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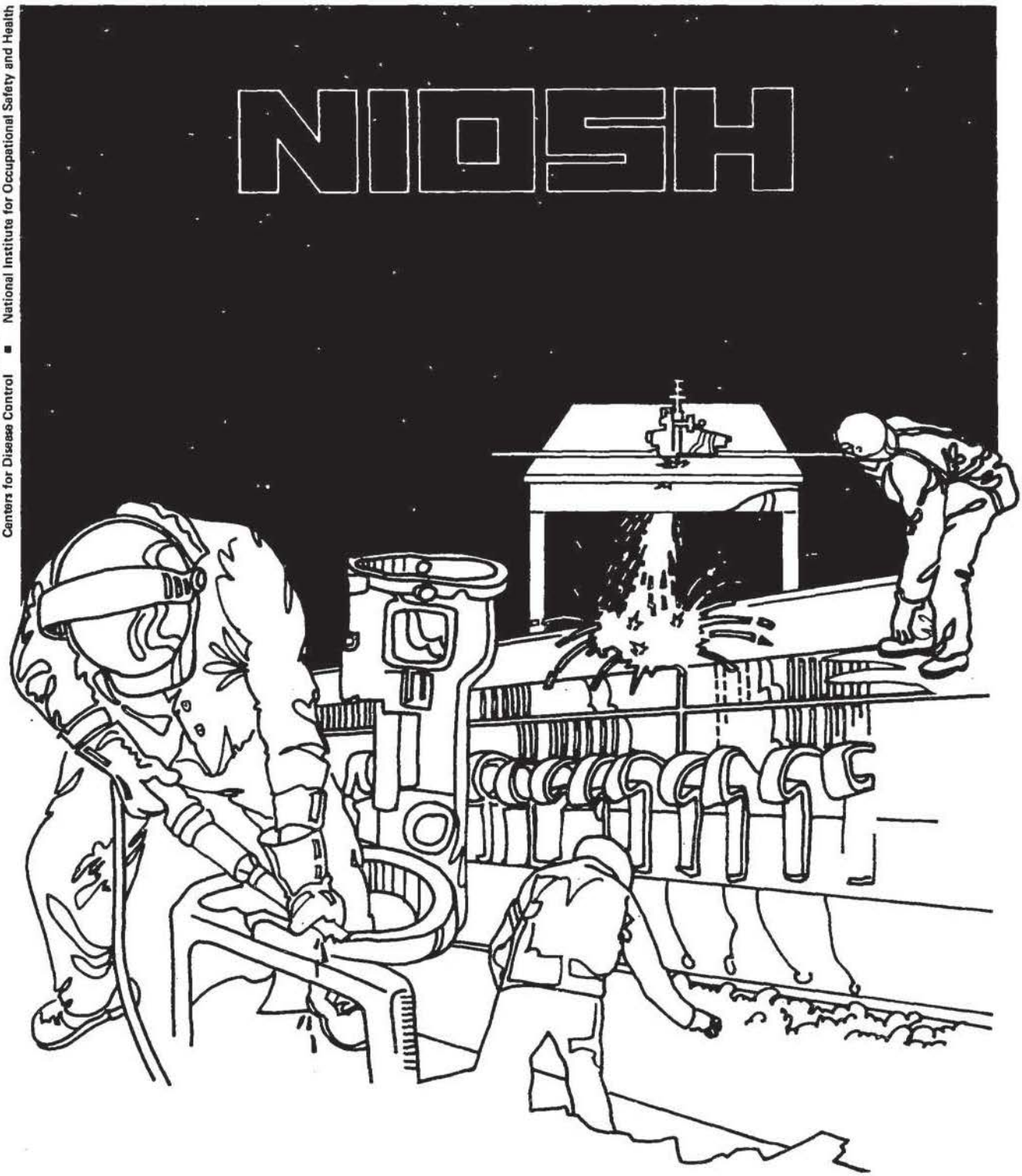

Health Hazard Evaluation Report

HETA 82-026-1272
JACKSON COUNTY
PARKS DEPARTMENT
MEDFORD, OREGON

HETA 82-026-1272
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Jackson County Parks Department
Medford, Oregon

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I SUMMARY

In November 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request from the Department of General Services, Jackson County, Oregon, to evaluate symptoms of dizziness, tremors, tingling and numbness in the arms and legs, chest pain, headache, nausea and eye irritation experienced by eight employees in the Parks Department Office and maintenance building, White City, Oregon.

In November 1981, NIOSH conducted an initial survey and on June 22 and 23, 1982, environmental samples were collected. The medical records of the affected workers were reviewed by a NIOSH physician.

The air samples and cement dust samples collected were qualitatively and quantitatively analyzed for organic vapors and pesticides. The pesticides identified were DDT, DDE, diazinon, and malathion. The airborne diazinon concentration in the old office was 3 ug/cu m or 33 times less than the evaluation criteria of 100 ug/cu m and in the new office was 0.1 ug/cu m. The airborne concentration of malathion present along the south wall was 0.5 ug/cu m which is 3,000 times less than the evaluation criteria. The charcoal tube samples showed traces of C-9 to C-16 aliphatic hydrocarbons and aromatic compounds (toluene, xylene and higher alkyl substituted benzenes). They were all less than 0.1 ppm which is 1,000 times less than the evaluation criteria for these substances.

The common symptoms previously experienced by the workers were dizziness, tremors, tingling and numbness in the arms and legs and chest pain. Other symptoms were headaches, nausea and eye irritation. The symptoms experienced by the workers occurred according to the following time frame: 1) none of the affected workers experienced the stated symptoms prior to the time the office was enlarged to include the former pesticide mixing and storage area; 2) the individuals felt better when they were away from work on weekends and vacations; 3) during the colder weather when the introduction of fresh outside air was minimal since the windows were kept closed and fresh air was not provided through the heating system; 4) after the old office area was converted to the county office supply warehouse and office, the two persons working in this area began to experience symptoms similar to those experienced by the former occupants of the room; and 5) on the day the hole was drilled through the concrete, a worker whose desk was in the immediate area experienced lightheadedness, chest pain and numbness in the arms and legs.

On the basis of the data collected from this evaluation, NIOSH has determined that there appears to be a correlation between the occurrence of symptoms to the time the old office was enlarged and a decrease in symptoms to the time the employees were away from and later moved out of the area. Recommendations to reduce or prevent exposure to potential air contaminants are included in this report.

KEYWORDS: SIC 8999 (Miscellaneous Services) insecticides, offices, pesticides, DDT, DDE, diazinon, malathion, parathion, petroleum solvents, toluene, xylene

II INTRODUCTION

In November 1981 the National Institute for Occupational Safety and Health (NIOSH) received a request from the Jackson County Department of General Services to determine if the adverse health effects experienced by eight employees in the Parks Department office and maintenance building are a result of exposure to airborne contaminants present in the work area. An initial survey was conducted on November 2, 1981, and an environmental survey on June 22 and 23, 1982. The medical records of the affected workers were reviewed by a NIOSH physician.

III BACKGROUND

The Jackson County Parks Department office and maintenance shop is in a former World War II Army motor pool building. It is approximately 80 x 256 feet in area and 30 feet high. In the center of the south side is a large floor drain where the wash rack was located which reportedly is connected to the sewer. There is also evidence that there were several floor drains in the northeast corner of the building that have since been covered over. After WWII, the building was used by the Parks Department as a storage area for pesticides and herbicides. These were stored in an area on the South side next to the wash rack. There was also pesticide mixing, storage and loading in the northeast corner. The building was then converted to a maintenance and warehouse shop with an office area in the northeast corner and a tool room directly to the west. Next to the tool room was a woodwork shop, next to that a conference room and then the restroom. In February of 1979, the office in the northeast corner was enlarged. The room is well insulated on the outside walls with fibrous glass insulation. The windows are thermopane. Heat was provided by a heat pump. There were no provisions for fresh make up air other than a window. (See attached drawing for a schematic of the building.)

The first person affected experienced symptoms in August of 1979. Her desk was in a corner of the room that had been added to the office. This area was formerly a pesticide mixing and loading area. Three of the other affected persons also had offices in this area.

In September 1981, a small trailer was placed in the building and the persons who were affected were moved into it. Their symptoms decreased after this move. In April 1982, a new office area was constructed in the northwest portion of the building that replaced the old conference room and wood shop. The workers then moved from the trailer to the new office area.

The old office area was converted to the county office supply warehouse and office in early 1982. Several of the walls which enclosed individual offices were removed. There is now a large amount of carbonless paper stored in this area.

There were three areas in the building where odors were detected by the NIOSH investigator: the old office area where pesticides had been stored, mixed, and loaded (a test hole was cut through the concrete here in August 1981); the new office area; and along the middle of the south wall, where pesticides had been stored.

IV EVALUATION DESIGN AND METHODS

On June 4-5, 1982, NIOSH collected air samples at the three locations where odors were detected. The samples were qualitatively analyzed to determine which organic vapors and pesticides were present and those compounds identified were then quantitated. A sample of the concrete in the old office area was also analyzed for these substances. The medical records of workers who had experienced adverse health effects were reviewed by a NIOSH physician. Interviews with the affected workers were conducted by the NIOSH investigator.

The air samples for organic vapor analysis were collected on activated charcoal at a flow rate of 200 cc per min. The charcoal tube samples were desorbed with 1 ml carbon disulfide and screened by gas chromatography (FID)[1]. Since only small amounts of contaminants were detected on any of the samples, a representative sample was concentrated by evaporating off most of the carbon disulfide solvent, then reanalyzed by GC and GC/MS. A portion of the bulk cement dust was extracted with iso-octane and analyzed by GC (FID). An aliquot of the iso-octane extract was concentrated by evaporating the solvent almost to dryness and analyzed by GC and GC/MS.

The air samples for pesticides were collected on porous aromatic polymer tubes at a flow rate of 200 cc/min. The samples were desorbed in 2 ml of toluene with sonication for 1 hour and analyzed on a gas chromatograph equipped with an election capture detector. The limit of detection was 0.02 ug/sample for diazinon, 0.05 ug/sample for malathion, 0.005 ug/sample for parathion, 0.01 ug/sample for DDE and 0.02 ug/sample for DDT.

SAIF collected air samples on florosil and charcoal tubes. The samples were analyzed by GC on GC/MS.

The environmental criteria for exposure to toxic substances used in this evaluation are based on the following: 1. NIOSH Criteria Documents Recommended Standards for Occupational Exposures, 2. Threshold Limit Values (TVL°s) of the American Conference of Governmental Industrial Hygienists, and 3. the Oregon State Occupational Health Standards.

Substance	NIOSH (or ACGIH) Recommended Criteria 10 hr TWA	Oregon Standards 8 hr TWA	Health Effects [2,3]
Organic Solvents			
C7 to C12 Hydrocarbons	350 mg/cu m or approx 75 ppm	200 ppm	Irritation of eyes, nose, throat, dizziness, headache
Toluene	100 ppm	100 ppm	Dizziness, headache, nausea, fatigue, weakness, muscle fatigue, insomnia, dermatitis
Xylene	100 ppm	100 ppm	Dizziness, excitement, drowsiness, staggering gait, irritation of eyes, nose, throat, headache, fatigue, nausea
Pesticides			
Diazinon	100 ug/cu m skin*	100 ug/cu m skin	See below
Dichlorodiphenyl Tricloroethane DDT	1000 ug/cu m skin	1000 ug/cu m skin	See below
Dichlorodiphenyl Bichloroethylene (DDE)	-	-	See below
Malathion	10,000 ug/cu m (ACGIH)	10,000 ug/cu m	See below
Parathion	50 ug/cu m skin	100 ug/cu m skin	See below

*Skin notation indicates potential contribution to the overall exposure by the cutaneous route.

Health Effects:

Chlorinated hydrocarbon insecticides (DDT, DDE) - All chlorinated hydrocarbon insecticides produce similar physiologic effects in man. These compounds can be inhaled, ingested or can be absorbed through the skin. Exposure can result in headache, lack of appetite, nausea, dizziness, tremors, weakness of the hands, irritation of the eyes and hands, confusion, mailaise, and convulsions.

Organic Phosphate Pesticides (Diazinon, Malathion, Parathion) - These compounds are characterized by the similarities of their structural relationship and by their identical mechanism of toxic action. They differ widely, however, in inherent toxicity and to some extent, in rate of absorption and secretion. These compounds are readily absorbed through the skin. Symptoms may include blurred vision, muscular weakness, nausea, headache, abdominal cramps, chest discomfort, wheezing, increased bronchial secretion, salivation, sweating, low blood pressure, anxiety, anorexia, eye and skin irritation, miosis, neurosis, slurred speech, disorientation and convulsions.

VII RESULTS AND DISCUSSION

A. Environmental

Various organic phosphate and chlorinated hydrocarbon pesticides were mixed and stored in the building. Pesticides known to be used in the past were diazinon, malathion, DDT, lindane, and various carbamates. Air samples collected in the old office area showed 3 ug/cu m of diazinon was present. This is 33 times less than the evaluation criteria. In the new office area there was 0.1 ug/cu m of diazinon which is 1,000 times less than the criteria. Along the south wall there was 0.5 ug/cu m of malathion which is 3,000 times less than the evaluation criteria. No other airborne pesticides were detected. A sample of the cement dust from the hole that had been previously drilled through the concrete in the old office area showed traces of diazinon, DDT and DDE. The charcoal tube samples collected in these areas showed traces of C-9 to C-16 aliphatic hydrocarbons and aromatic compounds (toluene, xylene and higher alkyl substituted benzenes). They were all less than 0.1 ppm which is 1,000 times less than the evaluation criteria for these substances. The airborne samples collected by SAIF in November of 1981 showed C-5 to C-11 hydrocarbon plus smaller amounts of benzene, toluene, xylene, and other substituted benzenes. They were all between 0.2 and 0.4 ppm.

There was a definite, though as yet, unidentified odor in the old office which was very strong in the area where the hole had been drilled through he concrete floor.

B. Medical

Five employees who had worked in the old office area were interviewed. The common symptoms they experienced were dizziness, tremors, tingling and slight numbness in the arms and legs and chest pains. Other symptoms were headache, nausea and eye irritation. None of the persons had experienced any adverse health effects prior to the time the old office area was enlarged in February 1979. (The enlarged portion of the office was formerly the pesticide mixing and loading area.) The workers stated the symptoms persisted when working in the office area, but that they felt better on weekends and vacations. After they were moved out of the old office area to the trailer, their health improved. On August 12, 1981, the day the hole was drilled through the floor, the person whose desk was near the hole, experienced lightheadedness, chest pain and numbness in the arms and legs.

One of the individuals was moved back into the old office area (now the office supply warehouse) in February 1982 and the symptoms began to reoccur. A second individual was assigned to work in the office supply warehouse in January 1982 and since then has experienced eye irritation, dizziness and nausea but feels better at night and on weekends. As of October 1982 the two were no longer employed at this facility due to a cutback in personnel. The medical records of six employees were reviewed by the NIOSH physician. Three of the six were not interviewed due to their absence at the time the interviews were conducted. The symptoms indicated on the medical records are the same as those obtained by personal interviews.

C. General Discussion:

The concentrations of substances present were very low, yet the symptoms experienced by the workers continued while they were working in the office area. This type of problem has been occurring frequently in many buildings which have been made energy efficient. NIOSH has investigated a number of these facilities, but as in this investigation, frequently have not been able to correlate symptoms to the exposure.

VIII CONCLUSIONS

The symptoms experienced by the workers are among those that can occur when there has been an exposure to toluene, xylene, aliphatic hydrocarbons, chlorinated pesticides and organic phosphates pesticides. However, the concentrations of those substances measured were extremely low and should not normally produce symptoms, especially to such a high percentage of the persons working in the area. There does, however, appear to be a correlation between the occurrence of symptoms to the time the old office was enlarged and a decrease in symptoms to the time the employees were away from and later moved out of the area. This conclusion is based on the following: 1) none of the affected workers

experienced the stated symptoms prior to the time the office was enlarged to include the former pesticide mixing and storage area; 2) the individuals felt better when they were away from work on weekends and vacations; 3) during the colder weather the introduction of fresh outside air was minimal since the windows were kept closed and fresh air was not provided through the heating system; 4) after the old office area was converted to the county office supply warehouse and office, the two persons working in this area began to experience symptoms similar to those experienced by the former occupants of the room; and 5) on the day the hole was drilled through the concrete, a worker whose desk was in the immediate area experienced lightheadedness, chest pain and numbness in the arms and legs.

IX RECOMMENDATIONS

Although it is desirable to confirm by chemical analysis the cause of any adverse health effects experienced by workers, this is not always possible as in this case. However, given the information on past and present exposures, symptoms, history of the building use, etc., the following recommendations are offered:

1. Workers should spend no more than 15-30 minutes at a time in the office supply warehouse area (the old office area) as it is now constructed.

2. Consider removing the south wall and the ceiling and replacing it with a security fence. This would permit a free flow of air through the area.

3. Carbonless paper usually emits formaldehyde vapors. The large quantity of this paper now in the storeroom could produce elevated airborne formaldehyde vapor concentrations. The formaldehyde concentrations should be measured and, if present, either move the paper to an open secured storage area or follow recommendation number 2.

4. The Amercian Society for Heating and Air Conditioning, in their publication 62-1981 "Ventilation for Acceptable Indoor Air Quality," recommends that there should be a minimum between 5 (for nonsmokers) and 20 (for smokers) cubic feet of fresh outside air per minute per person in an office area. Fresh air should be provided to the new office area at these rates.

5. Fill the hole with concrete that was cut through the floor in the old office area. Sealing the floor with an impervious material may reduce the pesticide and hydrocarbon vapors being emitted from the floor.

6. Keep open and well ventilated (do not enclose) any area where there is an odor.

X REFERENCES

1. NIOSH Manual of Analytical Methods, Vol 1-7.

2. Occupational Disease, A Guide to their Recognition, USPHS Publication No. 1097.

3. NIOSH Criteria Documents, Criteria for Recommended Standards, Occupational Exposure to:

Malathion, NIOSH Pub No. 76-205

Parathion, NIOSH Pub No. 76-190

Manufacture & Formulation of Pesticides, NIOSH Pub No. 78-174

Refined Petroleum Solvent, NIOSH Pub No. 77-192

Toluene, NIOSH Pub No. 73-11023

Xylene, NIOSH Pub No. 75-168

XI AUTHORSHIP AND ACKNOWLEDGEMENTS

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XII DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

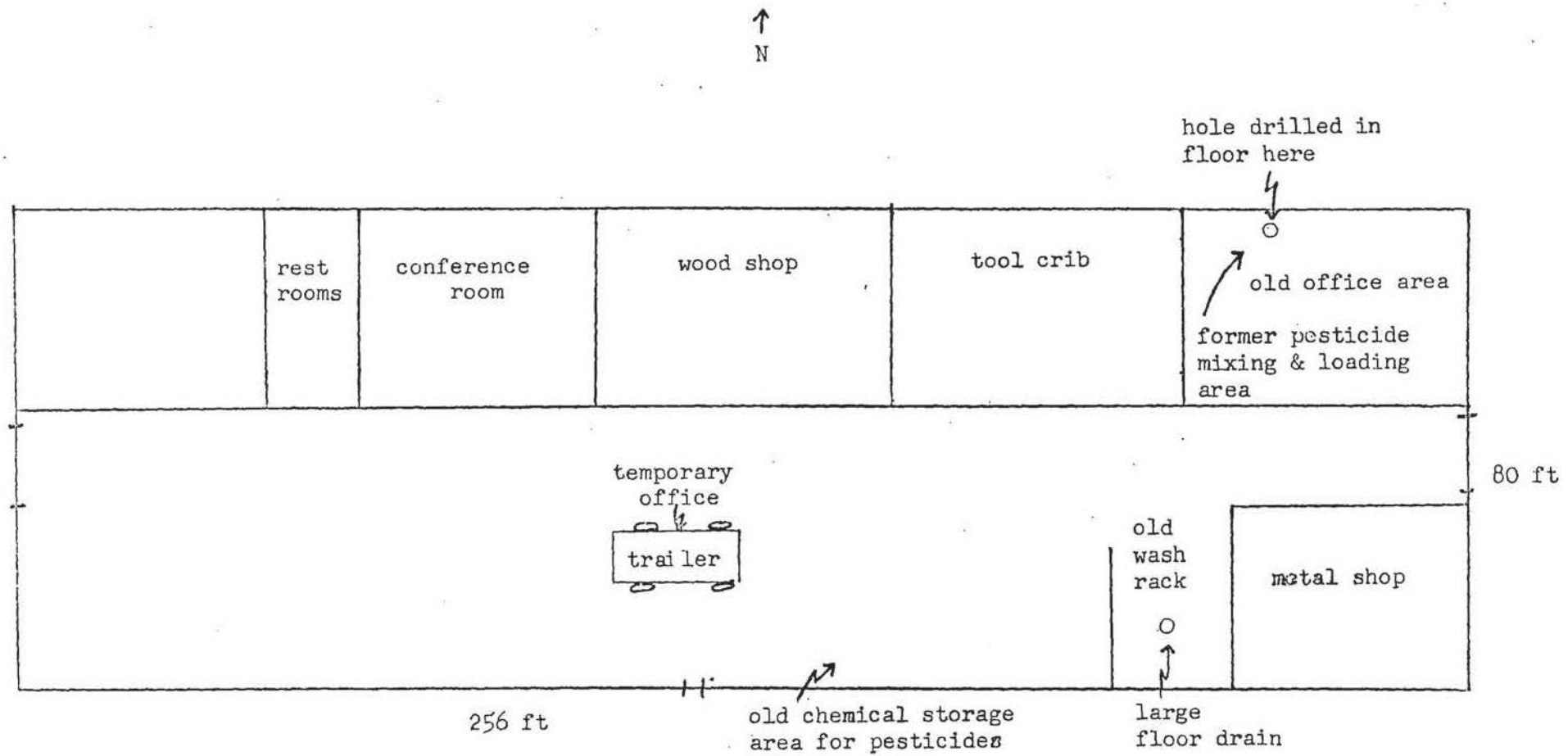
1. Jackson County Department of General Services, Medford, Oregon.

2. Oregon State Accident Prevention Division, Salem, Oregon.

3. U. S. Department of Labor, Occupational Safety and Health Agency (OSHA), Region X, Seattle, Washington.

For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

JACKSON COUNTY PARKS DEPARTMENT



(OLD WW II MOTOR POOL BUILDING)