

Introduction

San Diego County is dependent on imported water for domestic, agricultural and industrial uses. Approximately 95% of the County's water supply consists of imported water by the San Diego County Water Authority (SDCWA). This imported supply is considered limited and its future reliability uncertain. In addition, transport of this water requires energy that contributes to the total cost of the end use. There is concern that water shortages will occur in the future. Some of the possible causes are:

Increased population growth in San Diego County

Increased population growth in Southern California

Increased population growth in the Colorado basin states

Droughts in Northern California and Rocky Mountain states

California's routine overdraft of its allotment of Colorado River water

Arizona's claim to Colorado River water

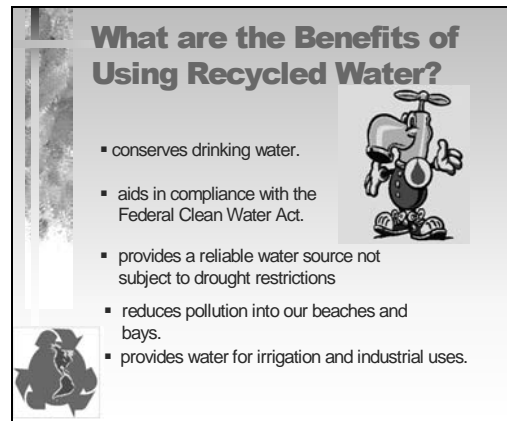
Mexico's claim to Colorado River water

Decreased supplies due to environmental issues

Currently (year 2000), San Diego County is beneficially reusing approximately 13,700 acre-feet per year of recycled water. SDCWA adopted the position that at least 46,000 acre-feet of wastewater is to be recycled annually by the year 2010. The State (in the Water Code) has set a goal of using 1,000,000 acre-feet of recycled water by 2010.

The beneficial use of recycled water derived from municipal wastewater is regulated by the California Water Code. California Water Code Section 13551 establishes a State policy to encourage the use of recycled water. Permission to use recycled water is based on the ability to adequately treat municipal sewage, now termed municipal wastewater, to the point that the recycled water (effluent) meets or exceeds the requirements of existing Title 22, Division 4, Chapter 3, California Code of Regulations (CCR). Title 22 was promulgated by the State Department of Health Services (SDHS) to ensure proper health protection and specify the treatment degree to match the intended application.

The County of San Diego Department of Environmental Health (DEH), Land and Water Quality Division is actively involved in plan check and inspection of all recycled water projects within San Diego County. DEH works closely with the recycled water producers, purveyors and different municipalities where recycled water projects are proposed, as well as SDHS, Drinking Water Field Operations Branch and the local California Regional Water Quality Control Board (CRWQCB).



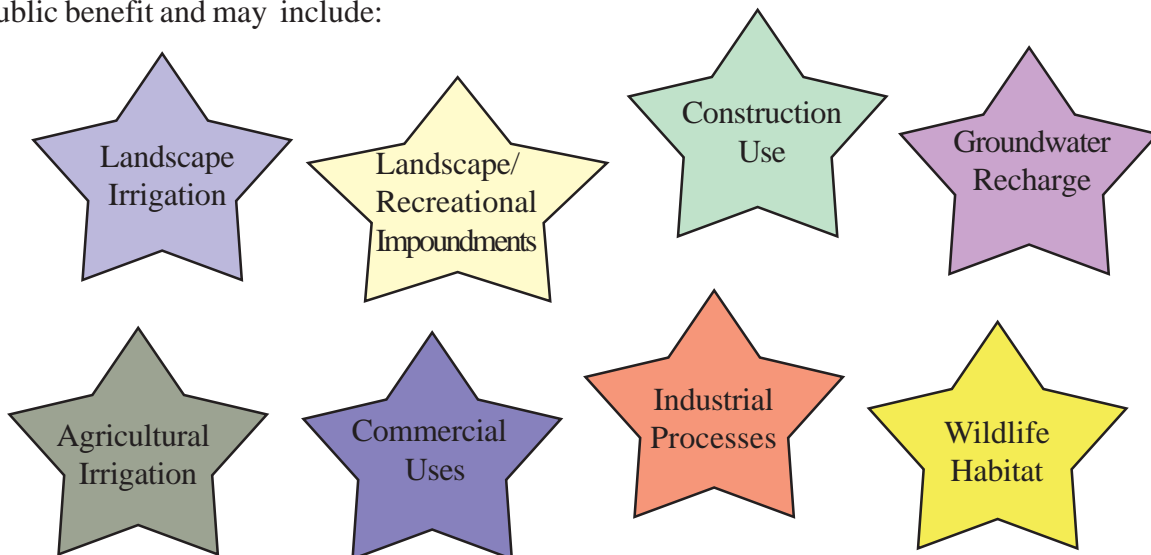
Division of Regulatory Responsibilities

In San Diego County, plan check and inspection responsibilities are divided between the SDHS and DEH. This division of responsibilities was established to avoid task duplication. SDHS is responsible for the plan review of treatment processes, treatment plants, main conveyance systems and proposed new and unusual uses of recycled water. DEH is responsible for plan review and inspections of all recycled water use sites.

DEH works closely with SDHS and the Regional Water Quality Control Board (the agency that issues the discharge use permits) on all matters pertaining to recycled water production and use. See Attachment 45 for background information and responsibilities of SDHS and RWQCB.

Goal of Recycled Water Use

The goal of recycled water use is to achieve conservation of potable water supplies by using recycled water for current and future demands. Recycled water shall be used for the maximum public benefit and may include:



Reason for Plan Check and Inspection

The submittal of improvement and irrigation plans for plan checking is to ensure that the proposed use of recycled water conforms to approved uses, rules, regulations and good public health engineering practices. Inspection of recycled water projects is done to ensure that the recycled water use facilities are constructed according to approved plans. Local building departments may also be involved in the inspection process. The inspection which concerns coverage, signage and cross-connection control is completed by the purveyor providing the recycled water and DEH. See Attachment 46 for Title 22 report submittal information.

The health and safety reason relating to DEH involvement in recycled water issues is that recycled water is not potable, is not safe for consumption and is used in areas of potential public contact. Recycled water is used predominantly on sites that also have potable (drinking) water, such as parks, golf courses, homeowner association common areas, commercial and industrial centers. By regulation, there can be no direct connections (cross-connections) between recycled and potable water. Consequently, a major concern of DEH is the demonstration by various means of testing that the recycled water system is not cross-connected with the potable water system. Regulation requires this demonstration be repeated at a minimum of once every four years due to normal site recycled water and potable water plumbing modifications. Although every effort is made to ensure that the two systems remain separate, there always remains the possibility of someone cross-connecting the recycled and the potable water systems, either from a lack of knowledge of the two systems or the desire for free water.

In most cases, the quality of recycled water used in San Diego County is 2.2 disinfected tertiary, which means that the treatment process ensures that the product is “virtually” pathogen free, although it in no way meets the requirements for potable water. However, the standard test for pathogens by the coliform method is done only once daily at the treatment plant; there is no regulatory requirement for testing in the distribution system or at the point of use. In addition, the coliform test requires 24 to 48 hours for the test to fully develop. What this means is that during a treatment plant upset, recycled water of a quality less than 2.2 disinfected tertiary may enter the distribution system for a significant period of time. Consequently, the need for initial inspections and continued monitoring of use sites.



Recycled water is essentially pathogen free as long as there are no treatment plant upsets.

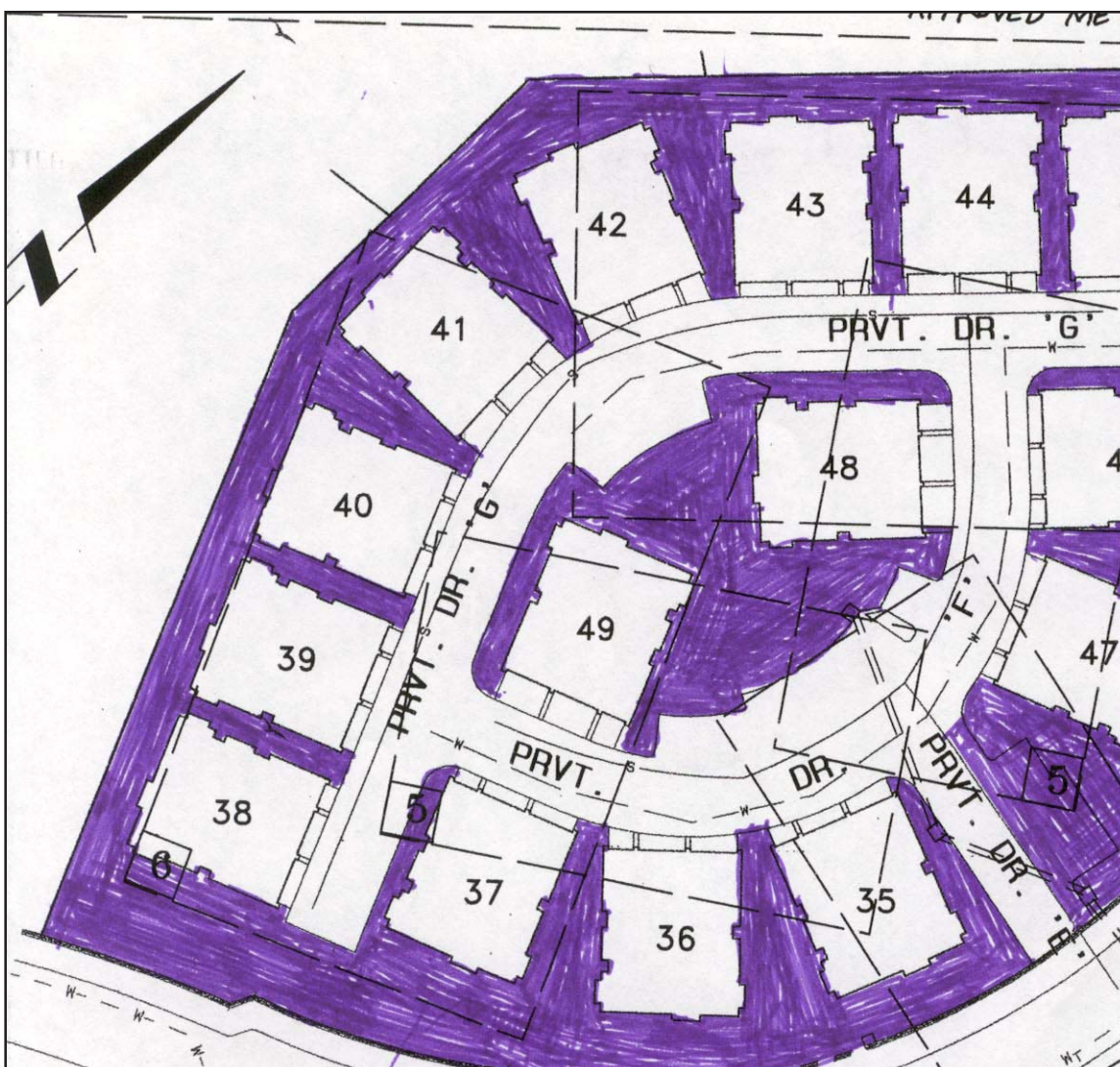
Records show that recycled treatment plant upsets are not uncommon.

Preliminary Meeting

The applicant meets with the purveyor and the appropriate municipality in order to establish potential service locations and service pressures for proposed irrigation and/or construction facilities. Areas that may receive recycled water and areas that must receive potable water are established, at which point the irrigation designer (engineer/architect) prepares plans and specifications for submittal.

A colored map shall be completed and submitted to DEH for approval prior to the actual plans being submitted. The colored map outlines the proposed general recycled water use area. The purpose of the colored map is to ensure that the use of recycled water is appropriate for the proposed use area.

Sample Colored Map



Plan Submittal Procedure

Once a project is approved for recycled water use by the recycled water purveyor and the colored map is approved, two (2) sets of plans of the landscape irrigation submitted to DEH for review, along with an initial plan check fee deposit. When the plans and payment are received, they are logged in and assigned the next available number (RW##### for new plans, RF##### for retrofit plans). From that point on, this number is used on every correspondence for that particular project.



Of the two sets of plans received, one set is used for plan check and the other is kept for DEH records. This second set will be discarded when the record (as built) set with signatures of all agencies involved is received and filed. **NOTE: If only one set of plans is submitted for review, it will be kept for DEH files.** DEH will permanently retain a copy of the final record (as built) plans. These plans will be used to conduct and monitor the recycled water cross-connection control shutdown tests and to ascertain changes to the use site recycled water system. After completion of the plan check, a letter that contains all of DEH comments, concerns and questions is drafted and returned with a copy of the plans to the recycled water purveyor and/or the engineer/architect of work.

Plan Resubmittal Procedure

Procedures may vary among the different purveyors; consult the purveyor's policy and procedure manual for specifics. Revised plans which incorporate DEH comments, concerns and questions will be resubmitted to DEH by the purveyor or engineer/architect of work. The plans are reviewed for further comments if needed. If upon re-review of the plans it is determined that DEH comments and concerns have been addressed, the record copy will be signed. However, if more comments are made and/or not all of DEH comments from the previous letter are incorporated into the plans, another letter is drafted, again stating DEH comments, plus any additional plan check comments.

When the plans are complete and ready for approval, mylars or vellums can be submitted for DEH signature. After signing the mylar or vellum, an approved signed set of plans and an as built set must be returned to DEH for permanent record.

The sequence of signing varies with the water agency. Some agencies require that DEH be the first to sign and other agencies require the opposite. Check with the water agency's policy and procedure manual for specifics. It is also important that DEH receives a final record set of plans. The reason is frequently the plans are for sites that will not receive recycled water for several years. When recycled water becomes available a final signed set of plans is necessary to conduct the required use site inspection. The final set of plans will be used for the site inspection cross-connection control shutdown test and they will be marked up to reflect any use site changes. The plans will also be used when conducting and monitoring the following shutdown tests.

Plan Check Procedure

Title Page: The following items need to be included on the plans and reviewed during the plan check:

1. Project Name
2. Vicinity/location map with North arrow shown
3. Engineer/architect's stamp, current and signed
4. Engineer/architect's address and telephone number
5. DEH signature block
6. Property boundary
7. Date plans were prepared and revisions were made
8. Declaration of responsibility
9. Index of sheet



Items to be Plan Checked on Other Plan Sheets: The following details are usually included on other plan sheets, but may be included on the title sheet:

1. Recycled water mains and laterals
2. Potable water main
3. Location of "Do Not Drink" signs
4. "Do Not Drink" sign diagram
5. Recycled water standard notes (see Attachment 37, 38)
6. Point of connection(s) (POCs)
7. Location of meters (potable and recycled)
8. Location of wells (if any)
9. Fire laterals and hydrants (if any)
10. Major catch basins and water courses (if any)
11. Typical cross section of recycled water and potable line crossings
12. Quick coupler design, with a note indicating that "quick coupler valves shall be of a type approved for recycled water use"
13. Irrigation legend
14. If biotech or research site, do buildings have wall/turf located air intakes?
15. Physical separation between recycled water and potable water irrigation.
16. Indicate on the plans any designated outdoor eating areas or drinking fountains. Verify these areas are protected against with recycled water overspray, mist or runoff.



Specific Plan Check Requirements

Minimum Separation/Proximity of Utilities: Vertical separation requirements do not apply to intermittently pressurized on-site irrigation laterals. Ensure the laterals do not contain valve in head units or maintain positive pressure in the line when the heads are not activated. If they do, they must be treated as constant pressure lines.

It is the purveyor's responsibility to ensure that proposed new and retrofit recycled water use site irrigation adjoining sites with potable water fed irrigation comply with all separation requirements. This also applies to new construction sites next to existing recycled water use sites; i.e. if the new site has irrigation fed with potable water, the separation requirements still apply and are the responsibility of the purveyor.

Horizontal Separation: (Off-site) A 10-foot separation of the recycled water line should be maintained at all times between a potable water line and/or a parallel sanitary sewer system. A minimum 4-foot separation may be considered at the discretion of the project's recycled water purveyor. For separations less than 4 feet, approval for special construction requirements should be obtained from SDHS, Drinking Water Field Operations Branch. Common trench construction is not permitted.

Vertical Separation: (Off-site) The potable water line should be installed a minimum of one foot above the constant pressure recycled water line which in turn, should be installed a minimum of one foot above a sanitary sewer line. If a one-foot separation is not possible, the approval for special construction requirements should be obtained from SDHS Drinking Water Field Operations Branch.

Separation: (On-site) On-site separation of utility lines is usually similar to the off-site separation rules. However, always consult the purveyor's Rules and Regulations because the individual purveyor may modify the separation rules.

If lines are shown to cross, then a typical cross-section must be provided on the detail section of the plans. This cross-section should adequately show potable lines, sewer lines and recycled water lines and show that the separations (vertically and horizontally) are maintained per SDHS and DEH criteria for the separation of water mains and sanitary sewers and the Rules and Regulations of the appropriate district.

A physical separation must be provided between adjacent areas of irrigation with recycled and potable water. Separation shall be provided by distance, concrete mow strips or other approved methods.

Minimum Depth

The top of the line should be below the finished street grade, as required by the rules and regulations of the water district. The required depth needs to be called out on the plans.

Recycled Water System Identification

Section 11681 of the California Health and Safety Code requires purple piping for recycled water systems. Keep in mind that warning tape (purple) should be installed above the recycled water pressure line to warn of its presence. Consult the water district's policy on this issue. All appurtenances (sprinkler heads, valve boxes, tags, quick couplers, etc.) on the system shall be color-coded purple per American Water Works Association (AWWA) guidelines. Valves and connections in valve boxes shall be marked with recycled water tags. On retrofit installation, all above ground appurtenances shall be color coded purple. Existing in-ground piping need not be changed.

A detailed drawing of the "Do Not Drink" sign(s), including dimensions shall be included on the plans. A typical sign should state that recycled water is in use, that it is unsafe to drink and shall include a do not drink symbol (see Attachment 39). In any case, purple coloring to identify the use of recycled water on the site shall be used.

Location of Sprinklers

Sprinklers shall be located in the approved use area within the boundary of the project. Sprinklers located close to swimming pools, eating areas and sand-filled play areas for children should be of the bubbler non-spray type. An alternate method is to locate the sprinkler heads so that these areas will not be oversprayed. Standard pop-up turf heads should be located so that they do not overspray non-use areas such as sidewalks.

For potable water irrigation systems, it is standard practice to install 180 degree turf heads immediately adjacent to sidewalks. However, the 180 degree heads usually cover about 190 degrees, which ends up spraying the sidewalk. This is not acceptable for recycled water use.

Sprinkler Coverage

Sprinklers should be checked to make sure that the radius of throw and the irrigation pattern are within the approved use area. There must be no overspray into public facilities and areas not approved for recycled water use. Windage and misting must be considered when designing the irrigation system. Modification to sprinkler head types and line pressures may be necessary to mitigate the effects of windage. Another consideration, especially on retrofit sites, is the location of foliage and trees. The reason is that foliage and trees will break up the droplets into fine mist that will drift into adjacent non-use areas, especially from large throw heads. It is the responsibility of the purveyor to ensure that recycled water heads remain in adjustment.

Drinking Fountains

Title 22 CCR states as follows: "Drinking water fountains shall be protected against contact with recycled water spray, mist or runoff". The reason is that the drinking fountain can fill with recycled water and consequently, the first person to drink from the fountain will drink recycled water.

Designated Outdoor Eating Areas

Title 22 CCR states, “Spray, mist or runoff shall not enter dwellings, designated outdoor eating areas, or food handling facilities.”

Ponds

Recycled water ponds used for storage or decorative purposes must be shown on the plans. An example of this use is golf course water hazards containing recycled water. Any potable make-up water to ponds must be via an approved air gap.

Food Establishments

In order to prevent food from being exposed to spray from the irrigation system, recycled water irrigation systems should not be installed near drive-thru windows and outdoor or patio eating areas.

Backflow Protection

Use sites, especially retrofit sites, may require the installation of backflow prevention assemblies before the site can be approved for the use of recycled water. Where large commercial centers are concerned, this may require the installation of a large number of backflow prevention assemblies. Because the installation of the backflow prevention assemblies can be time consuming and expensive, this should be considered when first conditioning a site for the use of recycled water or during the initial site inspection. If this determination is left for the cross-connection control shutdown test, delays in delivering recycled water to the use site may be inevitable.

A recycled water purveyor should maintain the water quality in a recycled distribution system. A backflow prevention assembly may therefore be desired at a specific meter where on-site exposures would impact the quality of the recycled water supply. Also, backflow prevention assemblies facilitate cross-connection control shutdown



Swivel ell changeover at Torrey Pines Golf Course, San Diego

tests. The need for an emergency backup potable water supply for a recycled water system at a use site is addressed in the State Department of Health Services Policy Memo 95-004. The policy memo is titled, “Guidance for the Alternative Use of Potable Water in Reclaimed Water Supply Use Areas.” The memo outlines use requirements for a swivel-ell type of connection (See Attachment 47).

Inspection Procedures



The Coverage Test: Upon completion of the construction of the irrigation system, an inspection is made to determine the adequacy of the system in meeting health and safety concerns. The coverage test looks at overspray, misting, ponding, runoff, color coding and signage. Changes from the approved plans shall be maintained on as-built plans (see Attachment 19). DEH must be involved during the coverage test because the test directly relates to the protection of public health and safety.

Cross-Connection Concerns

The Recycled Water Cross-Connection Control Shutdown Test: The cross-connection control shutdown test is based in law on Section 13521 and 13523 of the California Water Code; Sections 60314 and 60316 of Title 22; Section 7604 of Title 17 of the California Code of Regulations and Chapter 7, Sections 116800 and 116805 of the California Health and Safety Code.

The cross-connection control tests will be conducted on sites using both a potable, industrial and/or raw water system and a recycled water system. The individual overseeing the cross-connection control test will hold a current State of California-recognized certification as a Cross-Connection Control Specialist. A complete cross-connection control test is scheduled before the initial activation of the site's recycled water system and at least once every four years thereafter for dual plumbed sites. Based on Section 60316, Title 22, a site walk-through and record check will be scheduled annually for dual plumbed sites.



The frequency of the cross-connection control shutdown test and inspection of non-dual plumbed sites will be determined by the regulatory agency. It is recommended that the frequency follow the schedule for dual plumbed sites, other than those sites mentioned in Attachment 8. These tests may be conducted by the purveyor's cross-connection control specialist or a contract specialist, both with oversight and monitoring by the local Department of Environmental Health or State Health.

Purpose of the Recycled Water Cross-Connection Control Shutdown Test

The purpose or reason for the test is to demonstrate that at the time of the test there are no discoverable cross-connections between the site potable, industrial and/or raw water system and the recycled water system.

Considerations

COMMUNICATION: Before the start of the recycled water shutdown test, ensure that all affected parties are notified: (a) the date and time the test will take place; and (b) what the actual test entails. The major issue is that the potable water will be shut down on the site for a minimum of four to up to 24 hours. For a successful test, there can be no use of the potable water - if there is no threshold valve, no drinking, flushing, etc., which means on-site personnel will have to be a part of the shutdown test. And for that to happen, the on-site personnel have to know what is happening - and that is accomplished by thorough advance preparation and communication. A failed test means rescheduling, additional costs and a delay in converting the use site to recycled water.

Although the irrigation side of the test is less intrusive, it can raise interesting miscommunication problems. For example, at a major school site the head of maintenance was sure that the irrigation system operated during the night as part of the scheduled shutdown test. What actually happened was that the irrigation/landscape crew secured the irrigation because the lawns were to be mowed the next morning and the crew wanted to keep the grass dry. This mowing only happened once a month - coincidentally on the same day as the shutdown test. The shutdown test had to be repeated.

The notification of all affected parties should begin a minimum of one month before the scheduled test. Keep a log of who has been notified. Use a form letter and make sure it is addressed to a responsible individual at the use site. With proper notifications and knowing who was notified, it is much easier to deal with the individuals who say "I didn't know and you can't shut off the water" on the day of the shutdown test.

Although the letter notification is necessary, personal contact is vital. In the case of a school, talk to the superintendent; in the case of a building/industrial site, talk to the owner or manager; in the case of an apartment complex or a homeowner's association, ensure that the manager or president is personally notified. At a shopping center, visit every business and leave a copy of the notification letter. Schools are a particular challenge because many districts are now renting classroom or auditorium space to public organizations during off-class hours. It is suggested a flyer explaining exactly what will happen and when be included with a letter to the school principal. The principal can have the flyer duplicated and distributed to the staff.

Preparing for the Test

Any devices that may repressurize either the potable or recycled water systems during the cross-connection control test should be deactivated. Examples of these devices are water heaters, pump systems on cooling towers, heating systems, etc.; overhead plumbing which may become air locked during the depressurization and break free during the test; and any uses of water during the test, such as opening of hose bibs, flushing of toilets or the use of hand basins which may contribute to pressure changes in the system. There may be water-cooled systems that cannot be shut down during the test. If that is the case, water must be highlined from an available source, such as a fire hydrant. (See Attachment 24)

Pressure Recorder Use Considerations

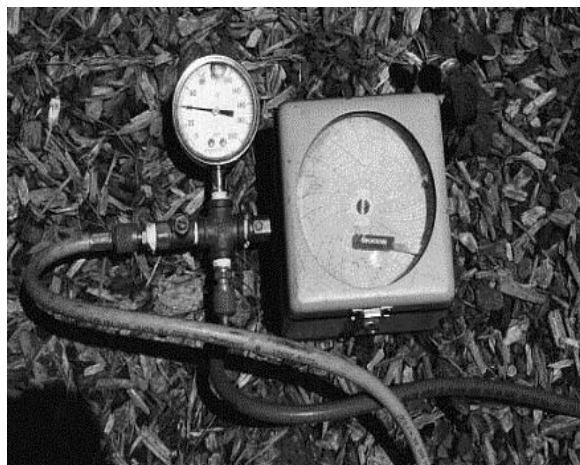
There are several methods of conducting the cross-connection control shutdown test. Each method takes into account site specific plumbing configurations. A combination of the various methods may be used based upon the site configuration. (See pages 24-34).

The pressure differential test utilizing pressure gauges was developed by DEH with significant input from the recycled water purveyors. This test was first used in San Diego County by the City of San Diego, Water Utilities Department. The type of pressure recorder used should be one that records for a 24-hour period and have a pressure range of 0-200 psi. The range is dependant on the water pressure range in your area. Frequently, the potable water meter backflow prevention assembly is used as an attachment point for the pressure recorder. To use the backflow prevention assembly as part of the test, it must have passed the routine backflow test within the past 12 months.

A battery check should be conducted on the recorder(s) before leaving the shop. Also, check to ensure that the ink in the recorder pen has not dried up. A test spike should be recorded before depressurizing to confirm that the recorder is in good working condition and a pressure spike should be recorded at the end of the test. If the pressure recorder is to be used in a high traffic area or at a school, the recorder should be covered to prevent tampering. A “Do Not Touch, Test in Progress” sign may be used.

Even with all the precautions, the pressure recorder may still be subject to tampering. This actually happened during a shutdown test at a golf course. A golfer, apparently having problems hitting the golf ball, took out his frustrations on a pressure recorder. The recorder was a total loss.

If the potable water cross-connection control shutdown test is to be conducted after business hours, the pressure recorder can be set up and started during normal working hours to show that the recorder is working. This will also provide an indication of normal operating pressures.



The 24-hour pressure gauges can be modified with a variety of fittings that will allow the attachment of the gauges to a variety of devices. Bob Mattson of Padre Dam MWD has assembled a kit which contains the following:

1. Hose bib fittings and hose bib key
2. Backflow test cock fittings and extra test cocks for replacement if needed
3. Mop sink and kitchen faucet aerator screw fittings
4. Quick connect fittings
5. Teflon tape, pipe dope and various tools including crescent wrench for removing ball valve handles
6. A hose fitting and hose so that the pressure gauge can be set on horizontal. (If it is set off horizontal, the recorder needle tends to skip.)
7. A hose fitting and hose so that the pressure gauge can be located in an area where space limitations would not allow the direct attachment of the pressure gauge to the device.
8. The pressure gauge should be fitted with a bleed-off petcock so that the gauge can be attached to a pressurized fitting (with the meter secured) and localized pressure bled off via the petcock.
9. A pressure gauge that is attached to the pressure recorder will allow easy calibration of the pressure recorder to actual line pressure. On systems where the potable system is sectioned off by gate valves, the pressure gauge will facilitate determining if the gate valves are holding.
10. Caution tape and 'Do Not Use Water' signs
11. Two-way radios for communication

Doug Clarke and Larry Olds of Otay Water District are using a new method of attaching the pressure recorder at the irrigation system during the installation of a backflow prevention assembly cross-connection test station. A point of attachment for the pressure recorder (i.e. a backflow assembly test station) is located downstream from the meter in a valve box. This method is used to provide 24 hours security for the pressure



New and Retrofit Site Considerations

Cross connection control tests and use site inspections will be conducted on two types of recycled water use sites. The first type is new construction with complete sets of planning and inspection documents. The second type is the retrofit, with retrofit planning and inspection documents. Although the basis for the test is the same for each type, the retrofit can pose additional challenges because of the lack of knowledge of the site and the existing plumbing layout.

When dealing with retrofits, the site must be carefully inspected by the regulatory agency Cross-Connection Control Specialist before the start of the use site plan process. This pre-inspection can determine where recycled water should or should not be used on the site. This can save the purveyor and site owner time and money by determining acceptable site usage before the start of the site plan process. There are certain sites, because of very complicated and unknown plumbing systems, where the use of recycled water should not be allowed. For sites that will use recycled water, plans must be developed, either by using existing as-builts or developing plans from thorough site investigations. Due to the possibility of unknowns on retrofit sites, the approved plans must be carefully reviewed on the actual site before conducting the shutdown test. Recycled and potable water irrigation systems are not recommended for the same retrofit site because all the buried piping is the same color.

Preparing for the Cross-Connection Control Test

The following is a suggested list of equipment to have available for the test: site plans, flashlight, TDS (Total Dissolved Solids) meter, notebook, tape measure, needle nose pliers (to activate hose bib vacuum breakers) and regulatory and guidance documents such as Title 22 and SDHS recommended policies relating to recycled water use and this manual.

The purveyor should provide the 24-hour pressure recorders. The purveyor should also provide shovels for potholing if necessary. If the site is using recycled water, a current reading of the TDS of both the potable water and the recycled water should be provided by the purveyor.

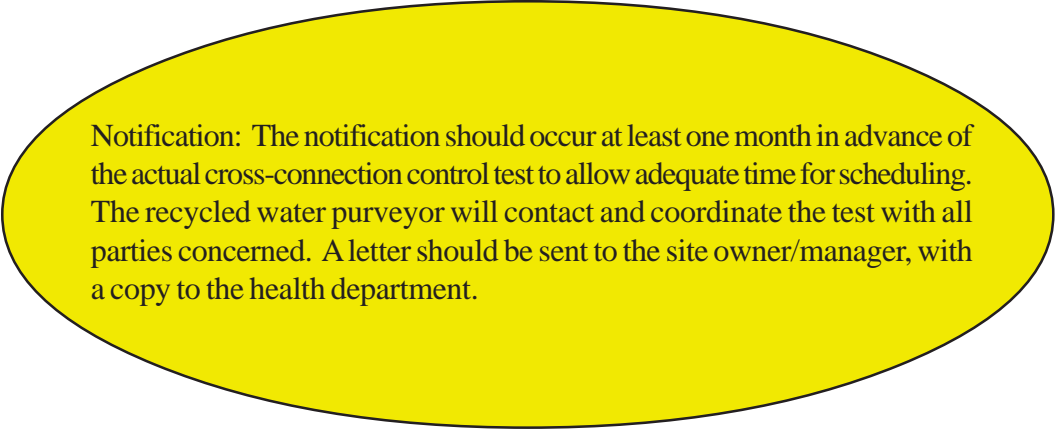
To minimize delays, the purveyor must ensure that someone that is familiar with the existing plumbing/irrigation systems is on-site. That person should also know how to operate the irrigation master control panel at the specific site. This individual is the Use Site Supervisor.

If you are from the regulatory community, it is very beneficial to have two specialists from your office on site for the initial cross-connection control test at a site. Health and safety questions will arise frequently and it is advantageous to be able to discuss the questions with a peer to resolve problems during the test. Also, there are very few hard and fast rules concerning recycled water use sites. The majority of the decisions concerning health requirements are judgment calls and as such, a second informed opinion is frequently helpful. Although the cost of the second person may seem initially burdensome, the cost of redoing the cross-connection control test could be much greater because of questions that cannot be resolved on site.

The duration of the test is the judgment call of the regulatory agency. An ideal test duration should be a 24-hour cross-connection control test in each direction. This is based on the initial cross-connection control protocol developed by Frank Hanamura, engineer with the State Department of Health Services. The initial cross-connection control test, especially with retrofits, ideally should be 24 hours in each direction. This is because of the many unknowns. In most cases, shutting down the irrigation system for 24 hours will cause minimal inconvenience. The exception is golf courses, where lack of water in hot weather may cause turf damage. This must be worked out with the golf course supervisor. Suggested times for modified test durations can be found in Attachment 7.

Normally, the cross-connection control test is the last element to be completed before the conversion of the site to recycled water. This is done in order to minimize the chance of use site personnel creating a cross-connection after the test is completed but before the conversion to recycled water.

To minimize customer inconvenience, the recycled water shutdown test can be scheduled during hours of minimal water use. Schools, for example, can be tested during vacation periods. Shopping centers can be tested when the businesses are closed, usually from 11:00 pm to 7:00 am. Industrial sites can be tested from 6:00 pm to 6:00 am. If approved by the regulatory agency, apartments and housing units can be shut down for four hours during the day. This period of time has been found to be acceptable to the occupants. It must be remembered that all parties involved in the test - the recycled water purveyor, use site supervisor, landscape personnel to run the irrigation clocks and a local or State health representative - must be on site during the test. Again, this will take a great deal of advance coordination by the water purveyor.



Notification: The notification should occur at least one month in advance of the actual cross-connection control test to allow adequate time for scheduling. The recycled water purveyor will contact and coordinate the test with all parties concerned. A letter should be sent to the site owner/manager, with a copy to the health department.

Irrigation Controllers

When doing a cross-connection control pressure test on an irrigation system, it is vital that the controllers be operated by someone familiar with both the irrigation system and the operation of the controller.

A controller may operate an irrigation system remote from the location of the controller. Controller charts which show the specific site and location of all irrigation stations that the controller operates must be available on site, and a copy maintained by the purveyor. A model controller chart was developed by Dee Kitchen of Padre Dam Municipal Water District and can be found in Attachment 16. The possibility exists that the on-site system and adjacent irrigation systems may be inadvertently cross-connected. An example of this was discovered when a private irrigation controller also operated part of a landscape maintenance irrigation system owned by the City of San Diego.



Pressure Recorders

At least two pressure recorders should be used for each phase of the test. Occasionally, a pressure recorder will malfunction and if only one recorder is used, the test will have to be repeated. One pressure recorder should be located at the service meter and the second recorder at a remote location on the system. If a large and complex system is being tested, multiple recorders should be used. The location of the pressure recorders should be determined by the cross-connection control specialist and approved by the regulatory agency. If this is a critical site, such as a large office building where retesting in case of recorder malfunction would be impractical, a splitter or “Y” connection can be used on the recorder connection point which will allow the attachment of two pressure recorders at a single connection.



Occasionally, an irrigation system will lack points of connection on the pressurized main line for the attachment of pressure recorders. Doug Frost and Humberto Torres of the City of San Diego developed the following procedure to address this problem:

On an irrigation system that is equipped with commercial grade control valves with manual override solenoids, all sprinkler heads attached to that control valve can be removed and capped. This creates a closed system which is now part of the constant pressure main line. One sprinkler head can be used as the point of connection for the pressure recorder.

When using this procedure, remember that the irrigation system must be leak-tight. If the water pressure drops below approximately 5 psi, the control valve will automatically close and separate the pressure recorder from the pressurized main line.

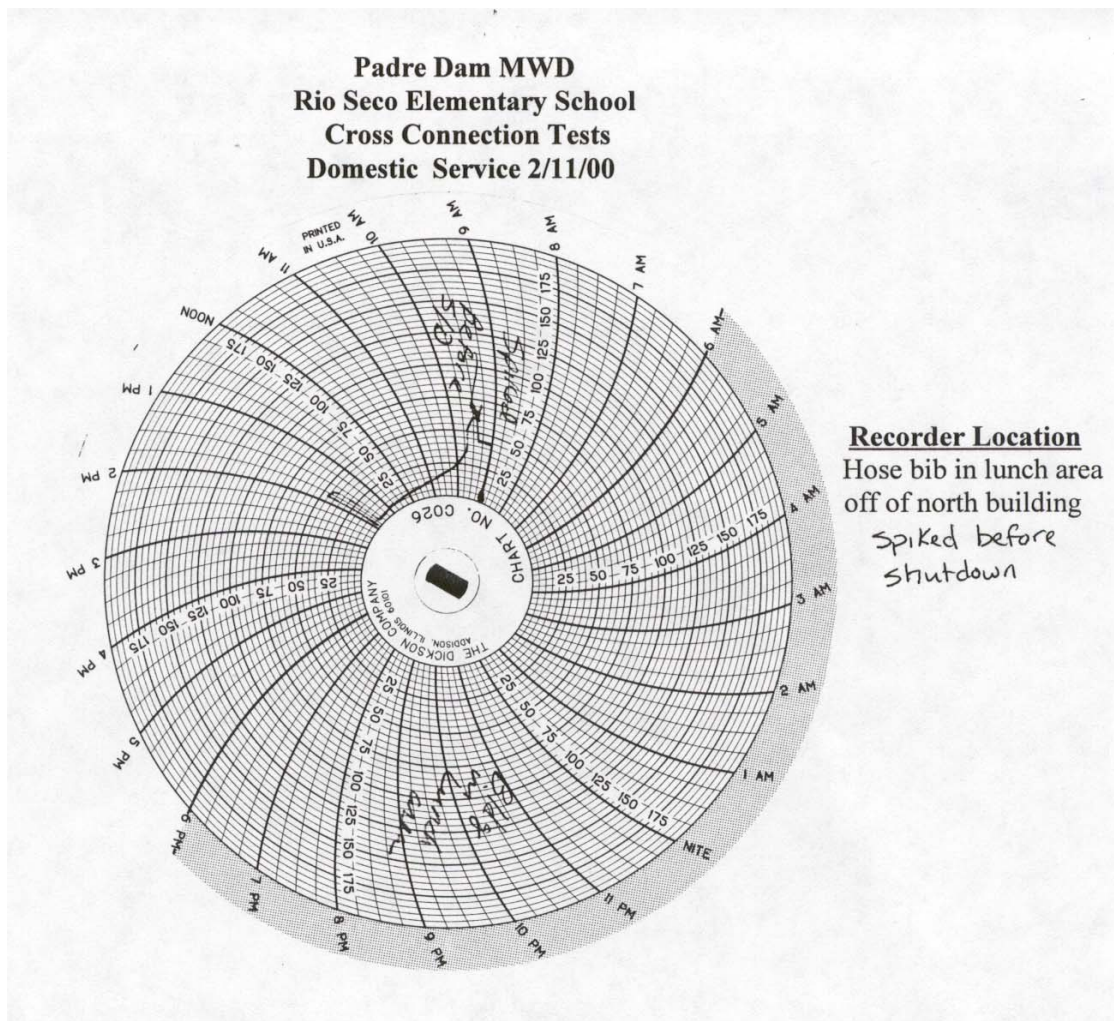


Potential Cross-Connections

It is recommended that when conducting the pressure test on both the potable and the recycled system, the pressure should be bled off to approximately 30 to 40 percent of the original line pressure. The reason is that if the system is completely drained, a cross-connection via a small line might not be noticed because the cross-connection might not provide the volume to repressurize the system. (See Method 1 for additional information.)

In the case of a rise and fall-off or a sustained increase in pressure, the test must be repeated and the irrigation stations manually operated while watching the recorder. This is done to locate and isolate the station causing the pressure increase. On an industrial use site, this would indicate a cross-connection with another source of water. However, in both an irrigation and an industrial use, this may also indicate water breaking loose from an air lock in an overhead water line.

The reason for the short or sustained pressure increase must be established. A new use site cannot be approved for the use of recycled water if the reason for the pressure increase cannot be determined. The same holds true for sites using recycled water. The regulatory agency must be satisfied that there are no unprotected cross-connections on the use site.



Cross-Connection Control Test

Methodology

There are currently nine methods of conducting the cross-connection control test in San Diego County. These various methods have been developed as modifications of the basic test procedure to accommodate various use site requirements.

The method used on the test will be based on the site considerations. For example, is this a new site or a retrofit site with plans? What are the points of connection for potable and recycled water lines? Do the points of connection have backflow prevention assemblies or other means to connect pressure gauges? See Attachment 6 for a General Cross-Connection Control Checklist for All Use Sites.

Method 1 is for systems that have a means to attach a pressure recorder at the potable and recycled water service meters. This can be either backflow prevention assemblies, a fitting or a combination of the two. This is the most commonly used method in San Diego County.

Method 2 is for systems without pressure recorder fittings.

Method 3 is for systems without pressure recorder fittings and where recycled water is being used on the site.

Method 4 can be used at sites containing occupied residences.

Method 5 involves exposing all potable water lines.

Method 6 involves the use of a dye test.

Method 7 is based on the 1998 California Plumbing Code for testing dual plumbed buildings.

Method 8 was developed for dual plumbed buildings and involves a combination of dye testing and pressure recorder testing.

Method 9 was developed for homeowners associations (HOAs) with no backflow prevention assemblies and a single potable lateral feeding a small (house) water system.

When doing the cross-connection control test on an irrigation system, all stations must be operated. A lateral may be tied into another system that is not part of the tested system. This was observed when a street median strip system was operated and an adjacent apartment complex irrigation system came on at the same time. The irrigation water at the apartment complex was being paid for by the potable water purveyor. This also happened at a private home when the house irrigation system was unaccountably tied into the adjacent street slope irrigation.

The Recycled Water Shutdown Test: Pressure Differentials and Pressure Loss

The basis of the recycled water shutdown test is the maintenance of pressure differentials for the duration of the test. In the first step, the potable system is left pressurized while the recycled water system is depressurized. The procedure is reversed in the second step. It is obvious that when the irrigation system is depressurized - to 20 psi for example - and the clock operates the irrigation stations, the pressure will drop to zero. That is an expected part of the test.

The problem occurs when the potable water system in step two is depressurized - to 20 psi for example - and the pressure subsequently drops to zero at some point during the test. The pressure loss can seriously compromise the outcome of the test. The loss of pressure can be attributed to many things, most of which are preventable.

If the pressure drop was caused by the flushing of a toilet or urinal or the turning on and off of a water faucet, the test may not be adversely impacted. These are one time opened and closed events. The fatal flaw in this scenario is the opening of a faucet and leaving it open or the start-up of water-using equipment. In this situation, if there is a cross-connection, the pressure will simply flow through the open faucet or the water-using equipment and not affect the pressure recorders. The obvious solution to this situation is to install a threshold valve on the potable water service where the potable line enters the building. This is discussed in the “An Alternate Method to Maintain Potable Pressure During the Shutdown Test” section.

We became aware of this issue when conducting a shutdown test at a psychiatric hospital. The potable water shutdown test ran from 12:00 midnight to 4:00 am. “Do Not Use, Water Secured” signs were posted and the staff notified of the test. We set the pressure recorders, ran them for a track at full pressure, then secured the water and depressurized the system to about 20 psi. About 30 minutes into the test, the pressure dropped to zero.

At 4:00 am, the water was turned on, but the water meter tattletale indicated constant flow. We checked with the orderlies, and one indicated he had opened the tap on a bath tub at about 12:30 am. Sure enough, when we checked, the tub was about to overflow. The test was invalidated. A midnight to 4:00 am test is one you do not want to repeat!

In light of the above, the following steps are recommended when securing and depressurizing the potable water system. (If the water system is old or if the building is difficult to make leak-tight, see “An Alternate Method to Maintain Potable Pressure during the Shutdown Test”).

Before securing the potable water meter, survey the building to stop any water use, then check the water meter tattletale for movement. No movement indicates a leak-tight building. It is strongly advised to have someone familiar with the building’s plumbing system on-site when doing the survey. It is also strongly advised that the on-site individual conduct a building water ruse survey before the actual shutdown test. This will markedly increase the accuracy and efficiency of the survey on the day of the test.

The placement of the pressure gauges is important to ensure that the pressure readings are accurate and recording actual pressure. For example, a pressure recorder located in a basement will record pressure due to head pressure, even if a tap is left open on an upper level. In multi-story buildings, one pressure recorder should be installed at the highest available tap or connection point in the building. When the pressure is dropped after meter shutoff, the drop should be accomplished through the highest installed pressure recorder.

After securing the water meter and dropping the pressure, wait for approximately 30 minutes to ensure that the residual pressure is holding and not dropping to zero.

If the pressure drops to zero at some point in the test, it will be the responsibility of the agency overseeing the test to make the determination that the test is valid or must be repeated. This determination will depend on several factors, such as the length of the test, when the drop in pressure occurred, the form of the pressure drop and the complexity of the site. The determination will also be dependant on the skill of the agency personnel overseeing the test. This “skill” is gained over time and developed during actual shutdown test participation.

If the water meter does not have a tattletale or if there is a pressure loss and the tattletale does not register water use - pressure can be lost by small water use that is too low to register on the tattletale, especially if it is a large water meter - then another method of detection can be used. A small detection meter can be temporarily installed between the #1 and #4 test cocks on the backflow prevention assembly. This temporary meter can detect water use not registered by the tattletale.

The following is a partial list of what to look for when surveying the building for water uses:

- Sinks, hand basins, mop sinks, hose bibs
- Toilets and urinals (these frequently have leaking valves)
- Cooling towers
- Heating and cooling equipment
- Ice makers
- Refrigerators with internal ice makers
- Laboratory equipment
- Decorative fountains
- Drinking fountains
- Under-sink reverse osmosis units, usually connected to coffee makers
- Wall-mounted cleaning chemical dispensers
- In large buildings, computer-controlled utilities operated from a panel that is activated by the occupant’s key card
- Water softeners (usually found in the mechanical room)
- Roof mounted swamp coolers
- Recirculation pumps
- Exotic coffee makers with automatic backwash

An Alternate Method to Maintain Potable Pressure During the Shutdown Test

Buildings with old plumbing systems, activities that have multiple water uses and private residences are all difficult or impossible to make leak-tight as is required by the pressure differential shutdown test method. In these cases, an alternate method that may require some modifications to the site plumbing is proposed.

The purpose of the shutdown test is to determine if a cross-connection has been created between the water service meter and the building threshold. The same holds true for any water lines extending from the building to remote water-using facilities such as cooling towers. There is still a concern with a cross-connection directly to building interior plumbing, but that will be addressed in the later part of the test.

First, see “The Recycled Water Shutdown Test, Pressure Differentials and Pressure Loss” to determine which shutdown test method is preferable for the specific site. If the alternate method is preferable, check to see if the building has a shutoff valve at the building threshold. If not, a shutoff valve must be installed. In the case of residential buildings, there is normally a house valve already installed at the threshold to the building.

Second, check any water lines exiting the building that may serve facilities such as cooling towers. These lines must also have a shutoff valve at the building threshold. If the valve(s) are not present, they must be installed. Additionally, these lines must have a downstream shutoff valve where the end of the line is exposed, such as in the cooling tower area.

The shutdown test is conducted in the normal manner for the irrigation system.

For the potable shutdown, the idea is to isolate the run of pipe between the meter and the building. The same is true of any pipe(s) that may exit the building to other facilities.

- Install a pressure recorder on the #4 test cock of the service meter backflow preventer.
- Install a pressure recorder on a connection point on any water lines that exit the building. These connection points can be backflow prevention assemblies, hose bibs, etc.
- Let the pressure recorder run for a period of time to ensure it is functioning properly.
- Depressurize the line(s) to approximately 30 psi. This pressure setting depends on the pressure of the irrigation system. Leave depressurized for a period of time, but never less than 4 hours.
- After the shutdown period, repressurize the line(s) and the system.
- Any increases in pressure during the time of the test may indicate a cross-connection and must be investigated.

Pressure recorders can also be installed in the building to determine if pressure can be dropped and held in the domestic plumbing system for a minimum of 4 hours. If pressure can be held, follow the preceding steps.

If pressure in the building cannot be held, then an interior piping inspection and report by a certified Cross-Connection Control Specialist must be performed. Special emphasis must be given to any piping that runs along exterior walls or penetrates the exterior of the building.



Method 1

This method is based on the availability of backflow prevention assemblies at the potable water meter(s) and the recycled water meter(s). Other methods of attaching pressure recorders, such as installed fittings, may also be considered. On large sites with multiple meters, the existence of different pressure zones must be reviewed.

First, the recycled water service meter is secured and the recycled system is depressurized. A complete drain down of the system is not required. The system should be depressurized to 30 to 40 percent of line pressure, although most irrigation systems will quickly lose pressure - which is normal. When the service meter is shut off to depressurize the system it should also be locked if possible. This will prevent an unauthorized turn-on of the meter. In the event that a site is served by a combination meter or meters, the depressurization of the irrigation system will be accomplished by shutting off the valve at the backflow prevention assembly. Also, if there is a backflow prevention assembly present, open the number one test cock. If there is flow through the closed service meter valve due to a leaking shutoff valve, the water will flow out of the number one test cock and not affect the pressure recorder.



A pressure recorder is attached to the number four test cock of the backflow prevention assembly at the secured meter. The pressure recorder is run for 24 hours while the potable system is operated normally. Test spikes should be recorded before depressurizing and at the end of the test to confirm that the recorder is in good working condition. Even though the irrigation system is depressurized, it must be operated through the normal irrigation cycle because an isolated lateral may be cross-connected into the potable system. If this is the case, it will show up on the pressure recorder graph.

For the second part of the test, the test method is reversed with the pressure recorder attached to the number four test cock of the backflow prevention assembly on the secured potable water meter. The irrigation system is pressurized and all stations are operated during this phase of the test. At least two pressure recorders should be used for each phase of the test, both as a backup if one recorder quits working and to get better test coverage.

If the site is served by a combination meter or meters, the depressurization of the potable water system will depressurize the entire water system. Provisions must be made to provide a temporary high line to serve the irrigation system while the potable system is being tested. This will typically be done by connecting the irrigation system to a nearby fire hydrant using a construction meter, backflow prevention assembly and a fire hose (see Attachment 24). This will also serve as the overspray and ponding phase of the test and it will require someone with on-site knowledge in the activation of the irrigation master control panel.

The regulatory agency should accompany the water purveyor's representative to ensure that the potable water system is depressurized and all depressurizing devices are secured before starting this portion of the test. This is critical, because this phase of the test will be concerned with the actual contamination of the site's drinking water. Ideally, this test should also run for 24 hours. However, since this phase of the test will frequently directly affect site operations, the regulatory agency can decide on a reduced time frame. This is a judgment call on the part of the regulatory agency, depending upon the complexity of the potable distribution system. The decision must be based on all available information, expertise and experience to determine the actual cross-connection control test duration.

If there are increases in pressure, the reason(s) must be determined. Initially, walk the system to ensure that all devices that may cause repressurization have been disabled. Next, attempt to isolate the cross-connection within the system. It may be possible to isolate specific areas of the distribution system by using isolation valves. Consequently, flow to one or more faucets or hose bibs may be traceable to areas where the potable line feeding these faucets or hose bibs is in close proximity to the recycled water system. This phase of the test should be repeated to determine if the pressure increase can be duplicated (see page 18, Potential Cross Connections).

If there are no pressure increases observed on the recycled and potable systems and any additional testing has been successfully completed, the cross-connection control test can be considered complete, with no cross-connections discovered at the time of the test.



If this is an initial test or retrofit, the following test may also be completed. This test is not usually necessary, and its use should be at the discretion of the regulatory agency. All taps and hose bibs should be slowly drained. The slow draining will minimize air locks in overhead water lines. After draining, the taps and hose bibs should be closed. Upon completion of the test, all hose bibs and taps should be checked for flow, using a paper cup to determine flow quantity. Some flow will be expected due to the air locks breaking loose. The amount of flow to cause concern is a judgment call. As a general rule, filling a quarter of a 12 oz. cup can be considered the result of an air lock breaking free. Quantities greater than that would lead to an investigation to determine the cause of the flow. This is site specific, and items such as the use of multiple overhead water lines must be considered. If this is a site using recycled water, the TDS of the flow can be checked using the TDS meter. It must be remembered that if a cross-connection exists, the TDS will probably be lower than that of the recycled water due to dilution.

Method 2

Method 2 can be used on sites with no connections for pressure recorders. The potable water system shall be activated and pressurized. Depressurize the recycled water system. The potable water system must remain pressurized while the recycled water system is depressurized. The minimum period of time the recycled water system is to remain depressurized shall be determined on a case-by-case basis by the regulatory agency, taking into consideration the size and complexity of the potable and recycled water systems (page 14). If this is an irrigation system, it should be depressurized for 24 hours.

If there is a drain on the recycled water system, it should be checked for flow during the test and at the end of the test period. Before repressurizing the irrigation system, operate all stations on the system for a short period of time to determine if any stations have repressurized.

Depressurize the potable water system. The recycled water system is then activated and pressurized. The recycled water system must remain pressurized while the potable water system is depressurized. The minimum period of time that the potable water system is to remain depressurized shall be determined on a case-by-case basis (see Attachment 7).

All taps and hose bibs should be slowly drained. The slow draining will minimize air locks in overhead water lines. The taps and hose bibs should then be closed. Upon completion of the test, all hose bibs and taps should be checked for flow using a paper cup to determine flow quantity. Some flow will be expected due to the air locks breaking loose. The amount of flow to cause concern is a judgment call. As a general rule, filling a 12 oz. cup to a quarter full can be considered the result of an air lock breaking free. Quantities greater than that would lead to an investigation to determine the cause of the flow. Again, this is site-specific and items such as the existence of multiple overhead water lines must be considered. If this is a site using recycled water the TDS of the flow can be checked using the TDS meter. Keep in mind that if a cross-connection exists the TDS will probably be lower than that of the recycled water due to dilution.

If there are indications of a cross-connection, the reason(s) must be determined. Initially, walk the distribution system to ensure that all devices that may cause repressurization have been disabled. Next, attempt to isolate the cross-connection within the system. It may be possible to isolate specific areas of the system by using isolation valves. Consequently, flow to one or more faucets or hose bibs may be traceable to areas where the potable water line feeding these faucets or hose bibs is in close proximity to the recycled water system. This phase of the test should be repeated to determine if the pressure increase can be duplicated (see page 18, Potential Cross Connections).

Method 3

This method can be used on sites with no backflow devices or connections for pressure recorders, but where recycled water is being currently used in the irrigation system. This test method is based on the difference in the concentration of TDS (total dissolved solids) in potable and recycled water. This method is commonly used at residential sites where the yard areas are controlled by a homeowners association (see also Method 9).

The number of TDS test meters should be based on the size of the project. This method depends on a significant difference in the TDS of the potable and recycled water. However, this test method may not be applicable if potable water is blended with recycled water before delivery or if low TDS is a significant constituent of the recycled water.

First, follow Method 1 for the recycled water system cross-connection control testing. Determine the TDS concentration of potable water in the area of the test. This can be provided by the water purveyor. The reading needs to be as close to the day of the test as possible due to the variations in TDS of the delivered water.

Shut off the potable water at the service meter(s). Drain each individual building through the hose bib. The draining should be done slowly to avoid air locks in the water lines. Secure (shut off) the hose bib to close the drained system.

Turn on the recycled water system for at least one hour or until runoff occurs. Activate all the stations. Secure (shut off) the recycled water system. Then go to each individual building and check the hose bib for flow. If there is flow, test the flow with the TDS meter. If the TDS is identical to the reading taken earlier, there is no detectable cross-connection noted at the time of the test. If the water in the house has not been used for a period of time, the TDS of the “old” water may be significantly different from the TDS noted on the day of the TDS reading.

If the TDS is significantly different from the earlier recorded reading, action must be taken to determine the reason for the difference. One way of doing this is to trench the potable water lateral from the service meter to the hose bib because this is the most likely area for a cross-connection.



Method 4

This method is a modification of Method 3, for use on sites where there are no connections for pressure recorders and the irrigation is still charged with potable water prior to conversion. This procedure can be used at sites containing occupied residences since it is the least intrusive of the test methods. However, in most cases this will be a retrofit situation. The irrigation system should be tested for 24 hours. The period of cross-connection control of the potable system should be at least 4 to 12 hours for the initial test, based upon site complexity.

First, follow Method 1 for the recycled water system cross-connection control and testing. Shut off the potable water at the service meter(s).

Drain each individual building through the hose bib. The draining should be done slowly to avoid air locks in the water lines. Secure (shut off) the hose bib to close the drained system. Turn on the recycled water system for at least one hour or until extensive runoff occurs. Activate all the stations.

Secure (shut off) the recycled water system. Go to each individual building and check the hose bib for flow.

NOTE: Although this method is the least intrusive because the exterior hose bibs are the only fittings tested for flow, it is the least certain of the test methods. This method places a great deal of reliance on the knowledge and judgment of the specialist conducting the test.

One method to increase the level of safety for the recycled irrigation system is to require the purveyor to install master shutoff valves at the irrigation service meter. As a result, the irrigation system would be depressurized any time it was not in actual use.

Method 5

This method can be used on new construction sites where the building(s) are located close to the potable service meter. Immediately before the conversion to recycled water, the contractor can expose the potable water line(s) to the building(s) for visual inspection. Future cross-connection control shutdown tests must be done by acceptable methods or uncovering the potable water line.

Method 6

The dye testing method was developed by Tucson Water in Tucson, Arizona. It has been successfully used for cross-connection control tests for a number of years in Arizona. It has also been successfully used for cross-connection control testing in San Diego County.

Dye testing is simple and quick. If set up properly, the test can be completed in only one to two hours which minimizes the inconvenience to use site tenants. It can give results that are seemingly more certain than the pressure differential test. However, it is only a one way test and will not reveal a cross-connection from the recycled system protected by a one way check valve. Another potential problem is that the dye may stain the hardscape and adjacent structures. The food safe dye fades when exposed to ultraviolet light, as found with exposure of the dye to the hot sun in the Tucson, Arizona area. However, the dye may not fade in shaded areas and in areas without maximum exposure to sunlight. Also, the quantity of dye to be used is based on the size of the use site and must be quantified. Dye testing can be used in specific cases where the inconvenience to tenants through shutting down the potable water system is the overriding issue and staining is not a concern.

To comply with the two way test requirements, follow Method 1 for the recycled water system cross-connection control and testing (this step is not used in the Arizona test). Shut off the potable water supply at the RP. Open the number four test cock. NOTE: All RPs must have been tested successfully as illustrated by a current test report prior to dye testing.

Open all potable water outlets and fixtures on the proposed recycled water site. These are left open until the dye test is completed. Charge the proposed recycled water system(s) with potable water and dye. Use powder dye to immediately color the system. Tablets or cakes can also be utilized and will be retained in a strainer to dye incoming water to the proposed recycled water system.

Check for water and dye at the RP #4 test cock and at all potable water fixtures and outlets. Open all potable water fixtures that could not be left open and check for water and dye while proposed recycled system(s) are under pressure.

If the systems check out OK, return the potable water system(s) to normal operation. The proposed recycled system may now be connected to the recycled water service if site evaluation (ponding and overspray) is complete and the recycled water use signs are posted.

Should the site fail any of the above criteria, the recycled water service to the site is prohibited until full site compliance is completed.



Method 7

Method 7 is used for dual plumbed buildings. The test methods were developed based upon the 1998 California Plumbing Code (Appendix J). The procedure should be followed by the applicant in the presence of the regulatory authority and other authorities having jurisdiction.

The potable water system shall be activated and pressurized. The recycled water system shall be shut down and completely drained. The potable water system shall remain pressurized for a minimum period of time specified by the regulatory authority while the recycled water system is empty. The minimum period the recycled water system is to remain depressurized shall be determined on a case-by-case basis, taking into account the size and complexity of the potable and recycled water systems. In no case shall that period be less than one hour.

All fixtures, potable and recycled, shall be tested and inspected for flow. Flow from any recycled water system outlet shall indicate a cross-connection. No flow from a potable water outlet would indicate that it may be connected to the recycled water system.

The drain on the recycled water system shall be checked for flow during the test and at the end of the period. The potable water system shall then be completely drained. The recycled water system shall then be activated and pressurized.

The recycled water system shall remain pressurized for a minimum period of time specified by the regulatory authority while the potable water system is empty. The minimum period the potable water system is to remain depressurized shall be determined on a case-by-case basis. In no case shall that period be less than one hour.

All fixtures, both potable and recycled, shall be tested and inspected for flow. Flow from any potable water system outlet shall indicate that it may be connected to the recycled water system. The drain on the potable water system shall be checked for flow during the test and at the end of the period.

If there is no flow detected in any of the fixtures which would have indicated a cross-connection, the potable water system shall be repressurized.

Method 8

Method 8 is a modification of Method 6 and 7 for dual-plumbed buildings. This method uses a food-safe dye. The basic procedure is the same as Method 7, with the following modifications:

- Pressure recorders are installed on the recycled water system prior to depressurization.
- The recycled water system is depressurized to a pressure of at least 50% of the potable water pressure.
- The potable system is operated normally for at least 4 hours.
- The recycled water system is repressurized.
- The potable water system is depressurized to at least 50% of the recycled water pressure.
- A food-safe dye is added through a valved standpipe to the recycled water system.
- The system is flushed until the dye appears in the last recycled water fixture.
- All fixtures are checked on the potable system for the appearance of the dye.
- The length of time for this phase of time it takes to check all fixture system.



Method 9: Recycled Water Cross-Connection Control Shutdown Test at Homeowners Associations (HOAs) with No Backflow Prevention Assemblies

The purveyor notifies the HOA of the scheduled test and homeowners know that the water will be turned off for a period of time. The purveyor is to have the total dissolved solids (TDS) reading for both the potable and the recycled water for the day of the test.

The test can be done in sections to minimize the water shutoff times.

Uncover each water meter in a section and turn off the curb stop. If the site is old, both the curb stop and the customer shutoff valve may have to be closed to stop water bleed-by.

Once the water in a section is shut off, open all exterior hose bibs to drain the water from the homes. Open the hose bibs slowly to minimize the creation of air locks in the plumbing system.

Close all hose bibs in the tested section.

Run all irrigation valves in the tested section for a minimum of two minutes each - this is the usual test cycle on the controller.

Open each hose bib and if there is any water flow, test it for TDS with the TDS meter. A paper or plastic cup is needed to collect the water flow. A cross-connection is indicated if the TDS of the house water is at or near the TDS of the recycled water.



Be aware that if the house has been unoccupied for some time, the TDS of the house water may vary from the test day potable water TDS. If the TDS is near that of the recycled water TDS, purveyor records should be consulted for previous (historical) TDS readings when the house was last occupied. Water softeners and where the softeners are located in the house water system also must be considered in this test method.

Be aware that the purveyor may be augmenting the recycled water supply with potable water to meet the demand. This will make the readings increasingly difficult to interpret as the TDS of the recycled water approaches the TDS of the potable water.

Note unprotected (without a backflow prevention assembly) connections off the potable line feeding the house that extend to potable backyard irrigation. The purveyor should notify the HOA on how to make the connection legal.

To assist the on-site purveyor staff, the regulator may help the purveyor shut off the water to the homes and check the hose bibs. However, it is the purveyor's responsibility to turn the water back on. If the home is unoccupied and the water continues to flow (as indicated by the meter tattletale), flooding may occur in the home. If the tattletale indicates continued flow, it is advised that the meter be shut off and a note left for the homeowner to contact the purveyor for meter turn on.

Attachment 1: Recycled Water and Health Effects

Recycled water is produced from municipal wastewater. The municipal wastewater undergoes a rigorous and controlled treatment process at wastewater reclamation plants. However, the waste stream comes from a variety of sources, the larger part of which is human, and human waste will contain pathogenic organisms. Pathogenic organisms found in municipal wastewater can be classified into four groups: viruses, bacteria, protozoans and helminthes. Each group contains disease-causing organisms that are a public health concern. Treatment of the municipal wastewater to an end product of 2.2 disinfected tertiary recycled water, which is the type of water we are normally dealing with, will eliminate virtually all of these organisms.

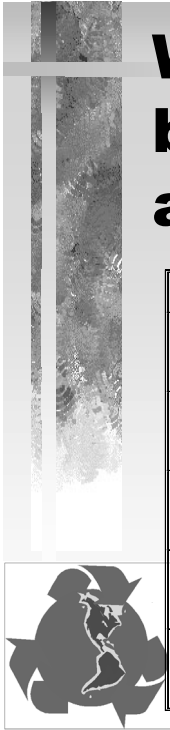
That said, the recycled water treatment train does not eliminate every organism. The 2.2 mentioned above means that the sample does not exceed a statistical average of 2.2 total coliforms per 100 ml (or 83 coliforms per gallon) of recycled water over the last seven days as sampled daily at the treatment plant. The sample should not exceed 23 total coliforms per 100 ml in any 30-day period and cannot exceed 240 total coliform in any one sample.

Coliforms are bacteria found in the intestinal tract of all humans and are used to monitor the quality of the recycled water. This quality of recycled water has been shown to be safe for many uses, but it is not considered safe to drink nor is it safe to inhale the mist created in many of the approved uses.

It must be remembered that recycled water is not the same as domestic (potable) water. However, when properly used and the appropriate rules and regulations followed, 2.2 disinfected tertiary recycled water is safe for specific uses.

What is the difference between potable water and recycled water?

	POTABLE WATER	RECYCLED WATER
<i>Source:</i>	Rivers, Lakes, Wells	Municipal Wastewater
<i>Treatment:</i>	Extensive	Adequate for Specific Uses
<i>Testing:</i>	Extensive	Once/Day for Coliform at Plant
<i>Distribution Testing:</i>	Extensive	None Required
<i>Safety Data:</i>	Extensive	Minimal



Attachment 2: Recycled Water Use Site Plan Process and Responsibilities

The initial set of new or retrofit plans are received by DEH to start the plan check process. The plans are logged in and plan checked by a DEH Cross-Connection Control Specialist. A plan correction letter is generated and sent to the recycled water purveyor. A corrected set of plans along with the plan correction letter and the mylar title page with signature blocks is returned to DEH for review and if all corrections are completed, DEH mylar title page signature. The plans are then returned to the purveyor for signature. It depends upon the recycled water purveyor who is to sign the title page mylar first - DEH or the recycled water purveyor.

A copy of the final signed set of plans and as built must be returned to DEH. The plan check process will not be considered complete until these plans are on file at DEH. The recycled water cross-connection control shutdown test will not be performed without a final signed copy of the use site plan.

It is the responsibility of the recycled water purveyor to ensure that the use site recycled water distribution system is installed in accordance with the approved plans. If the use site is not in conformance with the approved plans, the recycled water cross-connection control shutdown test may be delayed or cancelled.

Attachment 3: Reporting Requirements Prior to Conducting a Recycled Water Cross-Connection Control Shutdown Test

A report is to be submitted to DEH for review prior to conducting the cross-connection control shutdown test. The report should include the following:

- a. Site location and specific cross-connection control time schedule. This can be a copy of the notification letter to the owner of the site if it includes the specific scheduling information.
- b. Cross-connection control test methodology. This can be an excerpt from the DEH Recycled Water Plan Check and Inspection Manual.
- c. A site plan showing the proposed locations of the pressure recorders for both the irrigation and the potable water cross-connection control tests. This can be a marked up copy of the use site plan.
- d. DEH Control Number (RW# or RF #).
- e. Notify DEH in advance of the potable water shutdown test if the site has any operating food-handling facilities. DEH will then notify the food inspection section. The California Health and Safety Code prohibits food serving or preparation without hot and cold running water under pressure.

Attachment 4: Shutdown Test Notification Suggestions

The purpose of the test is to find out if there are any connections between the irrigation system and the drinking water system. The reason for the test is that the irrigation system will be converted to recycled water and recycled water cannot be mixed with drinking water.

This test requires the cooperation of ALL personnel on the test site, whether in the building or on the grounds. If there is ANY water use during the test, the test may be invalidated and have to be redone.

What is meant by water use?

Opening a sink faucet
Flushing a toilet or urinal
Opening a mop sink faucet

In addition to these obvious uses of water, there are other uses that must be secured before the start of the test. Following is a partial list:

<i>Cooling Towers</i>	<i>Water Softeners</i>
<i>Heating and cooling equipment</i>	<i>Roof mounted swamp coolers</i>
<i>Ice Makers</i>	<i>Computer-controlled utility</i>
<i>Refrigerators with internal ice makers</i>	<i>panels</i>
<i>Laboratory equipment</i>	
<i>Decorative fountains</i>	
<i>Drinking fountains</i>	
<i>Under sink and lab reverse osmosis units</i>	
<i>Wall-mounted chemical cleaning dispensers</i>	

The actual test creates a pressure differential between the irrigation and domestic water systems. When the domestic water system is depressurized, there must be residual pressure in the system - usually about 30 psi - for the test to work. Any water use will drop that pressure to zero and invalidate the test.

Again, the test requires the cooperation of ALL personnel on the test site. If there is ANY water use during the test, the test may be invalidated and have to be redone.

Thank you for your cooperation. If you have any questions, please call _____.

Attachment 5: Policy on What Makes up the Complete Cross-Connection Control (Shutdown) Test

1. A site specific cross-connection control protocol approved by the regulatory agency. This protocol is required by Title 22 and Title 17 CCR and State Health Department engineering report policy. The protocol shall include:
 - a. The method used to determine the complete separation of the recycled water and the potable water distribution systems.
 - b. The amount of time that the recycled water system (s) shall be off and the amount of time that the potable water system(s) shall be off during the cross-connection control shutdown test.
 - c. If pressure recorders are used, the location of the placement of the pressure recorders on the recycled water system(s) and the potable water system(s) must be documented on a use site plan.
2. Coverage and overspray tests should be conducted when the recycled water system is operated during the potable water phase of the cross-connection control test.
3. Site inspection of signage locations (as approved on original site plans) and any modifications of signage locations.
4. Site inspection of color coding of all above ground appurtenances and valve box tagging. If the appurtenances have been painted, check the fading and peeling of the paint. If the appurtenances, such as valve box covers, are specific for recycled water use and have the necessary recycled water verbiage and “Do Not Drink” symbol as part of the appurtenance, the color fading will not considered to be significant and repainting will not be necessary unless required by the purveyor.
5. A meeting with the use site Use Site Supervisor. Review the Use Site Supervisors qualifications and use site records as part of the inspection. If the site is new, review the Use Site Supervisor’s shutdown test responsibilities. These records will include use site as built plans of the water systems, cross-connection control tests and inspections. The records will also include major plumbing changes and repairs to the potable and recycled water systems.

Attachment 6: General Cross-Connection Control Test Step Outline for any Use Site

1. Is this a new site with approved plans or is this a retrofit site with approved plans?
2. Have all relevant personnel on the site been notified?
 - a. Notification should be both verbal and written
 - b. The notification process should start at least one month before the scheduled cross-connection control test (refer to page 11 for information concerning notification specifics)
3. Determine points of connection for potable and recycled water lines:
 - a. Potable domestic service meter
 - b. Irrigation service meter
 - c. Fire service
 - d. Recycled service meter
 - e. Non-metered service
4. Do the points of connection, except for fire service, have backflow devices or other means to connect pressure gauges?
5. Does the fire service have a detector check meter?
6. If using pressure gauges, are there site elevation differences?
7. Are there post meter connections for pressure gauges such as quick couplers and hose bibs?
8. Are the site buildings single or multiple story?
9. Do the buildings have threshold valves?
10. Has someone who knows how to operate the irrigation controller been notified?
11. What is the number and orientation of the buildings on the site with respect to the irrigation system?
12. Is the irrigation system separate from the buildings? For example, a remote play field. Or does the irrigation system extend around and close to the buildings?
13. Is there open access to all use site buildings?

Attachment 7: Recycled Water Cross-Connection Control Test Duration

The duration of the test is the judgement call of the regulatory agency. An ideal test duration should be 24 hours cross-connection control in each direction. This is based on the initial cross-connection control protocol developed by Frank Hanamura, engineer with the SDHS. Also, the initial cross-connection control shut down test, especially with retrofits, should be 24 hours in each direction. The duration of the potable water cross-connection control can be modified by the regulatory agency using the guide lines listed below. (The four-hour absolute minimum potable shutdown test duration is based on experience. A situation occurred when we were almost three hours into a potable shutdown test before a pressure increase became apparent. The cause was a leaking gate valve located between the potable system and the future recycled system).

Advanced scheduling of the cross-connection control shut down test will minimize the impact of the test on the public. The major impact will occur during the potable water shut down test. Here, the 24-hour rule can be modified based on a review and approval by the regulatory agency. Also, the policies of the involved regulatory agency will come into play concerning the scheduling of the cross-connection control test, which is usually based of the availability of qualified staff. For example, the potable water cross-connection control at shopping centers can be done from 11:00 p.m. to 7:00 a.m. Shutting down the irrigation system for 24 hours will, in most cases, cause minimal inconvenience. The exception is golf courses where lack of water on hot days may cause turf damage.

Modifying the cross-connection control shut down test times for retrofit situations, the following factors come into play:

- Site complexity
- Adequate site plans and plan approval
- Agency personnel qualified to conduct the cross-connection control test
- Agency personnel experienced in conducting the cross-connection control test
- A 24-hour irrigation system cross-connection control test

Considering the above, the following are suggested minimum cross-connection control shutdown times under the best of conditions for the use site potable water system:

- a. On sites without potable water such as street embankments: a coverage test only
- b. Parks with only restrooms and drinking fountains: four hours
- c. Commercial/industrial sites: four hours
- d. Apartment/condominium projects: four hours
- e. Schools/day care centers: four hours (24 hours on initial test)

Attachment 8: Policy on Frequency of Cross-Connection Control (Shutdown) Tests

1. The standard for the frequency of the complete cross-connection control test will be in compliance with the Title 22 CCR and the RWQCB discharge permit.

The standard frequency is a minimum of once every four years.

- a. For the intervening years, an annual use site inspection will be conducted in accordance with Title 22 CCR and the discharge permit.
 - b. The cross-connection control test will be yearly for dual plumbed systems without potable water backflow protection.
2. The complete cross-connection control test will be monitored by the regulatory agency.
 - a. The regulatory agency monitoring of the annual inspection will be site specific and based on the complexity of the site and public exposure to recycled water at the use site.
3. Use sites where construction changes are normal throughout the course of the year will require annual cross-connection control testing.
 - a. This applies specifically to public agencies such as schools where there are no requirements for building permits and concurrent inspections.
 - b. Annual cross-connection control tests may also be required at sites such as hospitals, day care centers, detention facilities and homes for the aged where a cross-connection may create an increased level of risk to the use site population.
 - c. The requirement for the annual cross-connection control tests will be determined by the regulatory agency.
 - d. At use sites such as hospitals and detention facilities, an annual cross-connection control test may be impractical due to the difficulty of shutting down the potable water system. This must be determined by the regulatory agency. In these cases, a thorough site inspection, which includes the testing of the irrigation system, may be acceptable. The irrigation system test will be a 24-hour cross-connection control test preferably using pressure recorders. The cross-connection control test at these sites will be monitored by the regulatory agency during the actual field test.
 - e. Another alternative to an annual cross-connection control shutdown test on very large, complicated or sensitive sites is the certification of a member of the use site full-time staff as a Cross-Connection Control Specialist. This does not modify the requirement for a recycled cross-connection control shutdown test every four years.

4. The purveyor will provide copies of the cross-connection control shutdown test completion form to the regulatory agency.
 - a. These reports are to be provided to the regulatory agency within thirty days of the completion of the cross-connection control test in accordance with Title 22 CCR.



Attachment 9: Overspray and Runoff Testing for All Recycled Water Use Sites

A recycled water overspray, ponding and runoff inspection and a signage review are part of the cross-connection control test. This inspection should also be conducted on sites without potable water, such as landscape maintenance districts (LSMDs), streetscapes and slopes, such as freeways and street slopes for the possibility of inhalation of irrigation spray, and overspray and misting into non-use areas.

Runoff into storm drains and directly into waters of the State must be absolutely minimized through best management practices. Recycled water contains nutrients which can promote plant growth in lagoons and other waters of the State. Recycled water will frequently have a high chlorine level which can adversely impact stream and lagoon flora and fauna.

The inspection must also consider the possibility of cross-connections between the recycled irrigation system and private potable systems. The overspray, ponding and runoff inspection is not necessary on sites with drip irrigation. (See Attachment 22 concerning Landscape Maintenance Districts).



Attachment 10: Policy on Cross-Connection Control (Shutdown) Tests and Delays of Recycled Water Delivery

1. Recycled water delivered to use site within 30 days of cross-connection control test.
 - a. Site inspection by purveyor to ensure no use site changes. Recycled water can be delivered to the site if there are no use site changes and the regulatory agency has given permission to delivery recycled water.
 - b. If the purveyor determines there are use site changes that may have an impact on the cross-connection control shut down test, the purveyor is to immediately notify the regulatory agency for a determination if additional testing is necessary before the delivery of recycled water.
2. Recycled water delivered to use site after 30 days of cross-connection control test, but less than six months. The following is to take place within 30 days of scheduled recycled water delivery to the use site. This time frame can be modified if the purveyor determines that there are use site changes called out in 2b (see below).
 - a. Site inspection by purveyor and regulatory agency if requested by the purveyor to ensure no use site changes.
 - b. If significant use site changes, i.e., evidence of new construction or digging in areas of irrigation and potable water lines, see item # 3 (see below).
3. If there are significant use site changes contact the regulatory agency. The type of retesting will be determined by the regulatory agency and the purveyor. Following are the retest options:
 - a. Site inspection by the regulatory agency and purveyor with the user site supervisor and if possible, individuals involved with the actual use site changes.
 - b. Twenty four hour irrigation cross-connection control test.
 - c. Overspray and run off test.
 - d. Repeat the complete cross-connection control sequence.
4. Delay longer than six months: Redo the complete recycled water cross-connection control shutdown test.

Attachment 11: Changes at Recycled Water Use Sites

Recycled water use sites are subject to change. Approved recycled water use sites, especially commercial and industrial sites, are constantly in a state of flux. New buildings are added, old buildings remodeled. Irrigation systems modified and industrial uses reworked. The obvious problem is that changes will frequently affect the use of recycled water.

The use site supervisor should notify the purveyor of changes that will directly affect the recycled water system. “Should” is the operative word in the previous sentence.

For instance, we have had a situation where a new building was constructed on an approved use site. The structure was built under permit and inspection. However, the purveyor was not part of the inspection process and the irrigation system was installed without purveyor and regulatory plan check. The irrigation system was to be fed off the potable supply. A cross-connection control shutdown test demonstrated that the irrigation system was actually connected to the shopping center recycled water system. Luckily, at this site the recycled water had not been connected to the center’s irrigation system.

The solution to this problem is a working agreement between the purveyor and the local building authority which will notify the purveyor whenever permits are taken out for construction on a recycled water use site. This also emphasizes the need for a close working relationship between the purveyor and the building authority. This relationship must also exist with the landscape maintenance district authority.

In addition to the working agreement, the purveyor must have an active and continuous inspection program for recycled water use sites. This will address situations where notifications of new building permits does not happen. It also addresses situations where work is done without permits, since in many cases changes or modifications to the irrigation system may not require a building permit.

Attachment 12: Recycled Water Use Site Certification Letter

Recycled water **shall not** be delivered to a use site until the Recycled Water Use Site Certification Letter has been signed by DEH, copy to State Health, Office of Drinking Water. Without the certification letter, the use site is not approved for the use of recycled water.

The use site certification letter will be generated by DEH upon the successful completion of the initial use site recycled water cross-connection control shutdown test and the overspray, ponding and signage inspection. The date of the certification letter will be the start date for calculating the next recycled water cross-connection control shutdown test.

The following letter can be used as a certification letter to the purveyor from the Health Department(s) that a use site is approved for the use of recycled water .

[Date]

[Purveyor]

RECYCLED WATER USE SITE CERTIFICATION [Use site address]

The recycled water cross-connection control shutdown test and/or use site inspection for the use site located at the address in the subject line has been successfully completed. No discoverable cross-connections between the use site potable water system(s) and the use site recycled water system(s) were discovered at the time and date of the shutdown test. The overspray, ponding and signage inspection was successfully completed.

This use site is approved for the use of recycled water.

If you have any questions, please feel free to contact (health department representative).

Sincerely,

RC:

cc: State Health Department or Local Health Department

Attachment 13: DEH Recycled Water/Shutdown Test Inspection Form Example

COUNTY OF SAN DIEGO DEPARTMENT OF ENVIRONMENTAL HEALTH RECLAIMED WATER/CROSS-CONNECTION CONTROL PROGRAM

Recycled Water System Inspection Report

TIME ARRIVED:	TIME OF DEPARTURE:	TRAVEL TIME:	TOTAL TIME:
SITE NAME			DATE
SITE ADDRESS			
OWNER'S NAME			TELEPHONE #
WATER PURVEYOR			
WATER PURVEYOR'S REPRESENTATIVE			TELEPHONE #
USE SITE USER SUPERVISOR			TELEPHONE #
TYPE OF INSPECTION		BACKFLOW PROTECTION	
RETROFIT	NEW <input type="checkbox"/>	APPROVED METER SERVICE PROTECTION	<u>YES</u> <u>NO</u>
CONSTRUCTION	ANNUAL/4 YEAR <input type="checkbox"/>	APPROVED INTERNAL PROTECTION	<input type="checkbox"/> <input type="checkbox"/>
REINSPECTION	<input type="checkbox"/>	NOT APPLICABLE	<input type="checkbox"/> <input type="checkbox"/>
IDENTIFICATION-MODIFICATION RECYCLED AND POTABLE WATER SYSTEMS			
		<u>YES</u> <u>NO</u>	
PIPING, VALVES, QUICK COUPLERS, HYDRANTS, AND OTHER APPURTENANCES PROPERLY MARKED	<input type="checkbox"/> <input type="checkbox"/>	SIGNS IN PLACE	<input type="checkbox"/> <input type="checkbox"/>
VALVE TAGS VISIBLE & LEGIBLE	<input type="checkbox"/> <input type="checkbox"/>	SIGNS LEGIBLE	<input type="checkbox"/> <input type="checkbox"/>
PIPING MODIFIED	<input type="checkbox"/> <input type="checkbox"/>	CONTROLLER CHARTS	<input type="checkbox"/> <input type="checkbox"/>
PIPING MODIFICATIONS APPROVED	<input type="checkbox"/> <input type="checkbox"/>	AS BUILT PLANS	<input type="checkbox"/> <input type="checkbox"/>
		RECYCLED PURPLE EXCESSIVELY FADED	<input type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/> RECYCLED WATER BEING UTILIZED FOR ITS APPROVED USE(S):			
IRRIGATION	<input type="checkbox"/>	<u>YES</u> <u>NO</u>	<input type="checkbox"/> <input type="checkbox"/>
INDUSTRIAL	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
COMMERCIAL	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
OTHER	<input type="checkbox"/>	EXPLAIN	_____
PRESSURE TEST PERFORMED	<u>YES</u> <u>NO</u>	RESULTS:	
	<input type="checkbox"/> <input type="checkbox"/>		

ALTERNATE TEST PERFORMED: YES NO [IF YES, EXPLAIN TYPE OF TEST]

COVERAGE TEST PERFORMED: YES NO NA

RECYCLED WATER SYSTEM APPROVED: YES NO

COMMENTS:

OBSERVED BY:	TITLE	AGENCY
OBSERVED BY:	TITLE	AGENCY
OBSERVED BY:	TITLE	AGENCY
OBSERVED BY:	TITLE	AGENCY

SIGNED _____ TITLE _____ DATE _____

CC: WATER SUPERVISOR
WATER PURVEYOR

Attachment 14: Sample Recycled Water Site Inspection Report (provided by Padre Dam MWD)

Site Name & Address: _____
 Recycled Water Account # _____ Meter # _____
 Potable Account # _____

On Site Supervisor _____ Phone _____ Fax _____
 Date Inspected _____

	Pass	See Comments
1. All facilities/appurtenances are properly color coded.	_____	_____
2. Overspray, runoff and ponding are kept to a minimum.	_____	_____
3. No connections to hose bibs.	_____	_____
4. Appropriate signs maintained.	_____	_____
5. Unauthorized modifications.	_____	_____
6. Hours of operation (10:00 pm to 6:00 am).	_____	_____
7. All backflow prevention assemblies are in compliance.	_____	_____
8. Cross-connection test completed. Date due?	_____	_____

Comments and Corrections: _____

REMINDER: All appurtenances are to be color coded purple whenever repairs or replacements are made. Also, seasonal program adjustments are recommended for plant health and water conservation.

 Inspected by

Attachment 15: Irrigation Controllers

When doing a cross-connection control shutdown pressure test on a recycled water irrigation system, it is vital that the irrigation controllers be operated by someone familiar with both the irrigation system and the operation of the controller. Ideally, the controller should be operated by a representative of the site landscape maintenance company.

The problem that may be encountered is that a controller may operate an irrigation system remote from the location of the controller. Also, the sequence of irrigation station activation may not be logical. It is a common irrigation practice to wire the controller so that adjacent stations do not activate sequentially to avoid overwatering from overspray into the previously watered area.



Station activation sequence is dependent on how the activation wires are connected to the controller. This has the potential of making the overspray test very difficult in that stations may be activated anywhere on the site for the standard two minute test run time. If this is the case, it is strongly recommended that the controller be rewired.

This also points out the necessity of the availability of a controller chart which shows the specific site and location of all irrigation stations that the controller operates. In addition, adjacent irrigation systems may be inadvertently cross-connected. An example of this happened when a private irrigation controller also operated part of an irrigation system owned by a city. Another potential problem may occur when controller wires from one system cross wires in the ground from another system. The result may be short circuiting between the two systems.

A copy of a model irrigation controller chart developed by Ms. Dee Kitchen of Padre Dam Municipal Water District is included in Attachment 16.

Attachment 16: Controller Chart (Example)

Irrigation Controller Chart					
Account #		Controller Type-		Owner-	
Meter #		Location-		Contact-	
Location-		# Stations		Phone #	
Station #	Start Time Run Time	Days	Sprinkler Type	Plant Type	Station Area Description
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

Plant Type
 T—Tree
 TF—Turf
 S—Shrub
 GC—Groundcover

Pedra Dam Municipal Water District—DK 1097

Attachment 17: Designation of a Use Site Supervisor

The concept of a “Use Site Supervisor” (also called a Recycled Water Site Supervisor) is based on Section 60314: Report Submittal, Part a, Item 1, Section D, of Title 22 which requires the identification of “the person or persons responsible for operation of the dual plumbed system at each facility.” The concept of the Recycled Water Site Supervisor is also based on Section 7586 of Title 17 CCR. This section allows the health agency and water supplier to require an industrial water user to designate a user supervisor when the water user’s premises has a multi piping system.

The Regional Water Quality Control Board, Region 9, has developed standard language concerning the Recycled Water Site Supervisor. This language, as found in the discharge permit for the City of San Diego, North City Water Reclamation Plant (Order No. 97-03), will be used in all subsequent and renewed recycled water discharge permits.

The language is as follows: “The recycled water user shall designate a recycled water supervisor who is responsible for the recycled water system at each use area under the user’s control. Specific responsibilities of the recycled water supervisor include the proper installation, operation, and maintenance of the irrigation system; compliance of the project with the Recycled Water Agency’s rules and regulations; prevention of potential hazards and preservation of the recycled water distribution system plans in as built form. Designated recycled water supervisors shall obtain instruction in the use of recycled water from an institution approved by the State and County Health Departments.”

The identification of the designated Recycled Water Site Supervisor) is required in the quarterly recycled water monitoring report from the purveyor to the Regional Board.

Because the Recycled Water Site Supervisor has specific responsibilities concerning the use and maintenance of the site recycled distribution system, a one-day course of instruction approved by the State and County Health Departments has been developed by the CWA. The CWA can be reached at (619) 682-4292.

Because of the many and varied use sites under development in San Diego County specific questions have arisen concerning the Recycled Water Site Supervisor. The following will address several of those questions and attempt to clarify the role and the designation of the Recycled Water Site Supervisor.

Each use site will have a Recycled Water Site Supervisor designated and tracked by the purveyor. The term “tracked” means that the purveyor will ensure that, because of turnover of use site personnel and management companies, the designated Recycled Water Site Supervisor is current and qualified. Although the attendance at the CWA course is highly desirable for all designated Recycled Water Site Supervisors, in specific cases, the Recycled Water Site Supervisor may have the option of attending the CWA course. This option will be exercised by the purveyor with the approval of the regulatory agency.

In these specific cases, the designated Recycled Water Site Supervisor may delegate the CWA course attendance to the landscape maintenance company or other entities actively involved in use site maintenance. The designated Recycled Water Site Supervisor is the point of contact for the purveyor and regulatory agencies and maintains the overall responsibility for the use site requirements specified in the discharge permit. The designated Recycled Water Site Supervisor is also invaluable for setting up cross-connection control tests and site inspections. In these specific cases, which will be addressed, the purveyor is responsible to ensure that the party to whom the work is delegated has attended the CWA course.

Large use sites such as golf courses, military facilities and cemeteries shall have an on-site use supervisor(s) who have attended the CWA course. Use sites such as schools, day care centers, hospitals (not small medical facilities), detention facilities, care homes and homes for the elderly shall have an on-site use supervisor who has attended the CWA course. The reason for this is the large number and high turnover of at risk population at these use sites. If there is a question on this designation for a specific site the regulatory agency should be consulted.

Residential sites, such as condominium projects or apartments, shall have a designated Recycled Water Site Supervisor, such as a member of the homeowners association or apartment manager, but may delegate the CWA course attendance to an off-site entity.

Governmental sites such as parks, slope and medium strip irrigation areas may have a Recycled Water Site Supervisor who has attended the CWA course that oversees a multiple number of governmental controlled sites.

Commercial sites such as strip malls, shopping centers and industrial complexes that do not have on-site personnel involved in the maintenance of the irrigation system may delegate the CWA course attendance to an off-site entity. The designated use supervisor point of contact may be the site management company, owner, manager or person in charge of the site.



Attachment 18: Duties and Responsibilities of the Recycled Water Site Supervisor

All recycled water purveyors require that the user designate a Recycled Water Site Supervisor. This person shall be responsible for the safe and efficient use of recycled water by all involved personnel at the user's site. The purveyor must approve of the person appointed to this position. This person shall be available to the purveyor regarding the operation and maintenance of the user's recycled water system. The user is responsible for notifying the purveyor immediately of any change in this position. The duties and responsibilities of the Use Site Supervisor shall include but not be limited to the following:

Maintain a current certificate of completion from the Recycled Water User Supervisor Training Course;

Be responsible for keeping the water purveyor informed of all failures, emergencies and proposed changes that occur involving the recycled or potable water systems and have current copy of recycled water use agreement available and readily accessible;

Responsible for the proper installation, operation and maintenance of the irrigation or other systems using recycled water;

Ensure compliance of the use site with the recycled water agency's Rules and Regulations;

Be knowledgeable of what recycled water is and how it is produced;

Be aware of the best management practices, specific equipment and principles relating to the intended use of recycled water;

Be responsible for keeping the equipment and facilities properly maintained. Educate all maintenance and landscape personnel on a continuous basis on the presence proper use of recycled water;

Maintain the use site recycled water distribution system as-built plans as well as up-to-date appropriate records of all on-site recycled and potable water systems. Requirements are use-site specific and are intended to document major changes made to on-site plumbing;

Act as a 24-hour contact and liaison with the recycled water provider to ensure the safe and efficient use of recycled water at the use site;

Maintain a basic understanding of cross-connection control, backflow prevention principles and practices, and be familiar with the purveyor's cross-connection control testing requirements;

Accompany water agency and regulatory personnel during the recycled water use site inspection and cross-connection control shutdown tests; and

Educate all maintenance and landscape personnel on a continuous basis on the presence and proper use of recycled water.

Attachment 19: As-Built Plans

One of the responsibilities of the recycled water Site Supervisor and the purveyor is to maintain current as-built plans of the use site. These are normally the irrigation system plans. However, in special cases, they may be engineering reports for cooling towers and other non-irrigation uses of recycled water.

The purpose of the as-built plans is to provide an up-to-date record of potable and recycled water system changes. On sites where there is no potable water such as median strips and slope irrigation, major changes to these systems should be noted on the plans. The as-built plans will be reviewed by the purveyor and regulatory authorities during inspections and cross-connection control shutdown tests. A copy of as-built plans for new use sites shall be forwarded to DEH.

As-built plans can come in several forms. The best form of the as-built is a copy of the actual site irrigation or recycled water use plan that was approved by the recycled water purveyor, the city or municipality and health authority. To confirm that it is a set of approved plans, check the title page for the signatures of the various approval agencies.

The recycled water purveyor shall maintain a set of approved plans for each use site. These plans shall be updated to reflect major changes on the use site.

Use Site Supervisors of large use sites such as schools, parks and large industrial/commercial sites should also maintain a set of approved plans. These plans will be marked up with any major changes to the potable and recycled water systems with the dates when the changes were made. Examples of major changes are when the potable or recycled lines are dug up, moved or undergo major modifications. It does not mean minor repairs such as irrigation head repairs or minor line patches.

For small use sites, such as residential, small industrial and commercial sites, maintaining an approved set of plans may not be feasible. One alternate method is to maintain a sketch of the site layout. Potable and recycled water system changes can be annotated with dates on the sketch. Another alternate method is a simple list of plumbing changes and the date when the changes were made.

Regardless of how the as built are maintained, some method must be employed for each recycled water use site to record use site major plumbing changes.

Attachment 20: User's Guide to Practical Do's and Don'ts

Do's:

1. Take preventive measures to ensure no cross-connections can occur.
2. Maintain and submit as-built drawings of any and all changes/additions to your recycled water system.
3. When performing repairs or modifications to the recycled water system, use only materials approved for recycled water use.
4. If your system has quick couplers, be sure that the user supervisor assumes sole responsibility of the quick connects for these couplers, and the use of these connections is closely monitored.
5. Closely monitor the recycled water system operation: be alert to and minimize overspray, runoff and ponding. If it occurs, make the necessary corrections and notify the appropriate agencies, if required.
6. Keep systems functioning properly. Repair any and all damage to the recycled water system immediately. Report breaks or spills directly to your recycled water purveyor and the Department of Environmental Health at (858) 694-2548.
7. Educate all workers of the correct uses and restrictions of recycled water. Check with your local recycled water purveyor for specific rules and regulations.
8. Be aware of the types of vegetation within your site boundaries and their responses to irrigation with recycled water. You may have to alter your water management practices based on soil and water characteristics.
9. Keep all records and references complete, up-to-date and accessible.
10. Keep others informed of all activities involving the recycled water system.

DON'Ts

1. Do not drink recycled water.
2. Recycled water should not be used to wash hands or other parts of the body.
3. Equipment (i.e. tanks, valves, hoses, pipes and pumps) that has been in contact with recycled water should not be used in conjunction with any potable water system unless adequately disinfected.
4. Do not attempt to modify or change the recycled water system without authorization from the recycled water supervisor.
5. Do not remove or tamper with recycled water warning signs.

Recycled Water Quick Coupler Advisory

Health & Safety Precautions

Recycled water is highly treated municipal wastewater (or sewage) that is used for certain non-potable applications. In San Diego County, recycled water is used extensively for landscape irrigation. It is also approved for some agricultural and industrial uses.

There are specific guidelines that have been established for the safe use of recycled water to protect the public health. Recycled water pipes, valves and sprinkler heads are color coded purple. Recycled water warning signs are also used to alert the public to the use of recycled water. The hours for the use of recycled water are limited to minimize public contact.

Recycled water quick couplers can be used only under the supervision of on-site supervisors, using equipment designated for recycled water use.

HOOKUPS FOR ANY TYPE OF WASHING, CLEANING, CONCRETE CUTTING, TANK FILLING OR DRINKING ARE NOT PERMITTED due to health and safety concerns.

There are other ways you can protect yourself from health risks associated with recycled water use:

- 1 Never drink recycled water or inhale its mist
- 1 Don't use recycled water to wash hands or rinse off equipment
- 1 Keep away from recycled water irrigation areas when sprinklers are in use

For more information, contact your local water district or the San Diego County Department of Environmental Health at (858) 694-2548.

Attachment 22: Documented Cross-Connections, Landscape Maintenance Districts and Methods of Control

In designing sites for recycled water use, consideration must be given to cross-connection control issues. This pertains mainly to recycled water use on landscape maintenance districts (LSMD) such as slopes and streetscapes. A properly designed use site can minimize the possibility of an illegal connection being created between the recycled water system and a drinking water system. The design can also minimize the need for continued regulatory oversight and inspections of sites adjacent to recycled water use sites.

Frequently a LSMD will abut private irrigation systems with no separation. This invites the homeowner or commercial site owner to connect into the recycled LSMD irrigation system for free water. The illegal connection is usually through a valved fitting and is consequently very difficult for the purveyor and the regulatory agency to find through the standard cross-connection control shutdown and inspection procedures.

Cross-connections between a LSMD and private homes have been documented in Orange and Los Angeles Counties. In January 2000, an irrigation system in Newport Beach was converted from potable to recycled water. In September 2000, city crews noticed a water meter running backwards. This was caused by an illegal cross connection which fed recycled water into a private home and then into the public main. In November 1997 in Los Angeles County a cross-connection resulted in the contamination of the drinking water in approximately 1600 homes and two schools. The contamination by the recycled water is caused by the normally higher pressure used in LSMD irrigation systems which overcomes the potable water system pressure and forces the recycled water through the potable system. If the service meter is without backflow protection, as is the case with most private residences, the recycled water flows through the meter into the main potable distribution system.

This potential problem can be minimized by the installation of concrete mow strips between the recycled system and the private irrigation system where one system is immediately adjacent to the other. An example of a mow strip is at the end of this attachment. Without the mow strip, the private irrigation system must undergo a cross-connection control shut down test and annual inspections. Also, there may be a need for the installation of a backflow device at the service meter.

Another area of concern is where LSMD recycled irrigation systems abut fenced back yards. If the fence is solid, such as block or stucco, the chance of a cross-connection is minimized, as is the concern with overspray into the private back yard. Balustrade fencing gives rise to concerns with both cross-connections and overspray. In this case, since there is a fence separation, a cross-connection control shut down test is not warranted but an overspray test is required. During the annual overspray test, the private back yard irrigation should be observed to see if it is activated at the same time as the LSMD irrigation system. If it is, further investigation is necessary to determine if the two systems are connected.

Attachment 23: An Actual Incident and the Resolution

What to do if a cross-connection between the recycled water system and the drinking water system occurs. This is a recap of an actual incident, included in the manual for guidance in case of an occurrence. It has happened before and, with the number of dual plumbed systems in place and the number of dual plumbed systems being installed, along with the unknowns on various use sites, it will happen again. The actual sequence of events will vary as will the regulatory response, but the response to the following incident can serve as guidance if what should not happen happens.

The irrigation system at a local park had been shut off for several days for an Easter egg hunt. The city employee who reactivated the irrigation system checked the park potable water system at the same time. He took the extra precaution of checking the potable system because he knew that the irrigation system was fed by recycled water and he was the site recycled water supervisor, having attended the San Diego County Water Authority Site Supervisor course. The site supervisor course is a requirement for the use of recycled water at any use site in the county. In this case, he noticed a problem with a park drinking fountain. With the irrigation off, the drinking fountain did not work.

The city employee immediately contacted the recycled water purveyors' cross connection control specialists, who in turn contacted the local and state health departments and the regional water quality control board. The on site investigation showed that one park drinking fountain was fed off the irrigation system. The park had been in existence for about 20 years and the conversion to recycled water was a retrofit situation. The reason that this connection had not been located during the recycled water cross-connection control shut down test is that the 3-inch irrigation main loop extended on a slight elevation above the drinking fountain. The drinking fountain was connected to a ¼ inch feed line. This loop was not called out on any available plans. With the irrigation shut off, the drinking fountain operated normally for over ten minutes, being gravity fed from the irrigation loop. The connection was located and severed during the initial investigation. The shut down procedures have been modified to take this type of situation into account.

On a positive note, the purveyor maintains chlorine residual in the distribution system that, at the park, is significantly higher than the chlorine residual in the drinking water system. But, a cross-connection – in this case in fact a direct feed - is a cross-connection between the recycled water system and the potable water system and it does have consequences.

It was found that the original plans (the park was initially operated by the county and turned over to the city), showed the drinking fountain to be connected to the potable water system. The retrofit review before conversion to recycled water did not pick up the connection between the drinking fountain and the park irrigation system. It was determined that the connection had been in existence for approximately nine months after the conversion to recycled water. The drinking fountain was in an area of the park somewhat remote from areas of normal park use and located near a tennis court.

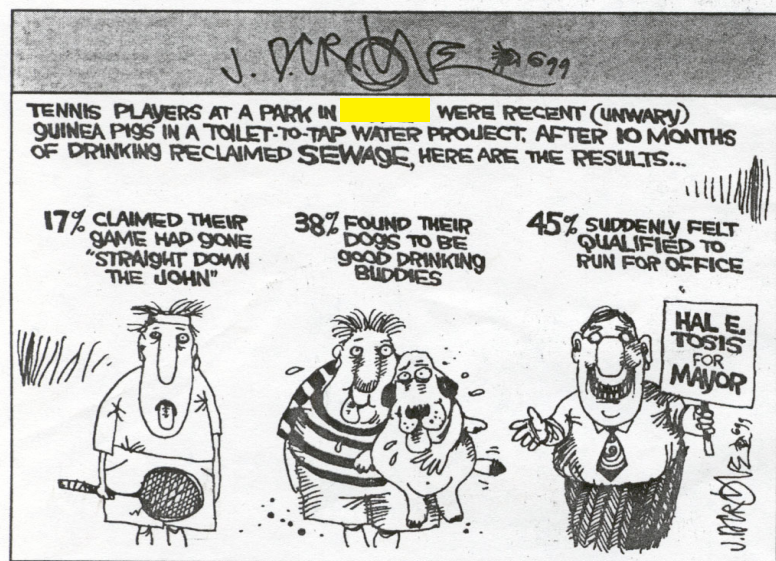
A series of meetings were held between state health and local health and the county epidemiologist to determine a course of action. A press release was issued to the local newspaper and a sign explaining the problem was posted next to the drinking fountain. The local press had fun with the situation as can be seen by the cartoon at the end of this attachment. It was not fun for the purveyor or the regulators who approved the site for the use of recycled water. The process was extremely time consuming because at that time there were no administrative procedures in place to deal with this situation.

Positive aspects:

1. The discovery of the connection was made by a city employee using the knowledge learned in the user supervisor course.
2. The purveyor immediately notified the regulatory agencies and cooperated fully in resolving the problem.
3. There was full cooperation between the various regulatory agencies and the recycled water purveyor in resolving the incident.
4. The purveyor cross-connection control specialists, who conducted the cross-connection control shutdown test, had complete and exacting records of the actual test. The shut down test had regulatory oversight, so negative impacts were equally shared between the purveyor and the regulatory agency.
5. The public was notified of the incident through a press release and posted sign at the site. This “full exposure” mitigated a potential negative public response.
6. The shut down procedure was modified to take into account use site elevations.
7. The scrutiny given to retrofit sites has been increased.
8. The reinforcement that each use site is unique and that the approval process must be conducted by cross-connection control specialists thoroughly trained and experienced in this type of work.

Negative aspects:

1. The public is placed at risk.
2. An actual incident is extremely time consuming, putting on hold other necessary work until the incident is completely investigated and resolved.
3. The use of recycled water may be negatively impacted.
4. With over 400 recycled water use sites approved in San Diego County, this was the first cross-connection (direct feed) that was not found before the site was actually converted to recycled water use.



Attachment 24: Highlining

Highlining in the context of the recycled water cross-connection control shutdown test means bringing water to a system or equipment from other than the normal supply source. This means running a hose from an available source of water, usually a fire hydrant, to the water-requiring device or system.

When doing the recycled water inspection of a commercial or industrial site prior to the cross-connection control shutdown test, always ask if there is any equipment on the site that must have a continuous source of water. Also, ask if there are any water pressure considerations. This equipment may include cooling towers, laboratory devices, industrial pumps, etc. Be very sure that the person you ask is familiar with all the water using devices at the facility.

Another item to consider is does the water requiring device require a special technician to be in attendance to monitor adding water during the test. In certain situations, such as small grocery store cooling towers, an adequate amount of water can be supplied by buckets. This, of course, means someone has to be at the cooling tower to add the water.

Equipment such as cooling towers will frequently have backflow prevention assemblies adjacent to the tower on the makeup water line to the tower. The highline hose can be connected through a fitting to the number four test cock of the backflow prevention assembly to supply the water.

Irrigation systems are frequently fed off the same service meter as the potable system. To do the cross-connection control shutdown test, the potable and irrigation systems must be separated. This separation is usually accomplished by highlining.

If this is a new irrigation system in an area where recycled water is currently used for irrigation, the new system must be highlined with potable water for the initial cross-connection control shutdown test.

Frequently the water requiring equipment is inside the building. This means a commercial grade hose should be used for the highlining. This is to minimize the possibility that the hose may burst or fittings may leak and flood the inside of the building during the test.

Another alternative is to use a fire hose for the highlining. Fire departments often will sell used fire hoses that no longer pass the fire department volume flow test. These hoses are very strong and will not burst. Also, they are easy to roll, unroll and store.

Attachment 25: Golf Course Recycled Water Irrigation Scheduling

Golf course irrigation has unique requirements that impact how recycled water can be used on the course. Normally, irrigation takes place at night when the course is not in use. This fulfills the recycled water use requirement for irrigation during times of minimal public exposure. However, there are two situations when the use of recycled water is necessary during times of public exposure. These situations are spot irrigation and annual overseeding.

Spot irrigation is used to establish or reestablish small plots of grass on the course. These areas must be kept moist until the grass is established which necessitates irrigation during periods when the course is open to the public.

Annual over seeding reestablishes the grass over the whole course. Overseeding takes place over an eight-to-ten day period during which the seeding may be irrigated approximately four times per day to keep the seeds moist for germination. This means that there may be times the irrigation system will be operating when the course is open for play. Irrigation during the playing hours is site dependent and there are courses where daytime irrigation is not required during the overseeding period.

Spot irrigation is controlled, usually with the areas being irrigated fenced off with some kind of boundary markers. On courses with individual irrigation head control, the course use supervisor can control individual areas ensuring that players are not in the area when the irrigation is activated.

For the annual overseeding, the current practice on courses using potable water is to warn the players that the irrigation system may come on during play. This frequently leads to wet golfers, an inconvenience that most golfers are usually willing to live with.

The concern with recycled water use is that the public must not be exposed to direct impact or misting from recycled water irrigation for health and safety reasons.

The obvious solution is to close the course during the period of overseeding. However, this solution is not practical due to both lost playing time and lost revenue. It would be very expensive to close a course for the eight-to-ten day period of overseeding and in most cases, would make the use of recycled water impractical.

An alternative to course closing is to install a swivel-ell device (see Attachment 47). This will allow the irrigation system to be converted back to potable water during the overseeding period.

Attachment 26: Recycled Water Use at Nurseries

Nurseries are unique in that several types of water can be utilized in the same immediate area. For example, a greenhouse may have potable water, well water, chemically treated (fertilizer injected) water and internally recycled water collected from irrigation run off - all in the same greenhouse to which you want to add recycled water. Not only is it in the same greenhouse, the point at which the various waters enter the greenhouse are usually in the same immediate area because the water supply contains redundancies, so that the nursery stock for obvious reasons should not run out of water, one often finds all four types of water interconnected.

The various types of water are used for various tasks. The potable is used for domestic purposes as well as supplementation. At certain times in the growing cycle, potable water may have to replace recycled water because of the high total dissolved solids (TDS) of the recycled water. At other times in the growing cycle, fertilized water is used for irrigation. The well water is used for greenhouse wash down and for the cooling pad and supplementation. The internally recycled water is also used for wash down.

The cooling pad is a unique use. It is used both for cooling and humidifying the greenhouse. Water is captured in a lined sump, then is pumped to a perforated water line above a rough filter material. The filter material lines a portion of the green house wall. The water trickles through the filter material and is captured in a trough at the bottom of the filter and directed back to the sump. On the opposite wall of the green house are fans which draw air through the area. The amount of cooling and humidity is controlled by solid shutters on the outside of the filter material, actually part of the green house wall, which can be opened and closed. The green house is in reality a giant swamp cooler.

There are several sumps per green house; based on the size of the green house. Recycled water can not be used for this type of cooling. The reason is that the humidification results from the mist being drawn by the fans through the green house. This means that the workers breath the mist. The mist from reclaimed water may contain bacteria and virus from either a treatment plant upset or from biofilm in the distribution lines.

Frequently, the potable water line will supply a break area in the green house, containing a drinking fountain and restroom facilities. These break areas are normally down stream of the interconnected water supplies.

One reason for the not quite plumbing code (NQPC) water supply is that the plumbing work is done by the nursery workers. The water lines will frequently be protected from cross-connections by single swing checks. These are frequently sold by supply houses as inexpensive backflow devices. That basic knowledge of cross-connections by nursery personnel can be very useful when redoing a system. The good news is that most of the plumbing is exposed plastic pipe. The bad news is that nothing is labeled. Consequently, the initial inspection of the facility is an interesting challenge. This inspection is usually done with the owner and his lead worker, both of whom have lived with the plumbing arrangement for a number of years and see no problem with what they have because it works. And it does work, most of the time; it is those other times that one has to be worried about.

The best way to get the immediate problem resolved is to build on what is there; usually a basic knowledge of cross-connections as evidenced by the installation of single swing checks. The reason for the use of recycled water for irrigation because it is uninterrupted supply; consequently, the other sources of water may not be needed and can be separated out by cutting and capping the other lines. Also, the different water lines must be labeled.

Potable water is frequently used for germination because the high salts content of recycled water may inhibit plant germination. A method for switching from recycled to potable or well water must be in place. In a green house this is usually done by manually disconnecting the recycled and reconnecting the potable and/or well water. The purveyor and regulatory agency must be informed when this will occur. A walk-through inspection, possibly on a quarterly basis, can control this situation and prevent the creation of new cross-connections. These walk-throughs should be done by the purveyor with oversight by the regulatory agency. If this “switching” is done, the purveyor should have a backflow prevention assembly (RP) on the recycled water point of connection.

Most of the actual irrigation of plants in green houses is via drip irrigation after the plants are transferred to pots. There can be spray irrigation and misting of plants in green houses, but this is done in raised beds that are covered by plastic supported by a framework. Consequently, this misting is contained and the workers are not exposed. If the whole green house must be misted, this must be done without workers in the green house. This method must be controlled by the site use supervisor.

There may be a need to have hose bibs on both the potable and the recycled water lines for growing needs. The solution to preventing cross-connections as developed by Colorspot Nurseries is to permanently install quick connects on the recycled water hose bibs. These quick connects, one model is made by Nelson, must be permanently installed. These are inexpensive devices that are attached to a hose bib. In that the Nelson type does not have breakable lock nuts like hose bib vacuum breakers, the quick connect can be installed with a glue that bonds the quick connect to the hose bib. The hose bib threads are eliminated and by plumbing code, the hose bib is no longer a hose bib. This meets the requirements of the Title 22, which does not allow hose bibs on recycled water systems. (see Attachment 27 for additional hose bib information)

This installation of a quick connect on the hose bib means that a fitting must be installed on the hose to allow connection to the quick coupler. The hose must be marked or labeled for use only on recycled water systems.

The use of recycled water in open growing fields is another matter that will be addressed separately as new situations are encountered. The same is true of open but shaded growing areas.

Attachment 27: Unique Situations (Hose Bibs, Golf Courses, Theme Parks)

There are unique situations where the strict application of rules and policies relating to recycled water use sites may not strictly apply. Although flexibility in the application of rules and policies may be desirable in certain applications, exceptions to the rules and policies make uniform interpretation and enforcement very difficult. Also, the flexibility must not negatively impact public health and safety. Consequently, exceptions or modifications will be kept to an absolute minimum.

Hose Bibs

Hose bibs on recycled water systems are prohibited by Title 22. However, commercial nurseries require some type of fitting on the recycled water system for plant watering. Quick couplers are usually impractical in this situation. Consequently, a cam lock- type fitting that is permanently attached to the hose bib changes the definition of a hose bib on the recycled water system. The hose must also be modified to use this fitting. With the installation of this fitting, the hose bib is no longer a “hose bib” as defined by the Uniform Plumbing Code. The following conditions apply to this use:

- a. The use must be approved by the regulatory agency.
- b. The fittings can only be used at commercial nurseries where there is no public access. The reason is when the device is turned on, water will flow from the recycled water fitting without a hose being attached.
- c. Fittings can be used at nurseries where there is public access but the fitting must not allow the flow of water when a hose is not attached.
- d. Nursery employees must be trained in the use of the fitting and warned that the recycled water is not drinkable.
- e. An option at commercial nurseries where there is public access is to use the cam-lock type fitting on a hose bib with the on/off valve handle removed. The handle can be replaced with an on/off key which is carried by the employee and is not a permanent part of the fixture. The key, which is commonly used at schools, must not be left in the fixture.
- f. Hoses used on recycled water systems must be labeled as “Recycled Water Use Only, Non-Potable, Do Not Drink.” Purple hose with recycled labeling is now commercially available.

Irrigation Head Markings - Golf Courses

The irrigation heads at golf courses are predominately of the large, approximately six-inch diameter type. Golf courses in the San Diego area are frequently featured on national television for tournament play. If all the large irrigation heads were the color purple against a green grass background, it would make for interesting television - interesting for the viewers but not interesting for the course owners and the proponents of the use of recycled water. The following conditions apply for the marking of golf course large irrigation head markings:

- a. The use of other than purple heads must be approved by the regulatory agency.
- b. An area of the head approximately the size of a half dollar can be painted purple. However, this means that the heads must be frequently repainted.
- c. A purple colored insert can be attached to the head. However, when this insert fades, it must be repainted, although this insert will last much longer than a painted head.
- d. A purple colored insert with “Recycled Water, Do Not Drink” verbiage and the “Do Not Drink” signs can be attached to the head. The insert doesn’t need to be repainted if it fades.
- e. The head cover can be replaced with a purple cover with the “Recycled Water, Do Not Drink” verbiage and the “Do Not Drink” sign as part of the head cover. If it fades, it does not have to be repainted.

Valve Box Covers

Purple valve box covers present the same problem on golf courses as do the large irrigation heads. This may also be true in the case of theme parks.

- a. The use of other than purple valve box covers must be approved by the regulatory agency.
- b. The valve box cover can be green if the “Recycled Water, Do Not Drink” verbiage and the “Do Not Drink” sign is a permanent part of the cover.
- c. The valve box and cover should be of a different size, if possible, than potable water valve boxes to minimize the chance of interchange of the covers.
- d. The valve box itself must be purple. This must be the color of the original valve box - it cannot be painted purple.
- e. The valves in the box must have a recycled water tag attached.
- f. Existing valve box covers can be used if there are approved recycled water use plates permanently affixed to the valve box cover. The plate is made of metal or plastic, colored purple and contains the “Recycled Water, Do Not Drink” verbiage and the “Do Not Drink” sign.

Attachment 28: Recycled Water Use in Private Yard Areas

The use of recycled water for irrigation of homeowners association common areas must be carefully considered. Homeowners will occasionally extend the private yard area into the recycled water use area. The use area is normally part of the common area controlled by the homeowner association. The use of recycled water in private yard areas, which is legal by regulation, will be discussed later in this attachment.

At retrofit sites, it is not uncommon to find that fenced yards have been extended over the existing common area irrigation systems. Consequently, when doing the initial site inspection before conversion to recycled water the fenced yard areas must be inspected. Frequently, this is easy in that one can simply follow the line of irrigation spray heads and note where they disappear into a fenced yard. However, the homeowner may tee off the common area irrigation system to provide irrigation to the private yard area. In either case, the irrigation system must be run while checking the private yard area for overspray. Another situation can occur when a tee off the irrigation system is extended into the home to feed an indoor plant area. This type of use is not permitted by regulation.

A method to address this situation “up front” is to have a recycled water purveyor representative at the initial negotiations with the homeowners association. This representative should be from the cross-connection control staff that will be conducting the actual site inspections.

Cross connections may also occur at existing use sites. Consequently, these yard areas must be inspected for changes during the annual inspections.

The use of recycled water in private fenced yards is approved by current regulations. Because the purveyor in essence loses control of the system in private yard areas, the following conditions apply to this type of use:

If recycled water is to be used on other than controlled areas, i.e. private yards, please see the below listed set of conditions:

- a. Recycled water serving private yards and slopes which are maintained by individual homeowners must be served through individual recycled water shut-off devices so that the individual site can be isolated for inspection and testing.
- b. All Title 17 and 22 regulations pertaining to the use of recycled water must be fully disclosed to the individual homeowners who must maintain the recycled irrigation systems on their property. The disclosure must include provisions to notify subsequent tenants such as renters and subsequent purchasers.
- c. An engineering report and shutdown methodology to demonstrate the separation between the potable and the recycled distribution systems on each privately maintained use site must be submitted in accordance with Title 22 recycled water requirements.
- d. If potable service meter backflow protection is waived, an alternative backflow protection plan in addition to the requirements in item c must be developed for each privately maintained use site as specified in Title 17.

Attachment 29: Cross-Connection Control Test and Thermal Expansion

The effect of sun light or mechanisms that will increase the temperature and cause thermal expansion in the water lines under test can have a dramatic effect on pressure readings. An example of this occurred during a cross-connection control test at a wastewater treatment plant. The plant has two open to the atmosphere chemical treatment sites which contain both industrial water lines and water lines feeding emergency showers and eye wash stations. The water lines were protected by reduced pressure backflow prevention assemblies (RP). Pressure recorders were installed on the number four test cocks and the lines were depressurized for four hours. Both the industrial and the shower and eye wash water lines were completely exposed except where they ran through concrete retaining walls. The test ran from 10:00 a.m. to 2:00 p.m. with an ambient temperature of 90° F. The water lines were depressurized by bleeding down via a test cock. The pressure recorders showed a pressure increase in both emergency shower and eye wash lines of 65 psi as well as one industrialized line of 25 psi.

To confirm that the pressure rise was caused by thermal expansion, the test was redone the next week with controls. The times and conditions of the first test were repeated, except that the temperature of the water at the shower and eye wash stations were recorded at the start and the end of the four hour test. Also, the valving at the end of one industrial line was closed and the end of the second industrial line was left open.

The pressure increase for the two emergency shower and eye wash lines and the one valved closed industrial line were similar to the first test. Reasonably, there was no pressure increase on the industrial line where the end valve was left open. The water temperature, as measured at the emergency shower and eye wash stations, showed a 20° F increase in temperature over the time of the test. The pressure rise was gradual but consistent over the period of the test.

Consequently, when doing a pressure test, any and all exposed water lines that may be subject to heat must be noted. Another alternative is to run the test at night, or if it is a small area of exposed pipe, shade the pipe.

Thermal expansion from water heaters may cause pressure increases. If the pressure recorder is immediately adjacent to a building, a water heater may produce a pressure increase. This was noted when a pressure recorder was attached to the number four test cock of an RP feeding a crafts outlet. A gradual pressure increase with a quick pressure decline occurred four times during a nine hour period when the crafts shop was closed for business. The crafts shop had a five gallon electric water heater. The test was redone with the water heater turned off and no pressure increases were recorded. Interestingly, when the potable water feed is remote from the building, pressure increases are usually not noted.

Attachment 30: Unregulated Irrigation System Conversions Using Purple Pipe

The use of purple pipe to convey recycled water is required by Section 116815 of the California Health and Safety Code. However, this law does not restrict the use of purple pipe to only recycled water.

Irrigation systems using purple pipe to convey potable water until such time that recycled water becomes available are common in San Diego County. These irrigation systems are installed with purveyor and regulatory oversight. Plans are developed and reviewed by both the purveyor of recycled water and the San Diego County Department of Environmental Health (DEH). There are many specific items that are required for recycled water systems that are not required for potable water systems (see other sections of this manual for specifics). When recycled water becomes available at a use site, the plans are used for the required inspections and cross-connection control shut down tests.

The unregulated use of purple pipe for an irrigation system that may receive recycled water in the future can lead to significant problems. On large use sites such as schools, college campuses and military bases the use of both recycled and potable water in the irrigation systems is frequently necessary. Large open areas may receive recycled water where as small use areas such as around buildings, may stay on the potable system. If all the irrigation piping is purple, keeping the two systems separated will be very difficult.

The complete separation of potable and recycled water irrigation systems is an absolute necessity. Consequently, the unregulated use of purple pipe is strongly discouraged.

If the use site irrigation system is already plumbed with purple pipe, and there will be both recycled and potable irrigation on the site and there has been no regulatory oversight, the following steps are necessary before the conversion of the site to recycled water use:

The use of recycled water must be approved by the regulatory agency (DEH or SDHS).

The recycled and potable water systems must be separated by both distance and barriers such as paved roads.

If there are no separations, barriers must be installed between the two systems. These barriers can take the form of concrete mow strips, solid walls or similar forms of separation.

Attachment 31: Hospitals and Recycled Water

The use of recycled water around a hospital for irrigation and cooling tower makeup water must be approached with a significant degree of caution. The population utilizing the hospital is by definition health-impaired. Recycled water by definition is not pathogen-free. Consequently, the application of recycled water at a hospital must be done with thorough planning and continued oversight.

A teaching hospital, which also accommodates the public, had been conditioned for the use of recycled water for the irrigation system and will be considered in detail in this attachment. The use of recycled water in the cooling tower is in the planning stage and will be handled separately.

Initial planning involved numerous meetings between landscape staff, hospital staff, the purveyor and the regulatory community. Ed Fordan, Doug Frost and Humberto Torres, City of San Diego recycled water staff, along with their consultant, spent a significant amount of time at the site developing the plan. Planning meetings were also attended by DEH staff to provide real time input as the plan developed. The continued involvement of DEH meant that there should be no “surprises” or fatal flaws in the actual shutdown test.

The overriding challenge was determining when the potable water service to a fully-functioning hospital could be shut down for a significant period of time. It was determined (obviously) that it must be done at a time of minimal hospital activity, which was from midnight to four in the morning, starting Saturday at midnight.

The hospital maintenance staff provided bottled water throughout the facility. The emergency room was operative and a communication plan was established to immediately terminate the test if necessary (more on this later). The hospital lab where purified water is required to operate certain machines used to continuously monitor patients was of special significance. A Nalygn container with a separate pumping system was filled with water before the start of the test was provided by the hospital to keep these machines in operation during the test. The maintenance staff had secured all other equipment that might normally require water during the course of the shutdown test.

The hospital building has three floors. It was determined that reducing the water pressure to about 25 psi on the ground floor would maintain water in the system on the top floor. This was necessary to avoid air locks on the upper floors in case the water had to be turned on in case of an emergency. Five pressure recorders were set up throughout the ground floor. If there were a cross-connection, it was determined that it would appear on the lowest level of the distribution system. The multiple number of recorders was used in case a problem developed with any of the recorders - which did happen. This is a test that you don't want to repeat because of a recorder failure.

All concerned parties met an hour before the start of the test to review procedures. City personnel had set up the recorders according to the plan which had been agreed upon. At this point, we were advised that the emergency room had a patient that required an emergency operation and the test might have to be terminated. Because of the advance planning and notifications, the medical staff decided that the operation could be delayed for the four hour duration of the test.

The water to the hospital was shut off both at the main feed to the hospital and in the mechanical room. The pressure was reduced from 65 to 25 psi and four of the five pressure recorders checked. A recorder that was attached to an emergency shower on the loading dock was not checked and subsequently drove home a very important point. The emergency shower had a spring-loaded off and on valve. The valve remained shut, trapping the pressurized water between the valve and the recorder. The other four recorders operated flawlessly and saved the test - again the reason for using multiple recorders. Also, when you are operating from midnight to four on a Saturday night, built-in redundancies help overcome a lack of mental acuity.

The other problem that arose was the operation of the irrigation system during the four-hour period. The operation of the irrigation system was the responsibility of an independent contractor who did not have a representative on site during the test. We were told that the system would operate around the hospital during the test, but found that due to the large size of the system - there are five separate controller clocks - all stations would not have time to operate during the four-hour period.

City personnel did have a set of master keys for the controllers and consequently manually operated the stations during the four-hour period of the test. The City had purchased a set of master keys for use in this type of situation. Again, advance preparation solved a problem that could have terminated the shutdown test. These keys can be purchased at irrigation wholesale outlets.

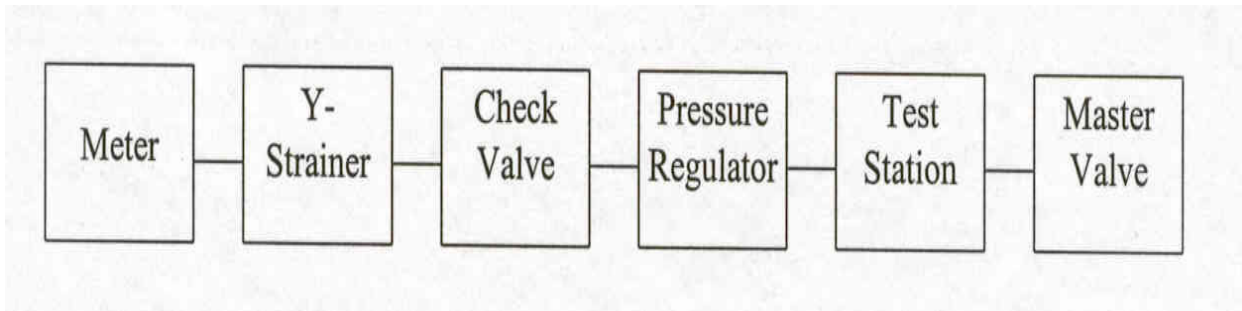
Finally, with only two minor glitches, which were accounted for by preparing in advance, the shutdown test was successfully completed. The potable water pressure was maintained at a constant 25 psi throughout the test. The fact that no water was used during the test - such as the flushing of a toilet or use of a handbasin - was due to extensive notification of hospital staff on the importance of the shutdown test.

Attachment 32: Construction Sites and Recycled Water

An approved beneficial use of recycled water is on construction sites, mainly for dust suppression. Here recycled water is used outside of the approved watering times during active grading and construction. This is a situation where the site employees are exposed to recycled water spray and mist during normal work hours. Although it is a temporary use of recycled water, the potential for employee exposure to overspray and misting of recycled water is a health and safety concern. Consequently the following will be required at all construction sites using recycled water:

1. DEH will be notified by the recycled water purveyor of construction site use of recycled water in the purveyor's service area.
2. DEH may perform a use site inspection with the purveyor's representative.
3. The site contractor should have an employee who has attended the County Water Authority Site Supervisor training.
4. The Site Supervisor will give tailgate training on the safe use of recycled water to the site employees.
5. If the contractor does not have a trained Site Supervisor, the tailgate training can be given by the recycled water purveyors' Site Supervisor or by a DEH Site Supervisor. Records of the training are to be maintained for inspection purposes.
6. All water trucks, drop tanks, hoses, meters, and other equipment using recycled water shall have signs stating, "Recycled Water - Do Not Drink."
7. Fencing and signage shall be provided around any open pond storage of recycled water.
8. Potable water for drinking and hand washing shall be provided on the construction site.
9. Drop tanks, water trucks, hoses, etc. should be disinfected before use with other than recycled water.
10. The recycled water fill point off the main distribution system shall be marked with signage and painted the color purple.

Attachment 33: Cross-Connection Control Test Station Example (by Larry Olds, Otay Water District)



In this summary, it is assumed that the reader has a thorough understanding of cross connection control shutdown testing procedures and the fluid dynamics of dual plumbed, pressurized systems, as it applies to cross-connection testing.

The schematic above delineates the order in which various items must be installed to insure a valid cross-connection control shutdown test on dual plumbed systems. All items are typical for systems in the Otay Water District.

It is important to understand the placement of the test station.

While we normally think of the pressure regulator as a dynamic device, in the context of a shutdown test it becomes static in its function. Once the source of pressure has been eliminated, such as closing the curb stop, any pressure between the pressure regulator and the meter is trapped; the irrigation system downstream of the pressure regulator is isolated from the system upstream of the pressure regulator. In simple terms, an increase in pressure downstream of the pressure regulator will not be transmitted to a test station on the upstream side of the pressure regulator. The pressure regulator acts as a one-way check valve, not allowing fluid movement in a reverse direction.

The master valve is a device used to control the flow of water. It is typical to have a flow sensor on an irrigation system, downstream of the master valve, to monitor the volume of water flowing into the irrigation system. If that volume should be in excess of the controller's programmed parameters, such as a broken irrigation line, the master valve will shut down the system. The only time the master valve is open is when the controller's program has energized the valve. By definition, it acts as the gateway to the onsite irrigation main. Additionally, it is possible, if the irrigation system is so designed, to be the only controlling valve, which may expose all downstream elements to atmospheric pressure. Because it is a gateway and master controlling valve and is normally closed, initial system pressure is not measurable downstream of the master valve, rendering it an unacceptable location for the test station.

In any case, the test station must neither be isolated by a pressure reducing valve nor left open to non-pressurized elements of the irrigation system.

Attachment 34: Recycled Water Pipe and Above-Ground Appurtenance Policy

Purpose:

To establish consistent guidelines for identifying areas of recycled water use in San Diego County.

Relevant Codes & Policies:

California Health and Safety Code, Section 116815

Title 17, California Code of Regulations (CCR)

Title 22, CCR

State of California Department of Health Guidelines for Use of Reclaimed Water for Irrigation and Impoundments

AWWA Guidelines for the Distribution of Non-Potable Water, California-Nevada Section

AWWA Retrofit Manual

Background:

The color purple is used to visually differentiate pipes and appurtenances that use or are affiliated with recycled water use from potable water and wastewater pipes and appurtenances. Title 22, California Code of Regulations (CCR) places restrictions on the use of recycled water for health and safety reasons. Title 17 CCR requires that the recycled water system and the potable water system remain completely separated with no direct interconnections. Section 116815 of the Health and Safety Code requires that all pipes installed above or below the ground that are designed to carry recycled water be colored purple. The American Water Works Association (AWWA) Recycled Water Retrofit Manual and Guidelines for Distribution of Non-potable Water, which have been adopted as policy by State Health Office of Drinking Water, requires all above-ground appurtenances to be colored purple.

Currently there are thirteen (13) producers and distributors of recycled water in San Diego County. The uniform interpretation of regulatory laws and policies relating to recycled water is desirable to allow for the most cost efficient and safe distribution of recycled water throughout San Diego County.

Policy:

All pipes installed above or below the ground and above-ground appurtenances on new recycled water sites and all above-ground pipes and appurtenances on retrofit sites shall be consistently color-coded purple to differentiate recycled water facilities from potable and/or wastewater facilities. This includes, but is not limited to pipes, meter boxes and/or covers, valve boxes and covers, air evacuation and vacuum release valve and blow-off assembly covers, irrigation heads, recycled water signage and labeling, backflow prevention assemblies on recycled water systems and pumps and fittings.

Staff from San Diego County Department of Environmental Health shall not approve a site for the use of recycled water until the piping systems and above ground appurtenances are in accordance with this policy.

Violations:

Violations of the above policy shall be considered on a case-by-case basis. Remedies can range from field inspection and correction to an office hearing to notification of concerned regulatory agencies to implementation of penalties listed in Section 116820 of the California Health and Safety Code.

Attachment 35: Recycled Water Plan Check Retrofit Guidelines

1. A preliminary site inspection should be conducted to address problem areas before drawing up site plans. On complex or questionable sites, DEH should participate in the preliminary site inspection. A site inspection by DEH can resolve many regulatory questions specific to the site before the project goes into the plan check phase.
2. Before a project can be converted to recycled water a site plan must be submitted to the DEH for approval. The title sheet shall include the following:
 - a. vicinity/location map with north arrow shown
 - b. engineer/architect's stamp (current and signed)
 - c. engineer/architect's address and telephone number
 - d. declaration of responsibility
 - e. recycled water standard notes

The site plans shall include:

- a. project name
- b. recycled water mains and laterals
- c. potable water mains and service lines (from as-builts or approximate locations)
- d. existing structures
- e. ponds, drinking fountains, hose bibs, wells, and any other potable usages
- f. point of connection for both potable and recycled water
- g. fire service and hydrants
- h. DEH signature block
- i. property boundary
- j. location of "DO NOT DRINK" signs
- k. backflow prevention assemblies

Once approval is granted, plans shall be submitted to the DEH for signature. Frequently, a large number of retrofit sites will be reviewed as part of the same overall project. In this case, the plans can be bundled into a notebook with one title page. The notebook must be approved as part of the plan check process.

3. Before a project is actually served with recycled water, a cross-connection test shall take place. The test must be conducted as closely as possible to the time of actual recycled water service delivery.

Attachment 36: Recycled Water System Plan Check

Cross-Connection

Both recycled water lines and potable water lines must be shown on the plans to ensure that no cross-connection exists.

Review proposed point-of-connection(s). If necessary (mainly at temporary connections to potable water system), make sure adequate protection (RPBP) is provided at the connection.

Verify adequate separations are maintained, both vertically and horizontally between recycled water lines, potable water lines and other utilities.

Where vertical pressurized pipe crossings or lateral separations cannot be maintained, ensure compliance with special construction requirements.

Design the recycled water system (purple pipe, appurtenances, warning tape, etc.) in compliance with Section 116815 of the Health and Safety Code, Title 22, AWWA Guidelines and Water Purveyor's Rules and Regulations.

Ensure the adequate burial of both wiring and piping.

Common trenching of potable and recycled piping is not permitted.

Public Health

Evaluate areas to be served with recycled water and those to be excluded.

Protect adjacent non-use site facilities from recycled water encroachment.

Incorporate all DEH Recycled Water Notes into the plans.

Hose bibs are not permitted on recycled water systems.

Drinking fountains and designated outdoor eating areas are clearly called out on the plans and are adequately protected.

Ensure entire system is designed to operated only during periods of minimal public use. Usually irrigation is done from 10:00 pm to 6:00 am.

Decorative fountains are of the bubble non-spray type to eliminate recycled water mist.

Recycled water use areas are adequately posted with "Do Not Drink" signs.

Adequate separation and protection exists between areas of recycled water use and public water use and public water courses and wells.

Attachment 37: Recycled Water Standard Notes City and County of San Diego

1. 48 HOURS PRIOR TO COMMENCEMENT OF ANY EXCAVATION ON SITE IMPROVEMENTS, CONTRACTOR SHALL NOTIFY CITY OF SAN DIEGO, WATER DEPARTMENT, RECLAIMED WATER SECTION AT (619) 533-7557.
2. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF SAN DIEGO "RULES AND REGULATIONS FOR RECLAIMED WATER USE AND DISTRIBUTION WITHIN THE CITY OF SAN DIEGO" - APRIL 1996 AND THE SAN DIEGO COUNTY DEPARTMENT OF ENVIRONMENTAL HEALTH REQUIREMENTS.
3. ALL BACKFLOW PREVENTER INSTALLATIONS AND LOCATIONS SHALL BE SUBJECTED TO APPROVAL BY THE CITY OF SAN DIEGO'S WATER DEPARTMENT.
4. ALL PUBLIC FACILITIES SUCH AS COMFORT STATIONS, DRINKING FOUNTAINS, ETC. SHALL BE PROTECTED FROM SPRAY AND/OR MISTING BY RECLAIMED WATER.
5. NO PONDING, RUNOFF OR OVERSPRAY IS PERMITTED. ADJUST ALL SPRINKLER HEADS TO PREVENT OVERSPRAYING ONTO SIDEWALKS, STREETS AND PRIVATE LOTS.
6. HOSE BIBS ON RECLAIMED WATER SYSTEMS ARE PROHIBITED.
7. ON-SITE CROSS-CONNECTION BETWEEN RECLAIMED WATER LINES AND POTABLE IS STRICTLY PROHIBITED.
8. QUICK COUPLING VALVES USED IN RECLAIMED WATER SYSTEMS SHALL CONFORM TO THE FOLLOWING:
 - A. QUICK COUPLING VALVES SHALL BE 1-INCH NOMINAL SIZE NELSON #7645, WITH BRASS CONSTRUCTION AND A NORMAL WORKING PRESSURE OF 150 P.S.I. OR RAINBIRD #44 NP. INSTALL QUICK COUPLERS NO CLOSER THAN 200 FEET O.C. AND NO CLOSER THAN 100 FEET TO ANY HARDSCAPE OR STRUCTURE.
 - B. IN ORDER TO PREVENT UNAUTHORIZED USE, THE VALVE SHALL BE OPERATED ONLY WITH A SPECIAL QUICK COUPLER KEY WITH AN ACME THREAD FOR OPENING AND CLOSING THE VALVE.
 - C. THE COVER SHALL BE PERMANENTLY ATTACHED TO THE QUICK-COUPLING VALVES. IT SHALL BE PURPLE RUBBER OR VINYL.
 - D. LOCKING COVERS ARE REQUIRED.

9. NO SUBSTITUTION OF PIPE MATERIALS WILL BE ALLOWED WITHOUT PRIOR APPROVAL BY THE CITY OF SAN DIEGO.
10. INSTALL APPROVED, METALLIC BACKED AND STENCILED WARNING TAPE OVER ALL PRESSURE RECLAIMED WATER LINES. STENCIL AND COLOR CODE (PURPLE PANTONE 522) ALL IRRIGATION PIPE. ORIENT THE STENCILING TO THE TOP OF THE TRENCH.
11. PROVIDE A MINIMUM OF AT LEAST 18 INCHES OF COVERING OVER ALL WIRING AND PIPING.
12. OPERATE THE IRRIGATION SYSTEM ONLY BETWEEN 10:00 PM AND 6:00 AM.
13. WHEN POTABLE WATER LINES AND RECLAIMED WATER LINES CROSS, THE RECLAIMED LINE SHALL BE INSTALLED WITHIN A PROTECTIVE SLEEVE. THE SLEEVE SHALL EXTEND 10 FEET FROM EACH SIDE, FROM THE CENTER LINE OF POTABLE LINE, FOR A TOTAL OF 20 FEET.
14. MAINTAIN A 10 FOOT HORIZONTAL SEPARATION BETWEEN POTABLE WATER AND RECLAIMED WATER OR SEWER LINES. INSTALL SEWER LINE BELOW RECLAIMED WATER LINE AND RECLAIMED WATER LINE BELOW THE POTABLE WATER LINE.
15. PROVIDE A MINIMUM OF 12 INCHES OF VERTICAL SEPARATION BETWEEN POTABLE/RECLAIMED WATER/SEWER.
16. THE SITE IRRIGATION SYSTEMS AS SHOWN ON THESE DOCUMENTS WILL UTILIZE POTABLE WATER UNTIL SUCH TIME AS THE CITY OF SAN DIEGO MAKES RECLAIMED WATER AVAILABLE TO THE SITE.
17. INSTALL PURPLE COLORED PANTONE #522 MATERIAL FOR ALL ABOVE GROUND IRRIGATION FACILITIES:
 - VALVE AND OTHER ON GRADE BOXES - INTEGRAL COLOR
 - BACKFLOW DEVICES - PAINTED 2 COATS OF ENAMEL
 - SPRINKLER HEADS - INTEGRAL COLOR PLASTIC
18. TAG ALL VALVES AND OTHER BELOW GRADE FACILITIES WITHIN BOXES WITH PERMANENT RECLAIMED WATER LABELS THAT ID THE FACILITY AS "RECLAIMED WATER - DO NOT DRINK" IN BOTH SPANISH AND ENGLISH. ATTACH THE LABEL WITH EITHER STAINLESS STEEL WIRE OR SELF LOCKING PLASTIC TIES.

19. THE REQUIRED CROSS CONNECTION TEST SHALL BE DONE BY EITHER THE CITY OF SAN DIEGO AND/OR THE SAN DIEGO COUNTY DEPARTMENT OF ENVIRONMENTAL HEALTH. COPIES OF INSPECTION REPORTS WILL BE FORWARDED TO THE NON-INSPECTING PARTY.
20. THE DESIGN LOCATIONS PROPOSED FOR RECLAIMED WATER “DO NOT DRINK” SIGNS SHALL BE CALLED OUT ON THE PLANS.
21. AN ANNUAL CROSS CONNECTION CONTROL INSPECTION WILL BE DONE BY THE CITY OF SAN DIEGO SUBJECT TO APPROVAL BY THE SAN DIEGO COUNTY DEPARTMENT OF ENVIRONMENTAL HEALTH. COPIES OF THE INSPECTION REPORTS WILL BE FORWARDED TO THE NON-INSPECTION PARTY.
22. PRIOR TO CONVERSION TO RECLAIMED WATER, AN ON-SITE SUPERVISOR SHALL BE DESIGNATED IN WRITING. THIS INDIVIDUAL SHALL BE FAMILIAR WITH PLUMBING SYSTEMS WITHIN THE PROPERTY AND WITH THE BASIC SPECIFIC REQUIREMENTS OF RECLAIMED WATER SYSTEMS. THE DESIGNATED “SITE SUPERVISOR” SHALL ATTEND THE COUNTY WATER AUTHORITY’S CLASS FOR RECLAIMED WATER SITE SUPERVISORS. COPIES OF THE SITE SUPERVISOR’S CERTIFICATE WITH A 24-HOUR CONTACT NUMBER SHALL BE PROVIDED TO THE CITY OF SAN DIEGO AND THE COUNTY DEPARTMENT OF ENVIRONMENTAL HEALTH.

IN CASE OF EMERGENCY CONTACT: _____ AT _____

AFTER HOURS CONTACT: _____ AT _____

23. A PHYSICAL SEPARATION SHALL BE PROVIDED BETWEEN ADJACENT AREAS OF IRRIGATION WITH RECYCLED WATER AND POTABLE WATER. SEPARATION SHALL BE PROVIDED BY CONCRETE MOW STRIPS, CHAIN FENCES OR OTHER MEANS AS APPROVED BY THE WATER DISTRICT AND DEPARTMENT OF ENVIRONMENTAL HEALTH.
24. CALL OUT ON THE PLANS IF THERE ARE OR ARE NOT ANY DRINKING FOUNTAINS AND/OR DESIGNATED OUTDOOR EATING AREAS ON THE SITE.
25. NON-DESIGNATED USE AREAS SHALL BE PROTECTED FROM CONTACT WITH RECLAIMED WATER, WHETHER BY WINDBLOWN SPRAY OR BY DIRECT APPLICATION THROUGH IRRIGATION OR OTHER USE. LACK OF PROTECTION, WHETHER BY DESIGN, CONSTRUCTION PRACTICE OR SYSTEM OPERATIONS IS STRICTLY PROHIBITED.

26. THE HOURS OF IRRIGATION WITH DISINFECTED TERTIARY MAY BE MODIFIED BY THE LOCAL AUTHORITY. IRRIGATION DURING PUBLIC USE PERIODS WITH THE DISINFECTED TERTIARY RECLAIMED WATER SHALL BE UNDER THE SUPERVISION OF THE DESIGNATED USER SUPERVISOR. IRRIGATION WITH WATER OF A LESSER QUALITY THAN DISINFECTED TERTIARY RECLAIMED WATER SHALL BE BETWEEN THE HOURS OF 10:00 PM AND 6:00 AM.
27. ALL PUBLIC AND PRIVATE POTABLE WATER MAINS INCLUDING FIRE MAINS AND ANY WATER WELLS AND WATER COURSES WITHIN THE RECLAIMED WATER PROJECT SHALL BE SHOWN ON THE PLANS.
28. THE DEVELOPER/CONTRACTOR SHALL CONDUCT A CROSS-CONNECTION CONTROL TEST AND COVERAGE TEST AS DIRECTED BY THE CITY OF SAN DIEGO, WATER DEPARTMENT AND/OR THE SAN DIEGO COUNTY DEPARTMENT OF ENVIRONMENTAL HEALTH PRIOR TO ANY USE OF RECLAIMED WATER.
29. EDUCATE ALL MAINTENANCE PERSONNEL ON A CONTINUOUS BASIS OF THE PRESENCE OF RECYCLED WATER. PERSONNEL MUST BE INFORMED THAT RECLAIMED WATER IS MEANT FOR IRRIGATION PURPOSES ONLY, AND IS NOT APPROVED FOR DRINKING PURPOSES, HAND WASHING, CLEANING OF TOOLS, ETC. GIVEN THE HIGH TURNOVER RATE OF EMPLOYEES IN THE LANDSCAPE INDUSTRY, IT IS IMPORTANT THIS INFORMATION BE DISSEMINATED ON AN ALMOST DAILY BASIS.

Attachment 38: Recycled Water Standard Plan Notes

1. All work shall be done in accordance with the NAME OF WATER DISTRICT's Rules and Regulations.
2. Drinking water fountains and designated outdoor eating areas shall be protected against contact with recycled water spray, mist, or runoff.
3. Best management practices shall be used to eliminate or control to the best extent possible ponding, runoff, overspray and misting.
4. Hose bibs are strictly prohibited.
5. Cross-connections between recycled water lines and potable water lines are strictly prohibited.
6. No substitutions of pipe materials will be allowed without prior approval of the NAME OF WATER DISTRICT.
7. All mainline pipes shall have warning tape per NAME OF WATER DISTRICT's Rules and Regulations.
8. Hours for irrigation with recycled water are from 10:00 p.m. to 6:00 a.m. The hours for irrigation with disinfected tertiary recycled water may be modified by the local authority. Irrigation during public use periods with disinfected tertiary recycled water shall be under the supervision of the designated user supervisor. Irrigation with water of a lesser quality than disinfected tertiary recycled water shall be between the hours of 10:00 p.m. and 6:00 a.m.
9. Burial of all wiring and piping shall meet NAME OF WATER DISTRICT's Rules and Regulations.
10. Non-designated use areas shall be protected from contact with recycled water, whether by windblown spray or by direct application through irrigation or other use. Lack of protection, whether by design, construction practice or system operation, is strictly prohibited.
11. Irrigation heads shall be relocated or adjusted to minimize or eliminate over-spraying on sidewalks, streets and non-designated use areas.
12. Recycled water quick coupling valves shall be of a type designed for the use on recycled water distribution systems per NAME OF WATER DISTRICT's Rules and Regulations.

13. On recycled water systems, all appurtenances (sprinkler heads, valve boxes, etc.) shall be color-coded purple per AWWA guidelines and Section 116815 of the California Health and Safety Code.
14. All irrigation pipes shall be stenciled with the warning, “NON-POTABLE or RECYCLED WATER,” color-coded (purple) and laid with warning tape and stenciling oriented toward the top of the trench per the NAME OF WATER DISTRICT’s Rules and Regulations.
15. On new on-site systems (post-meter), potable water, constant pressure recycled water and sewer lines should be placed a minimum of four feet apart or as directed by the project engineer and/or regulatory agency. Measurements shall be between facing surfaces, not pipe center lines.
16. Constant pressure recycled water lines shall cross at least twelve inches below potable water lines and maintain at least twelve inches crossing separation between other utilities.
17. If a constant pressure recycled water line must be installed above a potable water line or less than twelve inches below a potable water line, then the recycled water line shall be installed within an approved protective sleeve as per the NAME OF WATER DISTRICT’s Rules and Regulations.
18. Developer/contractor shall conduct a cross-connection test and coverage test as directed by the NAME OF WATER DISTRICT and/or the San Diego County Department of Environmental Health prior to any use of recycled water.
19. The required cross-connection control shutdown test shall be monitored by either the San Diego County Department of Environmental Health or State Health.
20. The design and locations proposed for recycled water “Do Not Drink” signs shall be called out on the plans.
21. When recycled water becomes available, an on-site user supervisor shall be designated in writing. This individual shall be familiar with plumbing systems within the property, with the basic concepts of backflow/cross-connection protection, the recycled purveyor’s rules and regulations and the specific requirements of a recycled water system. Copies of the designation, with contact phone numbers shall be provided to the NAME OF WATER DISTRICT and/or the San Diego County Department of Environmental Health.

In case of emergency contact _____ at _____
Name Phone Number

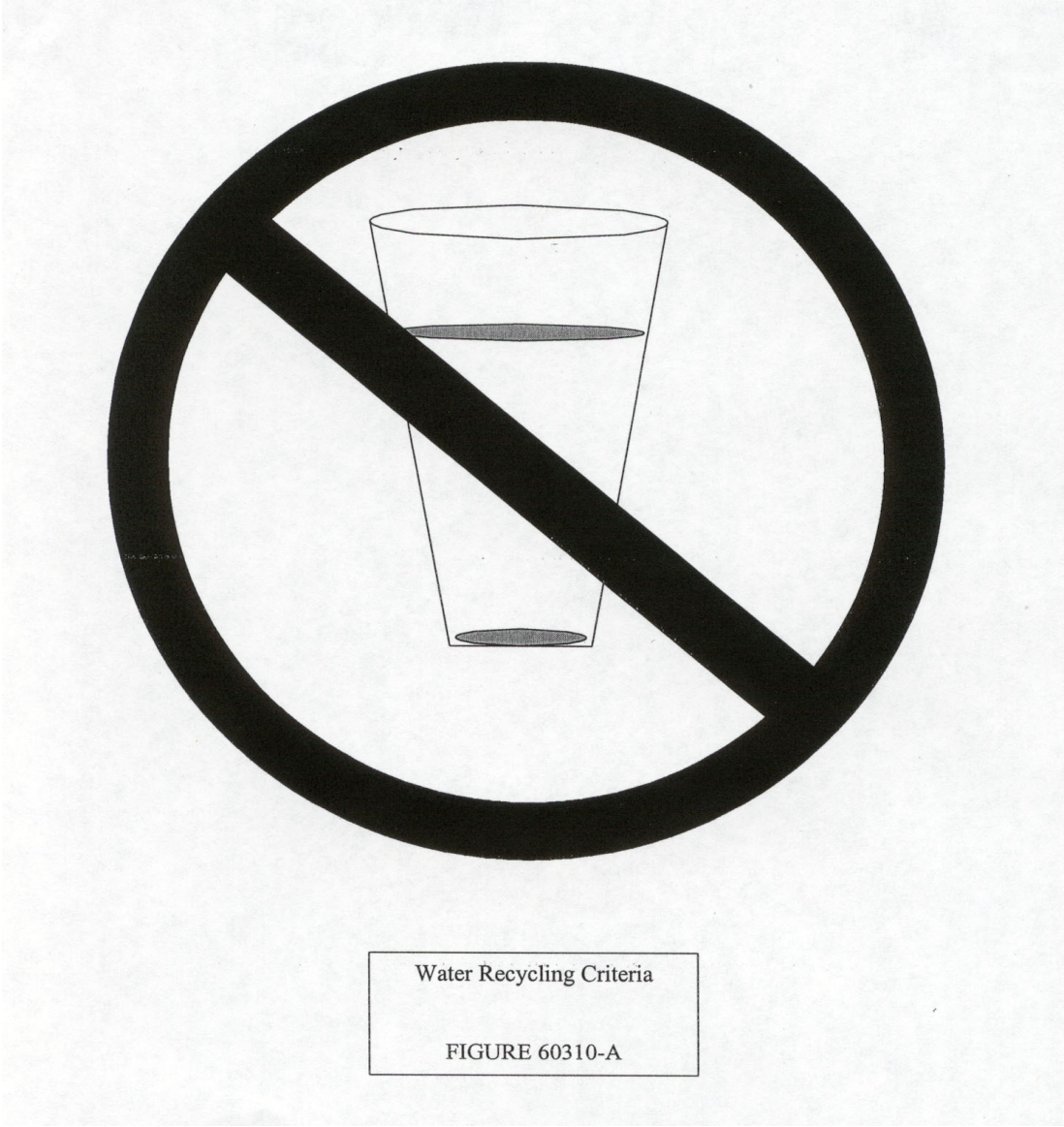
Or after hours contact _____ at _____
Name Phone Number

22. All public and private potable water mains including fire mains and any water wells and water courses within the recycled water project shall be shown on the plans.
23. Call out on the plans if there are or are not drinking fountains and/or designated outdoor eating areas on this site.
24. Educate all maintenance personnel on a continuous basis of the presence of recycled water. Personnel must be informed that recycled water is meant for irrigation purposes only, and is not approved for drinking purposes, hand washing, cleaning of tools, etc. Given the high turnover rate of employees in the landscape industry it is important this information be disseminated on an almost daily basis.
25. A physical separation shall be provided between adjacent areas irrigated with recycled water and potable water. Separation shall be provided by distance, concrete mow strips or other approved methods.
26. There shall be no direct (pipe-to-pipe) drainage of recycled water into the storm drains.
27. Absolutely minimize by best management practices recycled water runoff to storm drains.
28. Design of brow ditches and catch basins shall absolutely minimize recycled water runoff into storm drains.
29. All recycled water sprinkler control valves shall be tagged with identification tags. Tags shall be weatherproof plastic 3" x 4", purple in color, with words "Warning Recycled Water - Do Not Drink" imprinted on one side, and "Aviso - Agua Impura - No Tomar" on the other side. Imprinting shall be permanent and black in color.

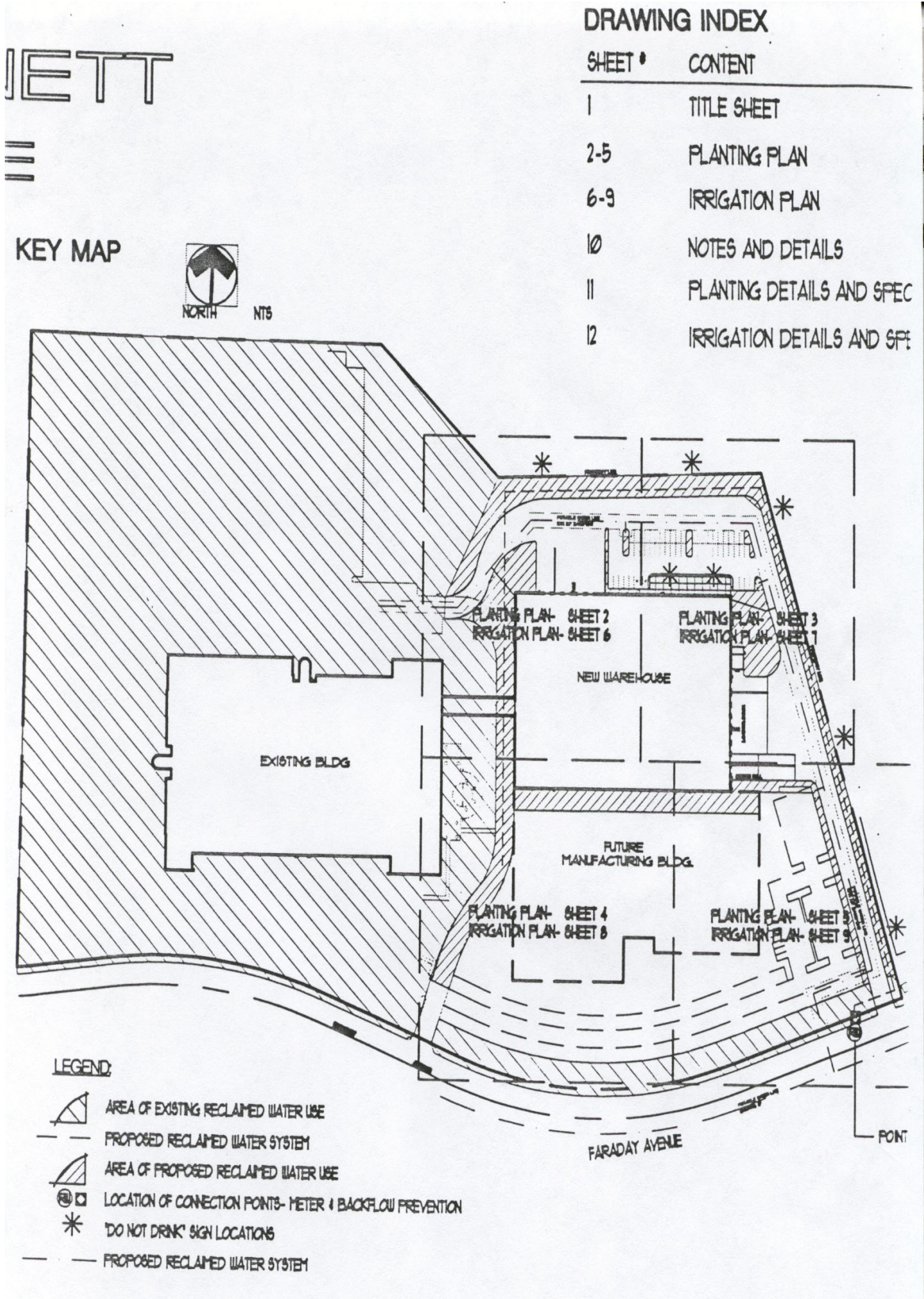
One tag shall be attached to each valve as follows:

Attach to valve stem directly or with plastic tie wrap; or
Attach to solenoid wire directly or with plastic tie wrap.

Attachment 39: Recycled Water Symbol for Signs



Attachment 40: Key Map (Example)



Attachment 41: DEH Signature Block

**COUNTY OF SAN DIEGO
DEPARTMENT OF ENVIRONMENTAL HEALTH**

APPROVED BY

DATE

Attachment 42: Declaration of Responsible Charge (Sample)

I HEREBY DECLARE THAT I AM _____ OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THIS PROJECT AS DEFINED IN SECTION 6730 OF THE BUSINESS AND PROFESSIONS CODE AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE _____ AND THE SAN DIEGO COUNTY DEPARTMENT OF ENVIRONMENTAL HEALTH IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME AS _____ OF WORK OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

FIRM

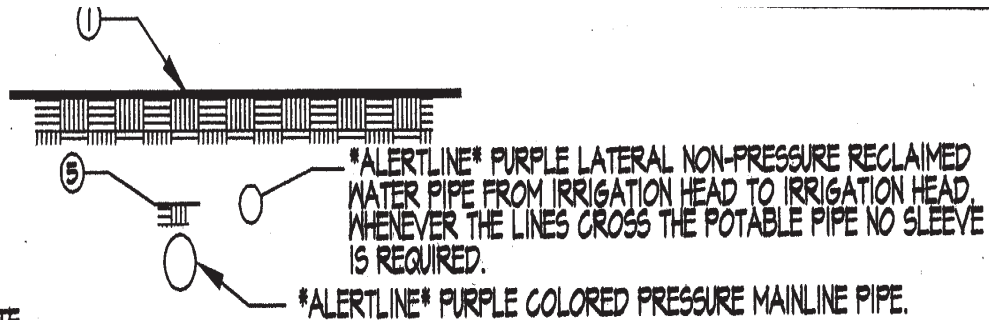
LANDSCAPE ARCHITECT

LICENSE NO. & EXPIRATION DATE

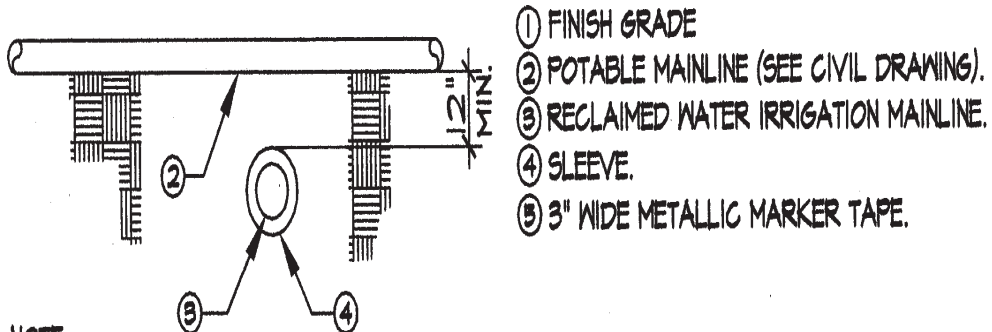
ADDRESS

PHONE

Attachment 43: Recycled Water/Potable Water Pipe
(Example)



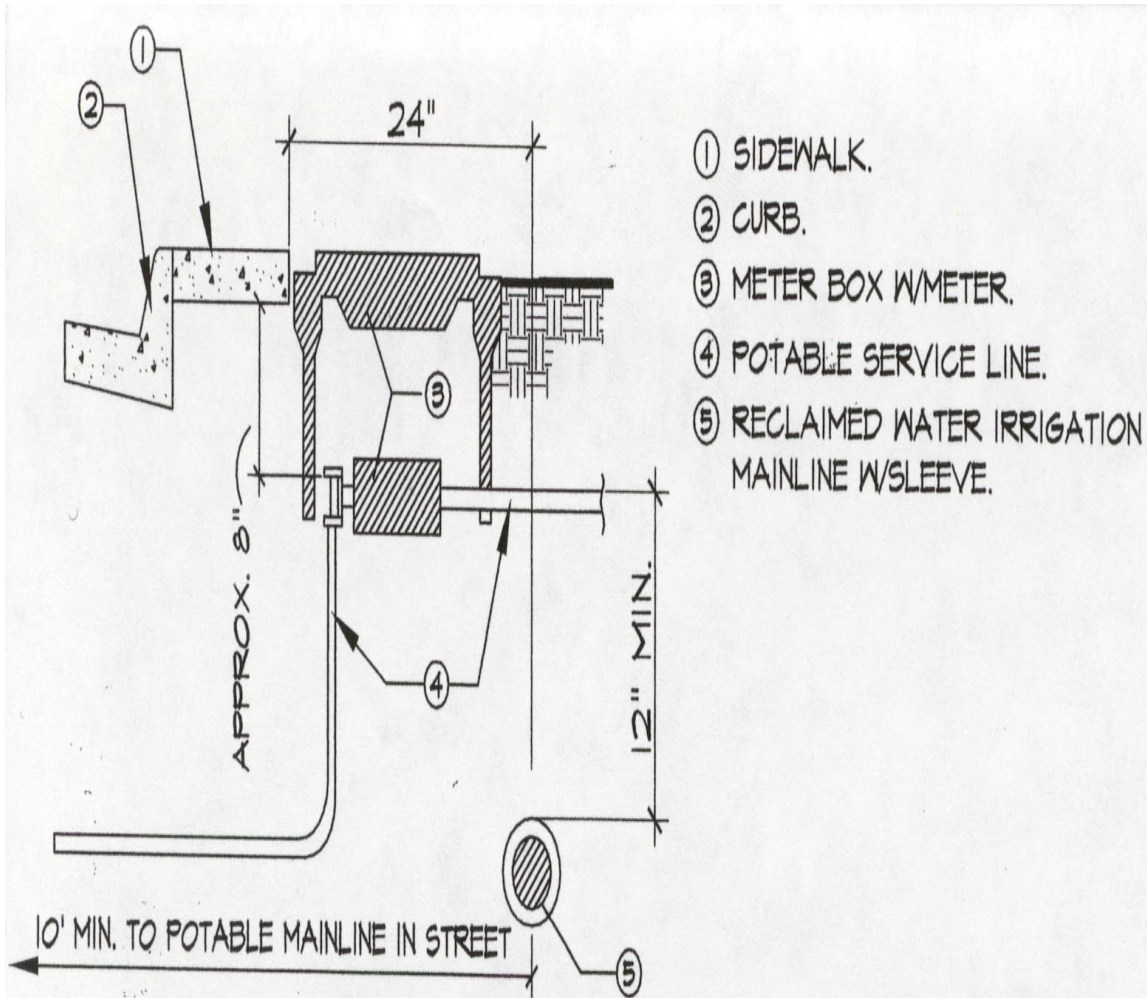
NOTE:
WHERE POTABLE LINES AND CONSTANT PRESSURE RECLAIMED WATER LINES CROSS, THE RECLAIMED LINES SHALL BE INSTALLED BELOW THE POTABLE WATER LINE IN A CLASS 200 PURPLE COLORED PVC SLEEVE. THE SLEEVE SHALL EXTEND 10- FEET ON EITHER SIDE OF THE POTABLE LINE FOR A TOTAL OF 20- FEET.



NOTE:
ALL RECLAIMED WATER IRRIGATION PIPE AND SLEEVES SHALL BE PURPLE PVC AND LABELED AS SPECIFIED IN THE "STANDARD SPECIFICATIONS FOR WATER, SEWER, AND RECLAIMED FACILITIES", LATEST EDITION AND THE RECLAIMED WATER NOTES.

A RECLAIMED WATER PIPE/POTABLE WATER PIPE
NO SCALE

Attachment 44: Potable Service Line Crossing (Example)



NOTE:

VERTICAL CLEARANCE OF 12" MIN. IS MANDATORY WHEN CROSSING PATH OF A POTABLE WATER LINE. INSTALLATION OF RECLAIMED WATER IRRIGATION MAINLINE 24" FROM FACE OF SIDEWALK WILL PROVIDE THE NECESSARY 10' HORIZONTAL CLEARANCE FROM POTABLE MAINLINE IN THE STREET.

B POTABLE SERVICE LINE CROSSING
 NO SCALE

Attachment 45: Recycled Water Background

DEPARTMENT OF HEALTH SERVICES

DIVISION OF DRINKING WATER
TECHNICAL OPERATIONS SECTION



RECYCLED WATER BACKGROUND

Definitions

Originally reclaimed wastewater. Statutorily changed to reclaimed water then statutorily changed again to recycled water, which is the current legally correct term.

Statutory definition. Recycled water means water which, as a result of treatment of waste, is suitable for a direct beneficial use, or a controlled use that would otherwise not occur and is therefore considered a valuable resource. (Sec 13050 Water Code)

Current Title 22 regulations illegally redefine the definition to limit it to "domestic wastewater". Since this conflicts with code definition, it is in the process of being deleted.

As currently interpreted by DHS, recycled water means:

The wastewater is derived from domestic or municipal sewage

An actual use of the recycled water is currently taking place or is proposed

The use of the recycled water is taking place offsite from the treatment process
(sec 13522.5)

Waste discharge versus recycled water use

The definition refers to "direct" beneficial use. This is defined as a use that occurs prior to any discharge to waters of the state (surface or ground).

DHS recycled water criteria **do not apply** to any waste discharge to waters of the State.

Regulation of Recycled Water

Two agencies, DHS and the RWQCBs, are the primary agencies involved with regulating treatment and use of recycled water.

Role of DHS.

Adopt statewide recycled water criteria in the form of regulations.

Criteria are contained in Title 22 and cover treatment design and operation, treatment performance criteria, reliability features, allowable uses, use area requirements, monitoring and cross connection control.

Title 22 criteria are currently being revised but not yet adopted. Proposed criteria are being used in the interim as guidelines.

The regulations and criteria *do not* replace the need for professional judgement.

DHS has no authority to enforce the criteria or to conduct inspections of recycling facilities unless a serious public health threat exists.

DHS has statutory authority regarding review and approval of new project proposal (SB 1722 which became effective January 1995).

Role of RWQCBs

Any person using or proposing to recycle or use recycled water must submit a report to the RWQCB and obtain water recycling requirements or a waiver. This applies to producers, distributors, or *users* of recycled water.

RWQCBs, therefore, are the primary agency involved with individual projects in terms of review, approval, surveillance and enforcement.

Unlike waste discharge requirements, recycled water requirements can:

- specify design or specific treatment requirements
- be imposed on the producers or users of both
- be consolidated under a master permit issued to a producer

Process (existing)

After receiving report, RWQCB must consult with and obtain comments from DHS prior to issuing RW requirements.

Boards must include Title 22 requirements but have discretion regarding other comments or suggestions.

Boards followup with surveillance and enforcement of the requirements as appropriate with technical assistance from DHS as necessary.

Master permits

Good tool to minimize paperwork and simplify project review process, particularly with respect to multiple users receiving recycled water from the same producer.

DHS supports and encourages the use of master permits, but key provisions need to be incorporated to protect DHS interests.

The master permit/order developed by the San Francisco Bay RWQCB (with DHS involvement) is an excellent model to use.

SB 1722

Went into effect in January 1995. Was adopted with industry support with the objective of speeding up review/approval of projects.

Changes the previous proposed project review and approval process somewhat as follows:

DHS *must* now respond to requests for review (either directly from project proponent or via RWQCB).

DHS must approve (or deny) proposed projects submitted for review

DHS may be reimbursed for its cost of review.

Due to the potential for confusion and duplication of effort between DHS and the RWQCBs as a result of SB 1722, the two agencies developed a Memorandum of Agreement (MOA) which was signed in 1996.

MOA Highlights

- Submission of report to the RWQCB constitutes a "request" for DHS review**
- DHS will use the RWQCB project submission and review process to review and approve proposals rather than duplicate.**
- Conditions of DHS approval will be incorporated into recycled water requirements but discretionary suggestions may not.**
- MOA spells out process for resolving problems or disagreements.**
- RWQCB will submit copies of project proposals to DHS as received rather than waiting for the development of draft RW requirements.**
- DHS agrees to respond to RB requests for review and comments within 30 days.**
- DHS will meet with board staff as needed or attend Board hearings to defend any DHS recommendations or conditions of approval.**
- DHS and SWRCB will jointly develop policy regarding the applicability of the ground water recharge criteria.**
- Operators will be certified by SWRCB.**

Attachment 46: Title 22 Regulations, Report Submittal (Section 60314)

Section 60314. Report Submittal.

(a) For dual-plumbed recycled water systems, the report submitted pursuant to section 13522.5 of the Water Code shall contain the following information in addition to the information required by section 60323:

- (1) A detailed description of the intended use area identifying the following:
 - (A) The number, location, and type of facilities within the use area proposing to use dual plumbed systems,
 - (B) The average number of persons estimated to be served by each facility on a daily basis,
 - (C) The specific boundaries of the proposed use area including a map showing the location of each facility to be served,
 - (D) The person or persons responsible for operation of the dual plumbed system at each facility, and
 - (E) The specific use to be made of the recycled water at each facility.
- (2) Plans and specifications describing the following:
 - (A) Proposed piping system to be used,
 - (B) Pipe locations of both the recycled and potable systems,
 - (C) Type and location of the outlets and plumbing fixtures that will be accessible to the public, and
 - (D) The methods and devices to be used to prevent backflow of recycled water into the public water system.
- (3) The methods to be used by the recycled water agency to assure that the installation and operation of the dual plumbed system will not result in cross connections between the recycled water piping system and the potable water piping system. This shall include a description of pressure, dye or other test methods to be used to test the system every four years.

(b) A master plan report that covers more than one facility or use site may be submitted provided the report includes the information required by this section. Plans and specifications for individual facilities covered by the report may be submitted at any time prior to the delivery of recycled water to the facility.

Attachment 47: SDHS Policy Memo 95-004: Swivel-Ell

SDHS POLICY MEMO 95-004: SWIVEL-ELL

Drinking Water Field Operations Branch
Division of Drinking Water and
Environmental Management
601 North 7th Street, MS-92
323-6111

POLICY MEMO 95-00x?: Guidance for the Alternative Use of Potable Water in Reclaimed Water Supply Use Areas.

Introduction

This policy provides guidance to staff for applying the California Regulations Relating to Cross-Connection Control. The practices outlined in this policy should be regarded as minimum conditions for providing backflow protection in the situations described.

Statement of Problem

Premises where reclaimed water is used for on-site non-potable uses may not utilize domestic water from a public water system as a supplemental source of water for the reclaimed water system unless the public water supply is isolated with an air-gap separation in conformance with Section 7604 of the California Code of Regulations (CCR). This regulatory requirement is based upon the potential for contamination of the public water supply from cross-connections created within a premises which utilizes reclaimed water for approved non-potable uses.

The Department has become aware of situations where reclaimed water is used for on-site non-potable uses and the potable supply is available as an emergency, alternative source of water in the event that the reclaimed water supply is temporarily unavailable. A swivel-ell type connection utilized to preclude connecting both sources of supply to the use area at the same time. The swivel-ell is switched from the reclaimed water connection to the potable connection in an emergency and the procedure is reversed once the reclaimed supply is available. The potable supply pipeline must be protected by an approved reduced pressure principle backflow preventer. The potential exists for concurrent use of the reclaimed water and potable water connections in violations of Section 7604 of the CCR. Therefore, special precautions must be taken to prevent the creation of cross-connections in these situations. In no case will it be acceptable for the potable supply to be directly connected to a reclaimed water supply.

Legal Status

The type of protection required (air-gap separation) is specified for premises where the public water supply is used to supplement the reclaimed water supply (CCR, T17, Section 7604(a)(1)). However, this Section does not include use of alternative sources of water and this policy addresses this practice and does not pertain to the use of supplemental sources.

Department Position

It is the opinion of the Drinking Water Program of the California State Department of Health Services that with proper safeguards, a swivel-ell type connection may be used when potable water is used as an alternative water supply to an on-site reclaimed water distribution system. This is acceptable only in cases where there is an unplanned, short term interruption of the reclaimed water service.

Directions to Department Staff

No concurrent use of the potable water supply and the reclaimed water supply will be allowed. Prior to construction of any facilities, written approval shall be obtained from the potable water purveyor and the Department. Water utilities proposing to use potable water as an alternative water supply to an on-site reclaimed water distribution system at a reclaimed water use area or facility must demonstrate to the Department that they can comply with the following:

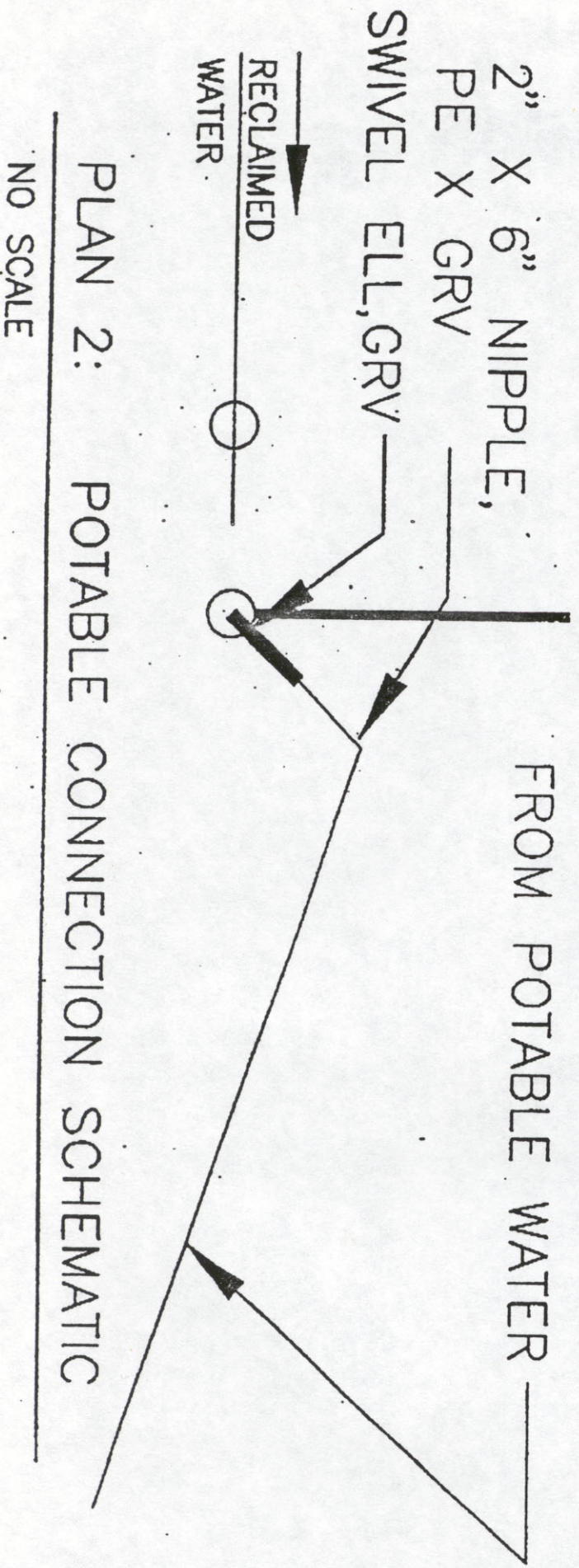
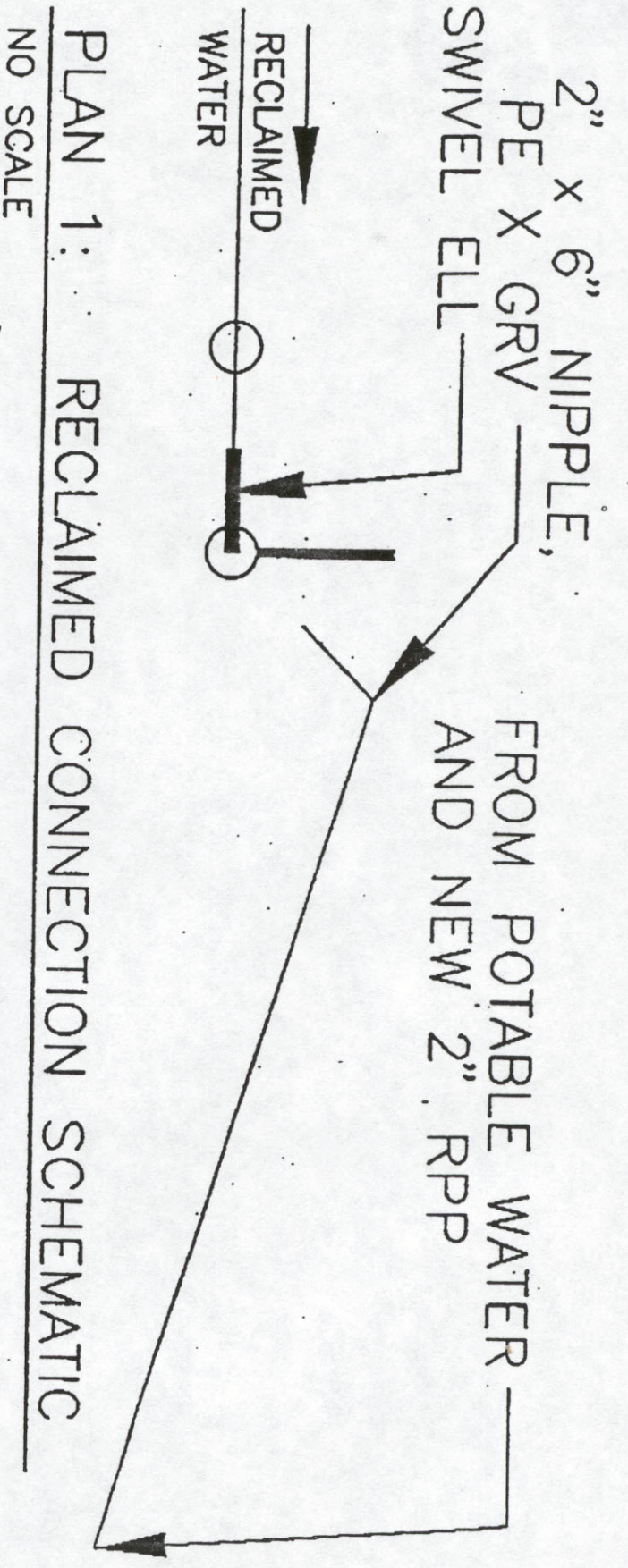
1. Only disinfected, tertiary reclaimed water is used.
2. The domestic water supplier has a cross-connection control program containing all of the minimum elements required by Section 7584 of the CCR. The program ordinance or rules of service must address the use of reclaimed water in these situations and must be acceptable to the Department.
3. Each on-site reclaimed water distribution system may only be supplied from a single reclaimed water feed line. There shall be no other inter-connections between the reclaimed water distribution system and potable water system within the use area or facility.
4. The swivel-ell connection, including the reclaimed water service, potable water service and the service riser to the facility or use area must be located above ground, color coded in accordance with Section 4049.54 and provided with appropriate signs on both the reclaimed water and domestic water facilities. Appropriate security precautions must be provided (e.g. locked gate valves, warning signs, etc.) to prevent inter-connections, vandalism and unauthorized use. The potable water purveyor shall inspect each location on a minimum quarterly basis to verify that a switchover has not occurred without the purveyor's approval. Meters must be provided on both connections and records of water use maintained.

5. The potable connection must be protected by an approved Reduced Pressure Principle Backflow Prevention Assembly (RP). Facilities for the swivel-ell connection must be located downstream of this assembly. The need for internal protection must also be evaluated.
6. To avoid concurrent use, swivel-ell connections must be designed such that a tee connection or other prefabricated mechanical appurtenances cannot readily be substituted for the ell. The reclaimed water and potable water services should not approach the service riser at an angle of 180 degrees (Figure 1).
7. A signed agreement between the public water supplier and reclaimed water supplier¹ that incorporates the following must be obtained:
 - (a) The RP on the potable water supply line must be tested in accordance with Section 7605 of the CCR immediately prior to a switchover from the reclaimed water supply to the potable water supply. The completed test report must be sent to the Department and potable water purveyor prior to activation.
 - (b) The potable water purveyor and Department must be notified within 24 hours of each switchover.
 - (c) The potable water purveyor shall supervise the switchover and activation of the potable water service and subsequent deactivation.
 - (d) Upon request, the potable water purveyor must follow-up with a written report to the Department within 7 days following the switchover.

This policy is intended for short term emergency switchovers, not to exceed 90 days.

The potable water supplier will have the responsibility for documenting that all conditions of approval have been satisfied. The Department shall require installation of a permanent air-gap separation in accordance with Section 7604 of the CCR in the event that a cross-connection is made between the potable water supply and the on-site reclaimed water distribution system.

¹If a common agency has both water and reclaimed water operations then rules of service incorporating the following items must be in place.



Attachment 48: State of California Retrofit of Potable Water Lines to Recycled Water Lines

DEPARTMENT OF HEALTH SERVICES
DIVISION OF DRINKING WATER AND ENVIRONMENTAL MANAGEMENT
TECHNICAL OPERATIONS SECTION
RECYCLED WATER UNIT
1180 Eugenia Place, Suite 200
Carpinteria, CA 93013
(805) 566-9767
FAX (805) 566-4790



MEMORANDUM

DATE: September 27, 2000

TO: Regional/District Engineers

FROM: Jeff Stone

SUBJECT: Retrofit of potable water lines to Recycled Water Lines

Several issues have been raised over the recent few months concerning retrofit projects and what our review and approval of proposals should be based on. The purpose of this memorandum is to outline what informational tools are available to staff concerning this matter.

First, it is pointed out that retrofits must be reviewed on a case-by-case basis and a determination made as to a projects acceptability, taking into account piping network complexities, availability of accurate field documentation (plans/specifications/maps), clearly demonstrated elimination of 'unknowns', and assurances that cross-connection control issues can be clearly addressed. We have run across several cases where these issues could not be adequately addressed and a determination made that retrofit is not reasonable.

To assist in the review process, several sources of reference material are available which should be utilized during a retrofit review;

1. "Guidelines For The On-Site Retrofit Of Facilities Using Disinfected Tertiary Recycled Water", published by CAL-NEV AWWA in 1997. These guidelines were specifically developed to address the multitude of issues relating to acceptable retrofit procedures, including cross-connection control shutdown tests. The Recycled Water Committee had previously recommended that each district office have this on file.

2. "Guidelines For Distribution of Nonpotable Water", published by CAL-NEV AWWA in 1992. Again, each District office should have a copy of these guidelines available for reference.
3. "Dual Water Systems" (Manual M24), published by AWWA National provides a broad perspective of dual plumbing issues and useful background information.
4. San Diego County Department of Environmental Health has a "Recycled Water Plan Check and Inspection Manual" which is in the process of being updated (current version dated December 1997). A request has been submitted to the County to provide SDHS with copies for all district offices when available (expected around October, 2000). This is a very practical and useful tool for staff reviewing any type of recycled water use/retrofit proposal.
5. Memorandum dated October 28, 1998 from the San Diego District Office concerning installation of lines which will eventually be converted for recycled water use (copy attached).
6. Note that Section 116815 of the H&S Code (page 10 in purple book) requires that all pipes installed for recycled water use after June 1, 1993 must be purple or distinctively wrapped with purple tape.
7. Local plumbing and building code ordinances, and appropriate local authorities should be consulted to ensure that any type of retrofit proposal in conformance with their requirements as well.

It is recommended that this memo be shared with the local county health departments in your District. If you have any questions concerning this issue, please contact Jeff Stone at (805) 566-9767.

Attachment

cc: Cliff Sharpe - DHS
Gary Yamamoto - DHS
Bob Hultquist - DHS
Rich Mills - SWRCB
RW Committee

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Attachment 49: Installation of Future Recycled Water Mains

Date: October 28, 1998

To: Recycled Water Purveyors in Riverside and San Diego County
(See Attachment)

From: Drinking Water Field Operations Branch
San Diego District
1350 Front Street Room 2050
San Diego, CA 92103

Subject: Installation of Future Recycled Water Mains

Introduction

Southern California is dependent on imported water for domestic use. The Department encourages the use of recycled water and future planning for use of recycled water in accordance with the Code of Regulations, Title 22. The use sites for recycled water in San Diego and Riverside Counties are growing at a rapid rate. As a result, recycled water distribution systems are being installed at this time as part of new development in anticipation of recycled water being available in the future.

Statement of Problem

Installation of future recycled water distribution systems when recycled water is not available at the time of installation is a situation that has arisen often. These pipelines are typically supplied with domestic water in the interim until recycled water becomes available. Water agencies that deliver domestic water in future recycled water mains to areas solely used for irrigation or for other non-domestic purposes have requested guidance for these temporary connections between potable and recycled water pipelines. Conversion of existing mains delivering domestic water, to recycled water, requires that no domestic water supply connections exist upon completion of the conversion.

Recommendations

Any water main that will be converted to recycled water should be installed in accordance with appropriate regulations and guidance related to recycled water including requirements for color coding and labeling, separation from domestic water lines and sewers, and installation of appropriate back-flow protection. A connection between a domestic water supply and a future recycled water main should be designed in accordance with the following:

1. Detailed plans and specifications for the distribution system and connections should be submitted to this Department and/or the County Health Department prior to construction.
2. The tie in between the two mains must be above ground.
3. A Reduced Pressure Principle Backflow Prevention Device (RP) or an air-gap separation must be installed between the connection of the recycled water main and the domestic water supply main. Annual testing of the RP Device or visual inspection of an air-gap must be performed by the water agency. All records of RP testing must be maintained by the water agency.
4. No domestic services supplying water for human consumption are allowed on the future recycled water main.
5. The water agency must maintain records of all users on the recycled water main and all inter-ties between the recycled water main and potable system.
6. Plans and specifications and as-built distribution maps should be maintained on file by the water agency.
7. Prior to delivering recycled water, all connections to the domestic system must be severed.
8. The water agency must notify the Department prior to the conversion from domestic water use in the recycled water main to recycled water. The Department will verify that all measures aforementioned were taken prior to charging the main with recycled water.

Implementation of these recommendations will save time when recycled water becomes available and will ensure that the domestic water system is protected from cross-connections. Failure to adhere to these recommendations will result in a requirement for a distribution system cross-connection shutdown test when recycled water becomes available and the distribution system is converted to use of recycled water.

Thank you for your time and cooperation in ensuring a safe delivery of recycled water to your consumers. If you have any questions please contact me or the engineer assigned to your system at (619) 525-4159.

cc: County of Riverside, Department of Environmental Health
San Diego County Environmental Health Services

Attachment 50: Site Use of Recycled Water Before Potable Water

There may be situations where because of a difficulty in highlining from a potable water source or stringent regulations on the use of a construction meter, the developer wants the recycled water meter set before the potable system is in place. In other words, the irrigation is to be off the recycled water main before the site is developed, the potable distribution system installed and the potable meter set.

The policy is that the recycled water meter shall not be set before the potable water meter nor shall there be use of recycled water on a non-approved use site. The reasoning behind this policy is that if there is recycled water but no potable water on the site, the easiest and quickest source of construction water will be off the recycled water system. The improper use of the recycled water would extend to drinking, hand washing, etc. The construction of a shopping center or strip mall, for example, involves many different construction trades, most of whom have little or no knowledge of recycled water and the many restrictions on the use of recycled water. Once a cross-connection with a potable system occurs, many health and safety issues arise, including disinfecting the contaminated potable system.

Exceptions to this policy, which will be kept to an absolute minimum and only considered in cases of extremely extenuating circumstances, must be approved by both the recycled water purveyor and the health department.

Even the recycled water site supervisor may not catch an illegal tap, as was demonstrated by an actual occurrence. In San Diego County, we had a case of a new construction site on an existing school site where recycled water was used for irrigation. The contractor made an unauthorized tap into the recycled irrigation pressure main and was found using the recycled water for various construction purposes. Why did the contractor make the tap? He needed construction water and it was the easiest method of getting the water.

Attachment 51: Rationale for Inventorying and Testing Post-Meter Backflow Devices

The primary reason for shutdown testing and inspections on sites with potable and recycled water is to ensure to the greatest degree possible that the two systems are not interconnected. If a cross-connection has been created between the two systems, the first likely area is between the irrigation system and the potable lateral feeding the building. The second likely area is between the irrigation system (or feeds to the cooling tower or other equipment) and equipment that utilizes water to operate. Here is where the post-meter backflow prevention device is usually found for protecting the drinking water system from the water contaminated by equipment use. Consequently, if the tie-in between the recycled water and the potable water systems is at equipment protected by a backflow prevention device, this backflow prevention device will likely also protect the drinking water system from contamination with recycled water. Although there may be a low probability of a tie in at this location, any steps that can be taken to protect the safety of the drinking water will add to the level of confidence in the on-site systems and also to the confidence of the on-site consumer.

With recycled water, the purveyor is brought on site past the meter. The purpose of the purveyor being on site is to protect the drinking water system from cross-connections with the recycled water system. This protection is required because recycled water is not potable water. Thus it is simply an on-site public health and safety issue. The purpose of post-meter backflow prevention devices is to protect the drinking water system from unprotected cross-connections with non-potable water. This is also an on-site public health and safety issue. Consequently, it is difficult to argue that the purveyor should be in the position of protecting against one source of contamination but at the same time ignoring the other, especially since Title 17, California Code of Regulations, allows the purveyor to deal with post-meter issues.

Why should there be a concern about recycled water and possible cross-connections with the drinking water or about unauthorized uses of recycled water? Recycled water is virtually pathogen free as long as there are no treatment plant upsets. However, treatment plant upsets do occur. The testing requirement at the treatment plant for pathogens is one coliform grab sample per day. This test takes 24 to 48 hours to develop. If the test is positive for coliforms, a surrogate indicator for pathogens, the contaminated water is already in the distribution system. Also we do not know the quality of recycled water at the point of use because there are no distribution system testing requirements. Consequently, the more protective measures we can take for the use site, the more confidence we may have in the safe use of recycled water.

Attachment 52: DEH Inspection Requirements

Before the cross-connection control shutdown test or site inspection can be scheduled with DEH, the following is required:

1. The proposed use site approved and signed plans must be held by DEH. This includes plans for site with recycled and potable water and sites with only recycled water.
2. A copy of the notification letter (see Attachment 4) must be forwarded to DEH. This can be accomplished with a phone call when dealing with temporary construction sites.
3. DEH must be notified a minimum of two weeks in advance of the recycled water cross-connection control shutdown test to allow for staff scheduling.
4. Billing information must be provided to DEH for the specific use site.



Attachment 53: Recycled Water Use in Cooling Towers

The recycled water used in any cooling device - cooling tower, evaporative condenser, etc. - that creates a mist shall be at least disinfected tertiary recycled water. At a minimum, disinfected secondary-23 recycled water shall be used in any cooling device that does not create a mist.

Whenever a cooling system, using recycled water in conjunction with an air conditioning facility, utilizes a cooling tower or otherwise creates a mist that could come into contact with employees or members of the public, the cooling system shall comply with the following:

1. A drift eliminator shall be used whenever the cooling system is in operation.
2. A chlorine or other biocide shall be used to treat the cooling system recirculating water to minimize the growth of *Legionella* sp. and other microorganisms.

“Drift eliminator” means a feature of a cooling system that reduces to a minimum the drift (water that escapes to the atmosphere as water droplets from a cooling system) from the system. This information is taken from Title 22, CCR Section 60306. It should be noted that the drift eliminator does not eliminate drift, it only minimizes the drift. In fact, the drift eliminator is simply parallel blades of PVC, wood, metal or an alternative material arranged on the air discharge side of the cooling tower fill so as to remove entrained water droplets from the leaving air stream.

An engineering report is required for each proposed cooling tower use of recycled water and must at a minimum address the following items:

1. Recycled and potable water piping engineering plans.
2. Details of the separation of recycled water drift points and fresh air intakes for building(s) HVAC systems.
3. Emergency response plan procedures in the event a cross-connection between the recycled and potable water systems is detected.
4. Standard conditions for the use of recycled water in cooling towers:
 - a. No interconnections between the potable and recycled water systems.
 - b. Recycled water meets the Title 22 treatment requirements.
 - c. Recycled water meets the Title 22 reliability standards.
 - d. The recycled water purveyor has approved rules and regulations.
 - e. The site is non-residential where children are not frequently present.
 - f. Plans and specifications shall be submitted for review to State DOHS and County DEH.
 - g. The recycled water shall only be used for purposes specified in the engineering report.
 - h. Appropriate backflow prevention devices shall be installed, tested and maintained.
 - i. Both the potable and recycled water lines, valves and valve boxes shall be labeled and/or color coded.
 - j. There shall be no hose bibs on the recycled water system.
 - k. Any outlets on the recycled water system shall be clearly marked for worker protection and shall not be accessible to the public.

- l. No piping system used for conveying recycled water shall be converted to potable water without prior written approval from DOHS and DEH.
- m. If the potable supply is to be used as a backup source, this must have prior approval of DOHS and DEH, and must be through a legal air gap.
- n. Appropriate signage shall be posted.
- o. The use site shall have a designated User Supervisor who, at a minimum, has attended the County Water Authority training class.
- p. Before converting to recycled water and annually thereafter, a complete cross-connection control shutdown test shall be conducted at the cooling tower by a certified Cross-Connection Control Specialist. The test shall be monitored by DOHS and/or DEH.
- q. Any significant failure of the recycled water system shall be reported promptly to the purveyor, DOHS and DEH.
- r. If this is a retrofit of an existing cooling tower, include comprehensive photos of the tower in the engineering report.

Index

A

Air lock 10, 18
American Water Works Association 8
Appurtenances 8
As-Built Plans 5, 10, 36, 39, 56-57

B

Backflow Protection 9
Background, Recycled Water 92
Beneficial use 1, 73
Bleeding off 18
Brow ditches 85

C

California Health and Safety Code 10, 37, 70, 84
California Plumbing Code 31
California Water Code 1, 10
Catch basins 85
Cemeteries 54
Colored map 4
Common trenching 78
Communication 11
Construction Sites 73
Controller Charts 51-52
Cooling Towers 22, 108-109
Coverage Test 8, 10
Cross connection test 40, 81, 84
Cross-Connections 3, 59, 83

D

Day care centers 42, 54
Declaration of responsible charge 89
Decorative fountains 38, 78
DEH signature block 88
Designated outdoor eating areas 9, 83, 85
Detention facilities 42, 54
Discharge use permits 2
“Do Not Drink” signs 8, 78, 81, 84
Do’s and Don’t User’s Guide 57
Drinking Fountains 8, 38, 83, 85

Drop tanks 73
Dual plumbed 10, 42
Dual Plumbed Buildings 31, 32
Dye testing 19

E

Engineer/architect 5

F

Fertilized water 64
Food establishments 9
Food-safe dye 32

G

Golf Courses 54, 66
Irrigation head markings 67
Recycled water irrigation scheduling 63
Valve box covers 67

H

Head pressure 21
Health and Safety Code 78
Health Effects, Recycled Water 35
Heating and cooling equipment 38
Highlining 24, 62, 105
Homeowners associations (HOAs) 19
Hose bibs 66, 77-79, 83
Hospitals 42, 54, 71-72
Hours for irrigation 82-83

I

Ice makers 38
Identification tags 85
Industrial water 11
Inspection Form
 Recycled water site 50
 Shutdown test 48
Inspection Procedures 10
Inspection Requirements 107
Irrigation Controllers 16, 51
Irrigation legend 6
Irrigation System Conversions
 Unregulated 70

K

Key Map 87

L

Laboratory equipment 38
Landscape Maintenance Districts 44, 59
Legionella sp. 108
Location of Sprinklers 8

M

Mains
Installation of future recycled 103
Military facilities 54
Minimum depth 7
Mow strips 70, 85
Mylars 5, 36

N

Non-designated use areas 81, 83
Non-dual plumbed sites 10
Notification 15
Nurseries 64, 66

O

On-site user supervisor 84
Overspray and runoff testing 44

P

Pathogenic organisms 3, 35
Plan check, retrofit guidelines 77
Plan check procedure 5-6
Plan check, reason 3
Play areas 8
Ponds 9
Post-meter backflow prevention 106
Potable Service Line Crossing 91
Pre-inspection 14
Pressure recorders 12, 17
Private yard areas 68
Purveyor 36

Q

Quick couplers 6, 57, 79, 83
Quick Coupler Advisory 58

R

Raw water 11
Recycled water standard notes, City of San Diego 79
Recycled water and potable water differences 34 -35
Recycled water site supervisor
Duties and responsibilities 55
Recycled water use, private yard areas 68
Recycled water use site, changes at 46
Recycled water/Potable water pipe 90
Refrigerators with internal ice makers 38
Regional Water Quality Control Board 53
Regulatory responsibilities 2
Retrofits 8

S

Schools 11, 54
Separations 7
Horizontal 7
New on-site systems 84
Physical 81, 85
Vertical 7
Shutdown Test 5, 9-11, 15, 36, 47, 84
Complete 39
Delays of recycled water delivery 45
Frequency, policy 42
Maintaining potable pressure 22
Method 1 24
Method 2 26
Method 3 27
Method 4 28
Method 5 29
Method 6 29
Method 7 31
Method 8 32
Method 9 33
Notification suggestions 38
Pressure differentials and pressure loss 20
Reporting requirements prior to 37

Sidewalks 8

Signs, recycled water symbol 86

Site Certification Letter 47

Site Considerations 14

Site Plan Process 36

Sleeve, protective 84

Solenoids 17

Sprinklers, location of 8

Standard Plan Notes 83

Recycled Water 83

Stenciling, pipes 84

Storm Drains 44, 85

Surveying, water uses 21

Swimming pools 8

Swivel-ell 9, 63

System Identification 8

T

Tailgate training 73

Tattletale 21

TDS meter 14

Theme Parks 66

Thermal Expansion 69

Threshold valves 22

Title 17 10, 53, 68, 106

Title 22 1, 3, 8-10, 42-43, 53, 66, 68, 78, 96, 108

Report submittal 96

Total coliforms 35

U

Under sink and lab reverse osmosis units 38

Unique Situations 66

Use Site Supervisor 39, 53, 84

V

Valves, identification tags 85

Vellums 5

W

Wall-mounted chemical cleaning dispensers 38

Warning tape 80, 83

Water trucks 73

Y

“Y” connection 17

Table of Contents

Introduction	1
Division of Regulatory Responsibilities	2
Goal of Recycled Water Use	2
Reason for Plan Check and Inspection	3
Preliminary Meeting	4
Sample Colored Map	4
Plan Submittal Procedure	5
Plan Resubmittal Procedure	5
Plan Check Procedure	6
Specific Plan Check Requirements	7
Minimum Depth	7
Recycled Water System Identification	8
Location of Sprinklers	8
Sprinkler Coverage	8
Drinking Fountains	8
Designated Outdoor Eating Areas	9
Ponds	9
Food Establishments	9
Backflow Protection	9
Inspection Procedures	10
Cross-Connection Concerns	10
Purpose of the Recycled Water Cross-Connection Control Shutdown Test	11
Considerations	11
Preparing for the Test	12
Pressure Recorder Use Considerations	12
New and Retrofit Site Considerations	14
Preparing for the Cross-Connection Control Test	14
Irrigation Controllers	16
Pressure Recorders	17
Potential Cross-Connections	18
Cross-Connection Control Test Methodology	19
The Recycled Water Shutdown Test: Pressure Differentials and Pressure Loss	20
An Alternate Method to Maintain Potable Pressure During the Shutdown Test	22
Method 1	24
Method 2	26
Method 3	27
Method 4	28
Method 5	29
Method 6	29
Method 7	31
Method 8	32
Method 9: Recycled Water Cross-Connection Control Shutdown Test at Homeowners Associations (HOAs) with No Backflow Prevention Assemblies	33

Attachment 1: Recycled Water and Health Effects	35
Attachment 2: Recycled Water Use Site Plan Process and Responsibilities	36
Attachment 3: Reporting Requirements Prior to Conducting a Recycled Water Cross-Connection Control Shutdown Test	37
Attachment 4: Shutdown Test Notification Suggestions	38
Attachment 5: Policy on What Makes up the Complete Cross-Connection Control Test	39
Attachment 6: General Cross-Connection Control Test Step Outline for any Use Site	40
Attachment 7: Recycled Water Cross-Connection Control Test Duration	41
Attachment 8: Policy on Frequency of Cross-Connection Control (Shutdown) Tests	42
Attachment 9: Overspray and Runoff Testing for All Recycled Water Use Sites	44
Attachment 10: Policy on Cross-Connection Control (Shutdown) Tests and Delays of Recycled Water Delivery	45
Attachment 11: Changes at Recycled Water Use Sites	46
Attachment 12: Recycled Water Use Site Certification Letter	47
Attachment 13: DEH Recycled Water/Shutdown Test Inspection Form Example	48
Attachment 14: Sample Recycled Water Site Inspection Report (provided by Padre Dam MWD)	50
Attachment 15: Irrigation Controllers	51
Attachment 16: Controller Chart (Example)	52
Attachment 17: Designation of a Use Site Supervisor	53
Attachment 18: Duties and Responsibilities	55
Attachment 19: As-Built Plans	56
Attachment 20: User's Guide to Practical Do's and Don'ts	57
Attachment 21: Quick Coupler Advisory	58
Attachment 22: Documented Cross-Connections, Landscape Maintenance Districts and Methods of Control	59
Attachment 23: An Actual Incident and the Resolution	60
Attachment 24: Highlining	62
Attachment 25: Golf Course Recycled Water Irrigation Scheduling	63
Attachment 26: Recycled Water Use at Nurseries	64
Attachment 27: Unique Situations (Hose Bibs, Golf Courses, Theme Parks)	66
Attachment 28: Recycled Water Use in Private Yard Areas	68
Attachment 29: Cross-Connection Control Test and Thermal Expansion	69
Attachment 30: Unregulated Irrigation System Conversions Using Purple Pipe	70
Attachment 31: Hospitals and Recycled Water	71
Attachment 32: Construction Sites and Recycled Water	73
Attachment 33: Cross-Connection Control Test Station Example (by Larry Olds, Otay Water District)	74
Attachment 34: Recycled Water Pipe and Above-Ground Appurtenance Policy	75
Attachment 35: Recycled Water Plan Check Retrofit Guidelines	77
Attachment 36: Recycled Water System Plan Check	78
Attachment 37: Recycled Water Standard Notes City and County of San Diego	79
Attachment 38: Recycled Water Standard Plan Notes	83

Attachment 39: Recycled Water Symbol for Signs	86
Attachment 40: Key Map (Example)	87
Attachment 41: DEH Signature Block	88
Attachment 42: Declaration of Responsible Charge (Sample)	89
Attachment 43: Recycled Water/Potable Water Pipe (Example)	90
Attachment 44: Potable Service Line Crossing (Example)	91
Attachment 45: Recycled Water Background	92
Attachment 46: Title 22 Regulations, Report Submittal (Section 60314)	96
Attachment 47: SDHS Policy Memo 95-004: Swivel-ElI	97
Attachment 48: State of California Retrofit of Potable Water Lines to Recycled Water Lines Guide- lines	101
Attachment 49: Installation of Future Recycled Water Mains	103
Attachment 50: Site Use of Recycled Water Before Potable Water	105
Attachment 51: Rationale for Inventorying and Testing Post-Meter Backflow Devices	106
Attachment 52: DEH Inspection Requirements	107
Attachment 53: Recycled Water Use in Cooling Towers	108
Index	110-113