Septic Tank to Cistern Conversion

One of the benefits of connecting to the Central Wastewater System is the opportunity it provides to convert your septic tank into a cistern. For slightly more than the cost of septic tank abandonment you can utilize your tank to capture rainwater for use in landscape watering, car washing, boat washing, motor flushing, and pressure-washing.

In doing so you will not only reduce your water bill, but will also reduce your wastewater bill.

How Much Rainwater Can You Collect?

A 2,000 square-foot roof can capture 1,200 gallons of water during a 1" rain.

Below are specific instructions originally provided by the late Fran Wagner, a Bay Point resident, who spearheaded a local effort promoting this cost effective conservation process and worked with the agencies to make this process possible in the Keys. Edits and updates have been made as necessary.

Summary of Conversion Steps

1. Obtain the abandonment/conversion permit from the Department of Health.
2. Have the septic tank pumped out and pressure cleaned.
3. Connect the roof gutter downspout(s) to fill the tank.
4. Connect an overflow pipe to the cistern tank and install 1 mm or 1/16" mesh over opening.
5. Allow the cistern tank to fill and add chlorine bleach.
6. Mount a pump with pressure tank in a convenient location and supply power to it.
7. Connect an intake suction pipe from the cistern tank to the pump.
8. At any time after step 5 and after the chlorine has dissipated to 1ppm, the Department of Health should be called to test the water. This is required to receive the DOH certificate of approval.
9. After DOH approval, connect an output pipe from the pump (pressure tank) to a garden faucet.
10. An optional float switch can be installed to prevent dry pump operation when tank is near empty.

Converting an Abandoned Residential Septic Tank to a Cistern to Collect and Store Rain Water for Landscape Irrigation

By Fran Wagner

This write-up describes the steps required for conversion. They are not complicated and can be done either by tradesmen or by the homeowner. Also they are not dangerous as long as no one enters the tank during the conversion process since harmful gases may be present. If for some reason the interior of the tank must be accessed, it should only be done by a professional with the proper breathing apparatus.

There are basically two types of individual septic systems in the Keys, Aerobic (the newer) systems and anaerobic (the older) systems. The older anaerobic systems consist of a single tank with drainage field(s). The newer aerobic type consists of two or three tanks with the first tank having air pumped into it to supply oxygen to the bacteria that break down the sewage.

The instructions that follow are for the older single tank systems. The newer aerobic systems require these same steps along with others, which are described later in this write-up.

The steps for anaerobic tank conversion are the following and each is discussed in detail below.

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5. Allow the cistern tank to fill and add chlorine bleach.
6. Mount a pump with pressure tank in a convenient location and supply power to it.
7. Connect an intake suction pipe from the cistern tank to the pump.
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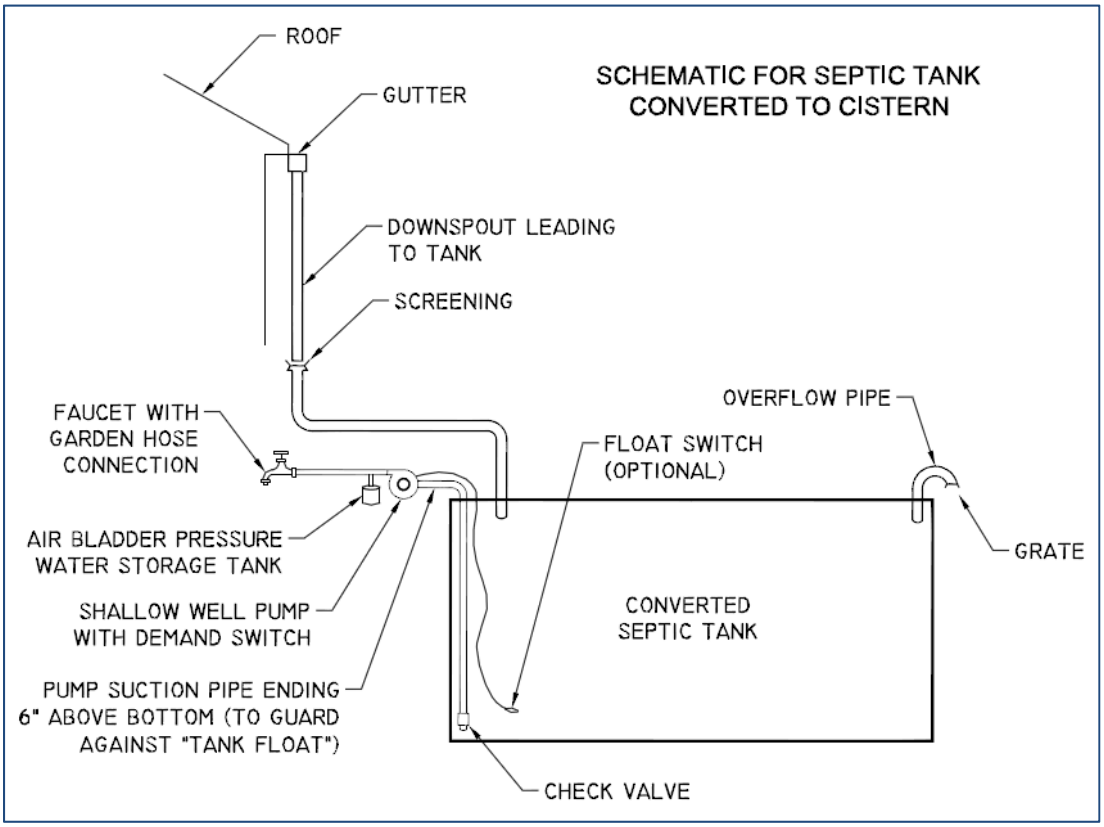
9. After DOH approval, connect an output pipe from the pump (pressure tank) to a garden faucet.
10. An optional float switch can be installed to prevent dry pump operation when tank is near empty.

The following diagram shows the conversion.



<u>These are the step-by-step details</u>.

1. All homes connecting to the Central Wastewater system are required to receive an abandonment permit. The cost for the abandonment permit is $95. A $77 lab fee is also required so the water in the tank can be lab analyzed.

2. After the septic tank is no longer in use and the house sewer pipe is connected to the municipal system, the septic tank should be pumped empty by a certified septic pumping contractor. Most such contractors have a pressure washer and fresh water supply on their truck. Ask the contractor to thoroughly clean the inside of the tank and then to pump out the wash water. If the contractor does not have a pressure washer, the homeowner should borrow one and have it ready for use when the pumping contractor arrives.

3. If roof gutters do not exist they must be installed. Connect the downspout(s) to 3” PVC pipe that is routed to the now unused septic tank. We will call it a cistern tank from now on. Usually the 3” pipe can be connected to the stub which remains of what was the old fill pipe running from the house. It is a good idea (though not necessary) to have a piece of 1 mm or 1/16” mesh screen material at a suitable location in the path from the gutter to the cistern. This will catch any debris which is flushed from the roof during the initial minutes of a rainstorm.

4. Connect an overflow pipe to the top of the cistern. This is usually a couple of 3” PVC 90 degree elbows which allow overflow water out of the cistern if it is full and it is still raining. Install 1 mm or 1/16” screen to prevent rodent and mosquito access to the cistern. It is also desirable to put some sort of splash basin or gravel field to reduce erosion at that point and to guide the overflow in a desired direction.

5. The tank is now able to collect rainwater. After it is about three quarter full, add 3 - 4 gallons of chlorine bleach. The best is ordinary plain (unscented) bleach. When the tank is full, add another gallon or two of bleach. These amounts of chlorine are more than is necessary for a very large tank (more than 1500 gallons. Most septic tanks are 1000 gallons or less in volume. The chlorine will totally disinfect the tank by killing any remaining bacteria even those that are in the pores of the concrete walls, while slowly dissipating. Swimming pool shock will not work in this application.

6. The best type of pump to use to pump the rainwater from the cistern to a garden hose bib faucet is called a “shallow well” pump. Most of these are supplied with a pressure tank that holds from one to about five gallons of water. Basically the pump draws water from the cistern and fills the pressure tank to about 40 – 50 psi. If the hose is turned on, the pressure in the tank forces water out the hose. As the water is used from the pressure tank, when the pressure drops by about 5 – 10 psi, a pressure demand switch automatically turns on the pump to refill the pressure tank. The pressure tank keeps the pump from running constantly and provides fairly constant pressure.
The pump should be mounted 6 to 8 feet above ground (remember Wilma). Such pumps run on regular 115V household power. If necessary have a GFI receptacle installed in a weather tight box near the pump and have a switch installed in the circuit to be able to disable the pump if needed.

7. Connect a PVC pipe from the cistern to the intake of the pump. Usually a 1” pipe is used. If the pump intake fitting is larger, use a reducer to get to 1”. If the pump intake fitting is smaller then use pipe of the same size as the fitting. The pipe should have a check valve installed near the end in the bottom of the cistern. The end of the suction pipe should be above the bottom of the cistern by about 6 – 8 inches to allow that much water to remain in the cistern. This will help weigh down the cistern tank and keep any groundwater pressure from “floating” it, which is raising it partially out of the ground.

8. In step 5, the cistern was allowed to fill and was chlorinated to kill any remaining bacteria. At any time that the chlorine level has dissipated to the level allowed by the DOH (which is less than 1ppm) they should be called to test the cistern water. This only has to be done once. The chlorine level can be easily tested by a common swimming pool test kit which is either available from a neighbor with a pool or from Home Depot. In addition to the chlorine level, the DOH requires certain parameters to be met for water clarity and for bacterial content. These should be no problem with rainwater. If you use tap water to fill the tank the pH may need to be adjusted to achieve the required pH of 6-8.

9. Once the DOH* has approved the tank, connect a PVC pipe from the pump outlet to a suitable location for a garden faucet. A 1/2" pipe is sufficient. If the pump output fitting is larger than 1/2” then the proper reducer should be used. The pump can supply several garden faucets. If several are required, they can be branched off the main output pipe from the pump and all can be serviced with 1/2” pipe.

10. An optional submerged float switch can be installed into the pump circuit. This will shut down the pump if the water level falls below the float switch setting. This prevents the pump from running when the cistern is almost empty and the pump cannot pump water. This damages some pumps.

Additional procedures required for an aerobic septic tank:

An aerobic septic system usually consists of 2 or 3 separate tanks. The tanks are made of concrete or fiberglass. There may also be aerobic systems which consist of one fiberglass tank. I am only familiar with the concrete aerobic system and this write-up only deals with that type.

The first tank is the one most easily converted to a cistern. The other tank(s), which are filled with filter sand, are best left full and abandoned as is. Check with the DOH to see if any additional procedures are required for these tanks such as the addition of any gravel to "top" them off, etc.

The first tank usually has several chambers separated by internal concrete walls. The walls have openings either at the top or bottom to allow flow from one chamber to the next. The first chamber is a "settling" chamber which allows solids to settle and for the remaining liquid to flow into the second chamber via an opening near the top of the separating wall. This first chamber has the solid waste products pumped out every 3-6 years by a septic contractor while the system is in use as a septic tank. The second chamber is for pretreatment of the liquid waste by bacteria, which require air to do their job. The air pump that supplies this air will be discarded when converting to a cistern.

*Please See DOH Septic to Cistern Guidance Document for additional details.

Sometimes the second chamber also has a type of plastic grate to trap lightweight floating material that makes its way through the separating wall opening. This grate should also be discarded after the tank is cleaned out. Usually there is a small third chamber, which is fed bacteria-treated liquid from the second chamber via an opening at the bottom of the wall which separates these two chambers. From the top of this third chamber, the treated liquid flows to the second tank for further filtering.

The complication of the aerobic design as far as cistern conversion goes is that the first and second chambers are connected via an opening near the top of the wall that separates them. While the treatment process for septic waste necessitates this, it unfortunately separates the chambers for cistern use. If cistern water is drawn from the first chamber, the water in the other two chambers cannot flow into the first chamber and thus is not available to the pump.

What is required is that a hole be punched in the separating wall near its bottom to connect the chambers. Someone experienced in its use can do this with a jackhammer with a long probe. The opening near the bottom is about 4 to 4 ½ feet down from the top of the tank. With a long probe, the jackhammer operator can reach this far down with the tip of the jackhammer. It is absolutely not necessary to enter the tank to perform this puncturing of the separating wall, and as stated in the beginning of this write-up, it is hazardous to do so. Although the concrete tank outer walls are quite strong, some care should be taken when jack hammering the interior separating wall to prevent any cracks in the outer tank wall. Alternatively, a portion of the separating wall can be totally broken down by a jackhammer. None of this jackhammer work has to be smoothed or finished off in any way. The rubble resulting from the jackhammering can, in fact, be left in the tank. The only purpose is to create an opening for water to flow between chambers 1 and 2. Since the wall between chambers 2 and 3 already has an opening at the bottom, the final overall result will be that all three chambers will be connected via openings near the bottom of the tank in effect making it one tank.

An alternative to opening the wall, which separates the first and second chamber, is to only use the second and third chamber as the cistern. The first chamber is usually about one quarter of the total tank in volume. Normally such septic tanks are about 1000 gallons in total volume so that this alternative would reduce the cistern capacity to about 750 gallons.

Remember that even in this case, this doesn't mean that only 750 gallons are saved per year. The cistern will be cycled several times per year as water is used for garden irrigation and then replaced by rain. In practice, an amount of water about three times the capacity of the cistern can be saved each year.

A final word about the other tank(s) of the aerobic system:

If desired, they can be emptied of the filter sand they contain and can also be used as cisterns. This can be done at the same time as the first tank is converted, or at some later time. In fact this is true for any septic tanks which were abandoned in the past and filled with sand or gravel. Any of them can be "resurrected" and converted as long as they were not crushed or had holes punched into them in any way.

There is however a complication in that there is no easy way to get the sand out. Some of these tanks are designed so that the entire top can be removed, some not. If the entire top comes off, a small backhoe can remove the sand. Under no circumstances should anyone consider removing the sand by hand since this means access to the tank interior which has already been stated is dangerous. However if such a tank <u>is</u> emptied then it will make a fine cistern especially since there are no chambers in these tanks to complicate matters. The simplest procedure at this point is to make two separate cisterns with duplicate pumps etc. where each one is filled from part of the roof. Alternatively it is possible to hook the two tanks together with a submersible sump pump arrangement where several float switches direct the second tank to pump into the first tank when appropriate. In this way there results a two tank cistern arrangement which functions as one large cistern of about 2,000 gallon capacity.

In those septic systems which consist of three tanks (these are the newest ones mandated by Monroe County) the third tank can be used in the same way as the second one.

A final word: Although these procedures seem tedious, they are not. They are very straightforward and, what's more, they only have to be done once. The gratifying result is that instead of destroying a completely useful concrete tank already on location, that tank is put to excellent use. And that use will continue to produce benefits for the life of the tank, which should be about 100 years.