

Discrepancies between SWPC and the references

1. Flame temperature: Estimate of SWPC about twice that of ref. #2 and #5.
2. Flame height: Estimate of SWPC about twice that of ref. #5 and three times that of the "ARCHIE" program.
3. Heat transfer coef: The equation equating two heat transfer coefficients was not found in the cited ref #4.
4. Air flow in T_f cal: Air flow used by SWPC was less than that used in ref. #5
5. Evap. rate in fires: Ref. #3 does not contain any consideration of the rate of evaporation in a fire scenario.

Consideration is not given to ref. #2's condition that evaporation rate be equal to or greater than the burn rate.
6. DRE and Burn Eff: The burn efficiency or DRE estimates of ref. #2 much lower than those of SWPC

VERIFICATION OF ACCIDENT SCENARIOS

1. Are the statements in the application consistent with the references cited by the applicant?
 2. Have the calculations provided by the applicant been done accurately?
 3. Can we use the applicants input data and equations and obtain the same output values?
 4. Are quantities involved in calculations such as mass and temperature consistent through out the calculation?
 5. Are the units for reporting quantities correct?
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SPILL SCENARIO INTO BEAVER CREEK

$$C(x, t) = \frac{M}{2A * (\pi * E_x * t)^{0.5}} * \exp\left\{ \frac{-(x - U * t)^2}{4E_x * t} \right\}$$

Units of terms provided by SWPC on page J-2 of CD .97

term	units	term	units
C(x,t)	mg/L	t	sec
M	kg	x	m
A	m ²	U	m/sec
E _x	m ² /sec		

$$\begin{aligned}
 C(x,t) &= \text{mg/L} = \frac{\text{kg}}{\text{m}^2 * \left[\frac{\text{m}^2 * \text{sec}^{0.5}}{\text{sec}} \right]} \\
 &= \text{kg/m}^3 = \text{kg/1000L} = \text{g/L}
 \end{aligned}$$

Discrepancies in temperature used calculation of a DRE.

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1. Temp. for cal:
DRE: Temperature in calculation of the rate constant k was to be 2108 K as per the text of CD .97. Staff found that a temp of 1000 °K had actually been used.

Temperature used for calculation of dwell time which is use in the second portion of calculation of the DRE was 2108 °K

Discrepancies in units of SWPC calculation

1. Spill into Beaver
accident scenario The concentration of pollutants in the stream should have been reported in g/L instead of mg/L.
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FLAME RESIDENCE TIME CALCULATION

No basis is found for the equation

$$h_t = h_{nc}$$

in Peters (Ref. #4) nor in the record.

It would be proper to write an equation

$$Q_t = Q_{nc}$$

where Q_t = the total heat transferred to the inside of the pipe by turbulent convection, and

Q_{nc} = the total heat removed from outside the pipe by natural convection of air.

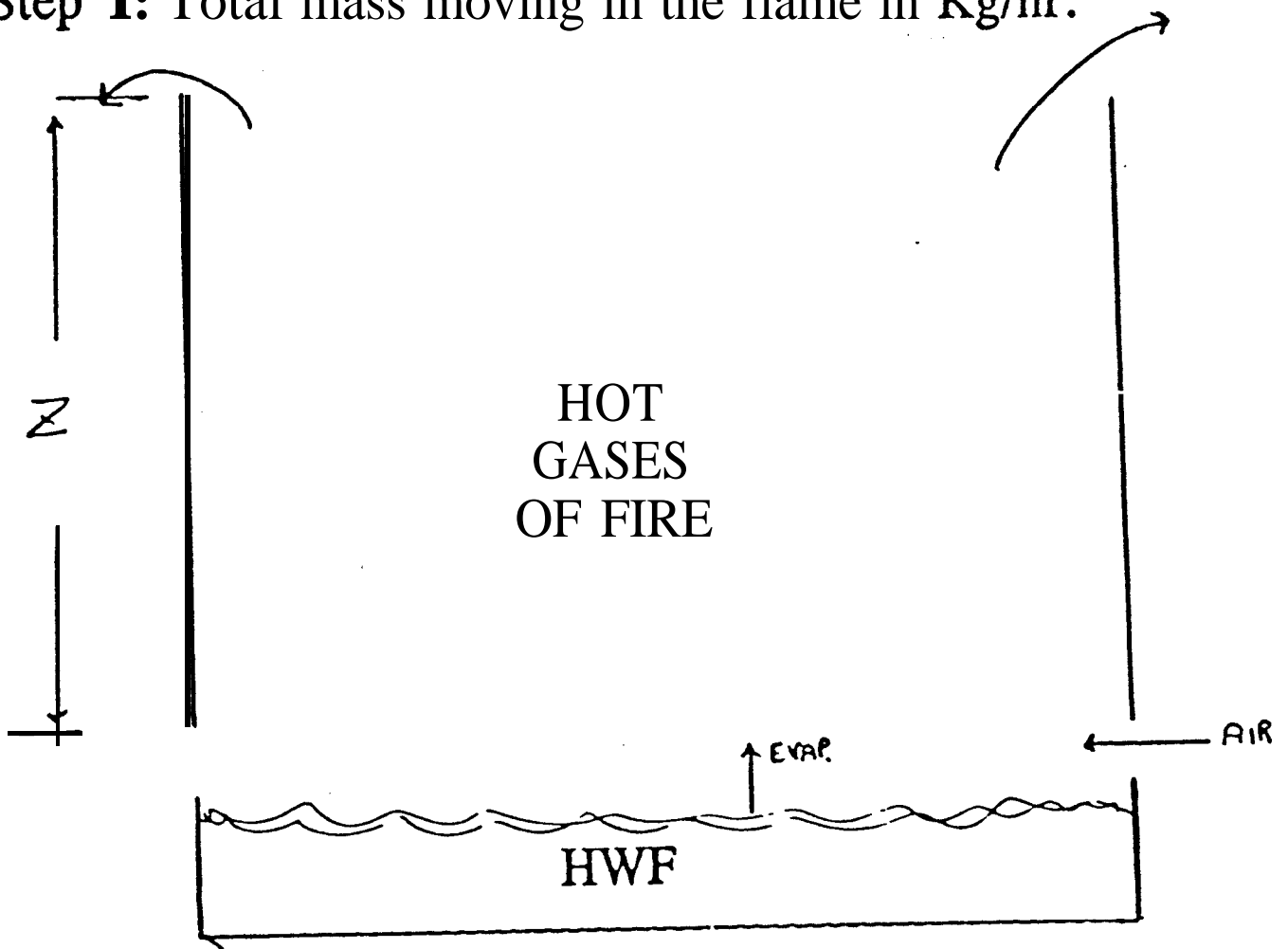
However it is not self evident that the heat transfer coefficients may be equated as was done by SWPC.

Discrepancies in mass flows among SWPC calculations

1. mass flow in flame: Total mass flow in the residence' time calculation was about 2.6 times the mass flow in the flame temperature calculation.
 2. evap. and burn rates: The total evaporation rate calculated by staff using SWPC emission rates and SWPC DRE values was about 1/40 th the burn rate.
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FLAME RESIDENCE TIME CALCULATION

Step 1: Total mass moving in the flame in Kg/hr.



$$\begin{aligned} \text{Mass flow by residence time} &= 1,980 \text{ lb/hr-ft}^2 \\ &= 1,388,700 \text{ kg/hr} \end{aligned}$$

$$\text{Mass flow in flame temp} = 539,353 \text{ kg/hr}$$

Similar discrepancies were observed for every value of k presented in Table I. 1-1 of CD .97.

However, if the flame temp of 1000 °K were used in the above equation the k values presented in Table I. 1-1 of CD .97 are obtained.

On page I-8 it is stated that the flame temperature was assumed to be 2108 °K.

On pages I-8 and I-9 a flame temperature of 2108 °K is used in the flame height and mass flow calculation.

No discussion or evidence was found in CD .97 that the flame temperature would be 1000 °K.
