- Various Colors

Dimensions:

Height	24 1/2"
Width.....	19 5/8"
Depth	29"
Rough-in	12"
Water Surface from Rim	5 3/4"
Trapway (min).....	2"
Water Surface	11 3/4 x 9 1/2"
Water Seal.....	2 7/8"
Shipping Weight.....	107 lbs



21-012: Includes a Plastic Closed Front Top Cover Toilet Seat #99-212



THIS FIXTURE QUALIFIES
ACCORDING TO ASME TEST
PROCEDURES AS A LOW
CONSUMPTION WATER CLOSET
WITH AN AVERAGE CONSUMPTION
OF 1.6 gpf (6 Lpf) OR LESS



GERBER.
PROFESSIONAL PERFORMANCE
www.gerberonline.com

Job Name
Date
Model Specified
Quantity
Customer
Contractor
Architect/Engineer

Because we are committed to continual product improvement, specifications are subject to change without notice.

11/07

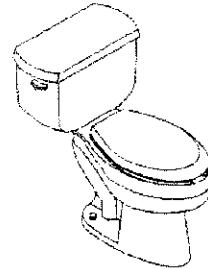


HIGHLINE

TOILET

K-3544

ADA

**FEATURES**

- 12" (30.5cm) rough-in
- Vitreous china
- 12" (30.5cm) x 10-1/4" (26cm) water area
- Elongated bowl
- Equipped with Sloan Flushmate™ - Sloan Valve Company
- 1.6 gpf
- Includes polished chrome trip lever
- Combination toilet
- 17-1/2" (44.5cm) high bowl is ADA compliant
- Less seat and supply
- With bedpan lugs (-L) or tank cover locks (-T)
- With right-hand trip lever (-RA)

CODES/STANDARDS APPLICABLE

Specified model meets or exceeds the following:

- ADA
- ASME/ANSI A112.19.2M
- ASME/ANSI A112.19.6M
- CABO/ANSI A117.1
- Energy Policy Act of 1992 (EPACT)
- IAPMO/UPC
- Canadian Standards Association (CSA)

SPECIFIED MODEL:

Model	Description	Colors/Finishes	
K-3544	Elongated bowl toilet (left hand trip lever)	<input type="checkbox"/> White	<input type="checkbox"/> Other
K-3544-T	Toilet with tank cover locks (left hand trip lever)	<input type="checkbox"/> White	<input type="checkbox"/> Other
K-4404 & K-4324-L	Toilet with bed pan lugs (left hand trip lever)	<input type="checkbox"/> White	<input type="checkbox"/> Other
K-3544-RA	Elongated bowl toilet (right hand trip lever)	<input type="checkbox"/> White	<input type="checkbox"/> Other
K-3544-TR	Toilet with tank cover locks (right hand trip lever)	<input type="checkbox"/> White	<input type="checkbox"/> Other
K-4404-RA & K-4324-L	Toilet with bed pan lugs (right hand trip lever)	<input type="checkbox"/> White	<input type="checkbox"/> Other
Recommended Accessories			
K-4664	Brevia™ seat with cover	<input type="checkbox"/> White	<input type="checkbox"/> Other
K-4653	French Curve™ seat with cover	<input type="checkbox"/> White	<input type="checkbox"/> Other
K-7637	Angle supply with stop	<input type="checkbox"/> CP	<input type="checkbox"/> PB
Optional Accessories			
K-9436-L	Trip lever, left-hand (non-CP)	<input type="checkbox"/> PB	<input type="checkbox"/> Other
K-9436-R	Trip lever, right-hand (non-CP)	<input type="checkbox"/> PB	

COLORS/FINISHES

- 0 White
- Other Refer to Fixtures Price Book for additional colors

Accessories:

- 0 White
- CP Polished Chrome
- PB Polished Brass

PRODUCT SPECIFICATION:

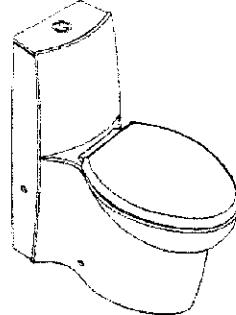
The elongated combination toilet shall be 12" (30.5cm) rough-in equipped with Sloan Flushmate™ - Sloan Valve Company. Toilet shall be made of vitreous china. Toilet shall have 12" (30.5cm) x 10-1/4" (26cm) water area. Toilet shall be 1.6 gpf (6 lpf). Toilet shall include polished chrome trip lever. Toilet shall be ADA compliant with 17-1/2" (44.5cm) high bowl. Toilet shall be less seat and supply. Toilet shall have bedpan lugs (-L). Toilet shall have right-hand trip lever (-RA). Toilet shall have tank cover locks (-T). Toilet shall be Kohler Model K-3544.

We reserve the right to make revisions without notice in the design of fixtures or in packaging unless this right has specifically been waived at the time the order is accepted.

Page 1 of 2
113112-4-EC



SAILE™

TOILET
K-3564**Features**

- Vitreous china
- Required minimum 12" (30.5 cm) rough-in
- One-piece
- Elongated bowl
- Dual flush flushing system
- High efficiency 1.6 gpf (6 lpf) or 0.8 gpf (3 lpf)
- 2-1/8" (5.4 cm) fully glazed trapway
- Skirted bowl design
- Includes polished chrome top-mount flush actuator
- Includes Saile seat and cover [K-4748]
- Less supply
- 28-1/2" (72.4 cm) x 14-1/4" (36.2 cm) x 28-3/4" (73 cm)

Codes/Standards Applicable

Specified model meets or exceeds the following:

- ASME A112.19.2
- ASME A112.19.14
- IAPMO/cUPC
- CSA B45
- Energy Policy Act of 1992

Specified Model

Model	Description	Colors/Finishes
K-3564	One-piece toilet – elongated bowl	<input type="checkbox"/> O <input type="checkbox"/> Other _____

Recommended Accessories			
K-7637	Angle supply with stop – 3/8" NPT connection	<input type="checkbox"/> CP	<input type="checkbox"/> Other _____
K-9384	Dual flush actuator	<input type="checkbox"/> G	

Colors/Finishes

- O: White
- Other: Refer to Price Book for additional colors/finishes

Accessories

- CP: Polished Chrome
- G: Brushed Chrome
- Other: Refer to Price Book for additional colors/finishes

Product Specification

The one-piece toilet with elongated bowl shall be made of vitreous china. Toilet shall be 28-1/2" (72.4 cm) in length, 14-1/4" (36.2 cm) in width, and 28-3/4" (73 cm) in height. Toilet shall feature a required minimum 12" (30.5 cm) rough-in and 2-1/8" (5.4 cm) fully glazed trapway. Toilet shall feature a dual flush flushing system. Toilet shall be high efficiency with 1.6 gpf (6 lpf) or 0.8 gpf (3 lpf). Toilet shall feature a skirted bowl design. Toilet shall include a polished chrome top-mount flush actuator. Toilet shall include a Saile seat and cover [K-4748]. Toilet shall be less supply. Toilet shall be Kohler Model K-3564.

WC-6

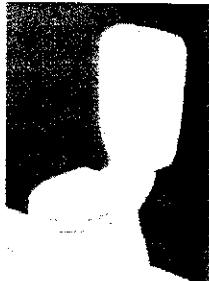
[Home](#) [Products](#) [Resources](#) [Where To Buy](#) [News & Events](#) [About Us](#) [Contact Us](#)

CAROMA - A world leader of innovative bathroom products

Exceptional

performance... **Caravelle 270 Round Front Plus**
Smart design...

Conservation with style

**# Products**

- [Bathroom Sinks](#)
- [Toilets](#)
- [Toilet Seats](#)
- [Urinals](#)
- [Parts & Accessories](#)



[Additional information](#)
[Technical Specifications](#)

Part #

Caravelle tank: 629435W/BI

270 bowl: 609159W/BI

Optional accessory:

Anti-vandal kit 413276

Recommended seats

Easy Closing: 326222W/BI

Detachable: 301032W/BI

Slimline design, European styling

- High efficiency toilet (HET) - 1.60.8 gallons (6/3 liters) per flush
- Two piece, two button dual flush toilet
- Large fully concealed trapway
- Virtually unblockable
- 10-12" adjustable rough-in
- WaterSense-approved

Standard: 326707W/BI

Wooden: 326606

Commercial: 328016W

Dimensions
 29" L x 14 1/4" W x 32 7/8" H (bowl height = 15")

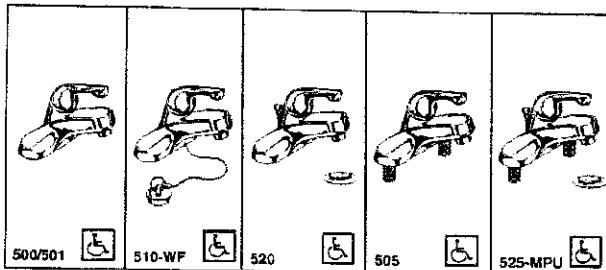
[View all Round Front Plus seats](#)

Caravelle 270 also available in:
[Easy Height Elongated](#)
[Easy Height Round Front Plus](#)
[Elongated \(standard height\)](#)

Available colors:

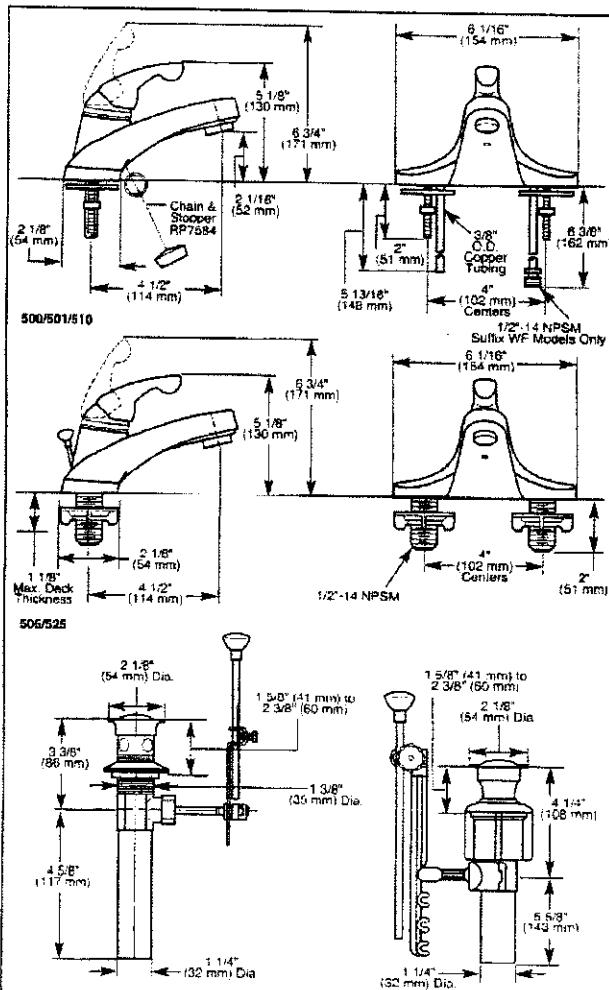
W = White, BI = Biscuit

[View complete Caravelle Range](#)**Complimentary sinks**[Leda Vasque Above Counter](#)[Leda Vasque Inset](#)[Leda Vasque Semi-Recessed](#)[View complete Leda Vasque](#)[Range](#)



Submitted Model No.: _____

Specific Features: _____



Delta reserves the right (1) to make changes in specifications and materials, and (2) to change or discontinue models, oom without notice or obligation. Dimensions are for reference only.

DELTA

LAVATORY FAUCETS

- Single Handle
- Deck Mount
- 2 and 3 Hole Sink Applications
- 4" Centerset



UL Listed in US and Canada
Safety Standard and Certified
in accordance with
ANSI Z123-1992
21c

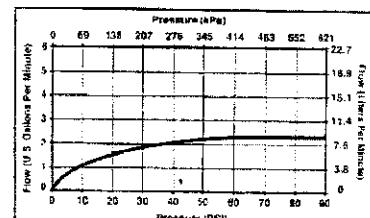


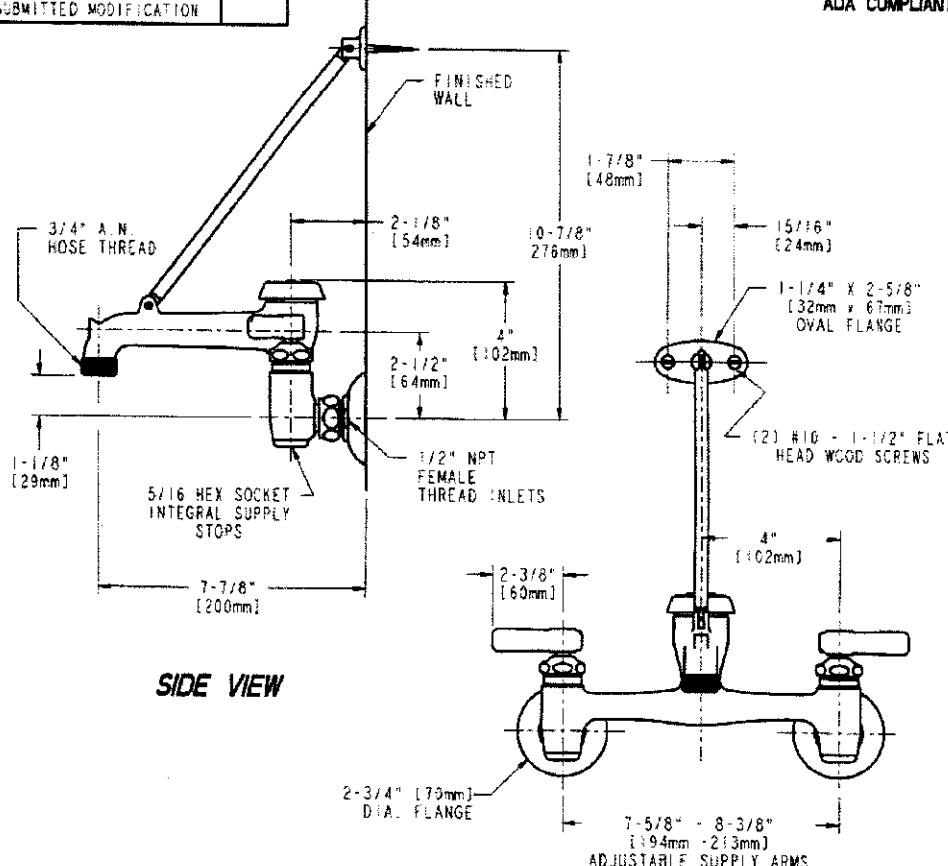
COMPLIES WITH:

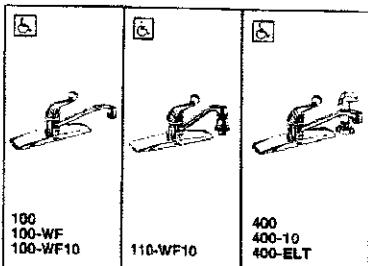
- ASME A112.18.1M-1996
- CSA B125.3
- Indicates ADA Compliance to
CARB/ANSI A117.1-1992
- IAPMO Listed
- CSA Certified
- ACTM F409 (for non-metallic drain)

STANDARD SPECIFICATIONS:

- Single handle lavatory deck faucets for exposed mounting on two and three hole sinks.
- 4" (102 mm) centerset.
- Solid brass forged body
- 4 1/2" (114 mm) long spout.
- Lever handle. Control mechanism shall be of the rotating stainless steel ball type with replaceable non-metallic seats operating in stainless steel lined sockets.
- Control handle shall return to neutral position when valve is turned off.
- Models 500, 501 and 510 and 520 Series supplied with 3/8" O.D. copper supply tubes.
- Models with suffix "WF" supplied with 1/2"-14 NPSM adapters.
- Models 525 and 525 Series supplied with 1/2"-14 NPSM threaded male inlet shanks.
- Models with Snap-N-Pop-Up® chain have polypropylene pop-up type fitting with plated flange and stopper.
- Models with metal drain have pop-up type fitting with plated flange and stopper.



 CHICAGO FAUCETS® <i>a GEBERIT company</i>		FITTING NO. 897 SUBMITTED MODEL NO.  ADA COMPLIANT	
JOB NAME _____ ITEM NO. _____			
<input type="checkbox"/> SUBMITTED AS SHOWN <input type="checkbox"/>			
<input type="checkbox"/> SUBMITTED AS NOTED <input type="checkbox"/>			
<input type="checkbox"/> SEE ATTACHED FOR SUBMITTED MODIFICATION <input type="checkbox"/>			
 <p>SIDE VIEW</p> <p>FRONT VIEW</p>			
TECHNICAL DATA		DATE: 05-22-07 BY: S10 CHK'D: APP'D: REV: A	
- WALL MOUNTED FITTING - VACUUM BREAKER SPOUT WITH PITCH HOOK AND WALL BRACE - 360° INDEXED LEVER HANDLES - QUATURN OPERATING CARTRIDGES - FINISH: CHROME PLATE OR ROUGH CHROME		- ADJUSTABLE SUPPLY ARMS - INTEGRAL SUPPLY STOPS - ASME A112.18.1M COMPLIANT - CSA B125 COMPLIANT	



Submitted Model No.: _____

Specific Features: _____

DELTA.

KITCHEN FAUCETS

- Classic Series
- Single Handle Deck Mount
- 3 and 4 Hole Sink Applications

STANDARD SPECIFICATIONS:

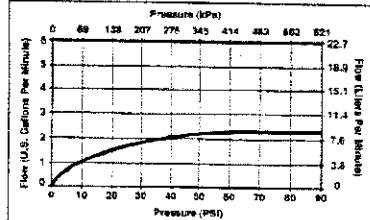
- Solid brass fabricated body.
- Standard 8" (203 mm) long spout swings 360°.
- 10" (254mm) long spout swings 360°. Standard on models 100-WF10, 110-WF10 and 400-10.
- Lever handle. Control mechanism shall be of the rotating stainless steel ball type with replaceable non-metric seats operating in stainless steel lined sockets.
- Control handle shall return to neutral position when valve is turned off.
- Model 400 series with spray attachment has anti-siphon device as integral part of valve body.
- Model 100, 110 and 400 series without dispenser can be field converted from 8" (203 mm) to 6" (152 mm) centers.
- Quick Snap® vegetable sprayer hose with white sprayhead on model 400 series - 45° (114mm) long hose.
- 3/8" O.D. copper tube inlets - 10" (254mm) long.
- Models with suffix "WF" supplied with 1/2"-14 NPSM adapters.
- Model 400-ELT has 18" (457mm) extra long supply tubes.
- Model 110-WF10 ships with 360° swivel spray aerator (RP2189).

WARRANTY

- Lifetime Faucet and Finish Limited Warranty to the original consumer purchaser to be free from defects in material and workmanship.
- 5 Year Limited Warranty for usage in all industrial commercial and business applications.

COMPLIES WITH:

- ASME A112.18.1 / CSA B125.1
- NSF 61
- Indicates ADA compliance to
- ICC/ANSI A17.1
- IAPMO Listed
- CSA Certified



DELTA.
FAUCET COMPANY

1000 University Avenue, Seattle, WA 98101
Call toll-free 1-800-448-8666 • Fax 206-467-1010
www.deltafaucet.com • E-mail: delta@deltafaucet.com

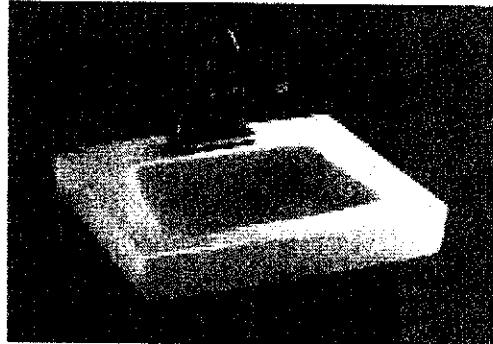
D-1

American Standard

ROXALYN™
WALL-HUNG LAVATORY
 VITREOUS CHINA

ROXALYN WALL-HUNG LAVATORY

- Vitreous china
 - Front overflow
 - Faucet ledge.
- Shown with 7401.172H Amarillis Heritage faucet with Wrist Blade handles (not included)



- Faucet holes on 203mm (8") centers:**
- 0194.019 For exposed bracket support
 - 0194.076 For concealed arms support

- Faucet holes on 102mm (4") centers (Illus.):**
- 0195.016 For exposed bracket support
 - 0195.073 For concealed arms support

- Single faucet hole on right:**
- 0194.035 For exposed bracket support
 - 0194.092 For concealed arms support

- Single center faucet hole:**
- 0194.225 For exposed bracket support
 - 0194.043 For concealed arms support

Nominal Dimensions:
 508 x 457mm (20" x 18")

Bowl sizes:
 362mm (14-1/4") wide, 279mm (10-3/4") front to back, 178mm (7") deep

NOTE: Roughing-in information shown on reverse side of page

Compliance Certifications -
Meets or Exceeds the Following Specifications:
 • ASME A112.19.2M for Vitreous China Fixture.

To Be Specified

- | | | | |
|--|---|-------------------------------|---------------------------------|
| <input type="checkbox"/> Color: | <input type="checkbox"/> White | <input type="checkbox"/> Bone | <input type="checkbox"/> Silver |
| <input type="checkbox"/> Faucet: | <input type="checkbox"/> Faucet Finish: | | |
| <input type="checkbox"/> Supplies: | <input type="checkbox"/> 1-1/4" Trap: | | |
| <input type="checkbox"/> Nipple: | | | |
| <input type="checkbox"/> Bracket Support (if required): | | | |
| <input type="checkbox"/> 485742-600: 361mm (15") painted bracket | | | |
| <input type="checkbox"/> Concealed Arms Support (by others): | | | |

* See faucet section for additional models available

SPS 0194/0195

LAV-061/
 COM/INS-048

Revised 4/96

© 2000 American Standard Inc.

Item # _____
Quantity _____

C.S.I. Section 1140

HOBART

701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com

AM SELECT DISHWASHER

HOBART

STANDARD FEATURES

- .74 gallons per rack final rinse water
- 58 racks per hour – hot water sanitizing
- 65 racks per hour – chemical sanitizing
- NSF pot and pan listed for 2-, 4- & 6- minute cycles
- Timed wash cycles for 1, 2, 4 or 6 minutes
- Solid state, integrated controls with digital status indicators
- Self-draining, high efficiency stainless steel pump and stainless steel impeller
- Stainless steel drawn tank, tank shelf, chamber, trim panels, frame and feet
- Spring counterbalanced chamber with polyethylene guides
- Revolving, interchangeable upper and lower anti-clogging wash arms
- Revolving, interchangeable upper and lower rinse arms
- Slanted, self-locating, one-piece scrap screen and basket system
- Automatic fill
- Door actuated start
- Automatic drain closure
- Vent fan control
- External booster activation
- Delime cycle
- Service diagnostics
- NAFEM Data Protocol capable
- Straight-through or corner installation
- Hot water or chemical sanitization

MODEL

- AM15

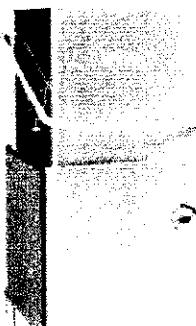
OPTIONS AT EXTRA COST

- Gas heat
- Sense-A-Temp™ 70°F rise electric booster heater
- Single point electrical connection for booster equipped machines (3 phase only)

ACCESSORIES

- $\frac{1}{4}$ " pressure regulator valve
- Peg rack
- Combination rack
- Splash shield for corner installations
- Flanged and seismic feet
- End of cycle audible alarm (field activated)
- Delime notification (field activated)
- Drain water tempering kit

Specifications, Details and Dimensions on Inside and Back.



VOLTAGE

- 208-240/60/1
- 208-240/60/3
- 480/60/3
- 200-240/50/3*
- 380-415/50/3*

*Not submitted for UL/CUL Listing

F-40078 - AM Select Dishwasher

Page 1 of 8

AM SELECT DISHWASHER

B.6 Proposed Fixture Cutsheets

Prepared WC

SLOAN.

SLOAN SOLIS™

MODEL
RESS-C-1.6/1.1
Solar Powered Dual Flush

- **Description**
Exposed Solar Powered, Sensor Activated Sloan SOLIS™ Dual Flush Model Retrofit Conversion Kit for Exposed Closet Flushometers
- **Flush Cycle**

<input type="checkbox"/> Full Flush (Large Button) / 1.6 gpf/6.0 Lpf <input type="checkbox"/> Reduced Flush (Small Button) / 1.1 gpf/4.2 Lpf	AVG 1.35 gpf	Proposed water closet
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- **Specifications**
 - Quiet, Exposed, Sloan Solis™ Dual Flush Solar Powered, Sensor Activated Closet Flushometer Retrofit Conversion Kit for Sloan Royal®, Regal Pro® and Regal® Flushometers with the following features:
 - Solar Powered. The sensor assembly is powered by a solar cell that will harvest power from artificial indoor light, either incandescent or fluorescent light, and use it as the energy source. The solar cell can provide approximately 100% power with 650 illuminance (lux).
 - Four (4) Size AA Battery Back-up Power Source
 - "Low Battery" Flashing LED
 - If the user is present for less than one minute and leaves the sensing zone or chooses the small override button, a reduced flush initiates (1.1 gpf/4.2 Lpf) eliminating liquid and paper waste, saving 1/2 gallon of water.
 - If the user is present for greater than one minute and leaves the zone or chooses the large override button, the full flush initiates (1.6 gpf/6.0 Lpf) eliminating solid waste and paper
 - Reduces water volume by up to 30% when a reduced flush occurs
 - PERMEX™ Synthetic Rubber Diaphragm with twin linear filtered bypass and vortex cleansing action
 - Flex tube Diaphragm designed for improved life and reduced maintenance
 - ADA Compliant Sloan Solis™ Electronic Dual Flush Solar Powered Infrared Sensor for automatic "No Hands" operation
 - Infrared Sensor with Multiple-focused, Locular Sensing Fields for high and low target detection
 - Latching Solenoid Operator
 - Engineered Metal Cover with replaceable Lens Window
 - User friendly three (3) second Flush Delay
 - Courtesy Flush™ Override Buttons
 - Infrared Sensor Range Adjustment Screw
 - CP Handle Cap
 - Initial Set-up Range Indicator Light (first 10 minutes)
 - Fixed Metering Bypass and Nu External Volume Adjustment to Ensure Water Conservation
 - Installation Tools provided
 - Diaphragm, molded from PERMEX™ Rubber Compound for Chloramine resistance
 - 100% of the energy used in manufacturing is offset with Renewable Energy Sources - Wind Energy
- **Special Finishes**

<input type="checkbox"/> PB Polished Brass (PVD Finish)	<input type="checkbox"/> GP Gold Plate (PVD Finish)	<input type="checkbox"/> BN Brushed Nickel (PVD Finish)	<input type="checkbox"/> SF Satin Chrome
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See Accessories Section and Sloan SOLIS™ Dual Flush Accessories Section of the Sloan catalog for details on these and other Sloan Solis™ Dual Flush Flushometer variations.



RESS-C shown installed on an existing Sloan Flushometer.

RESS-C units do NOT include a Valve Body, Supply Stop or Vacuum Breaker.

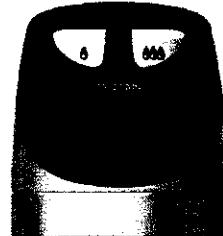
SLOAN.



**EPA
GREEN
POWER
PARTNER**

Sloan Valve Company is buying renewable energy certificates to meet 100% of the company's purchased electricity use at its Hermon Park, IL facility.

Sloan SOLIS™ Dual Flush RESS-C S.S. — Rev. Xb (05/08)



► ADA Compliant

Sloan SOLIS™ Solar powered, Dual Flush Flushometers can also be activated via multi-lobular infrared sensor. By detecting user presence and duration, the Sloan Solis™ Smart Sense Technology™ will determine the proper flush volume for unequalled water efficiency.

► Manual Operation

Sloan SOLIS™ Solar powered, Dual Flush Flushometers incorporate intuitive Split-button design for easy manual activation. The small button controls the reduced flush cycle (1.1 gpf/4.2 Lpf), the large button controls the full flush cycle (1.6 gpf/6.0 Lpf). Straightforward graphics alert user to proper activation. Reduced flush for liquid waste, full flush for solid waste. To further educate the user, two (2) instructional wall plates are included with each Sloan Solis™ Flushometer.

► Functional & Hygienic

Touchless, sensor operation eliminates the need for user contact to help control the spread of infectious diseases. The Sloan SOLIS™ Solar powered, Dual Flush Flushometers are provided with Reduced or Full Flush Override Buttons to allow a "courtesy flush" for individual user comfort.

► Warranty

3 year (limited)



This space for Architect/Engineer approval

Architect Name _____ Date _____

Model Specified _____ Quantity _____

Variations Specified _____

Customer/Wholesaler _____

Contractor _____

Architect _____

The information contained in this document is subject to change without notice.

SLOAN.
OPTIMA SYSTEMS
Battery Powered Flushometers

G2[®]
OPTIMA
plus*

Proprietary
Label/Model
Model
8186

► **Description**

Exposed, Battery Powered, Sensor Operated G2® Model Urinal Flushometer

► **Flush Cycle**

- Model 8186-0.5 (0.5 gpf/1.9 Lpf)
- Model 8186-1.0 Low Consumption: (1.0 gpf/3.8 Lpf)
- Model 8186 Water Saver (1.5 gpf/5.7 Lpf)

► **Specifications**

Quiet Exposed Diaphragm Type, Chrome Plated Urinal Flushometer for either left or right hand supply with the following features:

- PERMEX® Synthetic Rubber Diaphragm with Dual Filtered Fixed Bypass
- Flex Tube Diaphragm designed for improved life and reduced maintenance
- ADA Compliant OPTIMA Plus® Battery Powered Infrared Sensor for automatic "No Hands" operation
- Infrared Sensor with Multiple-focused, Lobular Sensing Fields for high and low target detection
- Latching Solenoid Operator
- Engineered Metal Cover with replaceable Lens Window
- Courtesy Flush™ Override Button
- Four (4) Size AA Batteries factory installed
- "Low Battery" Flashing LED
- Infrared Sensor Range Adjustment Screw
- Initial Set-up Range Indicator Light (first 10 minutes)
- Chrome Plated Metal Handle Cap
- ¾" IPS Screwdriver Bak-Chek® Angle Stop
- Free Spinning, Vandal Resistant Stop Cap
- Adjustable Tailpiece
- High Back Pressure vacuum Breaker Flush Connection with One-piece Bottom Hex Coupling Nut
- Spud Coupling and Flange for ¾" Top Spud
- Sweat Solder Adapter with Cover Tube and Cast Set Screw Wall Flange
- High Copper, Low Zinc Brass Castings for Dezincification Resistance
- Fixed Metering Bypass and No External Volume Adjustment to Ensure Water Conservation
- Flush Accuracy Controlled by CID™ Technology
- Diaphragm, Stop Seat and Vacuum Breaker to be molded from PERMEX® Rubber Compound for Chloramine resistance

Valve Body, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi-Red Brass. Valve shall be in compliance with the applicable sections of ASSE 1037, ANSI/ASME A112.19.2 and Military Specification V-29193. Installation conforms to ADA requirements.

► **Variations**

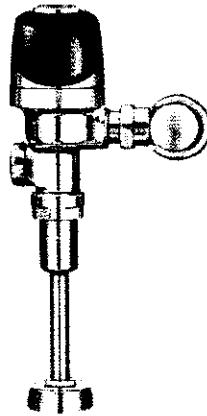
- LH Valve Body Supplied Less Handle Opening

► **Special Finishes**

- PB Polished Brass (PVD Finish)
- GP Gold Plate (PVD Finish)
- BN Brushed Nickel (PVD Finish)
- SF Satin Chrome

See Accessories Section and OPTIMA Accessories Section of the Sloan catalog for details on these and other OPTIMA Plus® Flushometer variations.

150 °F



► **ADA Compliant**

► **Automatic**

Sloan G2 Optima Plus® Flushometers activate via multi-lobe sensor detection to provide the ultimate in sanitary protection and automatic operation. A battery powered infrared sensor sets the flushing mechanism after the user is detected and completes the flush when the user steps away.

► **Functional & Hygienic**

Touchless, sensor operation eliminates the need for user contact to help control the spread of infectious diseases. The G2 Optima Plus Flushometer is provided with an Override Button to allow a "courtesy flush" for individual user comfort.

► **Economical**

Sloan installed batteries speed installation and provide years of metered flushing to control the use of water and energy. Batteries can be changed without turning off the water.

► **Warranty**

3 year (limited)



This space for Architect/Engineer approval

Job Name _____ Date _____

Model Specified _____ Quantity _____

Architects Specified _____

Customer/Wholesaler _____

Contractor _____

Architect _____

The information contained in this document is subject to change without notice.

Revised
Waterless
ORIGINAL

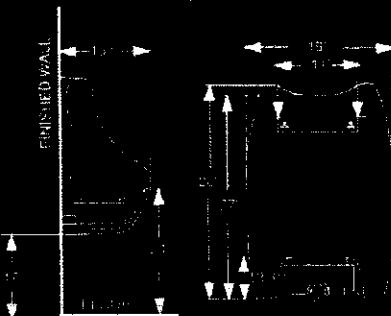
ZEROFLUSH
ZERO

ZERO WATER TOILETS

MODEL ZF - 101

DES:
Mounting Hardware

SCREW



ZF - 101

Corporate Headquarters: 3008-3016 Lions Court, Kissimmee, Florida 34744

EMAIL: SALES@ZEROFLUSH.COM PHONE: 1.888.785.9376 PHONE: 407.935.1180 FAX: 407.935.1103

WWW.ZEROFLUSH.COM

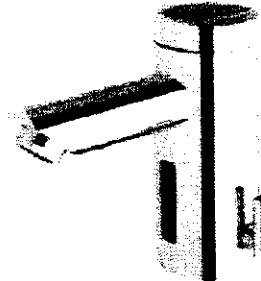


EAF-275

\$ 530



Solar Powered, Electronic
Hand Washing Faucet



EAF-275-ISM

Description

Solar Powered, Sensor Activated Electronic Hand Washing Faucet for pre-tempered or hot and cold water operation.

Models

- EAF-275 Single Supply Faucet (For pre-mixed water only)
- EAF-275-ISM With Integral Spout Temperature Mixer (For Hot and Cold water supply connection)

Flow Rate

- 0.5 gpm/1.9 Lpm Aerator Spray Head

Specifications

Solar Powered, Sensor Activated, Electronic, Chrome Plated Constructed Metal, Hand Washing Faucet with the following features:

- Modular One-piece Construction with all Concealed Components above deck
- Double Infrared Sensors with Automatic Setting Feature
- Automatic Self-adapting Sensor Technology
- Solar Powered
- Magnetic Solenoid Valve
- Water Supply Connection with Flexible High-pressure Hose and Strainer
- Appropriate Mounting Hardware Included
- Includes 6 VDC Lithium Battery Back-up Power Source

Variations

- ISM Integral Spout Mixer

Accessories

- Trim Plates
 - ETF-312-A Trim Plate for 4" (102 mm) Centerset Sink
 - ETF-510-A Trim Plate for 8" (203 mm) Centerset Sink

Trim Plates must be specified and ordered separately.

- Aerators
 - EAF-10 2.2 gpm/8.3 Lpm Aerator Spray Head
 - EAF-13 2.2 gpm/8.3 Lpm Laminar Flow Spray Head

Faucet Extension Kits

- EAF-36-A Faucet Extension Kit
- EAF-30-A Faucet Extension Kit (International Version - has 1/2G net connections)

Warranty

3 year (Product)

ADA Compliant



The new Optima solar powered faucet — Bringing intelligence to water

The first solar powered electronic faucet's integrated power plant transforms light into electrical energy. Optimal performance any place, any time: in sunlight or even artificial light. The unique "Solar Energy Module" utilizes any light source efficiently.

Sloan's new Optima EAF-275 Series electronic hand washing faucets operate by means of a dual infrared sensor and microprocessor based logic. The modular design incorporates all of the operating components of the faucet, including the sensor, solenoid, circuitry and solar energy module above the sink within a die-cast metal spout.

ISM models feature an integral temperature control lever which allows the user to adjust the water temperature. This adjustment can also be converted to a fixed setting. EAF faucets ordered without the ISM variation must be connected to a single, pre-tempered water supply.

This space for Architect/Engineer approval

Job Name	____	____	____
Model Specified	____	____	Quantity _____
Valentines Specified	____	____	____
Customer/Wholesaler	____	____	____
Contactor	____	____	____
Architect	____	____	____

The information contained in this document is subject to change without notice.

Optima Solis EAF-275 S.S. — Rev. Cd 109-09

Proposed
Low flow
Shower
Head

10/6/2008 1:12 PM

Delta Water-efficient Showerhead : Bath Products : Delta Faucet	http://www.deltafaucet.com/bath/	1s/RP46384.html
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DELT A

Delta Water-efficient Showerhead

Showerhead

List Price as Shower (US \$)
Showers - Catalog number: RP46384 MSRP: \$16.95
10.8L
\$4.95

Smart features

Water-efficient Showerhead

Water Efficient Showerhead
Module # RP46384

• Features Low Flow, Water Efficient H2O-Knot® Technology
• Features Low Flow, Water Efficient H2O-Knot® Technology

• 3.5" Spray Face diameter
• 4.75" showerhead height
• Lifetime Placard Free Warranty

• High Efficiency Technology
• In Water-Efficient
• In Water-Efficient

1. The manufacturer's list price (U.S. dollars) is shown for comparison only. The actual retail price may be lower than the price shown.

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1 of 1