RGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[X] ORIGINAL [ ] REVISION NO. _____

ct No. A-3511 GTRI/GIT DATE 4/13/83

ct Director: Paul Middendorf ~~School~~/Lab EDL/SHD

sor: Health Examinetics, Inc.

Agreement: Purchase Order #031683-BHM

rd Period: From 3/16/83 To 5/18/83 (Performance) 6/18/83 (Reports)

sor Amount: Total Estimated: $ 1,199 Funded: $ 1,199

Sharing Amount: $ _____ Cost Sharing No: _____

: Quantitative Mask-Fit Testing

MINISTRATIVE DATA OCA Contact Faith G. Costello x-4820

ponsor Technical Contact:

Bruce H. Meyer
Health Examinetics, Inc.
1424 Murdock Road
Marietta, GA 30062

2) Sponsor Admin/Contractual Matters:

ense Priority Rating: N/A

Military Security Classification: _____

(or) Company/Industrial Proprietary: N/A

STRICTIONS

Attached N/A Supplemental Information Sheet for Additional Requirements.

vel: 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.

uipment: Title vests with N/A

MMENTS:

APR 1983 RECEIVED Research Reports Office

PIES TO:

esearch Administrative Network	Research Security Services	Research Communications (2)
esearch Property Management	~~Reports~~ Coordinator (OCA)	Project File
ccounting	GTRI	Other Middendorf
ocurement/EES Supply Services	Library	Other _____

RM OCA 4:781 (Rev 982)

GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION SHEET

Date August 16, 1983

Project Title: Quantitative Mask-Fit Testing

Project No: A-3511

Project Director: Paul Middendorf

Sponsor: Health Examinetics, Inc.

Effective Termination Date: 6/18/83

Clearance of Accounting Charges: 6/18/83

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/SHD (School/Laboratory)

COPIES TO:

Administrative Coordinator	Research Security Services	EES Public Relations (2)
Research Property Management	Reports Coordinator (OCA)	Computer Input
Accounting	Legal Services (OCA)	Project File
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FORM OCA 10:781

A-3511

Final Report
Project A-3511

ENGINEERING EXPERIMENT STATION
Georgia Institute of Technology
A Unit of the University System of Georgia
Atlanta, Georgia 30332

June 1, 1983

Mr. Bruce H. Meyer
Health Examinetics, Inc.
1424 Murdock Road
Marietta, Georgia 30062

Dear Mr. Meyer:

Quantitative respirator fit-testing was performed at the Daniel Construction Company - Monsanto Project in Decatur, Alabama on May 25-27, 1983, by Mr. Paul J. Middendorf. The National Draeger, Inc., Mask Fit Tester, canopy type for dual cartridge respirators, was used for the tests. The procedure used was that recommended by National Draeger, Inc., and is included as Attachment #1. The test gas contained nominally 1% ethylene in air. The analyzed concentration of ethylene for fit tests was 0.970%. Protection factors (PF) were calculated using the following formula:

$$PF = \frac{C_o}{C_i \times 1.25}$$

where C_o = the concentration of ethylene in the test gas, and

C_i = the concentration of ethylene in the mask when worn

The constant 1.25 was included as a safety factor of 25%. It takes into account the normal variation of detector tubes.

A list of the protection factor for the make and size of respirator fit for each employee is included as Attachment #2. The "Qual OK" and "Qual Not OK" notations indicate whether the employee indicated that the mask passed a leakage test. The primary choice of respirators was the Survivair Medium because it was the most readily available. When the Survivair Medium did not fit properly a Survivair Large or MSA Comfo II Medium was tried. Employees should wear only the respirator (make and size) for which they have been fit-tested. A card was given to each employee who was successfully fitted with a respirator. The card identified the respirator make and size that the employee should use.

Ambient levels of ethylene were monitored daily to ensure that the source of ethylene in the respirator was from leakage around the respirator rather than from ethylene which had escaped from the hood during previous tests. Ethylene was non-detectable in all ambient air samples taken.

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Several items which should be noted and which the Daniel Construction Company should be made aware of are listed below:

1. Fit testing is done under close to ideal conditions. The respirators used for fit-testing are new and are adjusted so that an acceptable fit is achieved. The employee is not performing his normal work movements which could cause additional leakage around the respirator seal.

2. To ensure that employees receive the maximum benefit of wearing a respirator, training in the use, limitations, and field-fitting of respirators should be provided at least annually. Several employees attempted to put the respirator on upside-down, and most did not know how to perform leak tests. Because the employees are potentially exposed to acrylonitrile, a carcinogen, training in the proper use of a respirator is critical.

3. Many Daniel Construction Company employees had mustaches which entered the sealing surface of the respirator. These employees were required to shave off a portion of the mustache so that the selaing surface was not interrupted and fit-testing could be done. Many of the employees will most likely grow the mustache back in the days to come. To ensure that the actual protection factor of a respirator remains close to the protection factor calculated during the fit-test, employees should not be permitted to wear a respirator when the seal is interrupted by facial hair. Before wearing a respirator employees should be required to shave off that portion of facial hair which breaks the seal. All facial hair which contacts the sealig surface should be shaved within 24 hours before wearing a respirator.

4. Although protection factors greater than 10 are reported, no half-mask respirator can be used by an employee in an area where the concentrations and time of exposure to a hazardous chemical or other agent would result in an employee exposure (disregarding the effect of the respirator) greater than 10 times the permissible exposure level.

The staff of the Daniel Construction Company - Monsanto Project was most helpful and courteous in every way possible. Special thanks go to Mrs. Sharon Meares for her coordination of the project and assistance in handling the minor problems which were encountered.

Sincerely,

Paul J. Middendorf, CIH
Research Scientist I

PJM:sek

Attachments

NATIONAL DRAEGER QUANTITATIVE MASK FIT TEST APPARATUS
CANOPY TYPE - MODEL R9000

Instructions For Use:

Prior to testing the following must be checked:
1. Perform leak test on bellows pump.
2. Volume calibration of bellows pump: $V = 100\ (cm^3) \pm 5\ (cm^3)$
3. Expiration date of detector tubes
4. Check all components of canopy assembly to make sure they are in good condition.

Assembly of Apparatus to Test Subject

1.1 Fit Collar Assembly over the test subject's head. Make sure the neck assembly, (rubber or plastic), is fitted securely. It is most important that a gas tight seal is achieved at the neck area.

1.2 Have the test subject don the mask, according to the mask instructions for use.

1.3 Remove the exhalation valve cover from the mask and connect the exhalation connecting bag to the exhalation port of the collar and also to the exhalation valve of the mask. Note: It is important that the diameter of the opening of the connector is smaller than the diameter of the exhalation valve of the mask, adjust if necessary.

1.4 Connect right and left inhalation bags to the cartridges of the mask, making sure a good seal is achieved on the outside rim of the cartridge. Then, connect the tubes at the opposite end of the inhalation bags to the inhalation posts of the collar, firmly.

1.5 Open the canopy and place over the test subject's head. Care must be taken to prevent interfering with the components already connected. Starting at the back of the canopy fit the sealing edge of the frame to the sealing edge of the canopy. Carefully pull forward, snapping the sealing edges together on the right and left sides. Then snap the front edges together and follow the entire sealed edge of the canopy to ensure a gas tight connection.

1.6 Connect the exhalation sample bag to the outside center post firmly, and have the test subject do two full respirations. The exhalation sample bag should fill on exhalation and the test subject should experience no remarkable inhalation or exhalation resistance.

1.7 Connect the outlet of the test gas regulator to the inlet of the flow meter.

1.8 Turn on test gas cylinder and adjust the outlet pressure to 20 p.s.i.

1.9 Connect the gas inlet hose of the test apparatus collar frame to the outlet of the flow meter.

1.10 Set the flow meter to 8.0 L/min.

1.11 Break off the tips of the Draeger ethylene tube and insert firmly into the bellows pump.

1.12 After 2 minutes of pre-flushing, insert the detector tube into the sampling port of the exhalation sample bag and execute three strokes of the bellows. The 8.0 L/min. flow rate must be maintained for the duration of the test.

1.13 After the completion of the third stroke of the pump, pull out the detector tube and record the measurement immediately. The measurement of ethylene gas is the furthest discoloration of light blue on the scale.

1.14 Turn off the test gas and carefully disassemble the components.

The Protection Factor of the mask wearer results from the relationship:

$$\text{Protection Factor} = \frac{\text{Test Gas Exposure}}{\text{Measured Value in the Expired Air}}$$

* Example: $\frac{PF = 1\% \ (10{,}000 \text{ ppm})}{100 \text{ ppm}}$

PF = 100

Testing must be performed in a well ventilated area, especially to prevent test subject's exposure to ethylene from a previous test.

*A test gas mixture of 1.0% (10,000 ppm) Ethylene in Air, must be purchased from a specialty gas supplier. It is important that the actual concentration of Ethylene in ppm is known on the Supplier's test report of the gas mixture for accurate testing.

DATE 1983	SS #	NAME	JOB TITLE	MASK (TYPE & SIZE)		PF
5/25	429-76-9568	Carter Thompson	Foreman	Survivair M	Qual OK	121
5/25	560-74-3492	Ron Bodine	Pipe Welder	Survivair M	Qual OK	108
5/25	418-58-3606	D. H. McKay	Instruments	Survivair M	Qual OK	26
5/25	421-74-8523	Jeff L. Lipscomb	Iron Worker	Survivair M	Qual OK	86
5/25	420-56-8645	James Rice	Sheet Metal Foreman	Survivair M	Qual OK	111
5/25	418-28-6723	Harley Sanderson	Painter	Survivair M	Qual OK	16
5/25	244-50-1854	Ben Horne	Electrical Foreman	Survivair M	Qual OK	43
5/25	418-40-5491	A. Garrison	Electrician	Survivair M	Qual Not OK	-
5/25	418-40-5491	A. Garrison	Electrician	MSA Comfo II M	Qual OK	43
5/25	287-34-2057	Marcel Stephens	Pipe Foreman	Survivair M	Qual OK	78
5/25	408-60-5202	H. R. Marmore	Pipe Filter	Survivair M	Qual OK	86
5/25	422-36-8462	Spencer Hardin	Iron Welder	Survivair M	Qual OK	11
5/25	411-72-8919	B. Jones	Sheet Metal Worker	Survivair M	Qual OK	65
5/25	248-18-9948	Jo Don Thompson	Electrician Superintendent	Survivair M	Qual OK	194
5/25	421-48-5827	H. Robinson	Painter	Survivair M	Qual OK	129
5/25	416-64-5529	D. M. Dishman	Electrician	Survivair M	Qual OK	97
5/25	422-80-4656	Ronald D. Vinson	Electrician	Survivair M	Qual OK	16
5/25	423-64-1870	T. King	Laborer	Survivair M	Qual OK	78
5/25	383-34-0718	Dave Vickery	Millright Foreman	Survivair M	Qual OK	49

DATE	SS #	NAME	JOB TITLE	MASK (TYPE & SIZE)		PF
5/25	418-40-6393	George Anderson	Sheet Metal Mechanic	Survivair M	Qual OK	11
5/25	287-34-0517	Howell Evans	Welder	Survivair M	Qual OK	111
5/25	417-64-9397	P. Rowe	Electrician	Survivair M	Qual OK	71
5/25	416-74-6109	Carl Mote	Electrician	Survivair M	Qual OK	97
5/25	416-46-7975	Lyle Green	Pipe Foreman	Survivair M	Qual OK	194
5/25	422-52-4166	L. Parham	Laborer	Survivair M	Qual OK	<10
5/25	422-52-4166	L. Parham	Laborer	MSA Comfo II M	Qual OK	43
5/25	424-76-6664	R. L. Pierce	Pipe Fitter	MSA Comfo II M	Qual OK	129
5/25	423-42-7509	John T. Tidwell	Iron Worker	Survivair M	Qual OK	22
5/25	424-76-7078	D. Burden	Sheet Metal Mechanic	Survivair L	Qual OK	97
5/25	422-20-5142	Q. Vickery	Millwright	Survivair L	Qual OK	26
5/25	422-92-3443	Ralph W. Rush	Pipe Fitter	Survivair M	Qual OK	111
5/25	419-60-9950	Charles W. Lott	Insulator	Survivair M	Qual OK	194
5/25	416-48-2552	O. Stevenson	Cement Finisher	Survivair M	Qual OK	97
5/25	424-78-5738	W. Lindley	Electrician	Survivair M	Qual OK	65
5/25	318-30-3225	C. L. Harville	Carpenter	Survivair M	Qual OK	97
5/25	415-74-8346	John M. Robinson	Electrician	Survivair M	Qual OK	86
5/25	416-44-4399	L. Webb	Electrician	Survivair M	Qual Not OK	-
5/25	416-44-4399	L. Webb	Electrician	MSA Comfo II M	Qual OK	71

DATE 1983	SS #	NAME	JOB TITLE	MASK (TYPE & SIZE)		PF
5/25	418-48-8313	John Hill	Insulation	Survivair M	Qual OK	52
5/25	418-48-7780	Joe Hill	Labor	Survivair M	Qual OK	17
5/25	418-94-0975	Mike L. Denton	Electrician's Helper	Survivair M	Qual OK	97
5/25	416-46-3968	Ray L. Lynch	Pipe Helper	Survivair L	Qual OK	78
5/25	420-76-4748	Carl D. Smith	Electrician	Survivair M	Qual OK	19
5/25	418-40-3867	Wilbur Smith, Jr.	Millwright	Survivair M	Qual OK	78
5/26	417-96-7317	Eddie Lawrence	Carpenter	Survivair M	Qual OK	26
5/26	424-34-4263	L. McKay		Survivair M	Qual OK	11
5/26	263-58-1722	Betty J. Foster	Pipe Fitter Helper	Survivair M	Qual OK	26
5/26	420-92-9894	James Grantland	Electrician	Survivair M	Qual OK	78
5/26	421-34-0190	Willie Spangler	Laborer	Survivair M	Qual OK	46
5/26	422-66-9564	Aaron Ashford	Painter's Helper	Survivair M	Qual OK	41
5/26	422-20-7529	Willie Robinson	Laborer	Survivair M	Qual OK	<10
5/26	422-20-7529	Willie Robinson	Laborer	MSA Comfo II M	Qual OK	55
5/26	417-56-0184	Sam Jones	Heavy Equipment Operator	Survivair L	Qual OK	97
5/26	416-44-0181	B. Latham	Electrician	Survivair M	Qual OK	111
5/26	426-70-6028	J. W. Russell	Pipe Fitter	Survivair M	Qual OK	22
5/26	418-96-6955	J. M. Thompson	Electrician's Helper	Survivair M	Qual OK	103
5/26	418-30-7572	Ray Rice	Welder	Survivair M	Qual Not OK	-

DATE 1983	SS #	NAME	JOB TITLE	MASK (TYPE & SIZE)		PF
5/26	418-30-7572	Ray Rice	Welder	MSA Comfo II M	Qual OK	86
5/26	256-44-0680	Charles Osby	Pipe Fitter	Survivair M	Qual OK	31
5/26	419-12-5113	George Kilgo	Sheet Metal	Survivair M	Qual Not OK	-
5/26	419-12-5113	George Kilgo	Sheet Metal	MSA Comfo II M	Qual OK	49
5/26	421-48-8326	John Potts	Welder	Survivair M	Qual OK	97
5/26	261-42-9294	Manuel Burks	Sheet Metal Mechanic	Survivair M	Qual OK	86
5/26	413-58-4271	Barbara King	Insulation Helper	Survivair M	Qual OK	86
5/26	421-54-3071	Ben Dumas	Insulator	Survivair M	Qual OK	111
5/26	416-66-7236	Gary Lemmond	Millwright	Survivair M	Qual OK	104
5/26	416-40-4676	Clifton Kelsoe	Millwright	Survivair M	Qual Not OK	-
5/26	416-40-4676	Clifton Kelsoe	Millwright	Survivair L	Qual Not OK	-
5/26	416-40-4676	Clifton Kelsoe	Millwright	MSA Comfo II M	Qual OK	259
5/26	423-80-3803	Keith Barbrey	Sheet Metal Mechanic	Survivair M	Qual OK	86
5/26	421-76-2298	R. Blackwood	Sheet Metal Welder	Survivair M	Qual OK	46
5/26	422-56-8033	Bobby Peck	Sheet Metal Foreman	Survivair M	Qual OK	26
5/26	421-78-3226	J. K. Parrish	Sheet Metal	Survivair M	Qual OK	<10
5/26	421-78-3226	J. K. Parrish	Sheet Metal	MSA Comfo II M	Qual OK	39
5/26	421-82-2930	M. Sanderson	Sheet Metal	Survivair M	Qual Not OK	-
5/26	421-82-2930	M. Sanderson	Sheet Metal	MSA Comfo II M	Qual OK	65

DATE 1983	SS #	NAME	JOB TITLE	MASK (TYPE & SIZE)		PF
5/26	419-86-7696	Jeff Albright	Pipe Fitter	Survivair M	Qual OK	49
5/26	419-80-0369	L. Burden	Pipe Helper	Survivair M	Qual OK	259
5/26	254-04-5217	Richard N. Drennan	Electrician	Survivair M	Qual OK	129
5/26	422-36-9543	Silas Eckstein	Heavy Machinery Operator	Survivair M	Qual OK	13
5/26	421-50-3038	Percy Perkins	Carpenter	Survivair L	Qual OK	155
5/26	424-76-6326	Carl Fairbanks	Electrician	Survivair M	Qual OK	194
5/27	421-64-4909	Joe Garrie, Jr.	Welder	Survivair M	Qual OK	388
5/27	423-42-8839	Bill Curnutt	Welder	Survivair M	Qual OK	52
5/27	422-86-7747	T. Smith	Pipe Welder	MSA Comfo II M	Qual OK	776
5/27	357-40-8942	Joe Parsley	Pipe Fitter	Survivair M	Qual OK	194
5/27	266-44-7539	Elide White	Pipe Welder	Survivair M	Qual OK	22
5/27	420-56-8588	B. Cottingham	Mechanic	Survivair M	Qual OK	129
5/27	422-40-9702	Billy Hogan	Pipe Fitter	Survivair M	Qual OK	<10
5/27	422-40-9702	Billy Hogan	Pipe Fitter	MSA Comfo II M	Qual OK	129
5/27	424-34-9982	Will Farmer	Pipe Fitter	MSA Comfo II M	Qual OK	259
5/27	424-76-8038	R. Vest	Pipe Welder	Survivair M	Qual OK	17
5/27	407-40-9888	Charles Webb	Pipe Welder	Survivair M	Qual OK	194
5/27	421-82-3898	Keith McIntyre	Electrician	Survivair M	Qual OK	155
5/27	421-72-3806	Clayton H. Rice	Electrician	Survivair M	Qual OK	49