

**Illinois Department of
Public
Health**

John R. Lumpkin, M.D., M.P.H., Director

525-535 West Jefferson Street • Springfield, Illinois 62761-0001
#901279501

February 27, 1995

Mr. Joseph Pater
Grant Elementary School
1300 North 34th St.
Melrose Park, IL 60160

Dear Mr. Pater:

The Illinois Department of Public Health (IDPH) conducted an evaluation of indoor air quality (IAQ) at Grant Elementary School, Melrose Park, Illinois, from January 27 through February 1, 1995. The instruments used measured temperature in degrees fahrenheit (F), relative humidity (%RH), carbon dioxide (CO₂). The graphs generated from this sampling are attached. The uppermost line marked with a diamond symbol represents the temperature fluctuation over the sampling period. The middle line marked with a square symbol represents the CO₂ concentration detected during the sample period. The lower line marked with a triangle symbol represents relative humidity. The maximum, minimum, and average values over the sample period are shown in the lower left corner of the graph.

The purpose of the sampling was to determine if the heating, ventilation, and air conditioning (HVAC) system was operating properly, and to evaluate the air quality in different parts of the building. An HVAC system includes all heating, cooling, and ventilation equipment serving a building. A properly designed HVAC system provides thermal comfort, distributes adequate amounts of outdoor air to meet ventilation needs of all building occupants, and isolates and removes odors and contaminants through pressure control, filtration, and exhaust fans. HVAC systems have been identified as the primary cause of occupant complaints in the indoor air quality investigations conducted by IDPH. Grant Elementary School's HVAC system supplies heat and make-up air to three floors of classrooms. Windows are opened to varying degrees by teachers to regulate temperature and to relieve "stuffy" conditions.

Since CO₂ is a normal constituent of exhaled breath, measurements can be used to determine if the quantity of outdoor air that is being delivered to occupants is adequate. High concentrations of CO₂ indicate that outside air is not being adequately supplied to the building to mix with recirculated air. If indoor CO₂ concentrations are more than 1000 parts per million (ppm), complaints such as headaches, fatigue, eye, nose and throat irritations are often found to be prevalent. The elevated CO₂ concentration itself is not responsible for the

complaints; however, high CO₂ concentrations are indicative of stale stagnant air which can contribute to occupant complaints. Elevated CO₂ levels were noted in room 202, room 205, and in room G-7.

Currently, there are no regulations for the amount of outdoor air that is supplied to buildings. The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) has published guidelines, *Ventilation for Acceptable Indoor Air Quality* (62-1989), that recommends the amount of outdoor air that should be supplied to buildings. These guidelines are recognized throughout the country and some states have adopted these guidelines into legislation. These guidelines recommend that school classrooms be supplied with 15 cubic feet per minute (CFM) of outside air per person. This volume of make-up air roughly corresponds with a CO₂ concentration of 1000 ppm. This ASHRAE guideline is marked with a dotted line on the graphs to indicate when the volume of make-up air to the classrooms was low. Room 202 had the poorest IAQ during the long term sampling. This classroom was being supplied with about 5.5 CFM of outside air per person at peak occupancy on February 1. Room 205 was being supplied with about 9.5 CFM of outside air per person on January 30. Room G-7 was being supplied with about 13 CFM per person on January 30. The other rooms tested were receiving adequate volumes of make-up air.

Relative humidity is also routinely sampled in indoor air investigations. Relative humidity can be an important factor for occupant comfort. High relative humidity reduces the body's ability to lose heat, and can increase levels of body odors. Sensitivity to odors increases with increased humidity, as does release of gases from some building materials. High relative humidity (above 60%) can support microbial growth inside buildings. Relative humidities that are too low can dehydrate skin and mucous membranes. Recent studies have found higher rates of nasal, eye, skin, and mucous membrane symptoms, lethargy, and headaches in low relative humidity environments. Occupants who wear contact lenses often have problems with low relative humidities, due to lenses irritating the eyes from lack of moisture. The ASHRAE 62-1989 Ventilation Standard recommends that relative humidity be maintained between 30% and 60%.

Relative humidities in the building averaged from 11% to 16% during the sample period. The school has no mechanism to control relative humidity. In general, classroom temperatures during the sampling were maintained slightly higher than the upper range of the comfort zone recommended by ASHRAE (*Thermal Environmental Conditions for Human Occupancy* 55-1992). At a relative humidity of 20%, the ASHRAE thermal comfort range is from about 68 to 74.

In addition to the general indoor air parameters described above, IDPH conducted bioaerosol sampling in several first and second floor rooms. Samples were collected, maintained at room temperature, and incubated at IDPH labs in Springfield where they were read by a staff microbiologist. No microbial colony forming units were detected. The dry conditions of winter are not conducive to microbial growth. There was no evidence of water damage or visible mold growth in the school, and no mold-like odors were present.

Based on our sampling, our observations, and the concerns of district employees, IDPH recommends the following:

1. Make sure make-up air is adequate to meet the ASHRAE guideline of 15 CFM per occupant.
2. Adjust thermostats to temperatures within the ASHRAE thermal comfort range.

If you have any questions or require additional information, feel free to contact me at (217) 782-5830.

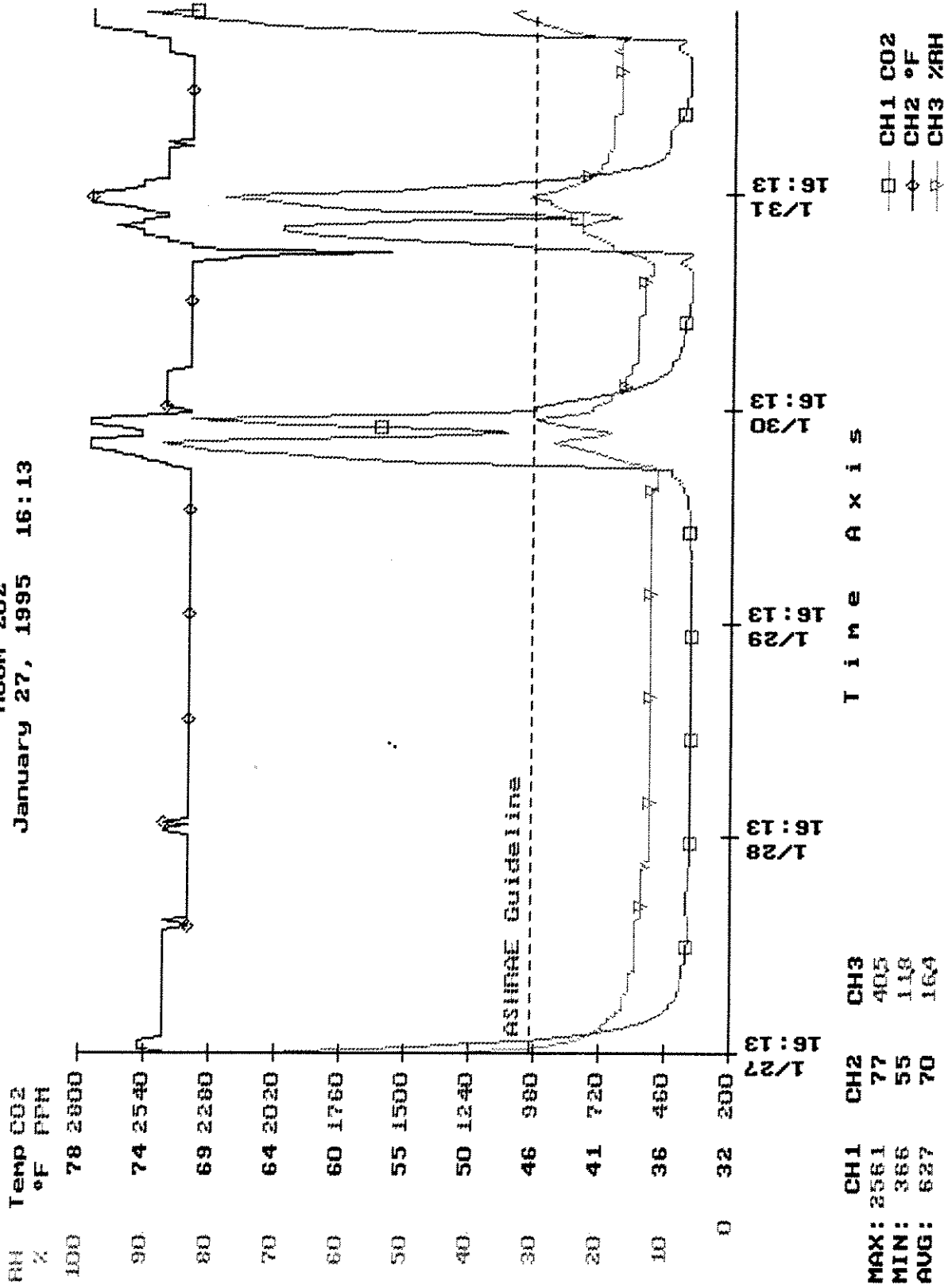
Sincerely,



K. D. Runkle
Toxicology Section

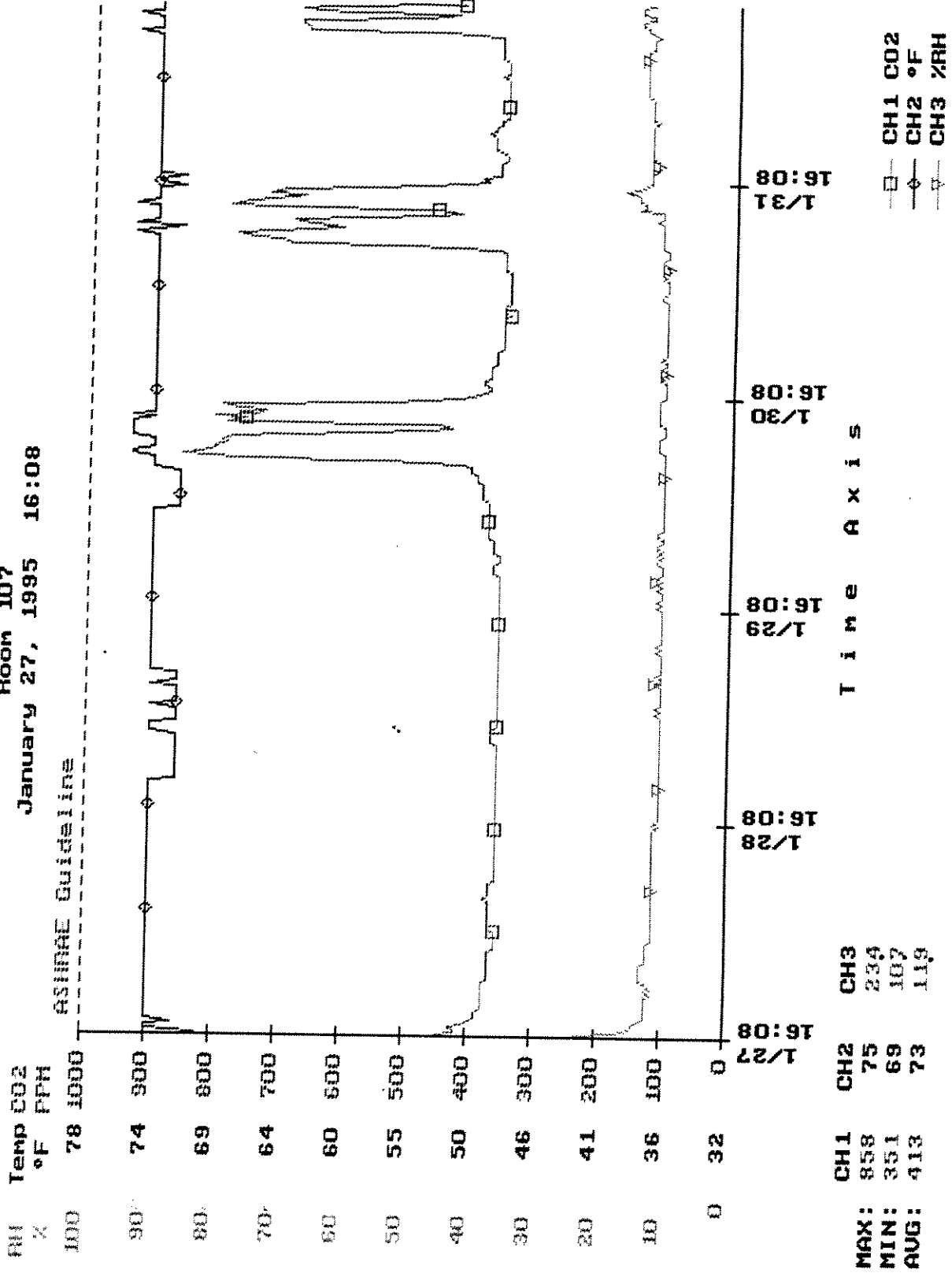
cc: IDPH W. Chicago Regional Office

Grant Elementary School
 Room 202
 January 27, 1995 16:13



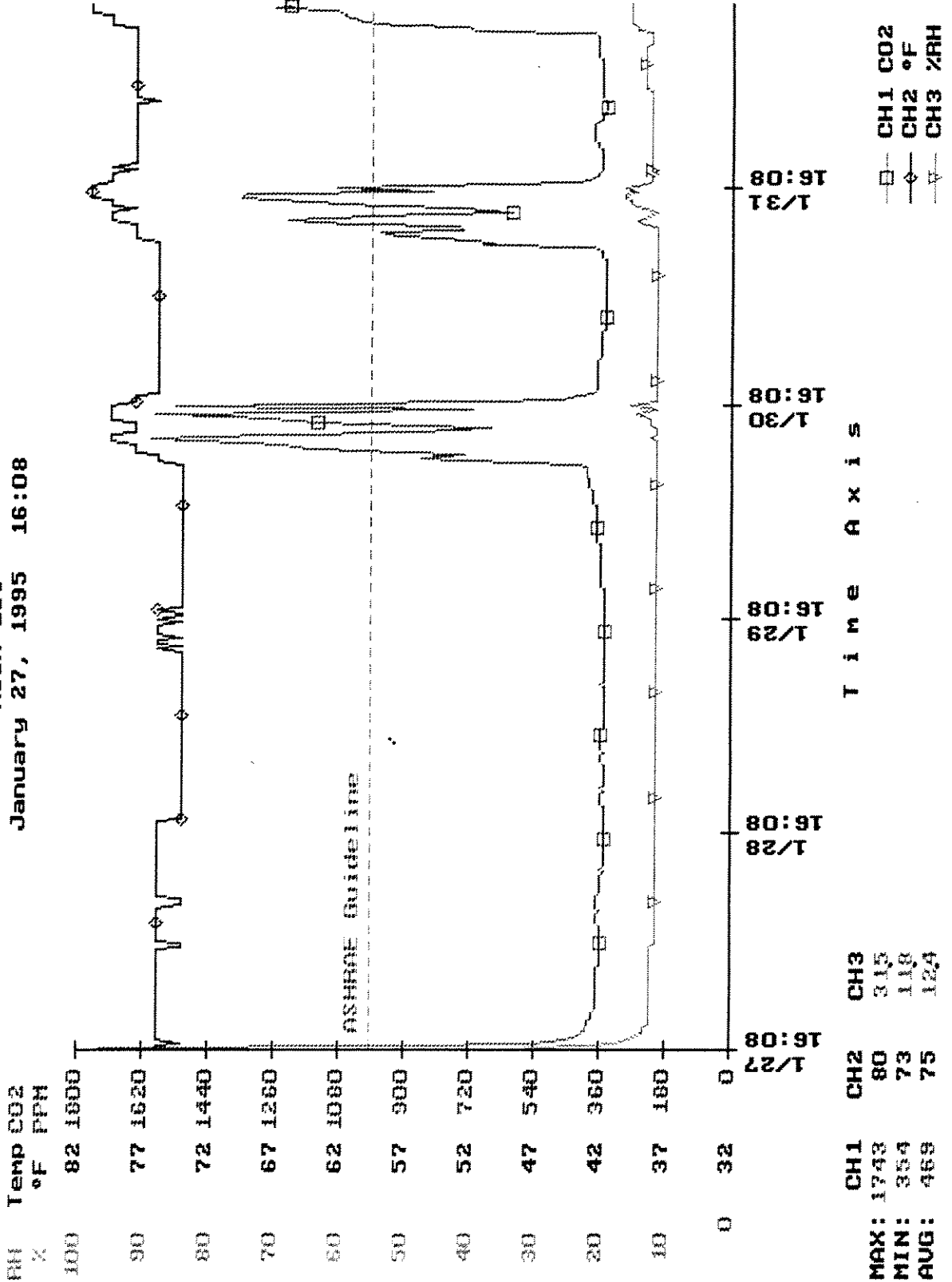
	CH1	CH2	CH3
MAX:	2561	77	405
MIN:	366	55	118
AUG:	627	70	169

Grant Elementary School
 Room 107
 January 27, 1995 16:08



	CH1	CH2	CH3
MAX:	858	75	234
MIN:	351	69	107
AUG:	413	73	119

Grant Elementary School
 Room 205
 January 27, 1995 16:08



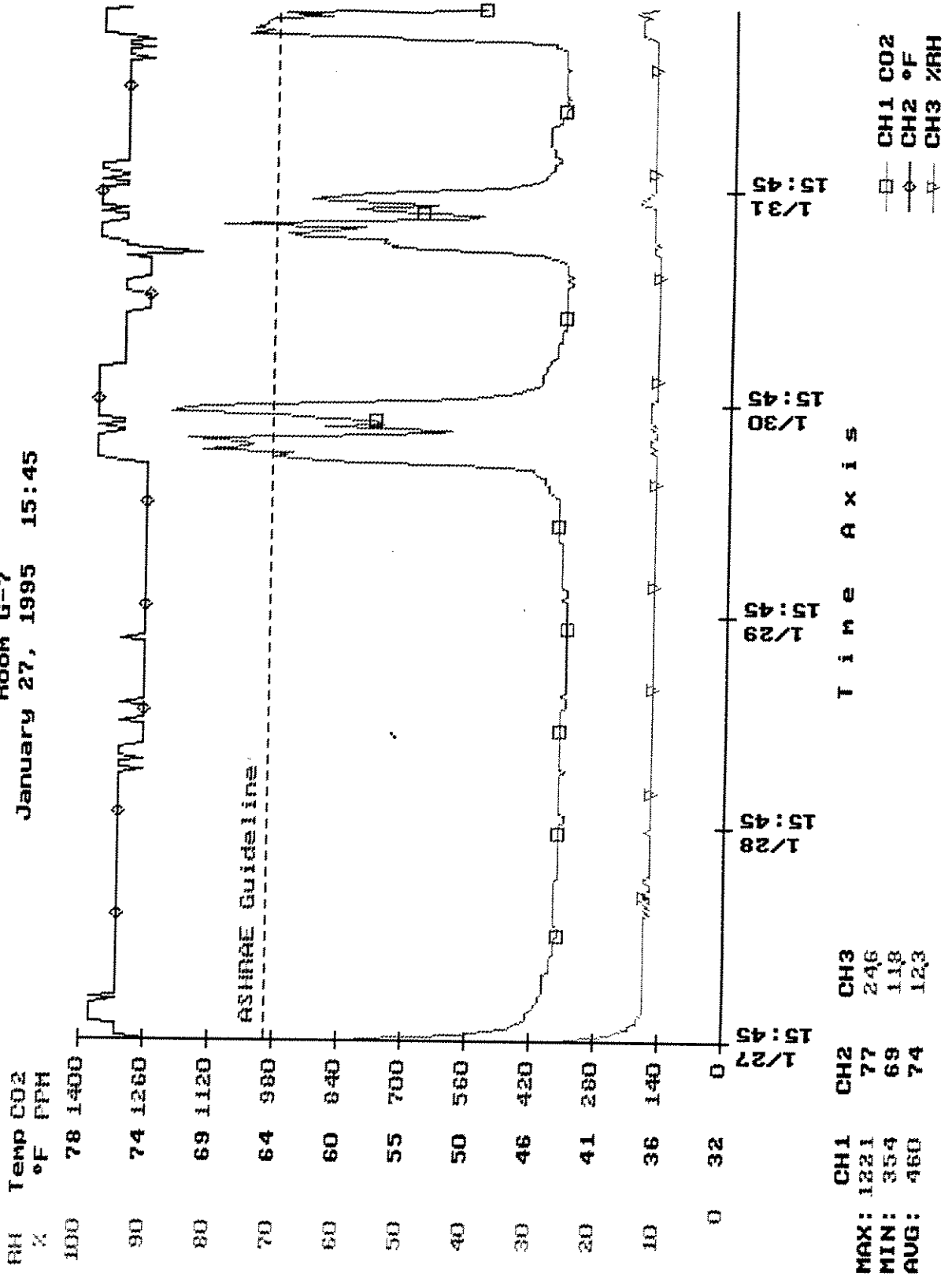
PH Temp CO2
 % PPH

	CH1	CH2	CH3
MAX:	1743	80	315
MIN:	354	73	118
AUG:	469	75	124

Time Axis

CH1 CO2
 CH2 °F
 CH3 %RH

Grant Elementary School
 Room G-7
 January 27, 1995 15:45

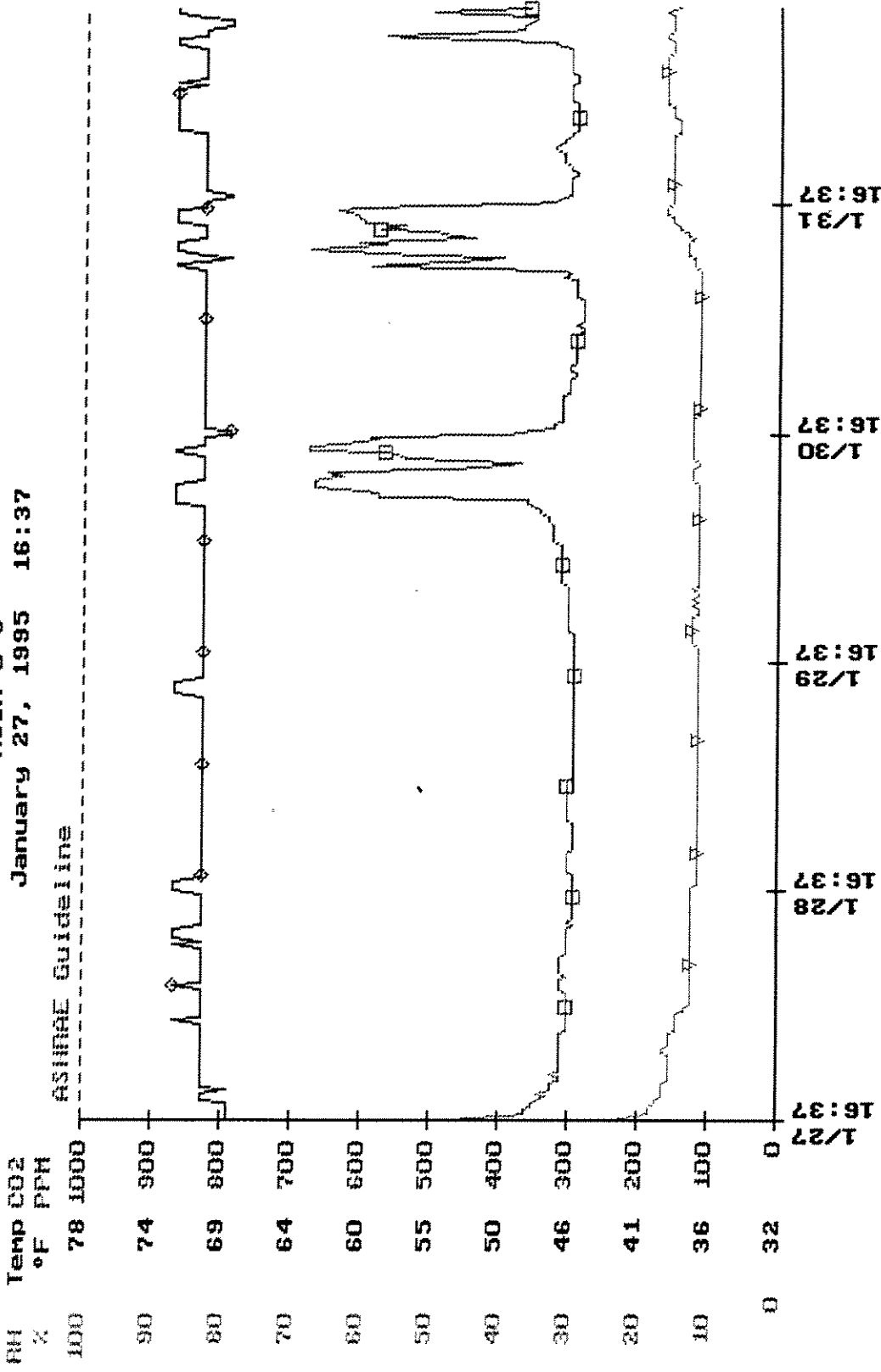


	CH1	CH2	CH3
MAX:	1221	77	246
MIN:	354	69	118
AUG:	460	74	123

T i m e A x i s

CH1 CO2
 CH2 °F
 CH3 %RH

Grant Elementary School
 Room G-3
 January 27, 1995 16:37



RH %
 100 78 1000
 90 74 900
 80 69 800
 70 64 700
 60 60 600
 50 55 500
 40 50 400
 30 46 300
 20 41 200
 10 36 100
 0 32 0

	CH1	CH2	CH3
MAX:	679	71	226
MIN:	285	68	118
AUG:	341	70	133

CH1 CO2
 CH2 °F
 CH3 %RH

Grant Elementary School
 Music Room G-8
 January 27, 1995 20:57

