October 15, 1981

TO: Department Of Energy
Savannah River Operations Office
Atlanta Support Office Phone: (404) 881-2696
ATTN: Appropriate Technology Program
1655 Peachtree Street, N.E.
Atlanta, Ga. 30309

FROM: James W. Mowery
427 Country Club Drive
Oldsmar, Fl. 33557

SUBJ: Proposal No. 12-0262, submitted May 1979. Small Grant
(\$1,450.00) Rec'd March 22, 1980, for Two (2) Projects:
✓ Proj. #1: Solar Collector Panels (Process-Method)
✓ Proj. #2: Rainwater Collection and Storage.

re: Final Report: Enclosure (Self-help Instructions)

SUMMARY:

Both projects have been tested and evaluated since installation date, May 16, 1980, and has proven the value and feasibility of the two self-help projects beyond any doubt. The method-process for solar panels to heat potable water has such wide potential that legal advisors recommended forming a corporation to enhance my ability to protect the method-process of wafering (suitable and approved) tubing in asphalt. Corporation, titled: Community Energy Conservation, Inc., was formed Sept. 22, 1980. Do-it-yourself instructions were written, printed and made available as a result of considerable publicity of grant recipients and their projects. Legal advise required copyright and patent protection; copyright was obtained and patent application filed, Re: S/N 276,523 - Solar Collector. Do-it-yourself instructions have been rewritten and are available at \$12.50 per copy, (1 copy enclosed) although no advertising has been initiated -- for capital and health reasons that have kept me restricted -- doctor's orders.

I intend to build one or two more prototypes to have available for exhibiting and display after which I may seek manufacturers.

CONCLUSION:

The costs demanded by the success of Project #1 has almost been devastating. I cannot consider the Small Grant as any help, unless its yet to come in a dissemination of the information and my address. Copies are available at \$12.50 per copy, yet all I get are requests for information -- this only costs me. Same goes for protection of Patent, Uncle considers himself as senior partner, but I must come up with the

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MASTER

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The following pages are an exact
representation of what is in the original
document folder.

Final Report - Conclusions (contd)

added costs. I am paying for protection within the United States but cannot afford foreign protection costs and must take the position: if the Government wants it protected on foreign markets (from which I am getting inquiries) the Government will have to pay the costs.

I am, of course, unable to respond to requests for information from foreign countries.

The primary and technical questions to be answered, such as: withstanding the pressure to meet municipal standards, while attaining a feasible longevity in exposed and operating conditions, required at least one year. This has been determined as more than satisfactory and can certainly now, be advertised and made available.

Although this report is intended as a final technical report, the evaluation for determining maximum longevity and further simplification in the construction of the Solar Panels will continue indefinitely.

Sincerely,

JAMES W. MOWERY

ENCL:

- 1 - Mowery's Simplified
Method of Solar Water
Heating Panels

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MOWERY'S SIMPLIFIED METHOD
OF
SOLAR WATER HEATING PANELS

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COMMUNITY ENERGY CONSERVATION, INC.
A Scientific-Consulting Organization

Dear Home-Owner:

It is not only difficult, but, very expensive, just to communicate. The original organization and meetings has been "shot down", by legal advisors, who claim it would be to complicated by: the many laws and the many departments of law that may have some jurisdiction, by the difficulty or impossibility to pinpoint responsibility for our actions, or to protect each of us separately from the other. Hence and thereby lies our problem -- America's problem.

I may continue mail out information, if, I form a business corporation, which to try to help I must do. This makes me responsible to tell you I'm not responsible for what you do --I already know you consider it none of my business, but I intend to tell everyone what I have done and am doing to stop the cost and energy demand we have created.

It must be realized that although several months of testing and analysis has shown the method and materials will work and save the installer (home-owner) energy and dollars in a reasonable amount of time, it is still in the experimental and development stage, and that I, James W. Mowery, as the original user and developer, does not intend to imply perfection or guarantee and that the degree of efficiency or quality of panels and system will depend on the skill and care of the manufacturer and installer. Thus, asking home-owners to avail themselves of the methods and instructions to help prove it will work, while helping themselves to reduce energy demands and costs.

Sincerely,

Phone: 813-855-1124

James W. Mowery
427 Country Club Dr.
Oldsmar, Fl. 33557

NOTES OF CAUTIONS

THE ORIGINAL DETAILS AND INSTRUCTIONS OF THE PAGE A SERIES, MISSED SOME DETAILS AND CAUTIONS OR MAY NOT HAVE BEEN SPECIFIC ENOUGH.

As testing and evaluation time increases some minor faults become evident. They are construction, not material or process faults and can easily be corrected by special attention in some steps of the construction.

1. All $\frac{1}{2}$ " pipe inserted into tubing, for connecting with hose clamps, (2), must be threaded to allow easier start and deeper (min. $2\frac{1}{2}$ ") insertion into tubing. One clamp (all stainless steel clamps) should be on the threads, the other on the smooth barrel of the pipe -- no separation has occurred where this care was taken,

Notes of Cautions (contd)

and special attention applied by checking tightness with an ignition wrench that fits the hex head of the clamp screws, after initial tightening with screwdriver.

2. Another special attention step, is in coiling the tubing in; assuring it is not pressured together, to give a pop-up effect when pressurized, heated and expanded. This effect can be eliminated by working tubing in place, foot by foot and pressing straight down, rather than toward or against the previous round or rounds. The stress or pop-up points are not the corners but mid-way between each corner -- keep these four areas weighted well -- a day or two in the sun before pouring the top asphalt will help tubing adjust to new shape and allow close checking for flatness, keep weights on until corners, center and a good strip between them have been poured. Wait until well cooled before removing weights and finishing the pour to level the surface over the tubing -- coat the over top part of tubing well also, but remembering the greater the thickness of asphalt over the tubing, the lesser the temperature achieved.

The method-process is adaptable for many shapes and uses and the specific tubing and materials, shape, weight and quantity of asphalt, suggested in these instructions, is for the specific use in panels to be used for heating potable water. This is where the materials must meet the Federal Safety and Quality Standards as well as state and local standards, and must be strictly adhered to. These do that.

When applying this method for heating pools, by passing recirculated pool water through the panels and where there is no connection to a potable water line (called, and referred to as a "cross-connection") an equivalent strength and structured commercial grade of tubing, that is less expensive, can be used. The same applies to any closed and recirculated use of hot water where the supply of water is not connected to the potable water supply

Painting was overlooked in the original instructions - this is important in that the application of driveway coating mix, a coal tar emulsion applied to the surface of the asphalt, will not only reduce the cracking and movement of asphalt, but will add to the absorption of heat - this low cost driveway coating mix is available at about \$6.00 per 5 gal. pail.

A light sprinkling of marble chips can be sprinkled over thick asphalt areas before painting - i.e., corners and center. This retards movement quite well and does not seem to reduce heat appreciably.

Notes of Cautions (contd)

During mid-summer, when rays are the hottest, panels should be adjusted to a more level position since sun will be east to west almost directly overhead - this too will be the time for any addition or relocating of asphalt - since small chips will melt right in place without having to heat or handle hot asphalt. Repaint after it has leveled in.

Tougher roof cements and asphalt sealers may be experimented with but the top should be kept a good dull black without adding to much thickness over tubing.

As faults or improvements are found or noted each will be informed, please be reciprocal so it may be passed on to others.

Consider these points carefully while proceeding with the step by step procedures.

PROJECT TECHNICAL DESCRIPTION

The original concept of bedding a tubing in a steep asphalt wafer to add strength, support and protection against direct sun-rays while acting as absorber and heat transfer medium, involved the determination (by actual tests and analysis) of the type, size and amount of tubing (of the limited approved ones on the market) and the amount of asphalt (steep-heated and poured) needed and used to obtain the highest temperature in larger volumes of water in panels of such size and weight as to be practical for one person to fabricate and install on their own home at a cost that is recoverable in a short time (5 years or less) and having a durability of at least 10 years with little or no maintenance.

Tests, experience and analysis of the original prototypes resulted in the reduction of volume/sq.ft. of panel area, thus reducing size and weight of panels (reducing material costs) while raising the temperatures obtained resulting in models now being tested that seem to be the answer for and to the low and middle income, do-it-yourself homeowner.

Each panel (36"x36"x2.5" min. depth) will contain 100' of 3/4", food and beverage grade clear PVC tubing, reinforced with a polyester cord webbing for a working pressure rating of 175psi, having a content volume of 2.3 gallons per 100' of tubing. The tubing trade name: POLY-BRAID is stamped at intervals along the tubing and it further contains a blue tracer cord to identify as food grade. It has a temperature range of 25°F. to 175°F. and is ozone and atmospheric resistant, as well as highly flexible (bend radius = 5 times I.D.) allowing flat coiling into square or rectangular shapes, eliminating dead or waste corner areas as well as centers, producing high efficiency per square feet of absorption area (panel area).

Panel weight will not exceed 75# empty of water (to facilitate easy one person handling and installing). It is designed for optimum simplicity and optimum efficiency and without excesses that become costly and wasteful. One simply builds and installs as many panels-collectors (at today's prices of approximately \$75.00 each) as needed to produce the amount of hot water by volume that covers or equals the greatest hot water use of the day, whether it be dish washing or two showers (baths) at the same time, or a combination of two operations at once. Only homeowners by their knowledge of their own hot water use and management can determine what that hot water volume (in gallons) need is.

This project-process allows and encourages just that; to eliminate the costs and waste of over sells and over productive devices and mechanisms. Two (2) panels contain four and one half gallons that is heated to 120°F and above when sun is shining. The conventional water heater of your home is set at 120°. Each time a hot water spigot or faucet is opened and hot water used from the tank it is replaced in the same amount used by hot water from the panels on the roof into the hot water tank at temperatures hotter than that amount used from the tank. Therefore, ~~the amount of~~

the tanks conventional heating elements will seldomly kick on when the sun is shining, reducing the cost and demand on generated electricity and non renewable energy fuels, this saving is not at the expense of the consumer and represents true feasibility that can further be enhanced by good hot water management in each home situation. Saving to the average 1000 Kwh user can range from a minimum of \$10.00 to over \$20.00/ month in this central Florida location. Area and locations will differ by added taxes and fees added to the basic Kwh cost, i.e. utilities, taxes, franchise taxes and fuel adjustment charges.

The following step by step procedures for fabricating these panels require no plans.

MATERIALS NEEDED

1. (a) One standard single jalousie window, glass included or optional. The standard aluminum jalousie window for masonry block homes is 36"x37", and are being replaced by more energy efficient windows and can be bought at used or scrap prices or \$2.50 to \$5.00 each.

(b) One (1) sheet of thin gage aluminum, 36"x37", backing for window frame (used).

(c) Two (2) lengths of 1"x2" aluminum channel 36" in length for bracing across the back of window frame, over the back sheeting. This is available used, at screen enclosure businesses.

2. (a) 25 pounds of steep asphalt. Asphalt is only available in 50 pound quantities from roofing suppliers and some building supply companies.

(b) Large cast iron or other heavy metal pot for heating and melting asphalt in, plus a small 1 or 2 quart stew or sauce pan with good handle for laddling hot asphalt (used pots should be located).

3. (a) 100 feet of food and beverage grade polyester cord webbing reinforced, 3/4" I.D. Poly-Braid, Clear P.V.C. Tubing. This tubing is identified as Food Grade by a blue tracer cord through its length and has Poly-Braid stamped at intervals along the lengths. Very flexible and will flat coil into rectangular shapes, eliminating dead corners and large dead (non-productive) centers.

(b) Two (2) 1/2"x8" galvanized steel pipe nipples for inserting into tubing ends.

(c) Four (4) hose clamps (for 1 1/4" dia.), 2 for clamping each pipe nipple into ends of tubing.

4. (a) Four (4) 1"x4"x36" lengths of cypress or redwood for frame to place completed solar panels on, on the roof.

NOTE: If tubing can be purchased at wholesale price and all other materials, except asphalt, is bought at used price, the price of doing it yourself (2 panels) should not exceed \$150.00 (7-1-80 prices).

Manufacturer: Kuriyama of America, Inc.
POLYFLEX DIVISION
546 Crossen Avenue
Elk Grove Village, Ill. 60007
Phone: (312) 593-4270

Local Distrib: Amazon Hose & Rubber Co.
222 N. 12th St. & E. Kennedy Blvd.
Tampa, Fl. 33601
Phone: 223-7554

See the following step by step procedures for fabricating panels, installing on roof and connecting to your present conventional hot water heater.

SOLAR WATER HEATING PANEL FABRICATING INSTRUCTIONS

1. Remove the glass strips (louvers) from a standard size 36"x37" jalousie window. Place aside and save the glass for replacing after panel is completed and installed on roof - if desired for looks and to keep top of panel clean - the added efficiency is questionable and depends on the type of glass.
2. With metal snips, clip the brackets to the movable bar of the opening - closing mechanism on each side and remove the bars. This allows independent movement of each glass louver clip and allows more room for coiling in the first round of the tubing coil.
3. Turn frame face (clips) down on level hard surface and fit 36"x 37" aluminum sheet on back, drill holes smaller than sheet metal screws to be used at intervals not less than 6" apart, close to outside edge using short $\frac{1}{2}$ " or less blunt nosed (to prevent any harm to tubing) sheet metal screws.
4. After aluminum sheet is well secured, brace across the back with the two pieces of aluminum 1"x2"x36" channel material. Place 1 piece across $9\frac{1}{2}$ " down from the top and the other across $9\frac{1}{2}$ " up from the bottom edge, with the flat surface of the channels against the sheeting drill and secure braces in place with sheet metal screws.

5. You are now ready for hot asphalt. Place the window frame panel face (clips) side up on a level or leveled surface near where the asphalt will be heated. A well arranged pit, with stone or iron supports for 3 or 4 cross irons or old pipe across the pit to support the melting pot. Using wood for fuel is the most economical in rural areas and where controlled burning is permitted. However the asphalt is heated, it must be done outside and the melting pot never moved, for pouring should be done by laddling small quantities for personal safety and safety of tubing while pouring. Use a small pot with a good handle. The first pour, about 1 gallon, is poured evenly over the bottom sheeting to a depth of $\frac{1}{4}$ ", after taping over any holes that may exist in used aluminum and checking for any screw points that will not be covered by $\frac{1}{4}$ " of asphalt - clip off any that may harm the tubing.. After pouring the $\frac{1}{4}$ " in the panel, let set and cool well while preparing for the next step.

6. Open the 100' coil of $\frac{3}{4}$ " I.D. Poly-Braid Tubing, stretch it out full length without kinking and allow it to lay until the two (2) $\frac{1}{2}$ " galvanized pipe nipples have been inserted, one in each end to a depth of at least 2" and clamped tightly with two (2) hose clamps for each pipe nipple (8" in length). It is now ready for coiling into the window frame panel on top of the $\frac{1}{4}$ " depth of asphalt previously poured.

7. Drill two $\frac{7}{8}$ " dia. holes - one on each side at the top of the panel. The top left side hole (standing at the bottom of the panel while its laying flat flat face (clips up) is the starting point to commence flat coiling in, and hole edge should be $\frac{1}{8}$ " above asphalt and $\frac{1}{8}$ " from top left corner to allow the insertion of the $\frac{1}{2}$ " pipe nipple from the inside to outside with clearance enough for the tubing end to fit straight and flush against the inside frame of panel. Turning tubing end so hose clamps do not interfere with allowing tubings first round to lay straight and close along the top inside edge.

The second hole, the top right $\frac{7}{8}$ " hole, must be directly across and opposite to the left side hole but an inch higher, since the finished coil end will come from the center of the flat coil, over the top of the rest of the flat coiled tubing and pipe nipple inserted from inside to outside in opposite direction of the left side nipple. There is just enough space for the higher right side $\frac{7}{8}$ " hole just under the canopy drip strip at the right side with the bottom edge of the hole just at the top of facing. With holes prepared and checked with $\frac{1}{2}$ " pipe nipple you are ready to coil in 100 feet.

8. Have four (4) $\frac{1}{2}$ or whole cement blocks on hand to weight flat coil in place and hold down after coiling in. Starting at top left side, push $\frac{1}{2}$ " nipple through $\frac{7}{8}$ " hole from inside to outside with tubing end against frame, start coiling to the right from the outside (close against the outside of frame) to the center.

Push tubing into the corners well (to within 3" of the corners) forming a rectangular flat coil and preventing dead or unproductive corners.

Coil in slowly and neatly, pressing tubing close together and downward, it will stick to the $\frac{1}{4}$ " layer of asphalt previously poured - so have it corrected before pressing it down - special care must be taken when forming the corners of each turn and a small space between each turn is desirable in each corner radius for several turns before tubing rounds out naturally when nearing the center.

After pressing 3 or 4 rounds neatly and into the corner radiuses desired, it will become necessary to weight the top at four (4) places (the 8"x8" end of the whole or 1/2 cement block does well and is usually most available) weight halfway between each corner, these are the areas of stress and tubing will tend to buckle upward if not weighted.

NOTE: A trial run (dry run) in a panel before the $\frac{1}{4}$ " of asphalt is poured is most helpful in familiarizing self with a 100' length and teaches how to do without doubt. (This is recommended)

When full 100' is coiled in, the center diameter (dead center) should be about 8" and have enough length left to go from center over the top of the flat coil in a natural contour from left to the right (about 2 feet) and push $\frac{1}{2}$ " pipe nipple through the previously prepared $\frac{7}{8}$ " hole, weight the center and the over the top 2 feet enough to hold in place.

Check the completed flat coil very closely for nay kinks or undue pressure and stress points or buckling up - work over and press all parts level and reweight. Let set in sunshine for a few hours to adjust and set to the new form before pouring hot asphalt over it.

9. Arrange asphalt heating and pouring work area as in Step 5. Asphalt should be heated to a very thin liquid state before starting and about twice as much liquid (about 2 gallons) asphalt will be needed. Before starting pour, see that panel with weights still on is level and have a garden hose attached (by adapters) to one $\frac{1}{2}$ " nipple and leaving the other nipple open. Turn on water, fill the coil and allow water to flow through the coil while pouring the hot asphalt.

Ladle into corners and toward the center from the corners in small quantities allowing it to run in well. After an X shaped pour has been made from corners to center and allowed to cool. The weights are removed and pouring continued until no tubing color is visible. This can be done with 2 gallons and remembering that additional asphalt adds weight and decreases the efficiency by added thickness and lessened surface area by flattening out.

the surface. The highest efficiency (temperatures) is reached when the surface has a corrugated effect by the tubing contour. After pouring, test before installing.

10. Testing can be done on one or a series of completed panels by attaching hose from the standard potable water supply on one side and a valve of some type on the other side of one or a series connected together. Open both the water supply (hose) valve and the valve installed on the opposite side of panel or panels and observe free flow through, then close the discharge valve and pressurize the panel or panels. Open and close valve a few times to purge all air.

If test area is set up in a sunlit area, various determinations of efficiency can be made before installing in a selected permanent location, i.e. temperature variations for differing solar index percents, heat recovery times, minimum and maximum temperatures, etc. After all tests that are desired are completed install at selected location, usually on the roof for the heating of potable water, but are adaptable for heating pools or water for other uses.

For locating on a roof, construct a square wooden frame of 1"x3"x4" cypress or redwood strips (4 pieces) arranged and nailed, 2 across and 2 vertical in a manner that the top cross piece is under and will rest over the crown (to prevent slipping when placed flat on the roof's slope) and that the bottom cross piece is on top and across 4" or 5" up from the bottom (lower end) of the vertical strips - this will allow the bottom cross brace (1"x 2" aluminum channel) on the panel to rest against the bottom cross piece of the wooden frame, panels weight is sufficient to hold it in place when so arranged.

SEE NEXT STEP INSTRUCTIONS FOR ARRANGING PIPING
SUPPLY AND RETURN ON HOT WATER HEATER

EXISTING HOT WATER HEATER SOLAR CONVERSION ASSEMBLY

MATERIALS AND FITTINGS REQUIRED

- 2 - 1/2" gate valve N.P.T. + 2 - 1/2" x close nipples
- 1 - 3/4" gate valve N.P.T.
- 2 - 3/4" x 1/2" tees, galv. steel
- 1 - 3/4" 90° el, galv. steel
- 4 - 3/4" x close nipples, galv. steel
- 1 - 3/4" backflow preventer (ball & spring type)
- 1 - 3/4" N.P.T. to 7/8" copper tubing compression adapter, plus the number of feet of 1/2" galvanized steel pipe or 3/4" Poly-Braid Tubing for supply and return lines to the solar units.

A combination line using 1/2" pipe nipples and two stainless steel hose clamps for each coupling simplifies installation down to a screwdriver operation that anyone can do and the extra cost of tubing and hose clamps should be afforded to reduce labor time - costs.

INSTALLATION INSTRUCTIONS

1. Cut off water supply to house and electric supply to hot water heater.
2. Assemble from left; attaching 3/4" 90° el to 3/4" tank top nipple, then working toward the copper tubing, cut cold water supply tubing to allow about 1" for inserting into the adapting (pipe threads to copper tubing) compression coupling.
3. After close nipples and valves (1/2") have been attached (pointing upward) to the 3/4" x 1/2" tees. The 1/2" valves may be closed and the 3/4" in line valve (center valve) may be opened to resume normal operation of hot water tank and test for leaks in new conversion assembly.
4. To operate: with solar pre-heaters properly located on roof, simply connect to the 1/2" valves with 1/2" galv. steel pipe, 3/4" I.D. tubing runs and through wall arrangements; two 7/8 to 1" holes through walls, with 12 to 14" lengths of 1/2" galv. steel pipe inserted and cemented in holes. 3/4" poly-braid tubing fits tightly over 1/2" pipe. Push tubing onto pipe ends at least 2" and tightly clamp with two 1 1/4" stainless steel hose clamps for each coupling. NOTE: Entire runs may be made with either 1/2" galv. steel pipe or poly-braid 3/4" tubing or a combination of both.

NOTES:

Blow all water out of tubing after ground testing, to reduce weight while moving to permanent hook up location.

After system is all hooked up and ready for installation testing, turn off electric, open the hot water tanks drain valve, the 1/2" supply valve and the 1/2" return line valve; close the 3/4" (center valve) direct supply valve.

Flush tank and new system well, then close the drain valve and open at least two hot water faucets within the house - leave the hot water faucets open until tank and system has been filled and all air purged, indicated by smooth running water from the faucets without air spurts. You are now ready to check for any leaks. If none, turn on the electricity (set at 120°F) and watch "Old Sol" save you dollars.

This process of wafering (a special flexible tubing having approval by all standards of testing laboratories including the F.D.A. as food and beverage grade and marked and identified by a blue tracer line) Poly-Braid Tubing within heated and poured quantities of steep asphalt, is a registered and copyrighted process and procedure. Using or commercializing without the direct permission and contracted agreement of the developer and owner of copyright or patent is forbidden. The process shall be referred to and titled: Mowery's Simplified Method for Solar Hot Water Heating Panels.

James W. Mowery
JAMES W. MOWERY

427 Country Club Drive
Oldsmar, Fl. 33557

MODERN CISTERN

MATERIALS - INSTALLATION - PROCEEDURES

The first step in considering the installation is calculating the roof areas (in square inches) of watershed and determine the amounts of water that flows to each length of eve drip line. It may only be necessary to gutter a small portion of your house. This is easily done by measuring from a crown or peak, (on the ground) of roof to corner of eve line, then measure length along the drip line. Multiply each of these dimentions by 12, before multiplying by each other - this gives square inches of surface area. Example - this project: $24' \text{ w} \times 12" = 288" \text{ w}$
 $45' \text{ lgth} \times 12" = 540" \text{ lgth}$. hence $288" \times 540" = 155,520 \text{ sq.in.}$
 $155,520 \text{ sq.in.} \times 1" \text{ rainfall}$ makes 155,520 cu. inches of water, and since there are 231 cubic inches in a gallon of water, simply divide total square inches - cubic inches area by 231 to get gallons of water, that will run to each section of eve line. Thus: $155,520 \div 231 = 673.24$ gallons to be caught per each inch of rainfall. The question then becomes: How many feet of guttering? The answer!: measure the length of eve drip line for the area calculated - so gutter the eves that carry the most gallons per inch of rain. Try for as much as possible (600 to 1000 gals.) with two runs of guttering to the best location for the two downspouts, to the 4" P.V.C. pipe openings for tank. After all figuring and planning has been done, purchase materials and work at it as time allows.

Guttering, downspouts and fittings first. Figure the slope by starting as low as possible at downspout end. Use maximum slope-drop available, with the 5" do-it-yourself guttering.

The 1050 gallon fiberglass tank is available as a septic tank at Tampa Fiberglass, Tampa, Ph. #238-2137. When bought for septic use it is unsealed and uncoated inside and sells for \$310.00 for this use - however for water storage, they will seal and coat the inside, with the white glass paint for \$490.00. The added cost is recommended.

Burying the tank requires a hole 6' w x 10' l x 6' d. Lay out this area so the front end (end with 4" pvc pipe fitting) of tank faces the house about 3' out from eve drip line, or 5 to 6' out from house.

Purchase enough 4" plastic sewer pipe, 1 - 4" tee, and 2 - 4" 90° bends to run from tank 4" fitting (when ordering tank have fitting placed high in the front) to eve drip line, then tee off in both directions, along the eve drip line to points directly below downspout, from the eve gutter, end the 4" pipe runs with the 90° bends, with openings upward and just above ground level, and directly under the downspout locations.

Modern Cistern - contd

Fabricate a filter for each 90° bend opening, with two 5 gallon plastic paint pails-buckets, by: cutting holes in bottoms and cementing a short section of pipe (3 or 4") in and onto the bucket bottoms with pvc cement - this will take several applications and drying times. When well dried and strong, fit bucket filters pipe fitting into the 90° bends, do not cement bucket fittings but allow for removing or replacing. Cut the downspout to fit into the bucket filters a few inches and strap them to sides of buckets with aluminum strips and small screws. Use hog-hair or screening cupped into bottoms of buckets to catch debris.

The pump should be of a capacity that will empty the tank (1000 gals.) in an hour and one half, so lawn and plant watering can be done in reasonable time. A 1/2 h.p. pump and motor comes close by using two hose bibs and hose off the discharge. A fairly good 1/2 h.p. pump can be purchased for \$150.00 (look for sales). Rig it up completely portable for maintenance ease. This can be done by wiring 12/3 portable cable to motor (if an outside receptacle is available and it is on a 20 amp breaker type fuse in your switch box) and installing a flexible suction hose with a foot valve (to hold prime water) that is placed in or taken out of tank through a 4" pipe (18" to 2') section fitted through the lid of one of the manholes by: cutting hole in lid and cementing well, use a pipe length that extends up well above ground (keep it wrapped or covered well to prevent entry by frogs, lizzards, insects, etc.).

Caution Note: Installing the tank should be done during dry ground conditions, to make it uncomplicated. If water is present in hole, water must be used in tank to prevent floating until leveled and back filled.

The tank will overflow and bubble up through the soil around the manhole lids - I chose to let it do this - and used gravel around the lids to prevent holes in soil. Very little dirty water will go back in tank, due to the lips on lids. This, preferable to cementing the lids on, and providing an overflow pipe.

Conclusion: The installation is worth it at most any cost.

1. Due to the long term fringe benefits of plant and tree growth.
2. Prevention of soil and nutrient loss from yard and the resultant pollution.
3. Protection of structure foundation.

Modern Cistern - contd

Conclusion - contd

4. Reduction of potable water demand for yard and plant irrigation.
5. Reduction of energy demand for supplying potable water.
6. Reduction of water drawn from our underground and endangered supply. The pluses simply go on, and on, and excuses are insipid. Homes should be constructed with modern cisterns as standard equipment.

COMMUNITY ENERGY CONSERVATION, INC.

MOWERY'S SIMPLIFIED METHOD
OF
SOLAR WATER HEATING PANELS

FIG. 1

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Patent Applied For: S/N 276,523 - Solar Collector

Standard 3" X 1" Flanged enclosure stock aluminum 12' length may be notched at 36" intervals for 90° bend in each flange, then bend full length into box, requiring bracketing at only the ends corner.

Use 3/8 min. to 1/2" max. lgth. fairly heavy sheet metal screws (snubnosed) for securing bottom sheet and braces to box-pan.

Fig. 2

Have 36" x 36" bottom sheet cut square. Place on bottom of panel box prepared, and square box with the squared bottom sheet before drilling any screw holes. When squared, drill and place enough screws to hold square before placing all screws -- at least 7 per side -- 28. Secure the 2 - 2" x 1" flange braces across back.

* 2 - 36" lgths. of 2" X 1" flanged Aluminum Channel,
Fig. 3

Upper Left Corner View - right hand coiling

+ 3/4" starting coil hole centered 9/16" in and 1-1/16" up from bottom.

Fig. 4

Upper Right Corner View - right hand coiling

Fig. 5

Fig. 6

1-12' length of 2"X1" flanged Aluminum screening standard stock. Cut at 36" intervals.

Fig. 7

COMMUNITY ENERGY CONSERVATION, INC.

Mowery's Simplified Method
Do-It-Yourself Solar Water Heating Panels

The method of wafering approved tubing in steep asphalt was developed primarily for home potable water heating, to reduce the demand and cost to homeowner for heating potable water, by solar energy use. Although the method is applicable for panels for heating water or other liquids for any purpose, e.g., space or pools, utilizing a closed recirculating system. These uses are not addressed in these materials specifications and instructions. Since the requirement and standards for materials and methods used for potable water systems are stringent and critical, and that the following specifications and instructions meet all Federal, State and Municipal requirements and standards, it follows that other uses and applications are more easily applied and less expensive to formulate, i.e., the use of commercial grades of tubing with equivalent characteristics but not approved by the Food & Drug Administration and other agencies or testing laboratories, as safe, or of a quality to contain, or transfer food, water or beverage, for human ingestion. Therefore, do not accept any substitute for the tubing specified in these instructions if your intent is, for use in, or in conjunction with, your potable water supply. Commercial grades of equivalent materials and working pressure ratings may only be used in a separate and closed system that has no connection to a potable water source or supply, e.g., recirculating water from a pool, tank or other reservoir through solar heating panels and returned to that same pool, tank or reservoir by its own closed piping system and recirculating pump.

The deterrent to the wide use of solar systems has been the costs of efficient flat plate solar panels -- not the technology! This new and simplified method of wafering tubing within asphalt is a process that eliminates the costs and needs for the use of metals for flat plate solar collectors. However, the use of available scrap aluminum, screening and siding or, aluminum window frames may be less expensive and more convenient for a do-it-yourselfer, rather than purchasing and constructing from new materials. This is dependent on each individual's situation: tools and materials available, craft ability and economic situation, plus the size and appearance of the finished product desirability, as well as accomplishing the functional goal within a feasible cost recovery time range. The goal of this process is to reduce cost recovery time to less than 2 years for the homeowner whom may construct a 9 sq. ft. panel consisting of 100 ft. of 3/4" specified tubing that will contain 2.3 gallons of water at a cost that should not exceed \$100.00 per panel. Ingenuity by the builder can reduce this cost by selecting the most readily available and economical durable material for constructing the container pans-panels, which the asphalt and tubing wafer will be molded into.

The use of a used jalousie window frame described in the following instructions is an example of available and suitable material that saved time and money to convert to a solar panel, but, does not exclude the use of many other materials or even a sand or soil bed to contain the asphalt and tubing wafers, excluding only those materials that would cause or support combustion. However remembering, that to contain 100 ft. of the specified and approved tubing with a volume of 2.3 gallons per each 9 sq. ft. panel, (36"x36"x3" deep), the tubing must be square flat coiled into panel, after having poured a layer of asphalt, (approx. $\frac{1}{4}$ to $\frac{1}{2}$ inch thickness) in bottom of panel-box. Special attention must be applied in coiling the tubing in. This is better done by laying out the 100 ft. of tubing in the yard as near straight in its full length as possible, then install the $\frac{3}{4}$ " O.D. of soft copper connecting length in each end: inserting copper tubing ($\frac{3}{4}$ " O.D.) into $\frac{3}{4}$ " I.D. (Selected & Approved) P.V.C. Tubing, insert at least 3" and secure each length of copper tubing into P.V.C. Tubing with 2 stainless steel hose clamps. The starting end; 9 to 10" of $\frac{3}{4}$ " O.D. copper tubing should be protruding 6" out of P.V.C. Tubing. The center of coil end: 32 to 34" of $\frac{3}{4}$ " O.D. soft copper, should be protruding at least 30" from the P.V.C. Tubing, center of coil end; this end will later be shaped into a gooseneck from the center of flat coiled tubing, over the top of coil and out through prepared $\frac{3}{4}$ " hole in panel side, opposite the starting 6" protruding $\frac{3}{4}$ " copper, to coupling points, for series of panels or coupling to $\frac{1}{2}$ " galvanized steel pipe return line. After copper tubing has been secured in each end of the 100 ft. P.V.C. Tubing length, let it lay and warm up, adjust to the straight length position it will then be limber and easy to handle.

With 36"x36"x3" minimum depth pan-panel prepared and $\frac{3}{4}$ " holes drilled at starting and exit points, the process of wafering into panel can start. (SEE Figs. 4 & 5)

Arrange 36"x36"x3" minimum depth panels on a level working surface, as close to the asphalt heating process as possible to allow ease in laddling from melting pot to panels.

Heating asphalt can be done in many ways: over a pit in the ground, where allowed and safe, but requires plenty of wood and frequent feeding - stoking. A very good way is using a large barbeque and charcoal, with a large old pot surrounded by the hot brickettes.

Chop asphalt in small pieces with a long handle chopping tool: axe, adze or grubbing hoe. When asphalt block is cool it will split off into small pieces easily for feeding into heating-melting pot. The heating-melting pot should be large enough, 3 gallons or larger, so that a one to two quart discarded sauce pan, with a good strong handle, may be used as a laddle--to laddle thin hot asphalt from melting pot to panels.

The first pour of $\frac{1}{4}$ " depth in bottom of leveled panels-pans will require a minimum of ($1\frac{1}{2}$) one and one half gallons of melted hot asphalt. NOTE: This first pour must cover all screw points -- fairly heavy $\frac{3}{8}$ " length sheet metal screws should be used. After laddling in the first pour, let set and cool well before commencing to coil in the lain out and prepared tubing.

Before coiling in tubing, have four good weight objects at hand, for weighting down the flat couled in tubing. Four cement building blocks, stood on ends are good and are usually available. One should be located halfway between each corner of panel. Coiling in may be done either to the right or left but must be pre-planned to have $\frac{3}{4}$ " holes for the copper tubing exits located properly, since the starting point hole must be lower (level with the flat coil) than the hole for the ending, over the top, longer section of copper tubing exit. (SEE Figs. 4 & 5)

Start by placing the short $\frac{3}{4}$ " copper nipple in the lower and pre-prepared hole, butting P.V.C. Tubing end against inside of panel, then foot by foot, pushing out against side and downward to stick tubing well to layer of asphalt, work around and around, slowly, sticking every foot well in place, especially into the corner radiuses of the first few rounds. They should be set into corners to 3", no more than a 4" radius, to make room for the full 100 ft. x $\frac{3}{4}$ " tubing and without closing or kinking into corners. NOTE: If there is any doubt as to your ability to do this, simply make a dry and practice run into a pan-panel before the asphalt layer is poured in the bottom. (SEE Fig. 1)

While preforming the round and round pressing in place, the corner radiuses will disappear after several rounds. Use the weight as soon as you can, after a few rounds and leave weights on after coil is completely flat coiled in, a day or two in the sun with weights on and moved occasionally, will set the tubing into the asphalt, as well as to its new shape and form. At this point -- with tubing satisfactorily coiled in, shape the copper gooseneck - from center of coil, over the top and out the hole prepared. Press down well at end of P.V.C. Tubing and hold down while pressing and bending soft copper tubing down and into desired shape. Caution: Take care not to kink copper. This is also the time to place the cross bar clamps on the tubing top. This consists of two (2) strips of metal, each 36" in length, strap or channel type, with $\frac{3}{8}$ " holes in center, (See Fig. 7), to match hole punched or drilled through bottom of panel, in the center of coiled in tubing, enabling the insertion of a bolt, (with a fair sized washer for the bottom) from the bottom of panel up and through the holes of the cross clamps and tightened down securely with a nut. Each end of cross bar clamps must be secured by a convient means: bracketed or wedged under the top flange edges of panel, before tightening down the center nut of cross clamp bars. NOTE: The cross clamp bars location must be considered while shaping and locating the gooseneck, so that its location does not interfere with centering the cross clamp bars. (SEE Fig. 1)

Two inch (2") x one inch (1") aluminum channel (screening aluminum) makes a good cross clamp when notched to fit the 2" surfaces together in the center and fitting in with the broad surfaces down. Care must be taken, that no part of the cross clamp bars or their center bolt does not extend up higher than the panel top edges -- to interfere with placing glass or plastic cover on top. If 2"x1" flanged stock is used, notch ends to fit under and level with top edge of panel-box. (SEE Fig. 1)

With coil clamped down, make final check of hose clamps, gooseneck, etc. and place weights back on, the coiled surface should be leveled and readied for final asphalt pour. Attach a garden hose, led from a nearby water supply, to one of the copper tubing ends, protruding from panel. When asphalt is hot (well liquified), turn on water and observe it running out the opposite copper tubing, let water run through the coiled tubing and during the entire hot asphalt pouring, but do not pressurize by closing discharging end. Starting hot asphalt pour: make sure there is no water on tubing or in panel. If moist or wet asphalt will pop and splatter -- be cautious; protect hands with gloves, and eyes with glasses.†

Pour all corners first, then the center, by laddling in (about a quart at a time) until leveled just over the tubing top. Then between each corner and center pour to form an X between the weights that have been left on. Let cool, turn off the water and remove the weights, if still on.

The final hot asphalt pour is somewhat difficult and technical getting the asphalt under and between the rounds of coil. The least troublesome way is to finish the pouring by leveling the entire surface just covering the tubing and place it in the sunshine. The surface will bubble the air out of cavities when sun heated and the surface will lower showing some contour of the tubing, which is preferred if tubing is well clamped in and there is no chance of pop-up. The pressure and pop-up point areas are between each corner and directly under the cross clamp bars. If clamp bar ends are secured well, no problems should occur when pressurized for testing.

Test by hooking up a garden hose to an adapting compression type and removable (when finished testing) coupling to one or more panels in series. The discharge side of panel or series must be fitted with a valve or nozzle for opening and closing. This testing should be done in direct sunshine. Do all the monitoring and checking you wish before locating permanently and hooking up. You will be happy with the results. (See Installation Procedures)

NOTES OF COMMENT

Since the process is designed to preheat and replace water used from a conventional hot water heater, the conventional heaters temperature setting should be set at 120° F., so that as

hot water is drawn from the conventional system it is replaced with water heated in the solar panel at temperatures of 120°F. and higher and does not require the conventional heating elements to kick on. Thus, resulting in a true saving feasibility that is free of over production costs that cannot be recovered by the owner in a reasonable time (3 years or less).

Two panels (vol. 4.6 gals.) with a hot water replacement capacity of 5 gallons of hot water every 20 to 30 minutes at temperatures of 120°F. and above is sufficient for considerable savings by a retired couple, especially if hot water use is managed during daylight sunshine hours.

Three or more panels will be necessary for a three or more family home. No exact statistics are available or necessary, but considering that 30% of electric billing for those months when neither cooling or heating has been used, the minimum costs will be \$20.00 per month and the cost keeps going up. Two panels can save 50% or \$10.00 per month minimum at today's costs and without good hot water management pluses. Two years = \$240.00, you can purchase the needed materials for very close to that. With the system and good hot water management 75% of hot water heating costs can easily be saved in sun belt areas.

MATERIAL PER PANEL

Panel 36"x36"x3" depth - used jalousie window frame or make up by use of used aluminum or other durable material most readily available; or have made up by window or screen enclosure fabricators, or as last resort, purchase:

- 1   12' lgth. of 3"w x 1" flanged aluminum channel
- 1   36"x36" sheet of thin aluminum (bottom of panel)
- 1   12' lgth. of 2"x1" flanged aluminum
         (2 - 36" lgths. for across bottom braces)
         (2 - 36" lgths. for cross clamp bars)
- 4 Doz.   3/8" min. to 1/2" max. lgth., snub nosed, fairly
         heavy sheet metal screws
- 1   3/8" x 2 1/2" bolt and 1 large washer (clamp brace bolt)
- 4 Ft.   48" x 3/4" O.D. Soft Copper Tubing (P.V.C. Tube ends)
- 6   1 1/4" S.S. Hose Clamps (clamp tubing over copper)
- 50 lb.   Steep Asphalt - the same solid type of asphalt that
         roofers use for built-up gravel roofs. Comes only in
         50 lb. quantities from roofing supply and some building
         supply businesses. If used conservatively and
         without any waste, 50 lbs. will do two panels.

Material Per Panel (contd)

100 Ft. POLYBRAID, 3/4" I.D., food and beverage grade tubing. Identified by two blue cords running its full length, one on each side and having "Polybraid", the trade name, stamped at intervals along its entire length, being readily and easily identifiable from the commercial equivalent grades - accept no commercial grade substitute if use is to be for potable water heating.

In the Tampa Bay Area the tubing is available at:

Amazon Hose & Rubber Co.
222 N. 12th St. & Kennedy Blvd.
Tampa, Fl. 33601
Phone: 223-7554

Manufacturer:

Kuriyama of America, Inc.
Polyflex Division
546 Crossen Ave.
Elk Grove Village, Ill. 60007
Phone: (312) 593-4270

Although other approved tubing can be used with this method-process, depending on use intended and laws governing, Polybraid is a selection because it meets many technical requirements of needs and laws governing the quality and safety of materials used in transporting, containing and supplying water or other liquids for consumption or injection by people or other animals:

1. Withstands a high working pressure at high temperature levels, as well as low temperatures.
2. Has high flexibility over a wide temperature range and may be coiled into small radius shapes providing large volume per sq. ft. of area at useful energy saving temperatures.
3. Resists atmospheric and temperature erosion without the needs of excessive protection.
4. Meets all Federal, State and Municipal Standards of quality and safety for food or beverage transfer, containment or service.
5. May be used in a wide range of environmental climates replacing the use and needs of more expensive and diminishing metals.

PANEL INSTALLATION PROCEEDURES

After checking and testing your newly constructed panel or panels in the sunshine and pressurized for a few days -- remembering they will do much better when located, painted with asphalt driveway coating (emulsion type, not plastic) and glass covered. Proceed with installation and connecting up to your conventional hot water heater.

For locating on roof, construct a square wooden frame of 1" x 3 or 4" cypress or redwood strips (2 pieces) 4 feet in length, arranged and nailed, 2 across and 2 verticle in a manner that the top cross piece is under and will rest over the crown of the roof, (to prevent slipping when placed on the roofs slope) and that the bottom cross piece is on the top and across the verticle strips at a point up from the bottom (lower ends) of the verticle strips; that will allow the bottom cross brace on the panel to rest against it. The weight of the panel is sufficient to hold it in place, in quite high winds, but if more precaution is deemed necessary, brackets may be secured into the wooden strips and the wooden strips cemented to roof. (SEE Fig. 6)

When in place, panels may be hooked together in series and/or to the $\frac{1}{2}$ " galvanized steel supply and return lines, with short pieces of Polybraid Tubing and stainless steel hose clamps (2 clamps per coupling).

The same tubing and $\frac{1}{2}$ " pipe or $\frac{3}{4}$ " O.D. copper jumper arrangement can be made from eves to nipples through wall or from the $\frac{1}{2}$ " pipe nipples of the top of hot water heater to nipples drilled and installed through wall making the whole installation a screwdriver operation, except drilling of $\frac{7}{8}$ " hole through wall and threading the long runs (from eves to panels) of $\frac{1}{2}$ " pipe together.

Although Polybraid may be used for the long runs on top of the house it must be either taped with a black and durable tape or coated with heated asphalt. Also, all connecting short sections of tubing must be taped or coated with asphalt. Heat small quantities and brush on with an old paint brush -- it will stay on and protect the tubing, as well as absorb heat -- paints will not stay on and odors may penetrate.

Only after panels are in place hooked up to conventional hot water heater, flushed, filled and tested to satisfaction, should the surface of panels be coated with asphalt driveway coating and glass placed on top.

Glass or plastic glass of selection should be lain on top on a good beading of non-hardening caulking all around, using light brackets on panel sides to hold from slipping.

NOTE

If a jalousie window frame is used for panel, the glass louvers should be removed and reinstalled after panel has been tested, located in place, hooked up, flushed and retested, and the surface coated.

The louver clips are left on the frame but the operating bars must be clipped out to make more space for first round of tubing.

A jalousie window frame is only $2\frac{1}{2}$ " deep, so the bottom pour of asphalt should not be over $\frac{1}{4}$ " depth.

Lets stop the false claims of other Nations dependancy for energy or anything else, for as we go, so shall other Nations follow. We should be the leaders by example only.

There is no fraud or misrepresentation contained in these instructions, nor is there any intent or implied fraud or misrepresentation, but is a challenge to all individuals and institutions.

- A combination line using 1/2" pipe nipples and two stainless steel hose clamps for each coupling simplifies installation down to a screwdriver operation that anyone can do and the extra cost of tubing and hose clamps should be afforded to reduce labor time - costs.

INSTALLATION INSTRUCTIONS

1. Cut off water supply to house and electric supply to hot water heater.
2. Assemble from left; attaching 3/4" 90° el to 3/4" tank top nipple, then working toward the copper tubing, cut cold water supply tubing to allow about 1" for inserting into the adapting (pipe threads to copper tubing) compression coupling.
3. After close nipples and valves (1/2") have been attached (pointing upward) to the 3/4" x 1/2" tees. The 1/2" valves may be closed and the 3/4" in line valve (center valve) may be opened to resume normal operation of hot water tank and test for leaks in new conversion assembly.
4. To operate: with solar pre-heaters properly located on roof, simply connect to the 1/2" valves with 1/2" galv. steel pipe, 3/4" I.D. tubing runs and through wall arrangements; two 7/8" to 1" holes through walls, with 12 to 14" lengths of 1/2" galv. steel pipe inserted and cemented in holes. 3/4" poly-braid tubing fits tightly over 1/2" pipe. Push tubing onto pipe ends at least 2" and tightly clamp with two 1 1/4" stainless steel hose clamps for each coupling. NOTE: Entire runs may be made with either 1/2" galv. steel pipe or poly-braid 3/4" tubing or a combination of both.

NOTES:

Blow all water out of tubing after ground testing, to reduce weight while moving to permanent hook up location.

After system is all hooked up and ready for installation testing, turn off electric, open the hot water tanks drain valve, the 1/2" supply valve and the 1/2" return line valve; close the 3/4" (center valve) direct supply valve.

Flush tank and new system well, then close the drain valve and open at least two hot water faucets within the house - leave the hot water faucets open until tank and system has been filled and all air purged, indicated by smooth running water from the faucets without air spurts. You are now ready to check for any leaks. If none, turn on the electricity (set at 120°F) and watch "Old Sol" save you dollars.

This process of wafering (a special flexible tubing having approval by all standards of testing laboratories including the F.D.A. as food and beverage grade and marked and identified by a blue tracer line) Poly-Braid Tubing within heated and poured quantities of steep asphalt, is a registered and copyrighted process and procedure. Using or commercializing without the direct permission and contracted agreement of the developer and owner of copyright or patent is forbidden. The process shall be referred to and titled: Mowery's Simplified Method for Solar Hot Water Heating Panels.

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MODERN CISTERN

MATERIALS - INSTALLATION - PROCEEDURES

The first step in considering the installation is calculating the roof areas (in square inches) of watershed and determine the amounts of water that flows to each length of eve drip line. It may only be necessary to gutter a small portion of your house. This is easily done by measuring from a crown or peak, (on the ground) of roof to corner of eve line, then measure length along the drip line. Multiply each of these dimentions by 12, before multiplying by each other - this gives square inches of surface area. Example - this project: $24' \text{ w} \times 12" = 288" \text{ w}$
 $45' \text{ lgth} \times 12" = 540" \text{ lgth}$. hence $288" \times 540" = 155,520 \text{ sq.in.}$
 $155,520 \text{ sq.in.} \times 1" \text{ rainfall}$ makes 155,520 cu. inches of water, and since there are 231 cubic inches in a gallon of water, simply divide total square inches - cubic inches area by 231 to get gallons of water, that will run to each section of eve line.. Thus: $155,520 \div 231 = 673.24$ gallons to be caught per each inch of rainfall. The question then becomes: How many feet of guttering? The answer!: measure the length of eve drip line for the area calculated - so gutter the eves that carry the most gallons per inch of rain. Try for as much as possible (600 to 1000 gals.) with two runs of guttering to the best location for the two downspouts, to the 4" P.V.C. pipe openings for tank. After all figuring and planning has been done, purchase materials and work at it as time allows.

Guttering, downspouts and fittings first. Figure the slope by starting as low as possible at downspout end. Use maximum slope-drop available, with the 5" do-it-yourself guttering.

The 1050 gallon fiberglass tank is available as a septic tank at Tampa Fiberglass, Tampa, Ph. #238-2137. When bought for septic use it is unsealed and uncoated inside and sells for \$310.00 for this use - however for water storage, they will seal and coat the inside, with the white glass paint for \$490.00. The added cost is recommended.

Burying the tank requires a hole 6' w x 10' l x 6' d. Lay out this area so the front end (end with 4" pvc pipe fitting) of tank faces the house about 3' out from eve drip line, or 5 to 6' out from house.

Purchase enough 4' plastic sewer pipe, 1 - 4" tee, and 2 - 4" 90° bends to run from tank 4" fitting (when ordering tank have fitting placed high in the front) to eve drip line, then tee off in both directions, along the eve drip line to points directly below downspout, from the eve gutter, end the 4" pipe runs with the 90° bends, with openings upward and just above ground level, and directly under the downspout locations.

Modern Cistern - contd

Fabricate a filter for each 90° bend opening, with two 5 gallon plastic paint pails-buckets, by: cutting holes in bottoms and cementing a short section of pipe (3 or 4") in and onto the bucket bottoms with pvc cement - this will take several applications and drying times. When well dried and strong, fit bucket filters pipe fitting into the 90° bends, do not cement bucket fittings but allow for removing or replacing. Cut the downspout to fit into the bucket filters a few inches and strap them to sides of buckets with aluminum strips and small screws. Use hog-hair or screening cupped into bottoms of buckets to catch debris.

The pump should be of a capacity that will empty the tank (1000 gals.) in an hour and one half, so lawn and plant watering can be done in reasonable time. A 1/2 h.p. pump and motor comes close by using two hose bibs and hose off the discharge. A fairly good 1/2 h.p. pump can be purchased for \$150.00 (look for sales). Rig it up completely portable for maintenance ease. This can be done by wiring 12/3 portable cable to motor (if an outside receptacle is available and it is on a 20 amp breaker type fuse in your switch box) and installing a flexible suction hose with a foot valve (to hold prime water) that is placed in or taken out of tank through a 4" pipe (18" to 2') section fitted through the lid of one of the manholes by: cutting hole in lid and cementing well, use a pipe length that extends up well above ground (keep it wrapped or covered well to prevent entry by frogs, lizzards, insects, etc.).

Caution Note: Installing the tank should be done during dry ground conditions, to make it uncomplicated. If water is present in hole, water must be used in tank to prevent floating until leveled and back filled.

The tank will overflow and bubble up through the soil around the manhole lids - I chose to let it do this - and used gravel around the lids to prevent holes in soil. Very little dirty water will go back in tank, due to the lips on lids. This, preferable to cementing the lids on, and providing an overflow pipe.

Conclusion: The installation is worth it at most any cost.

1. Due to the long term fringe benefits of plant and tree growth.
2. Prevention of soil and nutrient loss from yard and the resultant pollution.
3. Protection of structure foundation.

Modern Cistern - contd

Conclusion - contd

4. Reduction of potable water demand for yard and plant irrigation.
5. Reduction of energy demand for supplying potable water.
6. Reduction of water drawn from our underground and endangered supply. The pluses simply go on, and on, and excuses are insipid. Homes should be constructed with modern cisterns as standard equipment.