WATER TREATMENT - APPLICATION

1. GENERAL

1.01 This section describes water treatment applications to various building systems.

1.02 Whenever this section is reissued, the reason(s) for reissue will be listed in this paragraph.

2. WHY WATER TREATMENT IS NECESSARY

2.01 Pure water is a compound of oxygen and hydrogen. However, pure water is never found in nature. Even rain water becomes contaminated with dust and gases as it falls to earth. When it runs over the surface of the ground it seeps into the soil, dissolving small quantities of many minerals in varying amounts. These are in the form of mineral salts, some of which comprise the "hardness" in the water. Of the latter, the principal ones are calcium and magnesium carbonates, silicates and sulfates. (Table salt, sodium chloride, is a mineral salt.)

2.02 There is no sharp demarcation between soft and hard water. The U.S. Geological Survey gives the following classifications in terms of parts per million and grains per gallon of calcium carbonate:

	PARTS PER MILLION (PPM)	GRAINS PER U.S. GALLON (GPG)
Soft Water	0 - 60	0 - 3.5
Moderately Hard	61 - 120	3.5 - 7.0
Hard	121 - 180	7.0 - 21.0
Very Hard	181 up	21.0 up

2.03 Both soft and hard waters present problems in the cooling systems of air conditioning installations. Soft waters are usually corrosive and create rust problems. Hard waters deposit scale in the condenser tubes which restricts the flow of water and builds up an insulating film that reduces the efficiency and capacity of the condenser.

2.04 Soft waters are generally treated with a rust inhibitor. A common one is sodium dichromate. It is the same yellow powder that is used to prevent rusting in automobile radiators. This chemical is added to the cooling tower water in the proportion of 200 ppm. Another rust inhibitor that is sometimes used is sodium nitrite.

2.05 Hard waters are treated with a family of chemicals called polyphosphates. These chemicals are called sequestering agents. Up to certain limits they are capable of preventing the "hardness" of the water from deposition in the condenser tubes. Only 10 ppm of the polyphosphate chemical are required to produce the sequestering effect.

2.06 Most chemical compounds are more soluble in hot water than in cold. A few, however, have the reverse characteristics. They become less soluble as the temperature of the water increases. Among these few are calcium and magnesium carbonate, the two most troublesome "hardness"

chemicals found in water supplies. When

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cooling water reaches the condenser and is heated to 95^{o}F or more, the amount of these chemicals the water can hold in solution at normal temperature decreases. If the amount of "hardness: present exceeds solubility limits at the higher temperature, the excess is thrown out of solution (precipitated) and settles on the insides of the condenser tubes. It accumulates in the form of a sludge or as a solid mass. This so-called scale is removed by dismantling the condenser and wire brushing the tubes or by flushing them with an acid to dissolve the scale.

2.07 Raw water that is exceedingly hard must first be put through zeolite softening equipment before it is piped to the cooling system. This treatment completely eliminates the problem of scale deposits in the condenser tubes. However, softened water is generally corrosive and may require treatment with sodium dichromate, the same as natural soft waters.

2.08 Another problem that occurs in cooling tower water is the growth of algae and slime. These fungus and bacteria growths must be destroyed. Otherwise, they will accumulate in the piping and condenser tubes and reduce the efficiency and capacity of the equipment. The treatment is quite simple. It consists of "shock" doses of 100 ppm of sodium pentachlorophenate added to the cooling water on an as required basis (1 lb. of sodium pentachlorophenate added to 1000 gallons of water will give 120 ppm).

3. WATER TREATMENT CONTRACTS

3.01 Normally water treatment service is contracted due to its technical nature and lack of in-house employees knowledgeable in this subject. The following practices will be very useful for the basic knowledge of water treatment for all employees whether this service is contracted or performed in-house:

770-230-900 - Fundamental Principles of Water Conditioning
770-230-301 - Water Treatment--Air Conditioning Systems
770-230-302 - Water Treatment Equipment Open and Closed Heat Exchanger Systems
770-230-303 - Water Treatment Low-Pressure Heating Boilers

3.02 When outside contractors are used for the water treatment service, the following items should be considered:

(1) Only reputable firms knowledgeable in this subject should be considered.

(2) A chemical analysis of raw water should be performed by an independent laboratory. This analysis report should be obtained from the contractor and reviewed to see what type of treatment is

necessary.

(3) Amounts of blowdown and bleed rate in the cooling towers should be reviewed. Cost of water in some areas is very high and excessive bleeding or blowdown may be very expensive. Sometimes expensive chemicals are added to treat water and if the bleed rate is high, these chemicals are drained to wastage too. Therefore, a balanced, most-economical condition with the proper amount and type of chemicals and proper bleed or blowdown rate should be considered.

(4) On the job periodic tests must be conducted to adjust the amount of chemicals and bleed rate.

(5) Periodic inspections of the cooling towers, boilers, chillers, etc., should be performed to see if the water is properly treated.

(6) All chemicals and feeding equipment must be in compliance with municipal and state health codes.

(7) All chemical feeding and testing should be done in a safe manner.

4. GENERAL CAUTIONS

4.01 The following general cautions should be observed in all water treatment applications:

(1) Before feeding chemicals to water under pressure (condenser water, boiler, etc), do not open the chemical feed part without first discharging the water under pressure in the shot feed tank to the drain.

(2) General safety should be observed in feeding chemicals to the system.

(3) Chemicals that are banned by municipal, state or federal agencies should not be used for treating waters.

(4) Whenever chemicals that might come in contact with the body are handled, rubber gloves, rubber apron, chemical goggles, and in the case of dry powdered chemicals, a respirator shall be worn.

(5) In the event chemicals contact the skin, wash the affected area immediately with soap and water and rinse freely. If chemicals come in contact with the eyes, wash liberally with water and consult a physician promptly.