No. Deliverable Schedule

GEORGIA INSTITUTE OF TECHNOLOGY

OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[x] ORIGINAL

[ ] REVISION NO. ____

Project No. A-2982

DATE: 7/13/81

Project Director: James Burson

~~School~~/Lab EDL/ARD

Sponsor: DCASR, Atlanta, Ga. Misc

Type Agreement: Purchase Order NO. DLA8AT-81-M-6746

Award Period: From 6/22/81 To ~~8/15/81~~ 9/15/81 (Performance) 8/15/81 (Report)

Sponsor Amount: $2,000

Contracted through:

Cost Sharing: N/A

GTRI/~~GIT~~

Title: Environmental Health Testing within Building B-95

ADMINISTRATIVE DATA

OCA CONTACT Faith G. Costello

1) Sponsor Technical Contact: -See Below-

2) Sponsor Admin./Contractual Contact: Doris C. Lewis, Ordering Officer, DCASR, Atlanta, 805 Walker St., Marietta, GA 30060 Phone 429-6115/7

Reports: See Deliverable Schedule

Security Classification: N/A

Defense Priority Rating: N/A

RESTRICTIONS

See Attached N/A Supplemental Information Sheet for Additional Requirements

Travel: Foreign travel must have prior approval - Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with

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GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION SHEET

Date 10/19/81

Project Title: Environmental Health Testing within Building B-95

Project No: A-2982

Project Director: James Burson

Sponsor: DCASR, Atlanta, GA

Effective Termination Date: 9/30/81

Clearance of Accounting Charges: 9/30/81

Grant/Contract Closeout Actions Remaining:

- [x] Final Invoice ~~and Closing Documents~~
- [ ] Final Fiscal Report
- [ ] Final Report of Inventions
- [ ] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other _____

Assigned to: EDL (~~School~~/Laboratory)

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FORM OCA 10:781

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

September 28, 1981

Ms. Doris C. Lewis
Contracting Officer
DCASR Atlanta
ATTN: DCRA-EH
Marietta, GA 30060

Dear Ms. Lewis:

Enclosed is our final report for the services provided under your Contract/Purchase Order Number DLA8AT 81 M 6746 (our Project Number A-2982). The project involved an industrial hygiene survey of an office within Building B-95, Marietta, Georgia.

We thank you, Mr. Palmer and Mr. Carl for this opportunity to be of service to you. Please remember us again when you have further need for service.

Sincerely,

[redacted]

James L. Burson, Program Manager
Occupational Safety and Health
Services

JLB:rm
Enclosure

DCASR CONTRACT NO. DLA8AT81M6746
Georgia Tech Research Institute
Project Number A-2982

INDUSTRIAL HYGIENE SURVEY

OF

AN OFFICE IN BUILDING B-95
805 WALKER STREET
MARIETTA, GEORGIA

FINAL REPORT

Report Date:
September 28, 1981

By:

William H. Spain
Certified Industrial Hygienist
Occupational Health and Safety Consultant
EES/EDL/OSHG
GEORGIA INSTITUTE OF TECHNOLOGY
Atlanta, Georgia 30332

TABLE OF CONTENTS

I. SUMMARY

In response to DCASR Contract Number DLA8AT81M6746, an industrial hygiene survey was conducted within Building B-95, Edwina L. Daniel's office (Assistant Chief - Contract Management Division), 805 Walker Street, Marietta, Georgia. The survey included collecting a variety of samples, analyzing the samples, and conducting literature searches by hand and computer.

The goal of the testing and surveying was to identify any agent which may have caused a contract employee to incurr a skin reaction while restretching carpet in the office.

The tests indicated that: (1) toluene, bis (2-ethylhexyl) phthalate, $C_{15}H_{24}O$ (probably ditertbutyl methyl phenol), and unidentified compounds of molecular weights 180 and 322 were present in the carpet and pad. No pesticides were identified.

Literature searches indicated that the unidentified chemicals of molecular weights 180 and 322 might possibly be dinitrophenol(s) and diiso-octyl acid phosphate respectively. Both chemicals are included on a list of agents which can cause skin dystrophia (reactions) (Appendix A). Further study would be necessary to more accurately conclude whether either of these compounds were in fact present and could have been a causative agent.

Airborne concentrations of formaldehyde and total hydrocarbons were detected, but the sample results indicated that the concentrations were far to low to be significant to this case.

In conclusion, a thorough survey produced no positive identification of an agent which would have caused the reaction alleged by the contract employee.

II. INTRODUCTION

On June 22 and 23, 1981, a Certified Industrial Hygienist from the Georgia Tech/Engineering Experiment Station/Safety and Health Services Group conducted an industrial hygiene survey within Building B-95, Edwina L. Daniel's office (Assistant Chief - Contract Management Division), 805 Walker Street, Marietta, Georgia. The testing was conducted under DCASR Contract Number DLA8AT81M6746 for the understood purpose of trying to identify any agent(s) which may have caused a contract employee to experience redness and numbness on the top of his forearm while restretching carpet in Ms. Daniel's office.

Mr. Pat Carl, DCASR Safety Officer, served as the contact person during the performance of this contract.

III. OPERATION

The alleged reaction (instant but temporary redness and numbness of the forearm) of the contract employee reportedly occurred during June 20, 1981, while he was restretching the carpet in Ms. Edwina Daniel's office (Building B-95). The employee was reportedly working along the wall under the chalkboard when the carpet and/or carpet pad rubbed against the top of his forearm and caused the reaction. The employee was evidently in the process of replacing the carpet tack strip along the wall when the event occurred.

Ms. Daniel's office, the room in which the event occurred, is approximately 15 feet square with a ceiling height of about 12 feet. The tile floor was covered with carpet (burlap type backing) over a foam type pad. The carpet and pad is believed to have been in place for two to three years. The carpet was held by tack strips along the walls.

Visual evidence of stain marks indicated that the carpet, pad, and tack strip had been wet (at sometime) along the wall under the chalkboard. The stained area began in the corner of the room to the left of the chalkboard and covered an area to a location near the corner of the room at the right of the chalkboard. The stain area varied from a width of about four feet at the right side of the chalkboard to much narrower widths at the left and right ends.

The cause of the stains on the carpet and pad was not determined, but there were stains down the inside of the wall at the left side of the chalkboard indicating a previous leak from the roof area. The wooden tack strip along the full width of the wall under the chalkboard appeared to be decayed. The involved employee reportedly stated that the carpet, pad, and tack strip were wet at the time of the incident.

The perimeter of the office had reportedly been sprayed with an insecticide about once per month. The pesticdes included: Diazinon, Droptox, Vapona, and Pyrethrins.

It was stated that there is a drip pan on the roof at an air conditioning unit located about 50 feet from Ms. Daniel's office. The drip pan is periodically treated with tablets composed of sodium silicate, sodium phosphate and sodium carbonate (according to the product label). This drip pan may overflow onto the roof during rain.

Ms. Daniel's office was promptly vacated and closed up after the reported event; and, the carpet and materials were left undisturbed until this testing was begun.

IV. SAMPLING AND EVALUATION METHODS

A literature search by hand was made both prior to and after the on-site visits to determine what causative agent(s) might produce the reported symptoms. The agents listed in the literature as causing skin dystrophia (acne, blistering, burns, dermatitis, erthema, and irritation) after acute exposure (short term) are given in Appendix A.

A visit was made to the involved office during June 22, 1981, to determine the types of samples which should be collected. A decision was made to collect bulk, wipe, and air samples. The bulk and wipe samples would be checked directly for chemical agents which might cause the alleged employee reaction. The air samples would serve as an additional check for causative chemical agents which might be present on the carpet or pad and thus be evaporating into the air.

During the entire day of June 23, 1981, the planned samples were collected from the involved office. The collected samples included:

- Air samples drawn through solutions in midget impingers for determining formaldehyde-in-air concentrations.
- Air samples drawn through charcoal tubes for determining total airborne hydrocarbons.
- Bulk samples from the stained areas of the carpet and pad.
- Wipe samples of the carpet, pad, and floor.

The samples for determining airborne concentrations were collected by the use of constant flow air sampling pumps (DuPont P-4000) operating at calibrated flow rates. The air samples were collected at the location of the shelf on the bottom of the chalkboard. The wipe samples were taken at several locations in the stained area (on the floor, pad, and carpet) with Whatman 42 filters which had been moistened with distilled water. The bulk samples were cut directly from several locations of the stained area on the carpet and pad.

V. SAMPLE ANALYSIS

The samples were submitted to an analytical laboratory accredited by the American Industrial Hygiene Association for analysis. Appendix B (a letter dated June 25, 1981) shows our instructions to the laboratory for handling and analyzing the samples. The GC/MS abbreviations used in the letter represent a combined gas chromatography and mass spectroscopy technique. The gas chromatography technique was chosen to separate the

liquid mixture into individual chemicals and then the mass spectroscopy technique was used to help identify the separated chemicals. The GC/MS was merely a separation and identification technique - the laboratory was not able to quantify the compounds by this technique.

VI. SAMPLE RESULTS

The laboratory's report of the sample results is included in Appendix C (August 11, 1981, letter with two attached pages listing the results in Tables I, II, and III). The $C_{15}H_{24}O$ compound reported in Table III (of Appendix C) as "probably tertbutyl phenol" was later reported by the laboratory to be "probable ditertbutyl methyl phenol". This change in reporting was made official by the Mass Spectrum #231 attached to the September 8, 1981, letter from the laboratory (Appendix D of this report).

Reviewing and calculating the reported sample results yields the following summary:

FORMALDEHYDE (Midget Impingers)

Sample #	Pump #	Sample Period	Flow Rate	Sample Volume	Quantity	Air Concentrations
F-B	--	--	--	--	< 3μg	--
F-1	5088	8-10AM	1.0L/M	0.120M^3	< 3μg	< 0.02ppm
F-2	5088	3-4PM	1.0L/M	0.060M^3	< 4μg	0.06ppm

TOTAL HYDROCARBONS (Charcoal Tubes)

Sample #	Pump #	Sample Period	Flow Rate	Sample Volume	*Quantity	*Air Concentrations
CC-B	--	--	--	--	< 0.003mg	--
CC-1-1	5073	8-12AM	0.509L/M	0.122M^3	0.015mg	0.12mg/m^3
CC-2-1	5073	12-3PM	0.509L/M	0.092M^3	0.010mg	0.11mg/m^3
CC-2-3	5073	3-4PM	0.509L/M	0.031M^3	0.006mg	0.19mg/m^3

*Based on front section of charcoal tube; blank correction not considered necessary.

BULK SAMPLE (Carpet & Pad)

Extraction with both a polar and a non-polar solvent followed by GC/MS analysis indicated the following compounds to be present in the samples: toluene, bis (2-ethythexyl) phthalate, $C_{15}H_{24}O$ (probably ditertbutyl methyl phenol), and unidentified chemicals of molecular weights 180 and 322. No pesticides were identified.

WIPE SAMPLE (Filters)

Blank - Phthalate and possible hydrocarbon
3 Samples - Bis (2-ethylhexyl) phthalate

VII. DISCUSSION

None of the chemicals that were specifically identified and reported by the laboratory as being present in the bulk or wipe samples are found in the list of chemicals which may cause skin dystrophia under acute (short term) exposure conditions (see Appendix A).

Toluene was identified in the bulk sample of carpet and pad. Among its other uses, toluene is a common industrial solvent. Included in Appendix E is a discussion of the toxicity of toluene. The toxic effects of toluene do not include the employee's symptoms and thus it is eliminated from being the causative agent.

Bis (2-ethylhexyl) phthalate, also known as dioctyl phthalate and DOP, was identified in both the carpet/pad bulk samples and in the wipe samples. This chemical is used as a plasticizer for resins and elastomers and as a generated aerosol for respirator fit testing (human exposure). As could be expected since it is used as an agent of deliberate human exposure, the literature reports that this compound causes no skin or eye irritation, and is of low toxicity via oral and dermal routes. However, some sources report it to be teratogenic in mice. Therefore, the literature advises against exposure to women of childbearing age. The status of low toxicity for this compound is supported by the fact that OSHA allows exposures up to 5 mg/m^3 for an eight-hour average (same as for nuisance materials). This compound does not seem to have been the causative agent.

The third compound ("probably") identified in the bulk sample of carpet and pad was ditert butyl methyl phenol, also sometimes called DBMP. The literature reports this compound is used in small quantities as an antioxidant in a variety of materials including resins and plastic films, food wrappers, and cooking oils. The literature states: "From the results of chronic toxicity studies using dogs and rats it was concluded that DBMP

is a relatively innocuous compound". Based on the information from the literature this compound can be eliminated from being considered the causative agent.

Two other compounds, of unknown identity, were detected in the bulk sample of carpet and pad. The mass spectroscopy technique indicated that one of the compounds had a (probable) molecular weight of 180 and the other a molecular weight of 322. A check was made of the chemical agents listed in Appendix A (possible causative agents) to see if any of them had molecular weights equal to or very near 180 or 322. A possible match was found for each of the two molecular weights.

The possible match for the molecular weight of 180 is dinitrophenol(s) (several isomers) which have a molecular weight of 184. This difference in molecular weights is enough to make the match only possible. The literature reports the following for this chemical (several isomers): uses include synthesis of dyestuff; it is highly toxic and readily absorbed through intact skin and the respiratory tract; it is not a methemoglobin former; exposure may cause an elevation of the basal metabolic rate and a rise in temperature as high as 110° with possible nervous system effects and possible liver and kidney damage. The symptoms reported by the employee did not seem to have included these reactions. Considering this questionable match of molecular weights, this compound probably only deserves further investigation as the causative agent if the reported medical symptoms and observations did match the toxic effects listed above.

The possible match for the molecular weight of 322 is diiso-octyl acid phosphate (diiso-octyl ester phosphoric acid, diiso-octyl acid phosphate) which has a molecular weight of 322.5. The CAS number for this compound is 27215-10-7. Due to the close match of the molecular weights, and thus the possibility of this being a causative chemical agent, both a hand and a computer literature search was made to identify the toxicity and uses of this chemical. Only three reference sources addressed its toxicity; in summary they stated: toxic and a strong irritant to skin and eyes; corrosive; moderate irritant to eyes, skin, and mucous membranes (slight disagreement with the first source). It is included in the list of chemicals which cause skin dystrophia after acute exposure (Appendix A). Very few literature citations were located to explain the uses of this chemical. The stated uses which might relate it to materials possibly associated with the carpet, pad, and office were an ingredient of chemical mixtures used to inhibit electric charges in jet fuels and to prevent electric charges on synthetic fibers (two different chemical mixtures and two different literature citations). The statement of a "possible match" (for molecular weight 322, and causative chemical agent) has been made due to the following: (1) the Mass Spectroscopist at the laboratory stated via telephone that he would not expect Diiso-octyl Acid

Phosphate to fragment in the way that the unidentified (but detected) chemical of molecular weight 322 appeared to have fragmented during GC/MS analysis, (2) the very limited information concerning toxicity is inadequate to make a positive match with the reported symptoms of the contract employee, and (3) based on the extremely limited information in literature concerning the uses of the chemical, there appears to be inadequate prevelance of commercial use of the chemical to expect it to be present at the office site.

Regarding to the results of the other samples, the formaldehyde-in-air concentrations are far too low to be considered of any significance with regard to either respiratory or skin exposure. The highest detected level of 0.06 parts per million (formaldehyde) is several magnitudes below the USDL/OSHA allowed permissible-exposure limit (for airborne levels) of 3 parts per million for an eight-hour average. Such low airborne levels are interpreted to indicate that no significant amounts of formaldehyde were present in the carpet or pad. As a matter of more complete documentation, and possible interest, toxicity information for formaldehyde is given in Appendix E.

The only sample results remaining to be discussed are those for the "total hydrocarbons". Briefly and relatively stated, those results are extremely low.

Since an analysis for total hydrocarbons yields a concentration value for a wide group of chemicals (discussed in Appendix E) which would be collected and detected by the method used, but for no specific chemical, we must primarily limit our discussion of the results to assumptions and relative comparisons. This method of discussion can reveal some useful information in cases such as this one.

The first assumption could be that the identity of the chemicals is in fact total hydrocarbons as discussed in Appendix E. If that were the case, then the detected airborne levels are several magnitudes below the permissible-exposure limits (PEL) allowed by OSHA. Total hydrocarbons are not considered a suspected causative agent.

A different assumption could be that the identity of the total hydrocarbons were actually toluene (identified in the bulk sample of carpet and pad). A comparison to published standards can be made by using the molecular weight of toluene and converting the highest total hydrocarbon result to the same units of concentration as the OSHA PEL for toluene. This changes the 0.19 mg/m^3 result to 0.05 ppm (toluene). Since the OSHA PEL for toluene is 200 ppm, the converted result is far below the OSHA PEL. Toluene is also not a suspected causative chemical agent.

Futhermore, even if the identity of the total hydrocarbons is arbitrarily assumed to be any one of three chemicals being highly toxic and having the low OSHA PEL of 1 ppm per million (such as: ally chloride, benzyl chloride, or phenyl ether), the converted total hydrocarbon result is still several factors below the OSHA PEL for the three chemicals.

These assumptions and relative comparisons all support the original statement that the total hydrocarbon results are extremely low. Additionally, they do not reveal any indication of a toxicity hazard.

VIII. CONCLUSION

While toluene, bis (2-ethythexyl) phthalate, and (probably) ditertbutyl methyl phenol were found to be present in or on the carpet and pad, the literature does not indicate that these chemicals cause toxic symptoms of the nature described by the contact employee. Therefore, these chemicals are eliminated from consideration as the causative agent.

Unidentified chemicals of molecular weights 180 and 322 were also detected in the carpet and/or pad. These two chemicals could be any of hundreds of chemicals with those molecular weights. It is possible that those unidentified chemicals are dinitrophenol and diiso-octyl acid phosphate, respectively. Both of these chemicals are reported as being capable of causing some skin reaction upon acute exposure. However, considering the information presented in the DISCUSSION section regarding these chemicals, it cannot be stated with any certainty that these chemicals were either present or the causative agent. Further testing and study would be necessary to make a more defenitive determination.

Formaldehyde and total hydrocarbons were found to be present in the air, but the concentrations of both were far too low to be of any significance to this case.

In conclusion, the existing information has not identified an agent which could be considered to be a likely cause of the reaction reported by the contract employee.

IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

Project Directed by:	James L. Burson, C.I.H., C.S.P. Program Manager Georgia Tech EES/EDL/OSHG Atlanta, Georgia 30332
Evaluation Conducted and Report Prepared by:	William H. Spain, C.I.H. Health and Safety Consultant Georgia Tech EES/EDL/OSHG Atlanta, Georgia 30332
Laboratory Analysis of Samples by:	Clayton Environmental Consultants Southfield, Michigan 48075
Report Typing and Other Support:	Rachel G. McCain Administrative Assistant
Report Reviewed by:	James L. Burson, C.I.H., C.S.P. and Phillip L. Williams Health and Safety Consultant Georgia Tech EES/EDL/OSHG Atlanta, Georgia 30332

X. BIBLIOGRAPHY

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General Industry OSHA Safety and Health Standards (29 CFR 1910), U.S. Department of Labor, OSHA Publication 2206, Subpart Z, Section 1910.1000, Revised November 7, 1978.

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APPENDICES

APPENDIX A

Chemical Agents
Which Cause
Skin Dystrophia

J. DAUGAARD

SYMPTOMS AND SIGNS IN OCCUPATIONAL DISEASE

A PRACTICAL GUIDE

MUNKSGAARD
Distributed in North, South and Central America by
Year Book Medical Publishers, Inc.

Skin dystrophia including Acne, Blistering, Burns, Cracking, Dermatitis, Dermatosis, Erythema, Gangrene, Hyperkeratosis, Hypertrophia, Necrosis, Primary irritants

Acute *1.* Acetic acid, acetic anhydride, BAL (British Anti Lewisite), benzene sulphonyl chloride, benzine, bromine, n-butanol, Cresol, croton aldehyde, chromic acid, cutting oils, cyanides, Dibutyl maleate, N,N'-di-sec-butyl-para-phenylenediamine, 2,6-dichlorobenzonitrile, dichloro-(2-chlorovinyl)-arsine, dichlorophene, 2,4-dichlorophenoxyacetic acid (and compounds), diiso-octyl-acid phosphate, dimethyl-amino-ethyl methacrylate, dimethylcarbamide chloride, dimethylsulfoxide, dinitrophenol, Fiber glass, fluoboric acid, Glass fibers, guaiacol, Hexachloronaphthalene, hexafluoro acetone, hexylene glycol, hydrazine, hydrofluoric acid, hydrogen peroxide, hypochlorites, Iodine, IR-light, isobutylamine, Kerosene, Laser beam, lauroyl peroxide, lewisite, lime, liquid air and gases, Maleic anhydride, MBA (mechlorethamine), methyl bromide, methyl pyrrolidine, methyl toluene sulfonate, methyl vinyl ketone, mineral oil, morpholine, mustard gas, Naphthalene, nitric acid, nitriles, p-nitroso-dimethyl aniline, Oil (mineral), organic solvents, oxalic acid, Peroxides, phenol (gangrene), beta-phenyl-ethylamine, phenyl mercuric hydroxide, phosphorous (yellow), phosphorous acid, phosphorous pentabromide, phosphorous pentachloride, phosphorous pentafluoride, phosphorous pentoxide, phospho-tungstic acid, potassium hydroxide, pyridine perchlorate, pyridine, pyridine methanol, pyromellitic acid, Rotenone (derris), Sabadilla, selenium dioxide, sodium hydroxide, sodium isopropylxanthate, sodium silicate, strong acids, styrene, sulphuric acid, Tantalum, 2,2,4,4-tetramethyl-1,3-cyclobutanediol, thionylchloride, tin (organo-tin compounds), titaniumtetrachloride, toluenediamine, p-toluenesulfonyl chloride, trichloroethylene, triethylene tetramine, trisodium phosphate, Vinyl pyridine, Water glass (Na_2SiO_3), white spirit, Zinc chloride (soldering flux), zinc ethylene bis-(di-thiocarbamate),

APPENDIX B

June 25, 1981 Letter
to Laboratory

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

June 25, 1981

Mr. Robert Leickfield
Laboratory Supervisor
Clayton Environmental Consultants, Inc.
25711 Southfield Road
Southfield, Michigan 48075

Dear Bob:

As per my discussion with you today via the telephone, please analyze the enclosed samples as requested below. As I stated, we are attempting to identify an unknown contaminant which reportedly caused a skin reaction to an employee while re-stretching carpet. The only compounds we suspect in the wipe and bulk samples are sodium silicate, sodium phosphate, sodium carbonate and residual pesticides. The pesticides may include diazinon (organic phosphate compound), Vapona (organic phosphate-DDVP, plus other active related compounds), pyrethrins and pyrethrum, and Droptox (Stephenson Chemical Co.). Since pesticides may be present, arsenic compounds may also be present.

Please analyze samples DCASR-62381-F-1 and 2 for formaldehyde and use sample DCASR-62381-F-B as the blank. These samples were collected in a solution of 1% sodium bisulfite and distilled water.

Please analyze samples DCASR-62381-CC-1-1, CC-2-1, and CC-2-3 for total hydrocarbons. Sample DCASR-62381-CC-B is provided as the associated blank.

Divide each piece in sample DCASR-62381-B-1 into half and combine the halves into two separate samples. Extract one of the samples with a polar solvent and the other with a nonpolar solvent. Analyze both sample extractions by GC/MS.

Samples DCASR-62381-W-1 thru 3 are wipe samples taken with filters which had been wetted with distilled water. Combine them into one sample, extract them, and analyze them by GC/MS. Sample # DCASR-62381-W-B is provided as a blank.

Please call us by telephone when the results are available, then follow-up with a written report. Send your invoice for these services to me. I will approve it and have it processed for payment.

Sincerely,

[redacted]

James L. Burson, Program Manager
Occupational Safety and Health
Services

APPENDIX C

August 11, 1981 Letter
and
Laboratory Results

August 11, 1981

James L. Burson, Program Manager
Occupational Safety and Health Services
GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station
Atlanta, GA 30332

Job No. 12631-681-LA

Dear Mr. Burson:

The samples which you submitted to us on June 29, 1981, have been analyzed as requested; the results are compiled in the enclosed tables.

It is a pleasure to be of assistance to you. Please contact us if you have questions concerning any aspects of this report.

Sincerely,

[redacted]

Robert Lieckfield, Jr.
Laboratory Supervisor

RL:ch

Enclosure

25711 Southfield Road, Southfield, Michigan 48075, Telephone 313 424-8860

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.

Results of Analyses

for

Georgia Institute of Technology

Job No. 12631-681-LA

TABLE I

Lab Number	Sample Description		Total Hydrocarbons as n-hexane (mg)
204537	PCASR 62381-CC-B-Blank	Front	<0.003
		Back	<0.003
		Total	<0.006
204540	PCASR 62381-CC-1-1	Front	0.015
		Back	<0.003
		Total	0.018
204541	PCASR 62381-CC-2-1	Front	0.010
		Back	<0.003
		Total	0.013
204542	PCASR 62381-CC-2-3	Front	0.006
		Back	<0.003
		Total	0.009

TABLE II

Lab Number	Sample Description	Formaldehyde* (µg)
204538	DCASR-62381-F-B Blank	<3
204543	DCASR-62381-F-1	<3
204544	DCASR-62381-F-2	4

* Results have been blank corrected.

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.

Results of Mass Spectrometric Analyses
for
Georgia Institute of Technology

Job No. 12631-681-LA

TABLE III

Lab Number	Sample Description	Compounds Detected
204546	DCASR-62381-B-1 (hexane extract)	Toluene $C_{15}H_{24}O$ (probable tertbutyl phenol) Bis(2-ethylhexyl)phthalate MW=322
204546	DCASR-62381-B-1 (acetone extract)	Toluene Probably MW=180 $C_{15}H_{24}O$ (probably tertbutyl phenol) Bis(2-ethylhexyl)phthalte MW=322
204545	DCASR-62381-W-B,Blank	Phthalate Possible hydrocarbon
204546	DCASR-62381-W-1,2,3	Bis(2-ethylhexyl)phthalate

No pesticides were identified.

APPENDIX D

September 8, 1981 Letter
and
Mass Spectra

Clayton Environmental Consultants, Inc.
A Technical Service of Marsh & McLennan

September 8, 1981

Mr. William Spain
GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station
Atlanta, GA 30332

RE: Job No. 12631-681-LA

Dear Mr. Spain:

Enclosed are the requested mass spectra of the compounds found in the carpet sample DCASR-62381-B-1 of our Job Number 12631-681-LA.

If we can be of any further assistance to you, please feel free to call.

Sincerely,

[redacted]

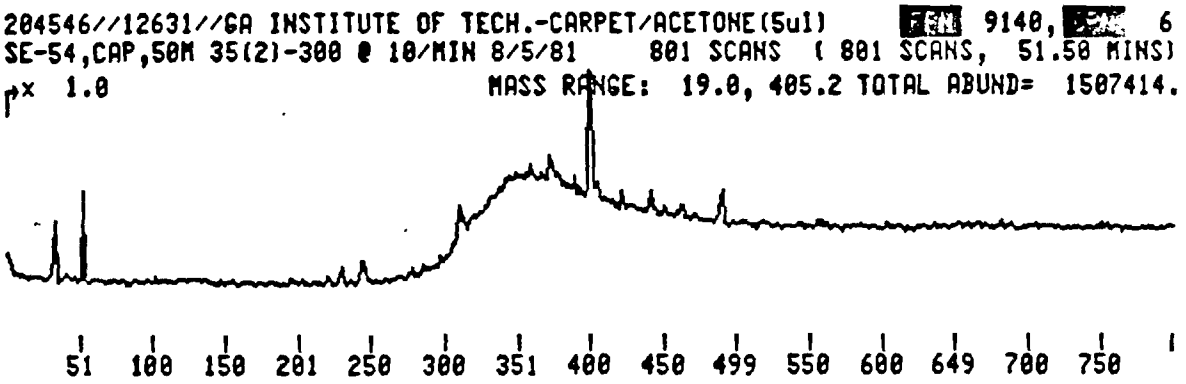
Daryl Strandbergh
Mass Spectroscopist

DS:li

Enclosures

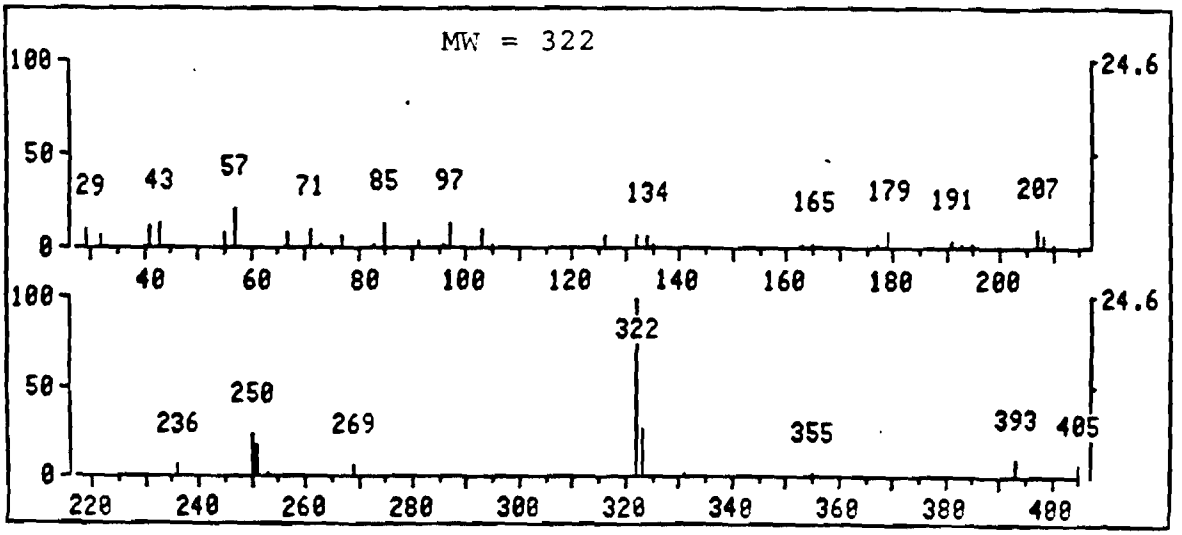
25711 Southfield Road, Southfield, Michigan 48075, Telephone 313 424-8860

TOTAL ION CURRENT CHROMATOGRAM



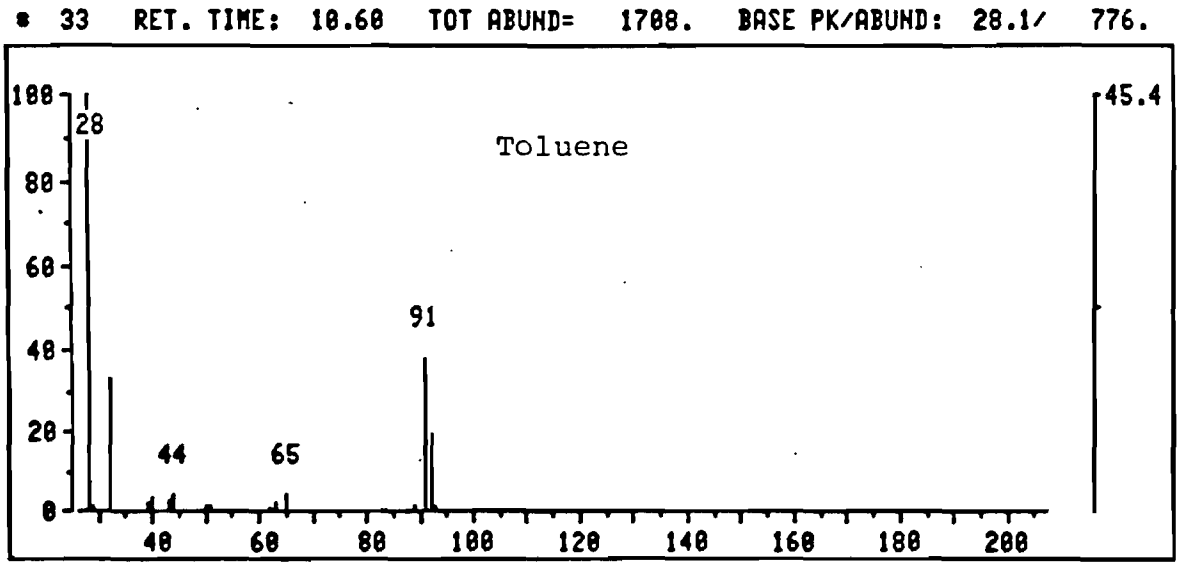
SCAN #

AVERAGED SPECTRUM # BASE PK/ABUND: 322.3/ 32000. + 489 -485



MASS SPECTRA

Spectrum # 33



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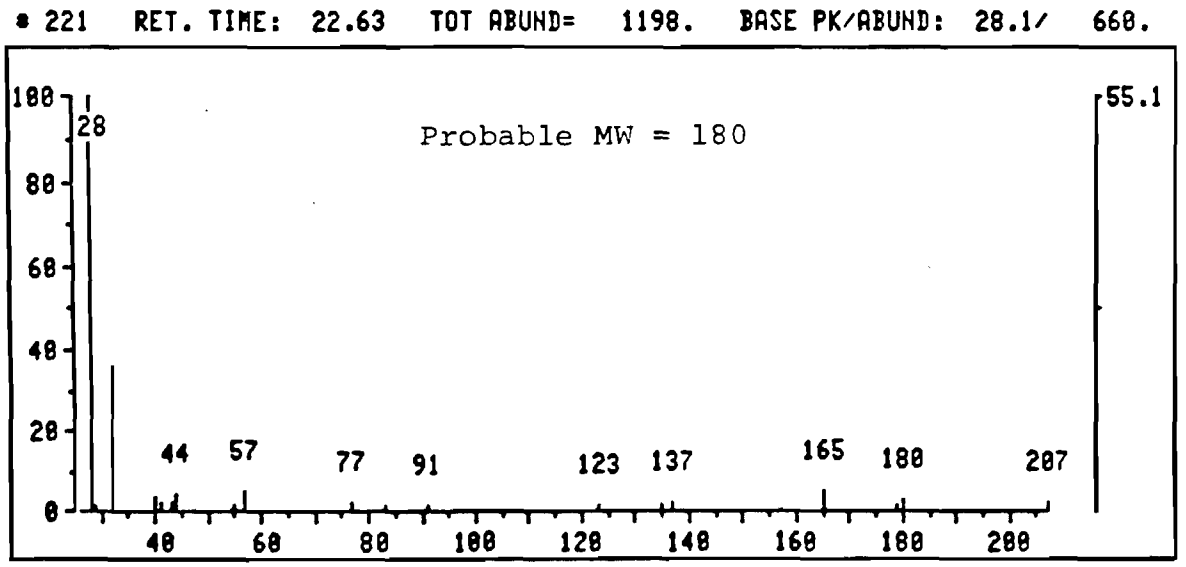

MASS SPECTRA

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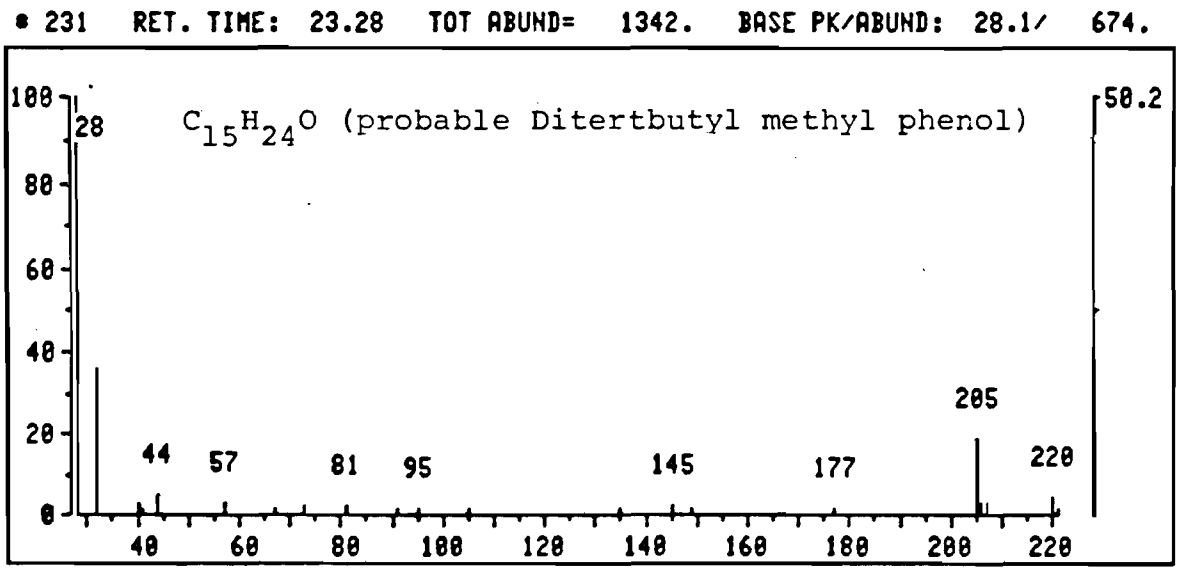

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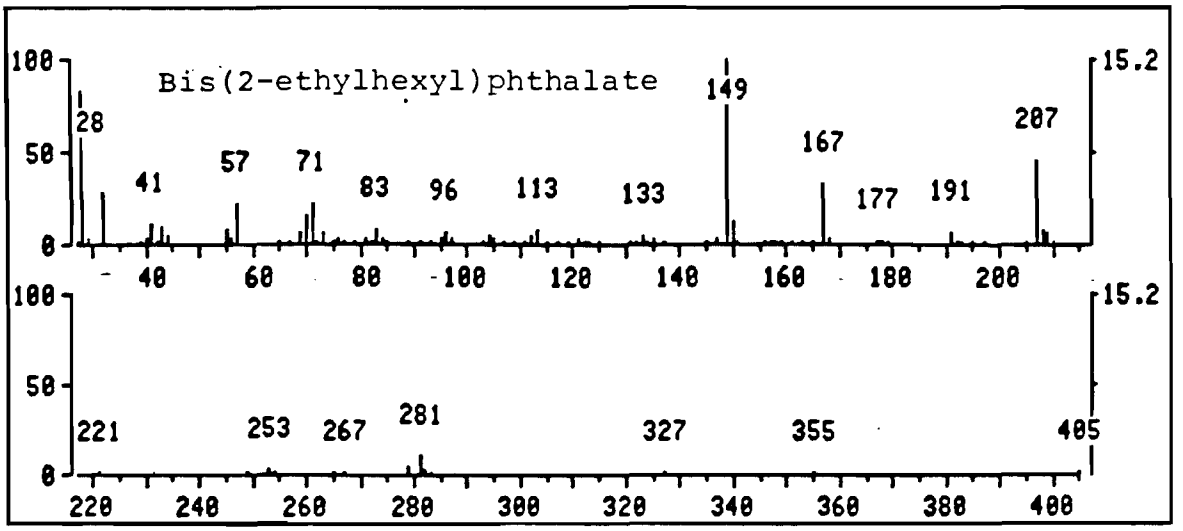

APPENDIX E

Toxicological Information

FORMALDEHYDE

Formaldehyde (HCH) is a colorless gas at ordinary temperatures, with a pungent odor which is perceptible at concentrations even lower than one ppm. Its characteristic odor and its strong irritating effect upon the eyes and upper respiratory passages may provide some warning of the presence of appreciable concentrations of airborne formaldehyde.

Formaldehyde is toxic by ingestion and inhalation and it may also cause skin lesions. It is primarily an irritant of the skin, eyes and mucous membranes of the upper and lower respiratory tract. A concentration of two to three ppm causes slight irritation of the eyes, nose and pharynx; at four to five ppm, discomfort rapidly increases; ten ppm is tolerated with difficulty even briefly; between ten and 20 ppm, there is severe difficulty in breathing, burning of the eyes, noise and trachea, intense lachrymation and severe cough. Asthamatic symptoms may occur due to allergic sensitivity to formaldehyde even at low concentrations.

A recent report of an ongoing study by the Chemical Industry Institute of Toxicology indicates that formaldehyde may be linked to nasal carcinoma in rats.

There have been reports of both inflammatory and allergic dermatitis due to direct contact with solutions, solids or resins containing free formaldehyde. The allergic form is usually the result of allergic sensitization, and may follow contact with only very small quantities.

Accidental ingestion of formalin (37% formaldehyde solution) causes prompt, severe irritation of the gastrointestinal tract. Circulatory collapse, central nervous system and kidney damage have been observed.

The Occupational Safety and Health Administration (OSHA) has adopted the American National Standards Institute (ANSI) Z37.16-1967 Standard for Exposure to Formaldehyde, which established an eight-hour, time-weighted average concentration limit of three ppm, along with an acceptable ceiling concentration of five ppm, not to be exceeded for longer than 30 minutes in an eight-hour shift, and a maximum peak concentration of ten ppm, not to be exceeded at any time. To prevent irritation in all exposed individuals, the American Conference of Governmental Industrial Hygienists (ACGIH) has recommended a ceiling limit of two ppm, not to be exceeded at any time. The National Institute for Occupational Safety and Health (NIOSH) has recommended a ceiling concentration limit of one ppm for any 30 minute sampling period.

TOLUENE

Toluene (toluol, methyl benzene) is a clear, colorless, non-corrosive liquid with a sweet, pungent odor. Toluene is readily absorbed from the lungs, the gastro-intestinal tract, and to a small extent, through the intact skin. Part of the absorbed toluene is eliminated in the expired air, but a large percentage is excreted in the urine. The only industrial hazards of significance result from inhalation of excessive concentrations of vapor, prolonged skin contact with the liquid, and liquid contamination of the eyes.

With acute exposure, toluene acts predominantly upon the central nervous system as a depressant causing fatigue, headache, confusion, paresthesia, dizziness, and muscular incoordination. There is usually some delay in the development of symptoms, and hence the effects commonly appear at the end of the work shift. With sustained exposure to high concentrations, death may ensue from paralysis of the respiratory centers.

Continuous daily exposures to low concentrations of toluene vapors may give rise to a clinical picture of chronic intoxication. Such cases may show varying degrees of fatigue, general nervousness, insomnia, and loss of appetite and weight. Frequent and sustained skin contact with liquid toluene may result in the development of dermatitis because of the defatting properties of toluene as well as its local irritative action. Toluene does not cause the severe injury to the bone marrow characteristic of benzene.

The Occupational Safety and Health Administration has adopted the ANSI Z37.12-1967 Standard for Exposure to toluene, which established an eight-hour, time-weighted average of 200 ppm with a ceiling of 300 ppm and an acceptable peak exposure of 500 ppm for a duration of not more than ten minutes if encountered not more than once during an eight-hour workday. The American Conference of Governmental Industrial Hygienists has established a threshold limit value of 100 ppm as an eight-hour, time-weighted average. The National Institute for Occupational Safety and Health recommends an eight-hour, time-weighted average of 100ppm with a ceiling of 200 ppm as determined by a sampling time of ten minutes. The American National Standards Institute, Inc. has revised the ANSI Z37.12-1967 in 1974. It has established a new acceptable eight-hour, time-weighted average maximum for peaks above the acceptable ceiling concentration of 500 ppm for a duration of not more than 10 minutes if encountered not more than once a day.

TOTAL HYDROCARBONS

The chemical composition of fuel oils, gasolines, refined petroleum solvents, etc. vary greatly depending on the nature of crude oil and the refining process parameters. They are complex mixtures of hundreds of hydrocarbons containing a small portion of nonhydrocarbon substances. Most of the hydrocarbons in such mixtures are members of the paraffinic, cycloparaffinic, olefinic and aromatic series.

Absorption is chiefly through the respiratory tract. The precise toxic effects depend on the chemical composition of the hydrocarbon mixture in question. If it consists of saturated and unsaturated aliphatic compounds and cyclic compounds, it will be a narcotic and an irritant to the mucous membranes. The main toxic action will be depression of the central nervous system with symptoms of giddiness, dizziness, hilarity and headache. Severe exposure may result in loss of consciousness associated with convulsive effects which are sometimes fatal. Moderate to severe absorption may produce various types of pulmonary inflamation. Whenever ingestion is a prominent factor, culminating hemorrhagic pneumonia is a frequent complication. Skin contact can cause dermatitis, and possibly a general sensitizing or photosensitizing effect.

If the material of concern is made from a crude oil containing a high content of aromatics, or is enriched in aromatics by the refining process, the toxicity may be substantially higher. This is especially apparent in the presence of benzene which increases the hazard of both acute and chronic poisoning because it is considered to be a carcinogen acting on blood-forming tissues.

The Occupational Safety and Health Administration (OSHA) has established eight-hour, time-weighted average (TWA) concentration limits of 500 ppm (2,000 mg/m3) for petroleum distillates and 500 ppm (2,950 mg/m3) for Stoddard solvent. The American Conference of Governmental Industrial Hygienists (ACGIH) has adopted eight-hour TWA threshold limit values (TLV's) of 400 ppm (1,600 mg/m3) for rubber solvent (Naphtha) and 100 ppm (575 mg/m3) for Stoddard solvent. ACGIH also lists as "tentative" a short-term exposure limit (up to 15 minutes) of 125 ppm (720 mg/m3) for Stoddard solvent.

The National Institute for Occupational Safety and Health (NIOSH) recommends a TWA concentration limit of 350 mg/m3 and a 15 minute ceiling concentration limit of 1,800 mg/m3 for petroleum either, and Stoddard solvent. NIOSH also recommends a TWA concentration limit of 200 mg/m3 for kerosene for up to a ten-hour work shift based on a 40-hour work week.