MONTHLY HIGH TEMPERATURE WATER PLANT OPERATING LOG

1. COMMAND:

2. BASE AND LOCATION:

3. BUILDING:

4. MONTH/YEAR (MMM YYYY):

DATE	5. FUEL								6. WATER CIRCULATED					7. EFFICIENCY ANALYSIS DATA												8. RECOVERY			9. PLANT DAILY TOTALS			
	1		2		3		4			1	2	3	4	1			2			3			4								
	TYPE	AMOUNT USED	TYPE	AMOUNT USED	TYPE	AMOUNT USED	TYPE	AMOUNT USED	SUPPLY TEMP *(°F)*	OUTPUT *(gal)*	OUTPUT *(gal)*	OUTPUT *(gal)*	OUTPUT *(gal)*	O_2 % *(0.xxx)*	STACK Δ TEMP *(°F)*	COMB. EFFIC. $\eta_{c\text{-}1}$ *(0.xxx)*	O_2 % *(0.xxx)*	STACK Δ TEMP *(°F)*	COMB. EFFIC. $\eta_{c\text{-}2}$ *(0.xxx)*	O_2 % *(0.xxx)*	STACK Δ TEMP *(°F)*	COMB. EFFIC. $\eta_{c\text{-}3}$ *(0.xxx)*	O_2 % *(0.xxx)*	STACK Δ TEMP *(°F)*	COMB. EFFIC. $\eta_{c\text{-}4}$ *(0.xxx)*	EXPAN. TANK PRESS *(psig)*	MAKE-UP ADDED *(gal)*	MAKE-UP % *(0.xxx)*	TOTAL INPUT *(MMBtu)*	TOTAL OUTPUT *(MMBtu)*	COMBUST EFF. $\eta_{c\text{-}plant}$ *(0.xxx)*	OVERALL EFF. η_{Plant} *(0.xxx)*
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								TOTAL		0	0	0	0															0		0	0		
								AVG																								
								MIN																								
								MAX																								

10. TOTAL FUEL USED

GAS *(Mcf)* :

OIL (gal):

COAL *(lbm)* :

11. PLANT INPUT *(MMBtu)*

12. PLANT OUTPUT *(MMBtu)*

13. PLANT COMBUSTION EFFICIENCY, $\eta_{c\text{-}Plant}$ *(0.XXX)*

14. PLANT OVERALL EFFICIENCY η_{Plant} *(0.XXX)*

SIGNATURE *(Boiler Operations Supervisor):*

DATE REVIEWED:

SIGNATURE *(Base Civil Engineer):*

DATE REVIEWED:

REMARKS:

PURPOSE: Use with Air Force high temperature water (HTW) generator plants with operating pressures greater than 160 psig IAW AFI 32-1068.

DIRECTIONS: This form is intended for recording monthly operating data for HTW generator plants. Post information on this form from completed AF Forms 1163, Daily High Temperature Water Plant Operating Logs. When this form is completed, it will be reviewed and signed by a supervisor of boiler operations and the Base Civil Engineer, or delegate. Where there is more than one plant, a separate log is required for each plant.

Items 1-4. Self-explanatory.

Item 5. Fuel Used. Enter the type of fuel, Gas (G), Oil (O), or Coal (C). Enter the daily quantity of each fuel used for the boiler. Gas is measured thousands of cubic feet (Mcf), Oil is measured gallons (gal) and Coal is measured in pounds (lbm). If multiple fuels are burned on a single day, enter Type1/Type2 in the Type and Amount Used boxes. Example: 10,368 gal of oil and 7260 Mcf of gas would be recorded as: O/G, 10368/7260. When operating two different gases, e.g. natural gas and propane, annotate how long each is used in the Remarks section. Enter the quantity of fuel used for each HTW generator.

Item 6. Water Circulated. Enter average daily Supply Temperature, in °F, from Item 6 on the AF Form 1163. Enter the Daily Water Circulated for each HTW generator and Plant Total, in gallons, from Item 12 on the AF Form 1163. If the plant has more than four generators, use additional sheets.

Item 7. Efficiency Data. Record the daily average Oxygen (O_2) percentage, shown as 0.XXX, for each HTW generator. Calculate and enter the daily average Stack Change of Temperature (Stack ΔT) by subtracting the average Stack Temperature by the average Combustion Air Temperature for each HTW generator. Record the daily combustion efficiency, η_c, for each HTW generator from Item 15 of AF Form 1163. If the plant has more than four HTW generators, use additional sheets.

Item 8. Recovery. Record the average daily expansion tank pressure, in psig, and total daily make-up water usage, in gallons, from Item 8 on the AF Form 1163. Record the daily make-up percentage from Item 14 on the AF Form 1163.

Item 9. Plant Daily Totals. Using the AF Form 1163, enter the total daily amounts. Record the Total Input from Item 11 and the Plant Total Output from Item 12 in MMBtu. Record the Plant Combustion Efficiency, $\eta_{c\text{-}Plant}$, from Item 15. Record the Plant Overall Efficiency, η_{Plant}, from Item 13.

Item 10. Total Fuel Used. Sum the total amount of each type of fuel used for the month entered in Item 5 on this form. When operating two different gases, e.g. natural gas and propane, annotate which gases and how much of each was used in the Remarks section.

Item 11. Plant Input. Sum the daily Total Inputs listed in Item 9 on this form, and any additional sheets. Record in MMBtu.

Item 12. Plant Output. Sum the daily Total Outputs listed in Item 9 on this form, and any additional sheets. Record in MMBtu

Item 13. Plant Combustion Efficiency - $\eta_{c\text{-}Plant}$. Calculate the average of the daily plant combustion efficiencies, $\eta_{c\text{-}Plant}$, listed in Item 9 on this form. Record to three decimal places (0.XXX).

Item 14. Plant Overall Efficiency - η_{Plant}. Calculate the Plant Overall Efficiency, η_{Plant}, for the monthy by dividing Item 12, Plant Output, by Item 11, Plant Input. Record to three decimal places (0.XXX).

UNIT NOMENCLATURE:

gal - gallon
GJ – gigaJoule
kg – kilogram
kJ/kg – kiloJoule/ kilogram)
kPa – kiloPascal
L – liter
lbm - pound - mass
Mcf – Thousands of cubic feet (can be incorrectly listed as kcf)
Mlbm – thousands of pound - mass
MMBtu – Million (Thousand Thousand) British thermal unit
psig – Pounds per square inch gauge
1000 m^3 – thousand cubic meters

METRIC CONVERSION

MULTIPLY	BY	TO OBTAIN
kPa	0.1450	psig
kg	2.2046	lbm
1000 m^3	35.310	Mcf
L	0.2642	gal
kJ/kg	0.4299	Btu/lbm
GJ	0.9479	MMBtu

TEMPERATURE CONVERSION TO OBTAIN DEGREES FAHRENHEIT

$T_{°F} = 1.8T_{°C} + 32$