

# **Skilled Nursing Facility Retrofit Program: Lessons from an Institutional Direct-Install Program**

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The Upper San Gabriel Valley Municipal Water District conducted a pilot program focusing on saving water at Skilled Nursing Facilities (SNFs). Co-funding for the program was obtained from the Metropolitan Water District of Southern California and the United States Bureau of Reclamation.

The primary goals of the SNF retrofit program were: 1.) To assist SNFs in retrofitting existing plumbing devices with water-saving devices and 2.) To determine the accuracy of water surveys conducted for SNFs and similar facilities.

During Phase I of the Program, fifteen SNFs were selected and visited by the Program Consultants who conducted full indoor/outdoor water use surveys for each of those facilities. The participating SNFs were a mix of convalescent homes and institutions for developmentally disabled adults. Based on survey results, a full report was developed for each site discussing potential water saving actions (WSAs), estimated water savings and payback times.

Phase II of the Program involved the installation of all recommended water saving devices and an analysis of pre-retrofit and post-retrofit water usage.

## **PROGRAM IMPLEMENTATION**

An RFP for selecting the Phase II Consultant was compiled based on the survey information from Phase I. Despite having copies of the water survey information, it was necessary for the selected Phase II Consultants to visit each of the facilities and compile a listing of actual fixture models for ordering devices that would fit correctly.

The Program Consultants were responsible for obtaining all necessary business licenses and permits as required by the cities in which the SNFs were located. Most of the cities did waive plumbing permit fees once information concerning this program was provided.

Concurrently, the Upper District developed a Participant Agreement that included written authorization to commence with work, indemnity clauses and the responsibilities of the SNF under this program. The Program Consultants were not allowed to begin any work at an SNF prior to the Upper District receiving a signed copy of the Participant Agreement.

The team handling all of the retrofits consisted of only two individuals: a licensed plumber and an assistant. Such a minimal amount of staffing, for a program of this size, might seem to cause lengthy delays in completing retrofits. Yet this minimal staffing strategy quickly revealed numerous benefits. With only a two-person team handling the retrofits, there was insignificant interruption of the SNFs' daily routines. In fact the majority of staff at the facilities never saw the team at work in their buildings. Having one plumber managing all of the retrofits ensured that all work was done in a consistent manner and met the same level of quality.

Once installations were completed at a facility the Program Consultants scheduled a final walk-through inspection. The final walk-through required that the Maintenance Supervisor of the facility be present along with the Program Consultant's plumber and a representative of the Upper District. An Inspection/Approval form was created for use during the inspection to document that all parties were satisfied with the completed installations. The final walk-

through required a visual inspection of each installed ULFT and most other installed devices. While this may seem a tedious process it ensured that all involved parties were aware of exactly what was installed and satisfied with the completed work. It also gave the plumber the opportunity to re-check the installed devices to make certain everything was working correctly.

The Administrator of each SNF was presented with two copies of the labor/parts warranty covering the sites' retrofits for one year from the date the Inspection/Approval form was signed. This warranty was vital for two reasons: 1.) From a customer service perspective, it assured the facility that the District and Program Consultants were not going to disappear once the devices were installed - that there would be assistance should a question or problem arise; 2.) From a quality assurance/conservation perspective, it ensured that devices were working properly, particularly during the crucial months right after installation when plumbing device problems are most apt to occur.

The agreement signed between the SNFs and the Upper District stipulated that the SNF would be responsible for filling out an evaluation form at the end of the program. Ten of the fifteen facilities completed and returned the evaluations. The predominant response of those SNFs that returned the evaluations was "extremely satisfied". The evaluations also indicated that the participants were overwhelmingly satisfied with the Program Consultants and water district staff they communicated with during the course of the program.

#### PROGRAM COSTS AND PAYBACK TIMES

The overall cost for retrofitting the SNFs was \$175,072.29. This cost included all devices, additional parts, labor, and associated program administrative costs.

The program cost for the Santa Anita SNF was unusually high when compared to the other participating SNFs since the number of toilet retrofits completed (145) was more than twice that of any other participating facility. This facility's toilet retrofits comprised 1/5<sup>th</sup> of the total toilets retrofitted during this program. Yet the predominant factor influencing cost, at this facility, was the *type* of ULFT installed: mainly wall hung flush valve toilets. Since this was a 'like-for-like' retrofit program (i.e. the type of ULFT installed had to be the same style as the toilet being removed), the wall hung toilets were replaced with wall hung ULFTs. The cost of wall hung flush valve toilets, and related labor cost, translated into almost twice the program cost of other participating SNFs. However the pre-retrofit estimated project cost (\$49,754), for this site, was still higher than the actual project cost (\$43,508). The extensive payback time is actually due to the unusually low water savings at this facility: only 1,607 ccf per year, which is approximately 1/7th of the original, estimated yearly savings of 7,398 ccf. This translates into a payback time of over 32 years for the individual facility while the site was originally estimated to have an 8-year payback time.

Two other facilities ended up with unusually long payback times as well: 1.) Ramona Care Center which was originally estimated to have a payback time of 2.9 years but will actually be 18.9 years and 2.) San Gabriel Convalescent Center which was originally estimated to have a payback time of 4 years but will be a payback time of 18.2 years.

In both of these cases, the estimated project costs were close to actual costs yet the actual water savings were less than 1/5<sup>th</sup> of the estimated amount of water savings. The decreased amount of water savings, in turn, increased the length of payback time. The cause for such limited water savings at these facilities has remained undiscovered.

There are also cases in which the payback times were notably underestimated. El Encanto was originally estimated to have a payback time of 9.9 years but will actually recoup costs for the site in a mere 3.5 years. Since the yearly volume of water saved was double the estimated amount, the payback time for this site's installations was extensively decreased. Mission Lodge is another site at which the payback time (4.9 years) will end up being much sooner than the original estimate of 7.2 years.

## WATER CONSUMPTION ANALYSIS

A water consumption data sheet was developed for each facility. The data sheets included several months of post-retrofit billing data compared to the same months from the year previous to the retrofits. This method ensured that seasonal changes affecting water use were consistent for both the pre-retrofit and post-retrofit analysis. Table 1 summarizes this data and lists the average monthly and yearly water consumption with calculated savings for each of the fifteen facilities.

**Table 1 - Average Water Consumption and Savings**

Skilled Nursing Facility	Monthly Avg. Consumption (ccf)		Monthly Avg. Saved (ccf)	Yearly Avg. Consumption (ccf)		Yearly Avg. Saved (ccf)
	Pre-Retrofit	Post-Retrofit		Pre-Retrofit	Post-Retrofit	
Community Care Center	606	447	159	7,269	5,363	1,906
Santa Anita Conv. Hosp.	1,831	1,697	134	21,974	20,368	1,607
Ramona Care Center	132	89	43	1,584	1,073	511
Garden View Care Center	504	378	126	6,047	4,538	1,509
San Gabriel Conv. Center	793	740	54	9,521	8,878	643
Wellesley Manor Conv. Hosp.	495	186	309	5,940	2,229	3,711
Golden State Care Center	613	491	122	7,356	5,895	1,461
Green Acres Lodge	465	297	168	5,578	3,560	2,017
Monterey Care Center	782	446	336	9,379	5,350	4,029
Sunset Manor Conv. Hosp.	711	249	463	8,537	2,984	5,552
Beverly Manor Conv. Hosp.	437	308	129	5,247	3,699	1,548
Live Oak Rehabilitation Center	664	418	247	7,973	5,015	2,958
Mission Lodge Sanitarium	789	536	253	9,471	6,434	3,038
Huntington Drive Conv. Hosp.	485	125	360	5,823	1,500	4,323
El Encanto Conv. Hosp.	1,058	466	592	12,690	5,587	7,103
<b>Total</b>	<b>10,366</b>	<b>6,873</b>	<b>3,493</b>	<b>124,388</b>	<b>82,472</b>	<b>41,916</b>

*Billing data from the 1994/1995 year was utilized for El Encanto's pre-retrofit consumption levels since the site had a malfunctioning meter, resulting in inaccurate consumption records from Dec. 1995 until March/April, 1997.*

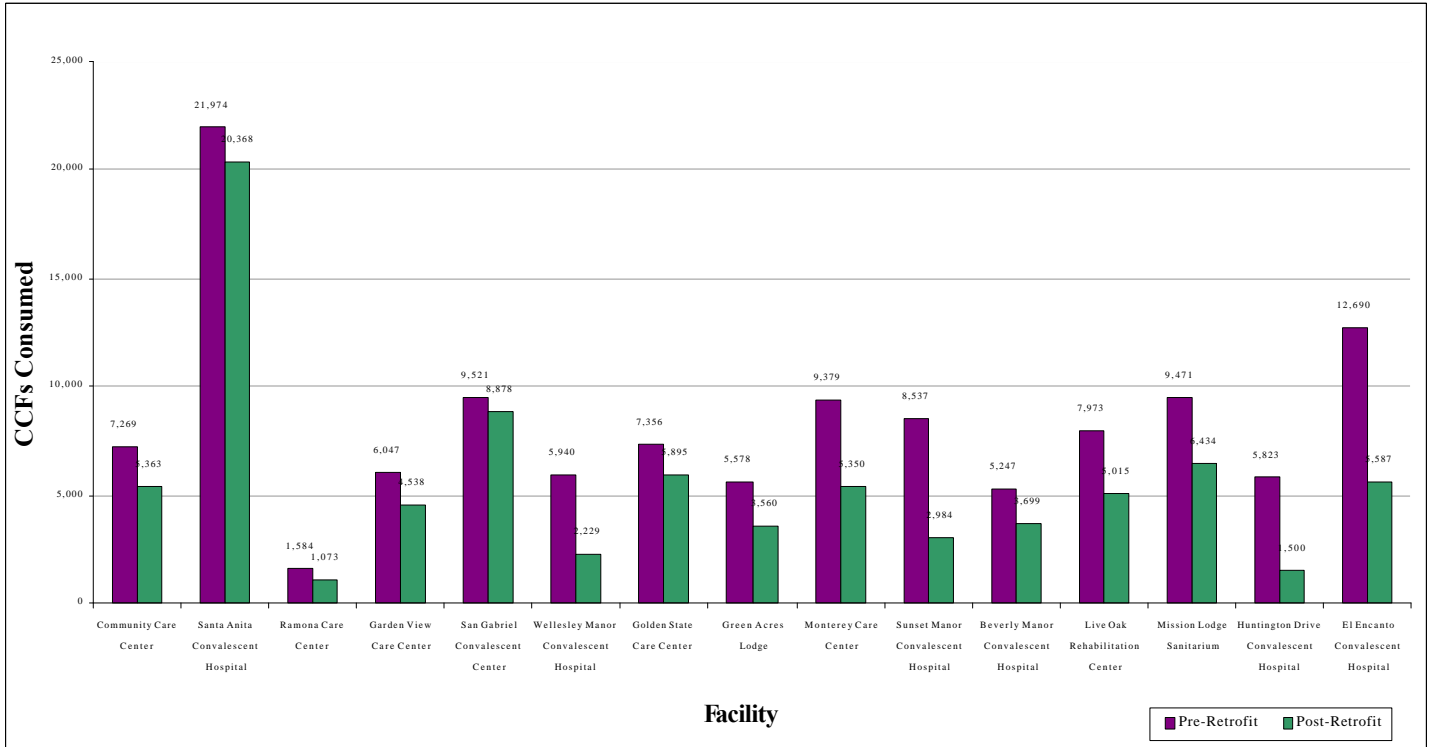
Based on the data in Table 1, Figure 1 visually charts the average yearly water consumption for both the pre- and post-retrofit time periods. All participating facilities experienced some reduction in water use.

### WATER SAVINGS

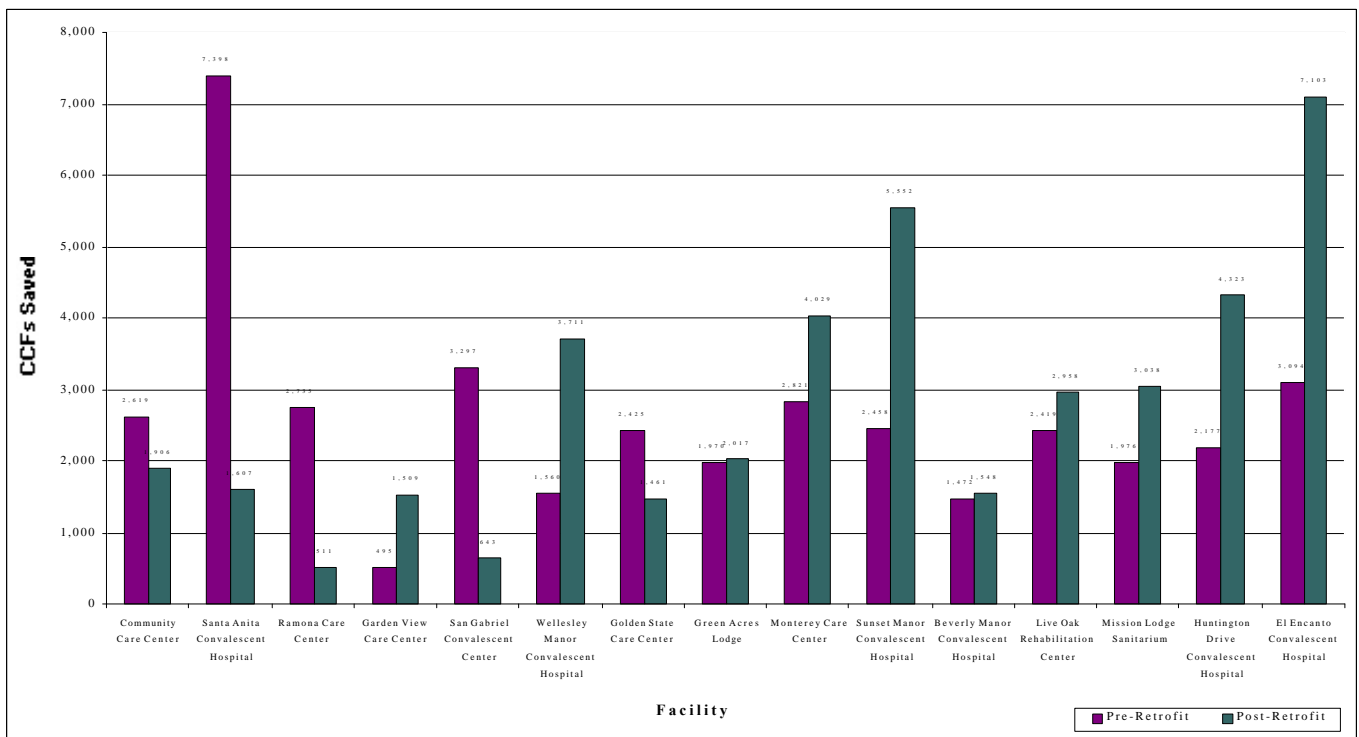
Sunset Manor exceeded its estimated yearly savings of 2,458 ccf with an actual saving of 5,552 ccf. Huntington Drive and Wellesley Manor SNFs are each saving approximately 2,100 ccf *more* per year than originally anticipated. The SNF that has experienced the largest amount of water savings is El Encanto, which was estimated to save a little over 3,000 ccf per year and is actually saving over 7,000 ccf per year, which is approximately 4,000 ccf more than originally calculated.

A comparison of the actual water savings data and estimated savings data is visually charted in Figure 2. Based on this information, the percentage difference between the estimated and actual water savings are charted in Figure 3.

**Figure 1 - Average Yearly Water Consumption**

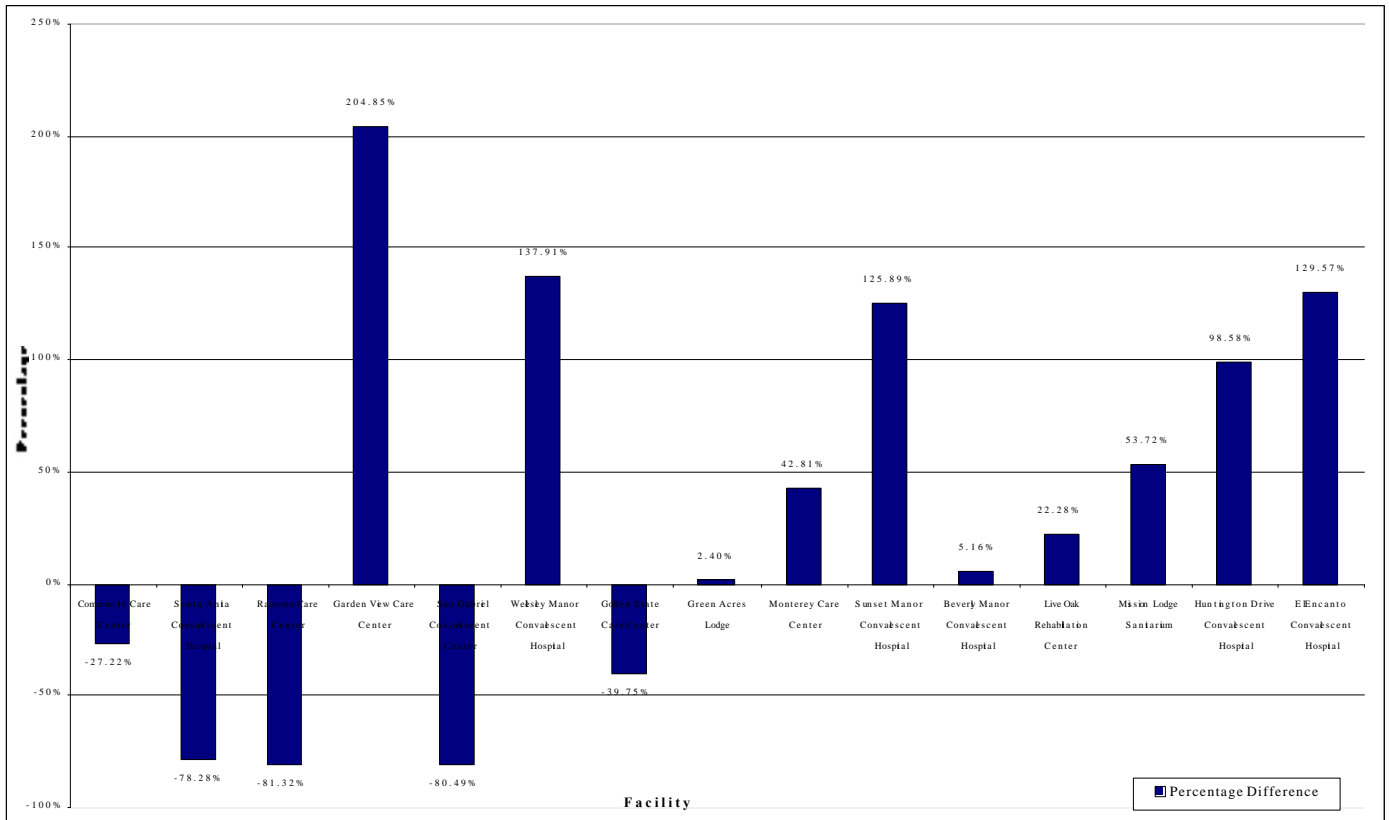


**Figure 2 - Estimated vs. Actual Yearly Water Savings**

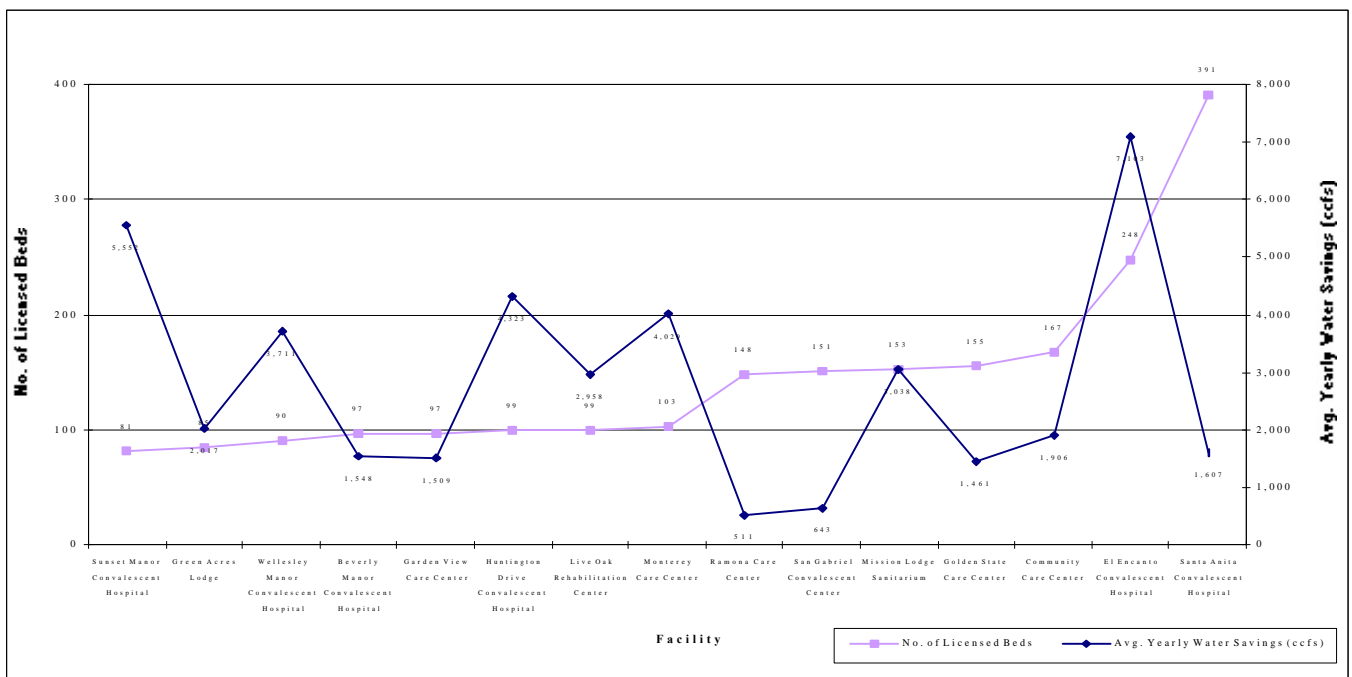


The estimated savings for some sites came close to the actual savings, such as for Green Acres SNF (*actual water savings is 2.4% more than the estimate*) and Beverly Manor SNF (*actual water savings is almost 5.2% more than the estimate*). The other site estimates ranged anywhere between 22% to 204% below or above their actual savings. This large range of difference indicates that the accuracy of estimates for individual sites is inconsistent.

**Figure 3 - Percentage Difference between Estimated and Actual Yearly Water Savings**



**Figure 4 - Size of Facility (Based on No. of Licensed Beds) Compared to Average Yearly Water Savings**



The amount of water saved varied from facility to facility and, in fact, had no correlation to the size of a facility as can be seen from Figure 4. Facilities are listed in order of bed size. Some small facilities had a tremendous amount of water savings while some large facilities had a relatively small amount of water savings but no consistent pattern occurred.

While the size of the facility had no correlation with the amount of water actually saved, the age of the facility did emerge as a relevant factor. Most of the facilities had made minimal changes to the plumbing infrastructure since their initial installation. Therefore older structures tended to have older plumbing infrastructure that utilized a larger volume of water and, typically, also a higher rate of plumbing devices in disrepair.

#### CUMULATIVE RESULTS

As mentioned earlier the comparison of estimated and actual water savings for individual sites is inconsistent and varied. However, the *cumulative* estimations of water savings and payback time are relatively close to the actual results. The actual volume of water saved per year, 41,916 ccf, is approximately 7.7% more than originally estimated savings of 38,916 ccf.

From an agency standpoint, when the water savings is converted to acre-feet, over 96.2 acre-feet of water are being conserved per year. This means an expected lifetime savings of 1,924 acre-feet based on a life span of 20 years. This equates a project cost of \$91 per acre-foot.

Using the 1997 rate of \$ 431.00 paid per acre-foot by Upper District for MWD treated water; the present worth for 1,924 acre-feet is calculated to be \$516,710.93. The total project cost of \$175,072.29 therefore proves to be a sound investment since it saves the agency \$341,638.64 over the life span of the project which is determined to be 20 years. The present sum of money saved annually is \$41,462.20, which would mean the entire cost of the project cost would be recouped in 4.2 years.

#### OBSERVATIONS

##### *Use of Survey Information*

During the Phase II bid process it was learned that the information provided in water surveys is useful but often insufficient to provide accurate bid pricing. The best example of this was the fact that while the surveys listed how many flushometers and tank type toilets existed in each facility, the information stopped there. What had not been included was how many of each type were floor mounted models or wall mounted. There was no information as to whether the current models were round bowls or elongated or if the seats were open or closed seats. There was also no mention of offset or rough-in measurements. Such information greatly affects the pricing for bids and actual project costs.

##### *Plumbing Challenges*

This program encountered plumbing challenges that required tremendous flexibility and creative solutions. The Consultants would discuss these challenges and potential solutions with the Upper District project liaison prior to any work being done. While many of the retrofits occurred without incident, there were cases that posed complex puzzles for the Program Consultants. Examples of plumbing challenges discovered include:

- ◆ The diversity to toilet types found even within a single SNF site.
- ◆ A toilet with an 8.5" rough-in.
- ◆ Already-installed ULFTs that had been re-engineered to flush at 3.5gpm.
- ◆ Varying horizontal and vertical offsets along with the fact that different models of toilets have different specifications for offsets.
- ◆ Custom pipe fittings necessary for many of the flushometer installations.
- ◆ Unusually tall vacuum breaker tailpieces.
- ◆ Very old fixtures and fragile carriers.

### *Consultant Interactions with Customers*

Another vital element of this Program was the interaction with individuals at the facilities. There is a large amount of direct contact with staff, patients and visitors at the SNFs. In any retrofit program it is *imperative* to emphasize the need for politeness and professionalism at all times during the program.

### *Determining Inefficient Water Use*

While high water volume plumbing devices is a primary culprit in inefficient water use at the SNFs, another factor is the ability of maintenance personnel to troubleshoot plumbing problems. Maintenance personnel of SNFs typically handle all types of repairs/maintenance and may not always have the appropriate level of know-how to handle leaks and other plumbing repairs. It may be beneficial to offer free basic plumbing repair/leak detection workshops for maintenance personnel of SNFs and other commercial/industrial/institutional sites. Such workshops might be done in conjunction with local home improvement stores.

## PROGRAM LESSONS

Develop direct communication with the facilities. If all contact is left up to the Consultants, the agency is apt to miss out on negative and positive responses that can help an agency make adjustments to the program to fit the needs of each site.

Obtain as much information about the existing plumbing fixtures as possible: offsets, rough-ins, models, mounting types, any model numbers and notes of potential plumbing problems that may occur during the retrofit. Also, ensure quality products are being installed to minimize devices breaking or falling into disrepair

Use Consultants that are willing to address a variety of plumbing situations and also deal with a variety of people/personalities. Emphasize constantly the need for polite and professional attitudes for all Consultants and staff that will be involved with the retrofits.

Have someone from the funding agency attend at least the majority of the final walk-throughs. This shows the SNF Administrator that the agency has genuine concern for this project and gives the agency first-hand knowledge of how well the installations went.

Follow-up with evaluations!

## FINAL ASSESSMENT

The results of this program indicated that implementing survey recommendations for individual sites might not provide reliable enough estimates for water savings and payback times. However, an agency implementing survey recommendations for several sites, will have a much higher incidence of meeting survey estimates since an increased savings at one site can balance out unexpectedly low savings at another site.

In most cases facilities are only able to implement a few of the survey recommendations due to limited funds and/or resources. Survey recommendations mean little if they are not carried out. Having an agency fund and implement the survey recommendations ensures that the retrofits are actually accomplished.

The cumulative water savings alone proved this program to be fiscally advantageous. Yet the added feature of providing local institutional sites with improved infrastructure made the program even more of a success from both the perspective of the Upper District as well as the participating facilities.

## **ACKNOWLEDGEMENTS**

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