LOG OF MEETING

Date of Meeting: July 29, 1997

Subject of Meeting: Testing of Carbon Monoxide (CO) Detectors

Location of Meeting: CPSC, East-West Towers, Bethesda, Maryland

Log Entry Source: Elizabeth W. Leland, EC

Log Entry Date: July 29, 1997

Attendees:

CPSC

Catherine Cumberland, CA
Mohammed Khan, ESEE
Elizabeth Leland, EC
Warren Porter, LSC
Marcia Robins, EC
Walt Sanders, COAB
Don Switzer, ESEE
Andy Stadnik, AED, ES

Non-CPSC

Irwin H. Billick, WEC Consulting
Sam Christy, Product Safety Letter
Alex Cohen, Consumer
Roger Hedrick, GARD Analytics, Inc.
Michelle Oum, Quantum Group
Sandy Ruiter, Underwriters Laboratories
Frank Stanonik, Gas Appliance Manufacturers Association
Leo Van Lahr, CCI Controls
Steve Wiersma, Gas Research Institute (GRI)
Ted Williams, American Gas Association

Summary of Meeting:

The Gas Research Institute (GRI) requested a meeting with CPSC staff in order to discuss the results of testing of carbon monoxide (CO) detectors. GRI has published two reports of testing completed on 96 CO detectors (24 detectors of 4 brands) at installation and after 3 months; the purpose of the testing was to determine the time-to-alarm of each detector when the detector was exposed to various concentrations of CO. The reports are titled: Chamber Tests of Residential CO Alarms (March 1997) and Chamber Tests of Aged Residential CO Alarms (March 1997) and are available from GRI, 8600 West Bryn Mawr Avenue, Chicago, Illinois, 60631. GARD Analytics, the contractor for GRI who is carrying out the testing, also tested the alarms after 6 months of being powered and presented an analysis of those test results to CPSC staff. (Nine-month testing is also completed, but the data have not yet been analyzed.)

Summaries of the results of the testing are displayed in the attached handout.

CPSA 6 (b)(1) Cleared
X No Mfrs/Prvtlblrs Identified
7/31/97

Research House Testing of Residential CO Alarms

GARD Analytics, Inc.
Project Manager - Roger Hedrick

for Gas Research Institute
Program Manager - Steve Wiersma

Background

- High Rates of Nuisance Alarms
  - Responders often could not find CO levels substantially above ambient
- Unnecessary Burden to Consumers and Utility Customers
- Revision to UL 2034 Ineffective at Eliminating the Problem
- No Field Testing of In-Service Alarms

2

Objective

- Evaluate Field Performance of Commercially Available Alarms
- Compare Alarm Performance to Basis of UL 2034 Criteria
- Evaluate Sensor Response Changes over Time

3

Units Tested

- Purchased 96 Alarm Units from Retail Outlets in Chicago Suburbs
- Units Include 24 Units Each of 4 Models from 4 Manufacturers
- All Units Certified to 1995 Revision of UL Standard 2034
- Brands A1, A2 and A4 Purchased from Multiple Stores, A3 All from 1 Store

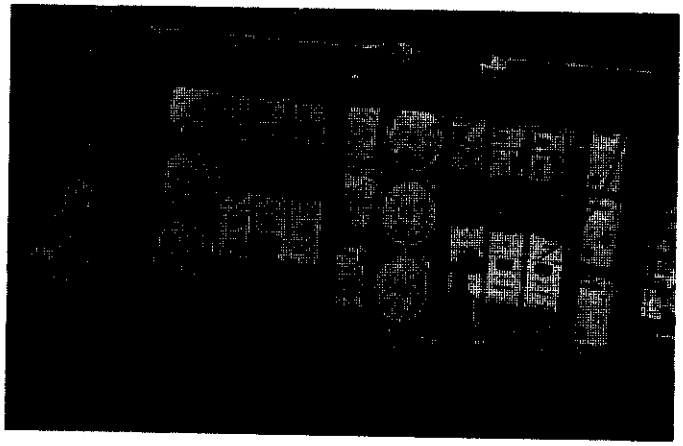
4

Test Configuration

- Conventional Research House in Chicago Used for Testing
- Test Chamber Set Up in Basement
- Space for 6 Units of Each Brand (24 Units) per Test
- Each Unit Can be Depowered Individually after Alarm Activation

5

Test Chamber



6

Test Procedure

- CO in Air Supplied to Chamber to Bring Concentration Rapidly to Target
- CO Concentration then Changed to Maintain Target
- Chamber Concentration Continuously Monitored by Non-Dispersive Infrared CO Analyzer

7

Test Procedure (Cont'd)

- Time of Alarm Activation Recorded for Each Unit
- COHb at Alarm Calculated for Each Unit

8

Test Concentrations

- Tests Performed at Five Concentrations
  - 40 ppm
  - 60 ppm
  - 100 ppm
  - 200 ppm
  - 400 ppm
- UL 2034 Contains Test Criteria At These Concentrations, Except 40 ppm

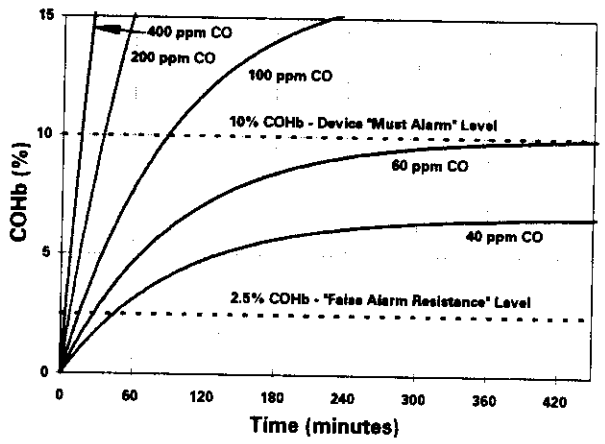
9

Test Duration

Concentration (ppm)	UL 2034 "Must Alarm" Time (min)	Test Duration (min)
40	None	480
60	None	480
100	**90**	**180**
200	**35**	**50**
400	**15**	**30**

10

COHb over Time



11

Aging Tests

- Four Test Series Completed to Date:
  - Initial – 96 Units Each at 5 Concentrations
  - 3 Month – 96 Units at 1 Concentration
  - 6 Month – 96 Units at 1 Concentration, 24 Units at 4 Concentrations
  - 9 Month – 96 Units at 1 Concentration

12

Aging Tests (Cont'd)

- At Least One More Series Planned:
  - 12 Month – 96 Units at 5 Concentrations
- Initial, 3 Month and 6 Month Results Presented Here
  - Reports available - GRI-97/0082 and GRI-97/0082.1
  - 6 month report in preparation
  - 9 month tests just performed - July 16-21

13

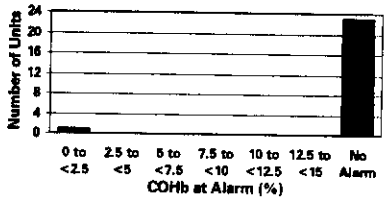
Results

- Units Evaluated on COHb at Alarm Vs. UL 2034 Criteria
- Mean COHb at Alarm by Brand and CO Concentration
- Standard Deviation in COHb at Alarm by Brand and Concentration

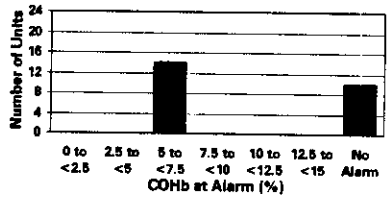
14

COHb at Alarm
Initial Tests - 40 ppm

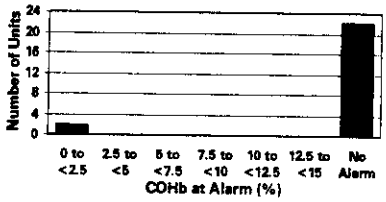
Brand A1



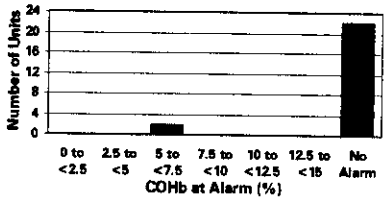
Brand A2



Brand A3



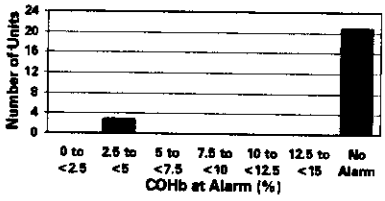
Brand A4



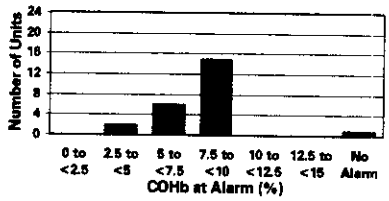
15

COHb at Alarm
Initial Tests - 60 ppm

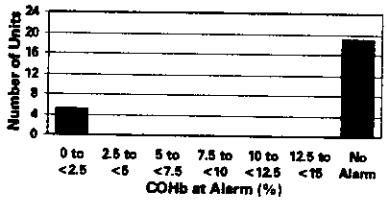
Brand A1



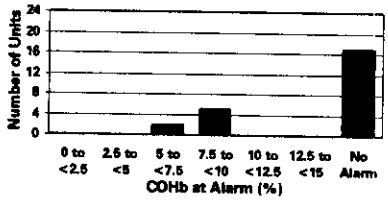
Brand A2



Brand A3



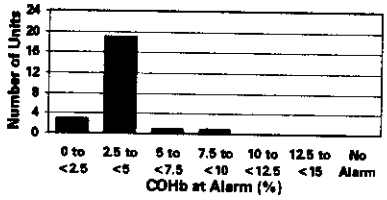
Brand A4



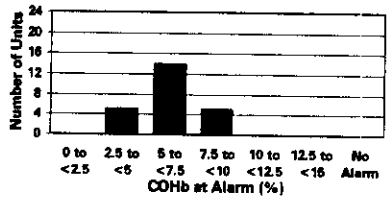
16

COHb at Alarm
Initial Tests - 100 ppm

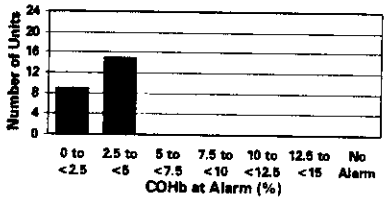
Brand A1



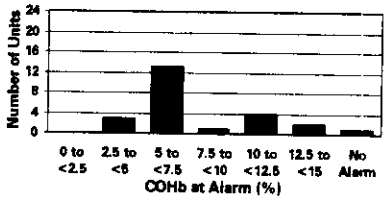
Brand A2



Brand A3



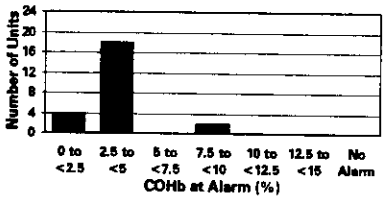
Brand A4



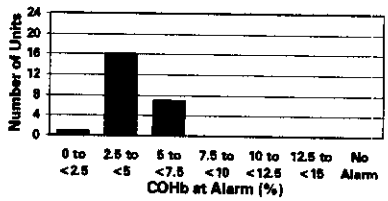
17

COHb at Alarm
Initial Tests - 200 ppm

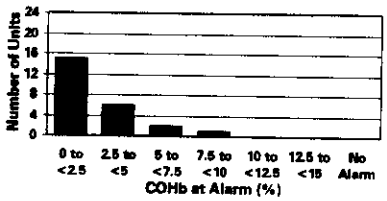
Brand A1



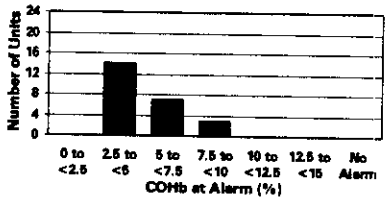
Brand A2



Brand A3



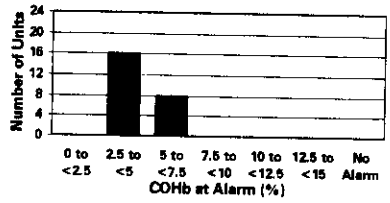
Brand A4



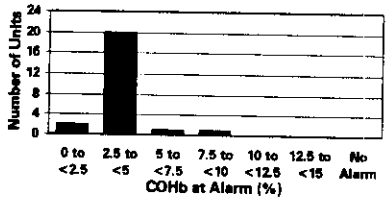
18

COHb at Alarm
Initial Tests - 400 ppm

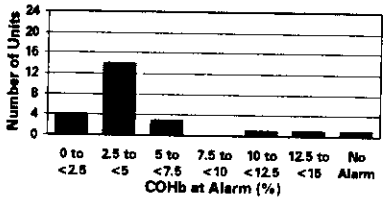
Brand A1



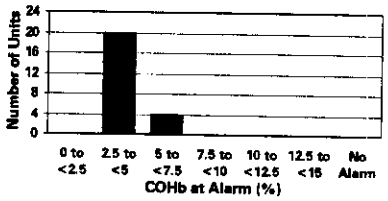
Brand A2



Brand A3



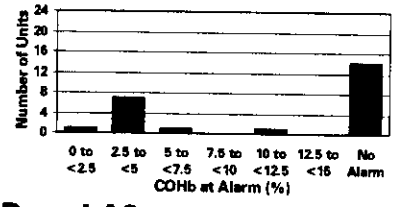
Brand A4



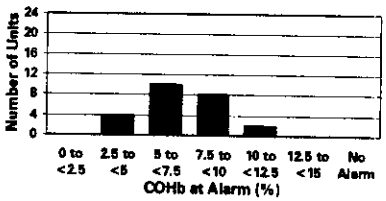
19

COHb at Alarm
3 Month Tests - 100 ppm

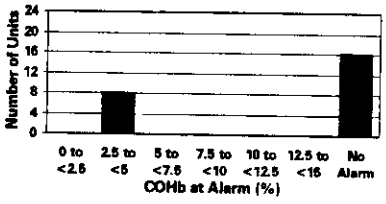
Brand A1



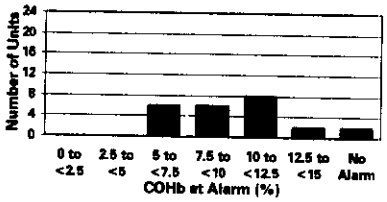
Brand A2



Brand A3



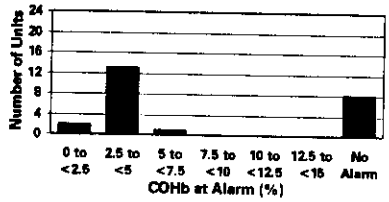
Brand A4



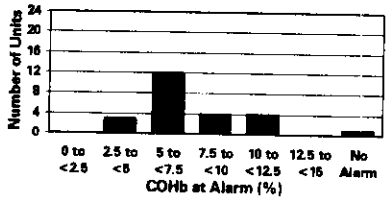
20

COHb at Alarm
6 Month Tests - 100 ppm

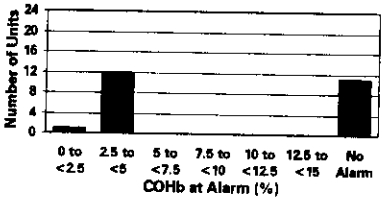
Brand A1



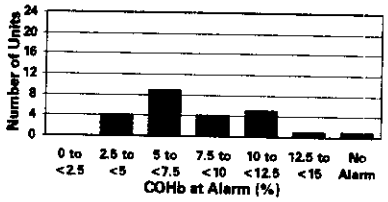
Brand A2



Brand A3

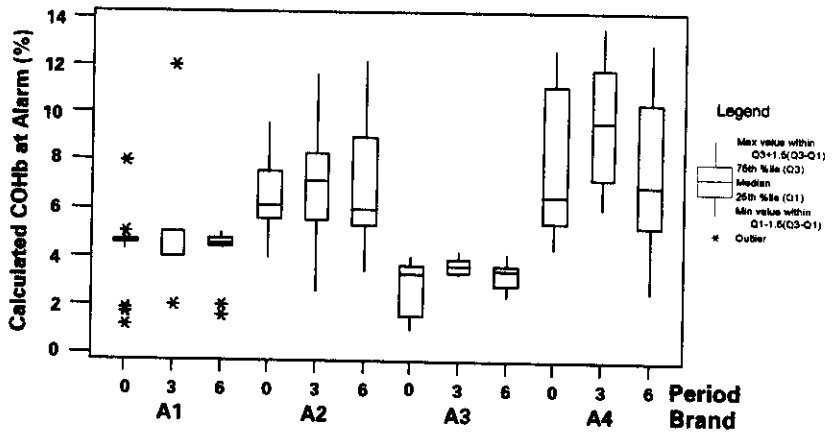


Brand A4



21

COHb at Alarm - 100 ppm



22

COHb at Alarm

100 ppm - 6 Month vs. Original and 3 Month Results

				COHb at Alarm				
		N	N*	Mean	Median	StDev	Min	Max
A1	0 Month	24	0	4.41	4.68	1.29	1.18	7.96
	3 Month	10	14	5.15	4.74	2.39	2.24	11.53
	6 Month	16	8	4.27	4.53	0.98	1.59	5.05
	Δ vs. 0 Month	-8	8	-0.15	-0.15	-0.31	0.41	-2.91
	Δ vs. 3 Month	6	-6	-0.89	-0.21	-1.41	-0.65	-6.48
A2	0 Month	24	0	6.36	6.18	1.53	3.99	9.60
	3 Month	24	0	7.01	7.11	2.15	2.62	11.65
	6 Month	23	0	6.96	5.98	2.40	3.44	12.19
	Δ vs. 0 Month	—	—	0.60	-0.20	0.87	-0.55	2.59
	Δ vs. 3 Month	—	—	-0.06	-1.12	0.24	0.81	0.54

23

COHb at Alarm

100 ppm - 6 Month vs. Original and 3 Month Results

				COHb at Alarm				
		N	N*	Mean	Median	StDev	Min	Max
A3	0 Month	24	0	2.74	3.32	1.08	1.09	4.05
	3 Month	8	16	3.72	3.67	0.33	3.28	4.27
	6 Month	13	11	3.32	3.44	0.54	2.40	4.11
	Δ vs. 0 Month	-11	11	0.58	0.12	-0.54	1.32	0.06
	Δ vs. 3 Month	5	-5	-0.40	-0.23	0.21	-0.88	-0.17
A4	0 Month	23	1	7.53	6.49	2.96	4.05	12.59
	3 Month	22	2	9.63	9.65	2.41	6.05	13.61
	6 Month	23	1	7.61	7.03	2.85	2.66	12.92
	Δ vs. 0 Month	0	0	0.09	0.54	-0.11	-1.39	0.34
	Δ vs. 3 Month	1	-1	-2.02	-2.62	0.44	-3.39	-0.69

24

-END-