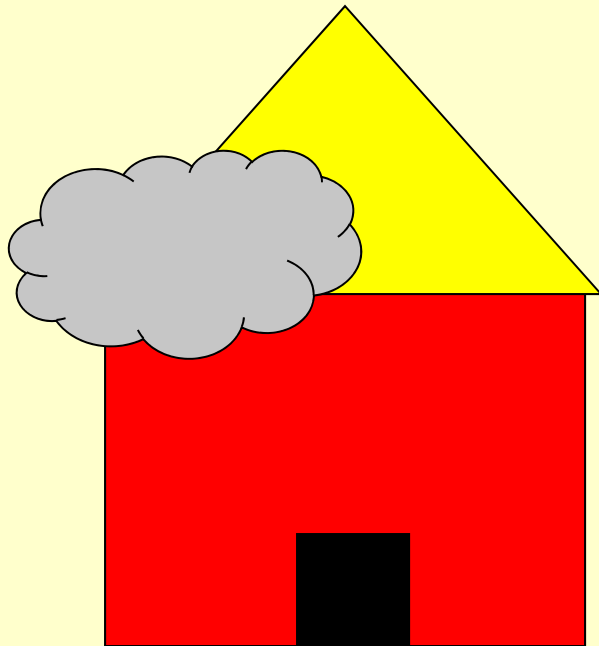




Air Infiltration Study

CAER Safety Summit

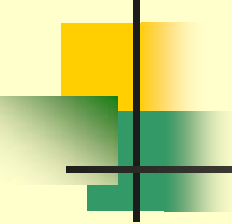


Nicole A. Alaniz

Accidental Release Prevention Engineer

Contra Costa Health Services

March 25, 2010



Study Objectives

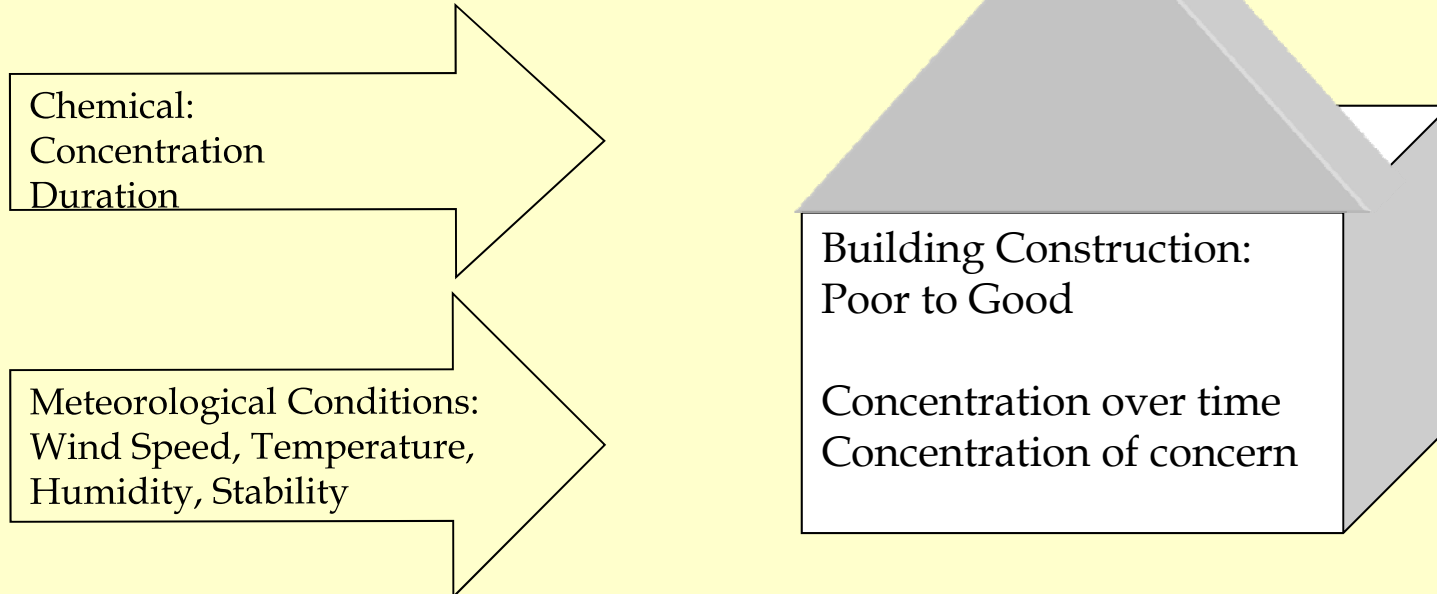
- The main objective is to determine how long is it safe to shelter-in-place when there is a release of a chemical of concern.
- To perform this study a model needed to be chosen which would allow for input of parameters related to air infiltration studies.
- A third party would need to be hired to perform the work.



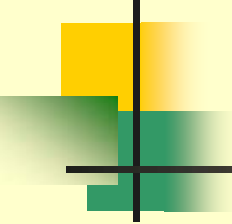
Study Scope

- House construction: taking into account `leaky' vs. `tight' construction using ACH (air change per hour) primarily determined from the age of home.
- Location: weather conditions for East, Central and West County (wind speed)
- Selected chemicals (based on quantities from RMP)

Study Model



Distance To Endpoint (1 mi)



Endpoint of Concern

- ERPG-2 is defined as the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individuals ability to take protective action.
 - Cl₂: 3 ppm
 - NH₃: 200 ppm*



Scenarios

- The two chemicals were chosen based on their volume and usage in the county.
- One worst case scenario was chosen: Entire contents of Cl₂ railcar to be released. (This can be used countywide and not even at a facility.)



Parameters

- CCHS also performed studies using the same scenarios but changing ACHs by house age (e.g. homes before 1950, 1950-1980, 1980-1995, and 1995+)
- Two different floor plans (low income housing (970 ft²) and conventional housing (1500 ft²))
- Focused on single story housing



Parameters cont'd.

- Safer Systems based their study on work published by LBNL to determine 8 different ACH values.

	1500 ft ²	970 ft ²
<1950	0.6	1.6
1950-1980	0.5	1.5
1980-1995	0.4	1.3
>1995	0.3	1.3



Emergency Response Scenarios

- Two emergency response scenarios were chosen:
 - Cl₂: 1 hour leak from 2" hole in Cl₂ railcar.
 - NH₃: 30 minute release from a 3/4" unloading hose.

Endpoints of Chemicals

	ERPG-2
Ammonia	200 ppm
Chlorine	3 ppm
HF	20 ppm
H ₂ S	30 ppm



Emergency Response Scenarios II

- Two more emergency response scenarios were chosen:
 - HF: 10 minute pipe leak.
 - H₂S: 10 minute release from a flange gasket failure

Indoor Concentration vs. Outdoor Concentration

- Based on the preliminary model runs of the indoor concentration for all 4 chemicals, a question was posed on how the outside concentration was affecting the indoor concentration of the house and how they compared.
- To get a better understanding CCHS reviewed the outdoor concentration as well to see when/if it is feasible to advise the community to go outside.

Varying Chemical Effects

	ERPG-1	ERPG-2	ERPG-3
Ammonia	25 ppm	200 ppm	750 ppm
Chlorine	1 ppm	3 ppm	20 ppm
HF	2 ppm	20 ppm	50 ppm
H ₂ S	0.1 ppm	30 ppm	100 ppm



Next Steps

- Better understanding of the relationship between different chemical concentrations and exposure duration (i.e. a dosing relationship) and the observable response.
- CCHS is pursuing using TRACE to understand these effects.
- CCHS is also working with TRACE to look at smoke modeling.
- Lastly CCHS will be working with Safer Systems to develop a way to incorporate this data with our existing GIS mapping system. This will allow us to overlay plumes and see geographical representation of affected areas for planning purposes.