Asbestos Survey and Assessment of Vehicle Assembly Building Lower Bays and Utility Annex Roofing

Location:

Kennedy Space Center, Florida

Prepared for:

Reynolds, Smith & Hills, Inc.
2235 N. Courtenay Parkway, Suite C
Merritt Island, Florida
32953-5227

Prepared by:

Browning Environmental Service Technologies
3954 N. W. 41st Court
Gainesville, Florida 32606-4557

BEST **Project # 412-015**
RS&H Project # 302-3354-019

January 6, 2005
Amended February 3, 2005

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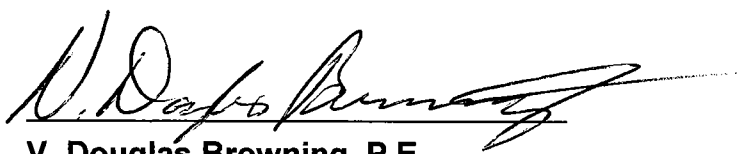
Environmental Survey Title Sheet

Facility Name:	**VAB and Utility Annex**
Address:	**Launch Complex 39**
City:	**Kennedy Space Center, Florida**
Owner:	**National Aeronautics and Space Administration (NASA)**
Date of Survey:	**December 28, 2004 & January 27, 2005**
Environmental Consultant:	**Browning Environmental Service Technologies**
Address:	**3954 N. W. 41st Court**
City:	**Gainesville, Florida 32606-4557**
Phone:	**(352) 258-6284**



V. Douglas Browning, P.E.
EA 0000029
PE 0041407

1.0 INTRODUCTION

1.1 Description of Asbestos

Asbestos is the name of a group of natural minerals that separate into strong, very fine fibers. The asbestos fibers being heat-resistant and extremely durable, make asbestos very useful in construction and industry. Although there are several different types of asbestos, nearly 95 percent of all asbestos used in commercial products today is a type called *chrysotile*.

The potential of an asbestos-containing product to release fibers is dependent upon several factors, including its location and degree of friability. Friable means that it can be crumbled with hand pressure and, therefore, is likely to emit fibers when disturbed. The fibrous or fluffy spray-applied asbestos materials used in many buildings as fireproofing, insulation, or for decorative purposes are generally considered friable. Non-friable materials such as vinyl floor tiles are likely to emit fewer airborne fibers unless subjected to sanding or cutting operations.

Between 1900 and 1980, some thirty million tons of asbestos were put in place; however, since the 1970s, asbestos use has declined significantly.

1.1.1 Identifying Asbestos

Asbestos has been used in a variety of forms. It has been sprayed or troweled onto ceilings, beams, walls, and other structural components of buildings. It was used for thermal, acoustical, and decorative purposes, and to insulate boilers and pipes, as well as many other construction materials and appliances.

1.2 Health Concerns

The physical properties that give asbestos its resistance to heat and decay are linked to several adverse human health effects. Asbestos breaks into a dust of microscopic fibers, and because of their size and shape, these tiny fibers can remain suspended in the air for long periods, and

can easily penetrate body tissues when inhaled. Due to their durability, these fibers can remain in the body for many years.

Asbestos is known to cause *asbestosis* and various forms of cancer. Asbestosis is a chronic disease of the lungs that makes breathing progressively more difficult, and can lead to death. *Cancer* can result from breathing asbestos fibers. *Lung cancer*, the most frequently seen asbestos-caused disease, is apparently made much more likely by smoking. Breathing asbestos also can cause *mesothelioma*, a cancer of the chest and abdominal membranes. Mesothelioma almost never occurs without exposure to asbestos, and is currently incurable. Other cancers, primarily of the digestive tract, also have been associated with exposure to asbestos.

These diseases have a long latency period--that is, they do not show until twenty to forty years after exposure. Right now, for example, we are seeing the results of exposure that occurred among asbestos workers during World War II.

2.0 METHODOLOGY

This report documents the inspection and sampling for the presence of suspected asbestos-containing material (ACM) the renovations to the roof of the VAB Low Bay and Utility Annex Roofing at the Kennedy Space Center, Florida. The sampling was conducted by V. Douglas Browning of BEST on December 28, 2004. The inspection included all of the areas scheduled to be affected by the renovation of the facilitys roof.

The inspector performed the survey moving in a systematic fashion and sampled each identified homogeneous area. A critical step in this process was the delineation of different suspect homogeneous areas of the various materials and the definition of these homogeneous areas for specific sampling of each type of suspect ACM to ascertain if any asbestos is present in the homogeneous areas identified. The delineation of these homogeneous areas formed the basis upon which subsequent steps of the inspection were completed.

In general, homogeneous areas were defined as "those areas of the facility containing a given type of suspect material or paint that is uniform in color and texture." This approach involved notation of the location of each homogeneous area of suspect material and paint by using a coding system to delineate different colors and textures of suspect materials. The designation of each suspect ACM homogeneous area was defined based upon the area containing the same type of material and/or color and texture of each material, (as determined by physical appearance, age, and general condition) it was then considered to be one homogeneous area.

Once homogeneous areas were defined, a sampling strategy was developed for each to provide random samples of suspect ACM. The suspect ACM samples from each homogeneous area were analyzed using the appropriate analytical method for each sample by a laboratory that is accredited by NVLAP .

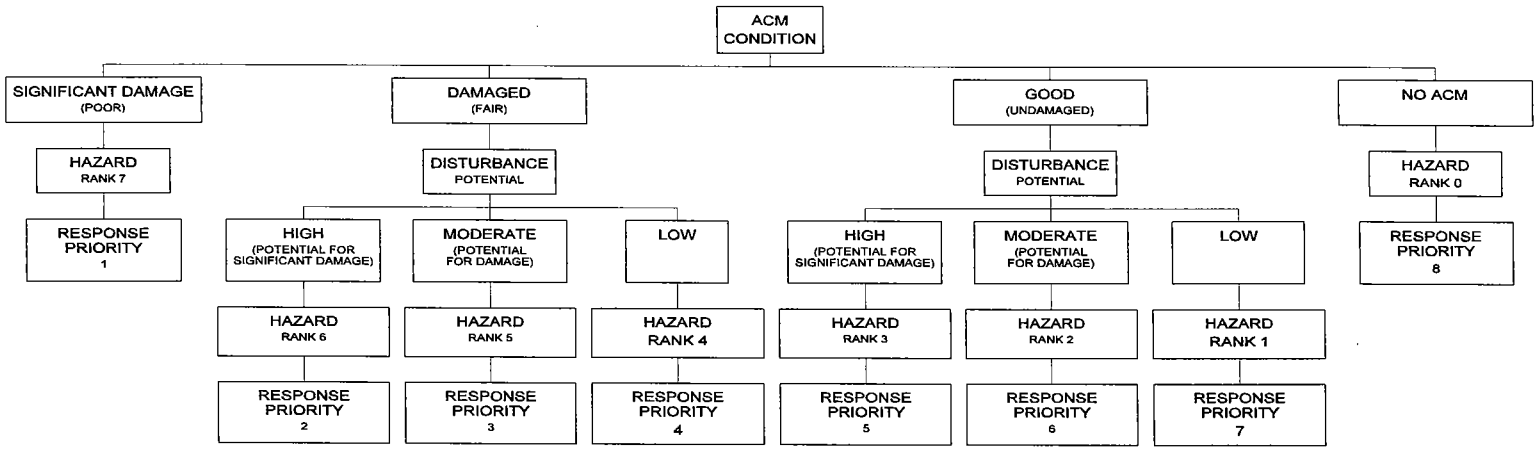
Sample locations using a unique identifying number were noted on the Field Survey Log Sheet and Chain-of-Custody Form. The Field Survey Log Sheet and Chain-of-Custody Forms accompanied the samples to the laboratory, after being signed by the sampler. At the laboratory the analyst receiving the samples then signs for the samples.

During the inspection some of the physical parameters documented by the surveyor for the suspect ACM:

- **Condition of material;**
- **Amount of exposed surface area of material;**
- **Activity, movement, or vibrational effects within the area;**
- **Potential for air erosion;**
- **Signs of past disturbance.**
- **Accessibility of material to building occupants;**
- **Friability of material; and**
- **Potential for disturbance.**

Using the above parameters, a risk assessment was conducted.

ASBESTOS HAZARD ASSESSMENT DECISION TREE



THE HIGHER THE HAZARD RANKING THE MORE SEVERE THE PROBLEM, AND BECAUSE PEOPLE TEND TO EQUATE A "1" WITH TOP PRIORITY, THE ASSIGNMENT NUMBERS FOR THE RESPONSE PRIORITY ARE REVERSED TO MAKE "1" THE HIGHEST RANKED.

Figure 2-1

ASBESTOS HAZARD ASSESSMENT TREE

3.0 DISCUSSION OF FINDINGS AND RECOMMENDATIONS

Table 3-1, shows the location of all suspect ACM samples taken and the associated homogeneous areas. Only the samples containing asbestos at greater than the 1 percent guidelines were considered as ACM. For this reason the findings do not discuss the homogeneous areas that were sampled but found to contain less than the 1 percent threshold which NESHAP considers to be ACM.

3.1 Sampled Suspect ACM

All of the suspect materials observed were sampled so there are not any materials that are presumed to be ACM and not sampled.

3.1.1 Spray/Trowel Applied Surfacing Material

3.1.1.1 Friable

There were no suspect homogeneous areas of friable spray/trowel applied surfacing material identified.

3.1.1.2 Non-Friable

There were no suspect homogeneous areas of non-friable spray/trowel applied surfacing material identified.

3.1.2 Thermal System Insulation (TSI)

3.1.2.1 Friable

There were no suspect homogeneous areas of friable TSI identified.

3.1.2.2 Non-Friable

There were no suspect homogeneous areas of non-friable TSI identified.

3.1.3 Miscellaneous Materials

3.1.3.1 Friable

There were no suspect homogeneous areas of friable miscellaneous materials identified.

3.1.3.2 Non-Friable

There were eight different suspect homogeneous areas (HA) of non-friable miscellaneous materials identified. All were HA's of built-up roofing materials BUR-1, BUR-2 and BUR-3 and roofing flashing RF-1, RF-2, RF-3 and RF-4 from the various sections and levels of the roofing were sampled and laboratory analyses of the samples confirmed the materials of BUR - thru BUR-3 and RF-1 were found to be non-ACM, while RF-2, RF-3 and RF-4 were found to contain 5 percent chrysotile asbestos in the bitumen/felt flashing on the curbing and perimeter roofing flashing on the Low Bay and Utility Annex roofing and RM-1 on the 210' Elevation was found to contain 10 percent chrysotile in the pitch pocket tar for the speaker supports.

3.2 Sampled Suspect Heavy Metal Paint (HMP)

3.3 Recommendations

3.3.1 ACM

The flashing found on the perimeter and curbs of the roofing was identified to contain 5 percent chrysotile asbestos in three of the four homogeneous areas sampled. Due to this it is recommended that all of the flashing on the roofing be abated prior to the material being disturbed. It must be treated as built-up roofing membranes when being abated. This would mean that all roofing and flashing be treated as ACM if it is within 24 inches of a curb or wall and be abated as such. If any or all of the eight pitch pockets are to be disturbed they must be abated first.

BROWNING ENVIRONMENTAL SERVICE TECHNOLOGIES

ASBESTOS SURVEY AND ASSESSMENT FORM

BEST PROJ. No.: **412-015** Field Group I.D.: B412KSCVABLB*
Building Owner: NASA, Kennedy Space Center
Building: VAB Low Bays and Utility Annex Roofing
Inspector (s): DOUG BROWNING
Date of Survey: December 28, 2004 & January 27, 2005

Building Contact Person: Darold F. Cole, RS&H (321) 453-0212
Laboratory Performing Analysis: EMSL Analytical, Inc.
Consultant/Lic. Nos.: V. Douglas Browning, PE0041407/EA0000029
BROWNING ENVIRONMENTAL SERVICE TECHNOLOGIES, 3954 NW 41st, COURT, GAINESVILLE, FL 32606-4557
BEST Phone: (352)372-4067 FAX No. (352) 335-4304

BUILDING ROOM ID/NO.	SAMPLE NO.	(TYPE) MATERIAL	HOMOGENOUS AREA OR FUNCTIONAL SPACE	UNITS & Approx.. QUANTITY	(Y-N) FRIABLE	PERCENT & TYPE ASBESTOS	G - GOOD F - FAIR, P - POOR CONDITION	(H, M, L) DAMAGE POTENTIAL	HAZARD ASSESSMENT	RESPONSE PRIORITY	AMBIENT AIR MONITORING REQ. (Y-RESULT)	APPROXIMATE RESPONSE COST RESPONSE	AIR MONITORING	REPLACE MENT	ADDITIONAL COMMENTS
Roofing, LB	1	Misc.	BUR-1	13000	N	None	G	L							Yellow Insulation
Roofing, LB	1A	Misc.	BUR-1		N	None	G	L							Tan Fiberous Layer, Insulation
Roofing, LB	1B	Misc.	BUR-1		N	None	G	L							Roofing Membrane, Insulation
Flashing, LB	2	Misc.	RF-1	1000	N	None	G	L							Black/Silver Flashing Material
Roofing, LB	3	Misc.	BUR-2	13000	N	None	G	L							Yellow Insulation
Roofing, LB	3A	Misc.	BUR-2		N	None	G	L							Tan Fiberous Layer, Insulation
Roofing, LB	3B	Misc.	BUR-2		N	None	G	L							Roofing Membrane, Insulation
Flashing, LB	4	Misc.	RF-2	2000	N	5% Chry	G	L	1	7	N/A	$30,000	$9,900	$30,000	Black/Silver Flashing Material
Roofing, UA	5	Misc.	BUR-3	50000	N	None	G	L							Fiberous Layer, Insulation
Roofing, UA	5A	Misc.	BUR-3		N	None	G	L							Roofing Membrane, Insulation
Roofing, UA	6	Misc.	BUR-3		N	None	G	L							Fiberous Layer, Insulation
Roofing, UA	6A	Misc.	BUR-3		N	None	G	L							Roofing Membrane, Insulation
Roofing, UA	7	Misc.	BUR-3		N	None	G	L							Fiberous Layer, Insulation
Roofing, UA	7A	Misc.	BUR-3		N	None	G	L							Roofing Membrane, Insulation
Flashing, LB	8	Misc.	RF-3	1000	N	5% Chry	G	L	1	7	N/A	$15,000	$4,950	$15,000	Black/Silver Flashing Material
Flashing, LB	9	Misc.	RF-4	1000	N	5% Chry	G	L	1	7	N/A	$15,000	$4,950	$15,000	Black/Silver Flashing Material
Roofing, LB	10	Misc.	BUR-1		N	None	G	L							Yellow Insulation
Roofing, LB	10A	Misc.	BUR-1		N	None	G	L							Tan Fiberous Layer, Insulation
Roofing, LB	10B	Misc.	BUR-1		N	None	G	L							Roofing Membrane, Insulation
Roofing, LB	11	Misc.	BUR-2		N	None	G	L							Yellow Insulation
Roofing, LB	11A	Misc.	BUR-2		N	None	G	L							Tan Fiberous Layer, Insulation
Roofing, LB	11B	Misc.	BUR-2		N	None	G	L							Roofing Membrane, Insulation
			Samples Collected	01/27/05											
Roofing, LB 210'	17	Misc.	RM-1	10	N	10% Chry	G	L	1	7	N/A	$250	$100	$0	LB Roof SE Corner, Speaker Suprt, Pitch Pkt
Roofing, LB 210'	18	Misc.	RM-1		N	None	G	L							LB Roof SE Corner, Speaker Suprt, Pitch Pkt
											SUBTOTALS (this page)	$60,250	$19,900	$60,000	
											Run Total for REMOVAL/REPLACE	$60,250		$60,000	
											Run Total for CONSULTANT FEES		$19,900		

COMMENTS/NOTES:

TABLE 3 - 1

Appendix A

Personnel Certifications

RETRA TRAINING SERVICES

113 S. Disston Avenue
Tarpon Springs, FL 34689
1-727-938-5459

V. Douglas Browning *255-68-2388*
3954 NW 41st Court Gainesville, FL 32606-4557

Has successfully completed the Requisite Training for Asbestos Accreditation
as required by TSCA Title II

Asbestos Inspector Refresher

Course Date: *October 9, 2004*

Exam Date: *October 9, 2004*

Expiration Date: *October 9, 2005*

Course Location: *Tarpon Springs, Fl*

Certification Number: *F* 020894

Silver

Instructors

John V. Lucio

Course Administrator

Appendix B

Laboratory Analysis Data Sheets

EMSL Analytical, Inc.
5125 Adanson Street, Suite 900, Orlando, FL 32804
Phone: (407) 599-5887 Fax: (407) 599-9063 Email: orlandolab@emsl.com

Attn: **Doug Browning**
Browning Environmental Serv. Tech.
3954 NW 41ST Court
Gainesville, FL 32606-4557
Fax: (352) 335-4304 Phone: (352) 665-1374
Project: **412-015 Vehicle Assembly bldg Low Bays**

Customer ID: BROW65
Customer PO:
Received: 12/30/04 10:11 AM
EMSL Order: 340402653
EMSL Proj:
Analysis Date: 1/5/2005
Report Date: 1/5/2005

Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Location**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
1 *340402653-0001*	roof 1 VAB W side at mechanical room NW corner	Yellow Non-Fibrous Heterogeneous	5%	Cellulose	95%	Non-fibrous (other)	**None Detected**
1A *340402653-0012*	fibrous layer W side at mechanical room NW corner	Tan Fibrous Heterogeneous	60%	Cellulose	20% 20%	Perlite Non-fibrous (other)	**None Detected**
1B *340402653-0013*	black layer W side at mechanical room NW corner	Black Non-Fibrous Heterogeneous	10%	Cellulose	10% 80%	Perlite Non-fibrous (other)	**None Detected**
2 *340402653-0002*	roof 1 VAB W side middle curb flashing	Black/Silver Non-Fibrous Heterogeneous	20% 20%	Glass Cellulose	10% 50%	Quartz Non-fibrous (other)	**None Detected**
3 *340402653-0003*	roof 1 VAB E side at mechanical room SE corner	Yellow Non-Fibrous Heterogeneous	5%	Cellulose	95%	Non-fibrous (other)	**None Detected**
3A *340402653-0014*	fibrous layer E side at mechanical room SE corner	Tan Fibrous Heterogeneous	60%	Cellulose	20% 20%	Perlite Non-fibrous (other)	**None Detected**
3B *340402653-0015*	black layer E side at mechanical room SE corner	Black Non-Fibrous Heterogeneous	10%	Cellulose	10% 80%	Perlite Non-fibrous (other)	**None Detected**

Analyst(s)
Randy Pruitt (22)

Blanca Cortes, Ph.D.
or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. Samples reported as <1% or none detected may require additional testing by TEM to confirm asbestos quantities. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of EMSL Analytical, Inc. EMSL's liability is limited to the cost of analysis. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client.
Analysis performed by EMSL Orlando (NVLAP #101151-0, Texas Cert. #30-0291)

EMSL Analytical, Inc.
5125 Adanson Street, Suite 900, Orlando, FL 32804
Phone: (407) 599-5867 Fax: (407) 599-9063 Email: orlandolab@emsl.com

Attn: **Doug Browning**
Browning Environmental Serv. Tech.
3954 NW 41ST Court
Gainesville, FL 32606-4557
Fax: (352) 335-4304 Phone: (352) 665-1374
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Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Location**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
4 *340402653-0004*	roof 1 VAB E side S expansion joint	Black/Silver Non-Fibrous Heterogeneous	5%	Cellulose	90%	Non-fibrous (other)	**5% Chrysotile**
5 *340402653-0005*	utility annex NW section of roof	Black Non-Fibrous Heterogeneous	10%	Cellulose	70% 20%	Perlite Non-fibrous (other)	**None Detected**
5A *340402653-0015*	tar layer utility annex NW section of roof	Black Non-Fibrous Heterogeneous	10%	Cellulose	10% 20% 60%	Quartz Perlite Non-fibrous (other)	**None Detected**
6 *340402653-0006*	utility annex center section of roof S side	Black Non-Fibrous Heterogeneous	10%	Cellulose	70% 20%	Perlite Non-fibrous (other)	**None Detected**
6A *340402653-0017*	tar layer utility annex center section of roof S	Black Non-Fibrous Heterogeneous	5% 5%	Glass Cellulose	10% 20% 60%	Quartz Perlite Non-fibrous (other)	**None Detected**
7 *340402653-0007*	utility annex NE section of roof	Black Non-Fibrous Heterogeneous	10%	Cellulose	70% 20%	Perlite Non-fibrous (other)	**None Detected**
7A *340402653-0018*	tar layer utility annex NE section of roof	Black Non-Fibrous Heterogeneous	5% 5%	Glass Cellulose	10% 20% 60%	Quartz Perlite Non-fibrous (other)	**None Detected**

Analyst(s)
Randy Pruitt (22)

Alexis Cortes, Ph.D.
or other approved signatory

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Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Location**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
8 *340402653-0008*	utility annex center ventilation fan curb flashing	Black/Silver Non-Fibrous Heterogeneous	5%	Cellulose	90%	Non-fibrous (other)	**5% Chrysotile**
9 *340402653-0009*	utility annex E center equipment curb flashing	Black/Silver Fibrous Heterogeneous	20% 5%	Glass Cellulose	70%	Non-fibrous (other)	**5% Chrysotile**
10 *340402653-0010*	roof 1 VAB W side at mechanical room SW corner	Yellow Non-Fibrous Heterogeneous	5%	Cellulose	95%	Non-fibrous (other)	**None Detected**
10A *340402653-0019*	fibrous layer W side at mechanical room SW corner	Tan Fibrous Heterogeneous	60%	Cellulose	20% 20%	Perlite Non-fibrous (other)	**None Detected**
10B *340402653-0020*	black layer W side at mechanical room SW corner	Black Non-Fibrous Heterogeneous	5% 5%	Glass Cellulose	10% 80%	Perlite Non-fibrous (other)	**None Detected**
11 *340402653-0011*	roof 1 VAB E side at mechanical room NE corner	Yellow Non-Fibrous Heterogeneous	5%	Cellulose	95%	Non-fibrous (other)	**None Detected**
11A *340402653-0021*	fibrous layer E side at mechanical room NE corner	Tan Fibrous Heterogeneous	60%	Cellulose	20% 20%	Perlite Non-fibrous (other)	**None Detected**

Analyst(s)
Randy Pruitt (22)

Blaine A. Cortes, Ph.D.
or other approved signatory

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Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Location**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
11B *340402653-0022*	black layer E side at mechanical room NE corner	Black Non-Fibrous Heterogeneous	5% 5%	Glass Cellulose	10% 80%	Perlite Non-fibrous (other)	**None Detected**

Analyst(s)
Randy Pruitt (22)

Blanca Cortes, Ph.D.
or other approved signatory

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PLM-1

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