

CAMEOfm EXERCISES

CAMEOfm—CHEMICAL LIBRARY

- 1) Open the Chemical Library
- 2) Find the following chemical information:

Chemical Name : _____

CAS # : 79-06-1

UN/NA# : _____

NFPA RATINGS:

FIRE : _____

HEALTH : _____

REACTIVE : _____

SPECIAL : _____

IDLH : _____

ERPG -2 : _____

TEEL-2 : _____

OTHER INFO: _____

Chemical Name : _____

CAS # : 78-00-2

UN/NA# : 1649

NFPA RATINGS:

FIRE : _____

HEALTH : _____

REACTIVE : _____

SPECIAL : _____

IDLH : _____

ERPG-1 : _____

ERPG-2 : _____

AEGL : _____

OTHER INFO: _____

ALOHA EXERCISES

This ALOHA exercise must be performed using ALOHA version 5.3.

A manufacturing facility stores 32% Hydrochloric Acid solution in an outdoor tank 20 feet high and 8 feet in diameter. It is surrounded by a dike which is 20 feet in diameter.

Assume the following weather conditions:

Wind Speed	12 mph
Wind Direction	S
Ground Roughness	Open
Partly Cloudy	5
Temperature	90 degrees F
Relative Humidity	50%

Question 1: What is the maximum amount volume of the tank?

Question 2: What are the hazards associated with Hydrochloric Acid?

Question 3: Develop an ALOHA footprint for 7500 gallons of Hydrogen Chloride as a Direct/Instantaneous source release. What is the Maximum Plume distance using the “default” red LOC value?

Question 4: Develop an ALOHA footprint for 7500 gallons of 32% Hydrochloric Acid using the Puddle source. What is the Maximum Plume distance for the “red” LOC value? What is the Maximum Plume distance for the “yellow” LOC value? How long will it take the tank to empty and all 7500 gallons of product to disappear?

Question 5: Compare and contrast the 3 ALOHA footprints.

ANSWERS

CAMEO answers

Chemical Name: Acryamide

CAS # : 79-06-1

UN/NA# : 2074

NFPA RATINGS:

FIRE : 2

HEALTH : 2

REACTIVE : 2

SPECIAL : BLANK

IDLH : 60 mg/m³

TEEL-1 : 0.3 mg/m³

TEEL-2 : 60 mg/m³

TEEL-3 : 60 mg/m³

OTHER INFO: White crystal shipped as solid or solution; used for sewage or waste treatment; may polymerize; water soluble; may polymerize when mixed with peroxides; toxic by ingestion

Chemical Name : Tetraethyl Lead, Liquid

CAS # : 78-00-2

UN/NA# : 1649

NFPA RATINGS:

FIRE : 2

HEALTH : 3

REACTIVE : 2

SPECIAL : No water

IDLH : 40 mg/m³

TEEL-1 : 0.4 mg/m³

TEEL-2 : 0.75 mg/m³

TEEL-3 : 60 mg/m³
LEL : 1.8 %
OTHER INFO: Colorless liquid; toxic by absorption,
ingestion, and/or inhalation; potential for explosion; very toxic

EXERCISE:

Question 1: What is the maximum amount volume of the tank?

Answer 1: 7,520 gallons

If you selected “Solutions” from the ALOHA Chemical list, you will find you are not able to use anything but “Puddle” as your Source option. However, to find the “volume” of the container, you will need to use the “Tank” source option. To find the tank volume, you may select ANY substance from the ALOHA Chemical list which you are sure is a liquid, enter the Atmospheric conditions, and select “Tank” as your Source option. Then, enter 8 feet and 20 feet as tank dimensions and ALOHA will calculate the tank volume.

1. select any liquid chemical from the ALOHA list...maybe Toluene?
2. enter Atmospheric conditions as listed above
3. select Tank as your source
4. select “vertical cylinder”
5. enter 8 feet as diameter; 20 feet as length
6. ALOHA figures tank volume at 7,520 gallons

I tried this with 4 different “liquid” substances, and got the same 7,520 gallons each time.

Question 2: What are the hazards associated with Hydrochloric Acid?

Answer 2: Look up Hydrochloric Acid, Solution in the CAMEO Chemical Library. It is very Reactive, and an Inhalation Hazard as well.

Question 3: Develop an ALOHA footprint for 7500 gallons of Hydrogen Chloride as a Direct/Instantaneous source release. What is the Maximum Plume distance using the “default” red LOC value?

Answer 3. Maximum Plume distance for “red” LOC, which is AEGL-3 = 620 ppm, is 1.8 miles.

Level of Concern

Select Level of Concern or Output Concentration:

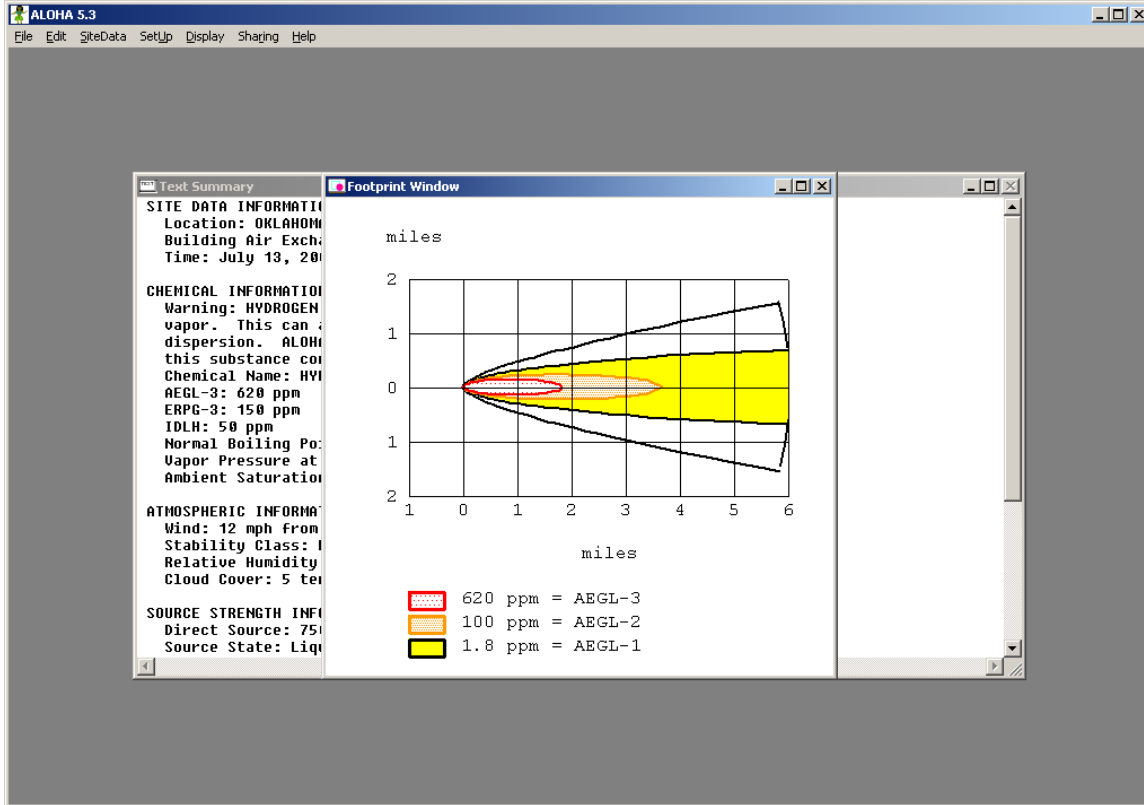
Red Footprint
LOC: AEGL-3: 620 ppm

Orange Footprint
LOC: AEGL-2: 100 ppm

Yellow Footprint
LOC: AEGL-1: 1.8 ppm

Show confidence lines:
 only for longest footprint
 for each footprint

OK Cancel Help

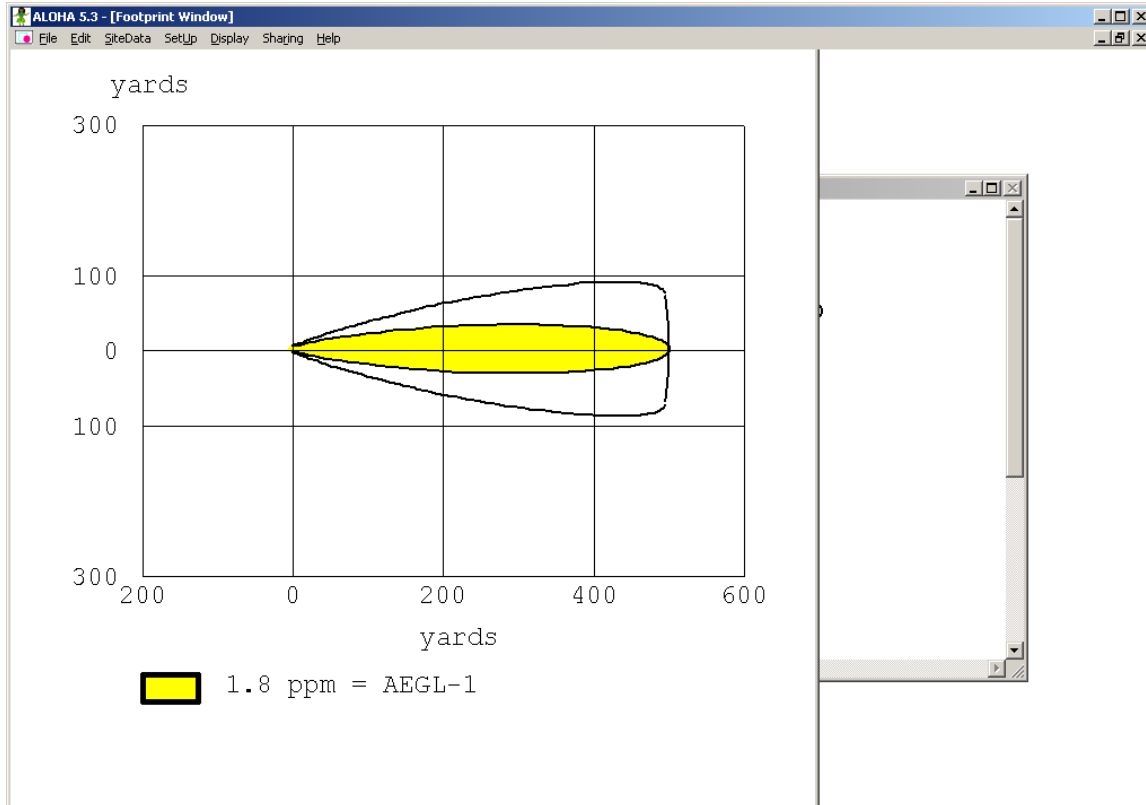


Question 4: Develop an ALOHA footprint for 7500 gallons of 32% Hydrochloric Acid using the Puddle source. What is the Maximum Plume distance for the “red” LOC value? What is the Maximum Plume distance for the “yellow” LOC value? How long will it take the tank to empty and all 7500 gallons of product to disappear?

Answer 4: ALOHA will not produce a footprint for the “red” LOC given these conditions. ALOHA has calculated that the AEGL-3 = 620 ppm was “not exceeded” at any appreciable distance from the source.

The “yellow” LOC plume distance is 503 yards.

The ALOHA “Source Strength” summary estimates the “release rate” as 4.47 pounds / minute. Hydrochloric Acid, even at 32% solution, is heavier than water, and a rough estimate might be 10 pounds / gallon. The amount in the tank is therefore estimated to be 75000 pounds (7500 gallons * 10 lb/gal). At 4.47 lb/min release, it will take approximately 220,000 minutes (75,000 lb/ 4.47 lb/min = 16,778 minutes), or 280 hours (16,778 min / 60 min/hour = 280 hours) to fully volatilize the product.



ALPHA 5.3 - [Text Summary]

File Edit SiteData SetUp Display Shading Help

SITE DATA INFORMATION:
Location: OKLAHOMA CITY, OKLAHOMA
Building Air Exchanges Per Hour: 0.91 (sheltered single storied)
Time: July 26, 2004 0945 hours CDT (using computer's clock)

CHEMICAL INFORMATION:
Chemical Name: HYDROCHLORIC ACID Solution Strength: 32% (by weight)
Normal Boiling Point: 176.9° F Ambient Boiling Point: 175.2° F
Partial Pressure at Ambient Temperature: 0.067 atm
Ambient Saturation Concentration: 69,923 ppm or 6.99%
Hazardous Component: HYDROGEN CHLORIDE
Molecular Weight: 36.46 g/mol
AEGL-3: 620 ppm AEGL-2: 100 ppm AEGL-1: 1.8 ppm
ERPG-3: 150 ppm ERPG-2: 20 ppm ERPG-1: 3 ppm
IDLH: 50 ppm

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)
Wind: 12 mph from S at 3 meters No Inversion Height
Stability Class: D Air Temperature: 90° F
Relative Humidity: 50% Ground Roughness: open country
Cloud Cover: 5 tenths

SOURCE STRENGTH INFORMATION:
Puddle Diameter: 20 feet Puddle Volume: 7500 gallons
Soil Type: Default Ground Temperature: 90° F
Initial Puddle Temperature: Ground temperature
Release Duration: ALOHA limited the duration to 1 hour
Max Average Sustained Release Rate: 4.47 pounds/min
(averaged over a minute or more)
Total Amount Hazardous Component Released: 248 pounds

FOOTPRINT INFORMATION:
Dispersion Module: Gaussian
Red LOC (620 ppm = AEGL-3) Max Threat Zone: 14 yards
Note: Footprint was not drawn because effects of near-field patchiness make dispersion predictions unreliable for short distances.
Orange LOC (100 ppm = AEGL-2) Max Threat Zone: 56 yards
Note: Footprint was not drawn because effects of near-field patchiness make dispersion predictions unreliable for short distances.
Yellow LOC (1.8 ppm = AEGL-1) Max Threat Zone: 503 yards

Question 5: Compare and contract the 3 ALOHA footprints.

Answer 5. Using “pure chemical” in this case will overstate the potential hazard area, but does allow the user to set the “Tank” source to estimate total tank capacity. Using the “solutions” for the Chemical selection provides a more realistic estimate of the footprint area. Notice the wide variance in footprint area predictions!