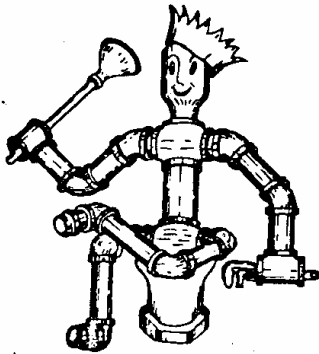


# CoSEIA SOLAR THERMAL CERTIFICATION EXAM STUDY GUIDE

## TEMPERATURES OF POTABLE WATER\*\*

The subject - Temperatures of Potable Water - is one that most in the industry pay little attention to but one about which I am very concerned. We are talking about the usable temperatures of hot water. In my opinion there are three: one we can classify as "general purpose" with a maximum of 120°F; one we would classify as "utility" with a maximum of 160°F; and one we would classify as "sanitizing" with a maximum of 190°F. We will analyze each of these.



CHUCK SEZ

First, we will look at 120° water. Most people use bath or shower water temperatures of somewhere between 105° and 107°. This will feel very hot to the body. (Remember, our body temperature is normally 98.6°. Anything over that temperature is going to feel warm and anything under that temperature is going to feel cool.) In fact, if we took a 110° shower, we would probably be quite red when we were through. For all practical purposes we say that 120° water is the general purpose temperature.

If we look at "utility" temperature, we find only two major uses. The first is clothes washing. The old cliché of our grandmothers - about the hotter the water, the whiter the wash - is very true. There is no question that if you increase the temperature of the water, the white clothes will have a tendency to be whiter.

However, today we have bleaches and low temperature detergents, and because of this it is not necessary to have high temperature water. So let me remind you again that the maximum of 160°F for clothes washing is all that is necessary. The other use for utility temperature water is dish washing. We are not talking about sanitizing but about the wash cycle itself. We can classify 160°F water as the maximum utility temperature we should have.

The next temperature to be considered is "sanitizing" with a maximum of 190°F. This temperature will sanitize dishes, silver, pots, pans, etc. It will not sterilize. We have to be careful to differentiate between sanitizing and sterilizing. Sanitizing means that a dish immersed for 10 seconds in 170°F water will be rendered relatively free of harmful bacteria.

Each of the three statements I have just made - general purpose temperature of 120°, utility temperature of 160° and sanitizing temperature of 190° - will usually trigger something in the engineer's mind that the temperatures stated are too high. And he would be right.

The temperatures I am talking about are the maximum settings for water heating equipment. You must allow for a line loss of approximately 10 degrees throughout the entire loop of the water heating system.

Look at 190°F for sanitizing. Again allowing for the 10 degree line loss, the system will deliver 180°F water at the dish machine. The National Sanitation Foundation says that for sanitizing purposes 180° water must be delivered to the dish machine so it can have 170° on the dish for 10 seconds at a pressure between 15 lbs. minimum and 25 lbs. maximum. So you must have 190°F water from the water heating equipment to get 170°F

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on the dish because the spray nozzle in the dish washer will atomize the spray and have a tendency to cool it very rapidly.

Now if you will forgive me, we get to a point in this discussion that is a pet peeve of mine - 140° water temperature! I have been in the industry over 20 years. And for over 20 years I have heard 140° temperature used, and for the past 15 years I have found absolutely no worthwhile use for this temperature. If I could accomplish one thing in this discussion, it would be to convince you, the consulting engineers, health officials, sanitary engineers that 140°F water is absolutely worthless! I think that many people felt that 140° water would make the tank appear larger because it took more mixing of cold water to blend with the hot water to get it to a usable temperature. But regardless of the reasons, I can find no justification for the use of 140°F water.

Because of the statements I have just made, I want to talk to you for a minute about scalding temperatures. First degree burns are those in which the surface of the skin is red and painful but not broken or blistered. Typical first degree burns result from sunburn, electric flash and other mild causes. Second degree burns are those in which blisters are formed. Third degree burns are deep with charring and actual destruction of the skin and underlying tissue.

Let's start at approximately 112°F and say that it takes six hours of immersion to generate second and third degree burns. For each two degree increase in temperature the time factor required for second and third degree burns will be cut of half. This means that at 114° it would take three hours for second and third degree burns. Just skipping along the mathematical ladder, for 120° it would take only 22 minutes and for 130° it would take only 45 seconds.

We have felt for years that 130°F water is safe. I want to say emphatically that it is not safe enough to be assured that irreversible damage cannot occur. Now we will increase that temperature only 10 degrees from 130° to 140°. The time required for second or third degree burns is less than three seconds. Going from 140°F to 160° it takes less than one second to sustain second or third degree burns. Ladies and gentlemen, this is a serious problem, one that each of us must recognize.

All of you know the dangers of product liability claims to your business organizations, but are you aware of the tremendous personal liability that can be generated from such lawsuits?

I have talked about scalding and liability. But there is one other thing that is vitally important. That is energy savings. I have done some rough calculations and find the difference in stored water temperature of 140°F and 120°F in an ambient temperature of 65°F is going to save in excess of 30% of the heat loss of that system.

You have three usable temperatures - 120°F maximum would be called general purpose; 160°F maximum would be called utility; and 190°F maximum would be called sanitizing. If each of these temperatures is used in its proper place, you will create a tremendous energy savings; you will decrease the possibility of a lawsuit against you or your associates; you will eliminate the possibility of scalding anyone with 120°F water in the general purpose system; and we have one more very major benefit to this program that I have not mentioned before. That is the entire water heating system will last much longer.

So I leave you with this thought -- 120°F temperature is the temperature that should be circulated through the potable water system. May you never say 140° water again.

\*\* Taken from parts of a speech on TEMPERATURES OF POTABLE WATER by Charles L Adams, President and Chairman of the Board of PVI given for the 72nd Annual Meeting of the A.S.S.E.