I. Complete the following calculations for hot water demand requirements. The gallons/hour demands per fixture are available on Attachment FFA.

II. List gallons/hour figures for all equipment using hot water. (See Attachment A).

GPH

a. Pot sinks (3 Compartment)   Number____   Demand ____
b. Bar /Fountain sinks (3 Compartment)   Number____   Demand ____
c. Vegetable & Pantry sinks   Number ____   Demand ____
d. Slop or Janitorial sinks   Number ____   Demand ____
e. Hand Wash/Lavatories sinks   Number ____   Demand ____
f. Pre-wash + <u>dishwashing machine</u>   Number ____   Demand ____
g. Garbage can wash facility   Number ____   Demand ____
h. Other   Number ____   Demand ____

Total Demand _____ GPH

RECAPITULATION OF TOTAL DEMAND ON DISHWASHING MACHINE HOT WATER SOURCE

a. Items a. through h. above   Total Demand (from above) _____ GPH
b. Recovery Rate (100% multi-service; 80% single service)   GPH x _____ % = _____ GPH
Final Total Demand _____ GPH

III. Calculate usable hot water from following equation:
(Supply cut sheet for hot water heater)

Gas Water Heater:

BTU's/hr. or BTU Input $= \dfrac{\text{(GPH) x 8.33 lb./gal H20 x TEMP RISE}}{\text{Heater or Thermal Efficiency (75\%) *}}$

* Assume thermal efficiency to be 75%

BTU Input $= \dfrac{\text{GPH (final) x 8.33 x 50}}{.75}$ BTU Input = _____

Electric Water Heater:

KW/hr or KW Input $= \dfrac{\text{GPH x Rise x lb./gal H20}}{\text{Thermal Efficiency* x BTU/KW}}$

*Assume thermal efficiency to be 98%

KW Input $= \dfrac{\text{GPH (final) x 50 x 8.33}}{.98 \text{ x } 3412}$ KW Input = _____

Section C

IV.   Allowances for hot water storage (total capacity above 100 gallons)

   a. $QS = \dfrac{0.7s}{d}$

          QS = Quantity of usable hot water from storage (GPH)
            s = Storage capacity of tank
            d = Duration of peak hot water demand; hours

* If specification sheet indicates hot water has a higher efficiency, that value may be substituted.
   b.   Qn = Qt – Qs
          Qn = Net quantity of hot water required from heater: gallons/hr.
          Qt = Total quantity of hot water required; gallon/hr.

VII. <u>SIZING REQUIREMENTS FOR INSTANTANEOUS WATER HEATERS</u>

   A.   One of the advantages of an instantaneous water heater is its ability to provide a continuous supply of hot water. However, since the water passes through a heat exchanger, the water must flow through the unit slowly to ensure proper heat transfer. Therefore, the quantity, or rate, at which the hot water is delivered can be significantly less than that provided by a storage water heater. When hot water is utilized at several locations of the food facility at the same time the flow of hot water to each fixture can be severely restricted. As a result of the restricted output of instantaneous water heaters, more than one unit may be required, depending on the numbers and types of sinks and equipment present. Due to the limitations inherent in the design of instantaneous water heaters, some local health agencies may restrict or prohibit their usage. Check with your local health agency prior to installing an instantaneous water heater in order to determine their requirements.

   B.   Instantaneous water heaters must be sized to provide hot water of at least 120° Fahrenheit, and at a rate of at least two gallons per minute (GPM), to each sink and fixture that utilizes hot water. (Note: Hand lavatories must receive at least 1/2 GPM.) The following example is provided to explain how this sizing criteria is applied:

         <u>Assume:</u>
            1 18" X 18" three compartment sink   2 GPM
            2 hand lavatories   1 GPM (1/2 GPM each)
            1 janitorial sink   2 GPM
                                                                          5 GPM

   C.   In the example given above, one or more instantaneous water heaters would have to be provided in order to supply a total of at least 5 GPM.

   D.   Food facilities that install an automatic ware washing machine that utilizes a large quantity of hot water may be required to provide an instantaneous water heater exclusively for the ware washing machine. NSF International listings or listings established by other nationally recognized testing laboratories are used to determine the minimum GPM hot water demand for automatic ware washing machines.

Section C

COMPUTING HOT WATER DEMANDS FOR FOOD ESTABLISHMENTS

A.   GENERAL PURPOSE WATER (140º F)

	Fixtures/Sinks	No. Compartments	Gals. Per Hour
1.	Pot Sinks (18"x18")	3	42
2.	Bar & Fountain Sinks	3	25
3.	Vegetable/Preparation Sinks	1	10
4.	Slop or Janitorial Sinks	1	15
5.	Hand Wash Sinks (Hand Lavatory)	1	5
6.	Pre-wash (dishwashing):		

a.	Hand Spray		45
b.	Pre-Flush-Open Type		45
c.	Pre-Flush-Recirculating Type		40
d.	Pre-Flush-Closed Type		240
e.	Pre-Scrapper-Open Type		160

7.	Garbage Can Wash Facility	15

B.   Final Rinse Requirements (180º F) – Machine Dishwashers

Dishwashing Machine Classification	GPH 20 PSI
Class 1-16 x 16 Single Tank, Hood	
Class 2-18 x 18 Single Tank, Door	
Class 3-20 x 20 Single Tank, Door	
Class 4 – Multiple Tank Conveyor, Inclined	
Class 5 – Multiple Tank Conveyor, Flat	
Class 6 – Single Tank Conveyor	

C.   Low Temperature Requirements

Ex. Auto Chlor

1.	Single Rack	2.5 gal/cycle 1.5 min/cycle	100
2.	Double Rack	4 gal/cycle 1.8 min/cycle	133

Section C