

AN INDUSTRIAL HYGIENE SURVEY

OF THE

GSA PRINTING PLANT

CINCINNATI, OHIO

AUGUST 25-28, 1975

September 22, 1975

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SUMMARY

On August 25-28 and September 22, 1975, the Industrial Hygiene Services Branch of the National Institute for Occupational Safety and Health conducted an environmental survey of the printing plant of the General Services Administration (GSA) located in the sub-basement of the Federal Office Building (FOB) in Cincinnati, Ohio.

Atmospheric samples were taken for carbon monoxide, nitrogen dioxide, benzene and perchloroethylene. All results were negative. (Tables 1-3) Deficiencies in the ventilation system were found; the ventilation system in the print shop is unbalanced. The system delivers a total of 3300 cubic feet of air per minute (CFM) while exhausting a total of 700 CFM. (Tables 4-5). A properly balanced ventilation system should have approximately the same amount of supplied air as exhausted air.

INTRODUCTION

On August 25-28 and September 22, 1975, the Industrial Hygiene Services Branch of the National Institute for Occupational Safety and Health conducted an environmental survey of the printing plant of the General Services Administration (GSA) located in the sub-basement of the Federal Office Building (FOB) in Cincinnati, Ohio. The study was conducted at the request of Mr. Donald Burke, Building Manager, GSA, Cincinnati, Ohio.

BACKGROUND

In February 1970, the Bureau of Occupational Safety and Health conducted a survey of the GSA print shop and studied its ventilation system. At that time employees were complaining of headaches and unpleasant odors. Investigators found the fresh air supply for the printing plant was separate from the main ventilation system and the inlet supply grille was located ten feet above ground level near a loading dock located in the alley behind the FOB. The proximity of the inlet supply grille to engine exhaust emissions was thought to be the cause of the problem. Subsequently, the inlet supply grille was relocated laterally away from the loading dock. Since then no complaints had been received from GSA until August 1975.

DESCRIPTION OF FACILITY

The GSA printing plant consists of a printing shop, paper baling shop (storage) and two offices. In the print shop approximately six (6) employees perform printing and related duties. During printing operations small amounts of benzene and perchloroethylene are used to clean the rollers on the multilith machines. The paper baling shop is used predominantly as a storage and plate making room. Employees are very seldom in this room. (Figure 1).

ENVIRONMENTAL STUDY PROCEDURES AND SAMPLING RESULTS

Samples were taken for carbon monoxide (CO) using an Ecolyzer, Model 2400. The Ecolyzer was located on a table top in the printing shop near Point "E". (Figure 1) Samples were also taken for nitrogen dioxide and carbon monoxide using Draeger length-of-stain detector tubes. (Tables 1 & 3)

Samples for benzene and perchloroethylene were collected on activated charcoal tubes and detector tubes. (Tables 2 & 3)

All samples for carbon monoxide, nitrogen dioxide, benzene and perchloroethylene were below the federal standards.

TOXICOLOGY AND HYGIENIC STANDARDS

Carbon Monoxide: Carbon monoxide is a colorless, tasteless and odorless gas. Inhalation exposure to excessive concentrations may produce one or more symptoms: tightness across the forehead, weariness, dizziness, nausea, vomiting, increased rate of respiration, slowing of pulse and death. At lower concentrations, alertness, vision and time preception are affected. Carbon monoxide can form as a result of incomplete combustion of gasoline in internal combustion engines.

Nitrogen Dioxide: Nitrogen dioxide is a reddish brown gas above 70°F. The first effects of exposure to high concentrations may be only bronchial irritation. Later symptoms of dizziness and headache may be followed by edema. Exposure to low concentrations may produce systemic effects in the body. The gas can be produced following oxidation of atmospheric nitrogen in the internal combustion engine.

Benzene: Benzene is a clear, colorless, highly flammable organic liquid. Hematological changes can occur following chronic exposure to the compound. In acute heavy exposures to the vapor there is a sense of well being followed by headache, giddiness and vomiting. When in contact with the skin a dermatitis may follow removal of natural skin oils.

Perchloroethylene: Perchloroethylene is a clear, colorless, non-flammable organic liquid. Symptoms of over exposure to the vapor include irritation of mucous membranes, sleeplessness, nausea, loss of appetite and shortness of breath. Skin exposure may cause acute and chronic forms of dermatitis.

The present federal standards as promulgated by the Occupational Safety and Health Administration (OSHA) are found in the Federal Register, Volume 39, Part 1910.93, Subpart G, Tables 1 and 2.

CONTAMINANT	CONCENTRATION (PPM)*
Carbon Monoxide	50
Nitrogen Dioxide	5
Benzene	10
Perchloroethylene	100

*PPM=parts of contaminant per million parts of air, 8-hour time-weighted average concentration.

VENTILATION

The ventilation system for the print shop is unbalanced. The ventilation system in the GSA print shop delivers a total of 3300 cubic feet of air per minute (CFM) and exhausts a total of 700 CFM. (Tables 4 & 5) As a result, stale air "builds up" and creates an uncomfortable working environment. A properly balanced ventilation system should have approximately the same amount of supplied air as exhausted air.

A substantial amount of air which should be exhausted through ductwork located in the print shop is actually being exhausted by ductwork located in the paper baling shop. This is evidenced by the measurement of 2900 CFM in the doorway leading to the baling shop. As a consequence, air from supply grille #10 is being short-circuited into the paper baling shop. The even distribution of air into the print shop is decreased by this condition.

DISCUSSION AND RECOMMENDATIONS

During the winter months the vehicles will be idling while waiting to be unloaded or during unloading, rather than be turned off. This may increase the possibility of exhaust emissions entering the ventilation system and being distributed in the printing shop.

To alleviate these conditions the following recommendations are made:

1. The inlet supply grille should be located at a minimum height of 25 feet above ground level.
2. The ventilation system for the printing shop should be balanced. Additional exhaust ducts should be installed and located to facilitate even air distribution.
3. All vehicle engines should be turned off during loading, unloading or while waiting.

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TABLE 1

RESULTS OF CARBON MONOXIDE SAMPLING
GSA PRINT SHOP
FEDERAL OFFICE BUILDING
CINCINNATI, OHIO

SAMPLING PERIOD		
DATE	HOURS/MINUTES	RANGE OF CONCENTRATION (PPM) *
8/25/75	6 hrs/45 min.	4 - 10
8/26/75	6 hrs/20 min.	5 - 13
8/28/75	7 hrs/5 min.	4 - 20

*PPM = Parts of Carbon Monoxide Per Million Parts of Air.

TABLE 2

RESULTS OF PERSONAL SAMPLING FOR ORGANIC VAPORS
GSA PRINT SHOP
FEDERAL OFFICE BUILDING
CINCINNATI, OHIO

DATE	EMPLOYEE	SAMPLING PERIOD HOURS/MINUTES	CONCENTRATION (Mg/M ³)* (PPM)**	
			BENZENE	PERCHLOROETHYLENE
8/26/75	Printer	3 hrs/45 min.	11*(3.4)**	22 (3.2)
"	"	3 hrs	6 (1.9)	11 (1.6)
"	"	3 hrs	5 (1.6)	12 (1.8)
8/28/75	"	3 hrs/25 min.	7 (2.1)	14 (2.1)
"	"	3 hrs/25 min.	8 (2.5)	12 (1.8)
"	"	3 hrs	3 (0.9)	5 (0.7)
"	"	3 hrs	4 (1.2)	13 (1.9)

* Mg/M³ = Milligrams of Contaminant per Cubic Meter of Air.
** PPM = Parts of Contaminant per Million Parts of Air.

TABLE 3

DETECTOR TUBE RESULTS
GSA PRINT SHOP
FEDERAL OFFICE BUILDING
CINCINNATI, OHIO

DATE	LOCATION	RANGE OF CONCENTRATION (PPM) *			
		CO	NO ₂	PERC**	BENZENE
8/25	Print Area	N.D.	--***	--	--
8/26	Print Area (near supply air duct)	8	0	0	0
	Bindery Area	5	--	--	--
8/27	Print Area (near supply air duct)	5	--	--	--
8/28	Print & Bindery Areas	4-6	0	0	0

* PPM = Parts of Contaminant per Million Parts of Air.

** Perc = Perchloroethylene.

*** -- = Not Sampled at This Area.

TABLE 4

VENTILATION SURVEY
GSA PRINT SHOP
FEDERAL OFFICE BUILDING
CINCINNATI, OHIO

9/22/75

AIR INTAKE

LOCATION	VELOCITY (FPM)*	CFM**
<u>Printing & Publication Shop</u>		
Grille, South End	800	1500
Grille, North End	600	1100
Small Grille, North End	600	200
Diffusors:		
1	50	20
2	100	40
3	200	70
4	200	70
5	100	80
6	300	140
10	<u>100</u>	<u>70</u>
Total	3050	3300
<u>Paper Baling (Storage) Shop</u>		
Grille, South End	800	2500
Grille, North End	700	2400
Diffusor (Dark Room) #9	<u>200</u>	<u>100</u>
Total	1700	5000

* FPM = Feet of Air per Minute.

** CFM = Cubic Feet of Air per Minute.

TABLE 5

VENTILATION SURVEY
GSA PRINT SHOP
FEDERAL OFFICE BUILDING
CINCINNATI, OHIO

9/22/75

AIR EXHAUST

LOCATION	VELOCITY (FPM)*	CFM**
<u>Printing & Publication Shop</u>		
Grilles (near double doors)		
1	10	40
2	10	30
3	50	100
4	100	300
Louvers (in double doors)	<u>100</u>	<u>250</u>
Total	270	720
<u>Paper Baling (Storage) Shop</u>		
Grilles		
1	800	2600
2	<u>700</u>	<u>1300</u>
Total	1500	3900

* FPM = Feet of Air per Minute.

** CFM = Cubic Feet of Air per Minute.

FIGURE 1
GENERAL SERVICES ADMINISTRATION
PRINTING PLANT
FOB, CINCINNATI, OHIO

