HEARING ON THE MANAGEMENT OF ASBESTOS AND HAZARDOUS MATERIALS AT THE SMITHSONIAN INSTITUTION

HEARING

BEFORE THE

COMMITTEE ON HOUSE ADMINISTRATION HOUSE OF REPRESENTATIVES

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

HELD IN WASHINGTON, DC, APRIL 1, 2009

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MANAGEMENT OF ASBESTOS AND HAZARDOUS MATERIALS AT THE SMITHSONIAN INSTITUTION

WEDNESDAY, APRIL 1, 2009

HOUSE OF REPRESENTATIVES,
COMMITTEE ON HOUSE ADMINISTRATION,
Washington, DC.

The committee met, pursuant to call, at 1:00 p.m., in Room 1310, Longworth House Office Building, Hon. Robert A. Brady [chairman of the committee] presiding.

Present: Representatives Brady, Lungren, and Harper.

Staff Present: Liz Birnbaum, Staff Director; Jamie Fleet, Deputy Staff Director; Matt Pinkus, Professional Staff/Parliamentarian; Kyle Anderson, Press Director; Kristin McCowan, Chief Legislative Clerk; Matt DeFreitas, Staff Assistant; Peter Schalestock, Minority Counsel; Karin Moore, Minority Legislative Counsel; and Katie Ryan, Minority Professional Staff.

The CHAIRMAN. Good afternoon. I would like to call the hearing on the House Administration to order, and thank all of you for coming and participating.

The subject of our oversight hearing today is management of asbestos and hazardous substances at the Smithsonian Institute. This is our first hearing on the Smithsonian in the 111th Congress. We will receive testimony from the Secretary of the Smithsonian Institute and others on the Smithsonian's effort to control asbestos and other hazardous substances at its facilities.

A story in The Washington Post on March 15th raised issues about the Smithsonian practices, focusing on the National Air and Space Museum, which is the most visited museum in the Smithsonian complex, indeed in the world, with more than 6 million visitors in the year 2007. We are concerned about how well the Smithsonian has been complying with Federal laws and best practices in controlling asbestos and other hazardous substances that the staff and the visiting public may be exposed to.

Millions of visitors to the Smithsonian facilities and the thousands of people who operate and work in and around the buildings deserve to know whether the Institute is ensuring their well-being. We are also concerned about how well and how frequently the Smithsonian communicates with the staff about the exposure to and control of hazardous substances. What is the expected role of the staff in controlling and abating hazardous materials, and how good is their training? We would also like to know whether the

Smithsonian standards are uniform or vary from museum to museum. How can the Institution's performance be improved?

In the last Congress, the committee held an oversight hearing on the Smithsonian governance practices. During that period, the Smithsonian was attempting nothing less than a cultural revolution. An insular management style, presided over by a part-time Board of Regents, supplemented by reckless fiscal practices by top officials and inconsistent personnel policies is being transformed into a full-time professional operation worthy to receive Federal funds. This transformation is still a work in progress. I hope to hear—and I welcome and thank Secretary Clough—that improving handling of hazardous materials will be another product of the management changes.

The committee has also extended its oversight over the appointment of nine citizen regents who serve on the Board of Regents for up to two consecutive 6-year terms. The committee has two such citizen regent nominations pending before that at this time, and we have postponed action on them until we could conduct this oversight hearing.

I thank the ranking member, Mr. Lungren, for being here again and showing up and letting us get this hearing under way. And I also thank Secretary Clough for being here.

I need to make a little point that a lot of this is being—you are here receiving this; you weren't there when this happened or anything has happened in the past. You were a part of my statement that says we are transforming, and we feel really confident and good about the fact that this has been transformed. The whole operation, I think, from the top down, has been revamped, so to speak. And you are now at the helm, and we are confident that any problems that existed that were in the past will be rectified. We have been monitoring; so far, they have been rectified. You have been open with us. There has been constant cooperation between our staff and your staff, ourselves and yourself, and we do appreciate that.

I would now like to recognize Mr. Lungren for any opening statement he would like to make.

Mr. LUNGREN. Thank you very much. I thank the chairman for calling today's hearing regarding the presence of asbestos at the Smithsonian Institution.

And while we know the mission of the Smithsonian is primarily to serve as our Nation's premiere cultural institution, the men and women who make it possible to deliver on that mission should not be forgotten in the process. There are many competing priorities that exist in running an organization that is the size and scope of the Smithsonian, but the institution cannot lose sight of its responsibility to ensure that the handling of hazardous materials buried deep within the museums' walls is conducted with a full understanding of potential health and safety implications.

As we have seen with past cases of exposure to harmful elements, these problems do not simply go away because we wish them to, and they must be continually addressed through an aggressive management plan. We must anticipate these issues and take decisive actions once evidence of hazardous materials in the

environment becomes apparent, in order to protect the employees and contractors who may be exposed to these elements.

One way to prevent long-term exposure to these hazardous materials once they are found is to increase communications between the safety officials within each museum, as well as among the museums that make up the Smithsonian Institution.

In reviewing the timeline of events related to asbestos issues at the Smithsonian's National Air and Space Museum, it appears that asbestos awareness training sessions were neither as comprehensive nor as regular as they should have been. Given the staff turnover that would have likely occurred at the museum since the last comprehensive study was conducted in 1992, the deficiencies in awareness and training for employees increased the risk of asbestos exposure.

Now, again, Mr. Secretary, you are here as the person—I don't know if you are like the fellow following the elephant in the circus, cleaning up, and then we blame you for what you are cleaning up, but we do appreciate the commitment that you have made to understanding this issue and its importance to the continued operation of the Smithsonian.

Therefore, I look forward, as does the chairman, to hearing from you as to what may be done to fortify communications protocols among museum officials to ensure that lapses such as those that we saw at the Air and Space Museum do not recur in the future, either at that facility or any other in the Smithsonian's jurisdiction.

And finally, I understand that today's hearing is being held, in part, due to the alleged asbestos exposure of one of the Smithsonian's long-time employees. And while we are not here to discuss the merits of the particular case—we shouldn't interfere with a case that is going forward—whenever an accusation of this type is made, it is our responsibility to ensure that a culture of openness exists and that employees who act as whistleblowers are taken seriously and not subjected to retaliation. That message has to go out loudly and clearly.

So I thank our witnesses for participating in today's hearing and look forward to their testimony.

And, as you know, Mr. Chairman, we are probably going to have votes that interrupt, but we will do our best effort to be here for it.

The CHAIRMAN. Thank you.

Mr. Harper, any statement?

Mr. HARPER. No opening statement.

The CHAIRMAN. Thank you.

We welcome today the Secretary of the Smithsonian, Dr. G. Wayne Clough.

Dr. Clough, the regents chose you last year after a rigorous yearlong searching process. We have had the opportunity to talk to you several times since you took office last July, and I appreciate your efforts in engaging with the Members on a regular basis. This is your first appearance before the House Administration Committee, and I am pleased to welcome you.

Your formal statement will be entered into the record. Normally, we ask witnesses to speak for 5 minutes, but we will not put that time limit on you. You can speak as long as you want.

STATEMENT OF G. WAYNE CLOUGH, SECRETARY, SMITHSONIAN INSTITUTION

Dr. CLOUGH. Thank you, Mr. Chairman, and to the other committee members. I appreciate this opportunity to testify on behalf of the Smithsonian.

Let me begin by assuring the committee as well as the American people that all of our museums are safe, they are open, and they are free, as always. And that is one of the reasons we have a very large attendance at the Smithsonian.

We have never had any indication of public asbestos hazard in any of our museums. The safety of our employees, volunteers, and visitors remains our highest priority. I believe the Smithsonian has an excellent and an improving safety record. As you can see from the chart over here that I will refer to shortly, we work diligently to comply with OSHA and EPA regulations and standards.

Based on our calculations, the Smithsonian's total recordable injury rate is below the Bureau of Labor Statistics' national average of all museums, historical sites, and similar institutions. For the past 4 years, we have been below that national average benchmark by more than 60 percent. And for the same time period, we are 45 percent below the Federal Government average. As you can see from the chart and as I just indicated, where these rates have dropped well below the benchmarks.

Now, there are reasons, I think, to be pleased with the progress that is being made. But as pleased as we are, our goal is zero injuries for our workers. And we will continue to seek to improve, I promise you that. And I have submitted details of our safety programs that are intended to accomplish this to the committee in the written testimony.

We are certainly concerned about Mr. Pullman's health and well-being, and we take his complaint seriously. I assure you, he has been and will continue to be treated fairly and equitably. Any worker at the Smithsonian has the right to call attention to safety issues on the job and always will, and that is written clearly and plainly in our policy.

I know something from personal experience about what hard work is. My dad never went to college. He was a construction worker and traveled the country installing industrial HVAC systems for York Air Conditioning, around the Southeast particularly. He broke his leg and never fully recovered from a fall off a ladder.

I worked my way through college as a surveyor for the railroad company and a delivery guy for Sears. As a civil engineer, I have worked on design and construction of major infrastructure projects all around the country. And I have spent time on underground projects, which is one of my specialties, with the "sandhogs." I respect hard work, and I value the people who do it.

I am also a father and a grandfather. My wife, my children, and my grandson and I visited the Air and Space Museum within the past 2 months, and I would visit them again tomorrow and the next day—or any of our museums. They are all safe.

We do conduct and have improved our safety and health oversight operations and have an extensive safety and health communications and training program, which I believe, based on the stud-

ies done so far, has steadily improved, particularly over the past 3 or 4 years.

Every year, in each Smithsonian museum and facility from here to Hawaii, from Boston to Panama, we conduct annual comprehensive evaluations of those facilities. Reports are issued in which we assess fire, occupational safety, industrial hygiene, radiation safety, environmental management and compliance requirements, including asbestos. We track mistakes and have a track record of implementing solutions. A lot of progress has been made; work needs to continue.

We also have a targeted training program for staff and volunteers working with hazardous materials in hazardous areas. In addition, we have safety coordinators for every building, and they meet every 2 months to discuss safety issues, including asbestos, to try to fix any problems. That is why we believe the situation we are here to discuss today is an exception. It was an oversight on our part, we admit that, and it has since been corrected.

To respond to the concerns about asbestos exposure and preclude any future problems, particularly on my watch, I have directed the following steps be taken:

First, a complete review of our asbestos safety policies and procedures, to include interviews with workers and oversight by an independent, outside workforce safety expert. This will be under-way shortly. The expert will report directly to the Office of the Secretary. And to ensure candor, our workers are going to be free to make anonymous comments.

Second, to validate the effectiveness of our annual environmental safety assessments—which, as I described, seem to be in good order—we will conduct an independent review of these processes. Again, the independent expert will report directly to the Office of the Secretary.

Third, for all current and former Air and Space Museum employees who believe they might have been exposed to asbestos in the performance of their work, we will provide free medical screenings as well as consultation with a known outside expert.

Fourth, asbestos safety will be an agenda item at every bimonthly meeting of our safety coordinators, who will keep museum directors apprised of the safety issues as they arise.

Fifth, in addition to the carpenters, plumbers, welders, pipefitters, electricians, and others, who have already received mandatory asbestos safety training, all exhibits production employees have been mandated to undergo similar training.

Sixth, any current or former Smithsonian employee or volunteer concerned about asbestos-related disease is welcome to visit our health service office, free of charge, to discuss any questions. And we are going to bring in a medical expert to provide a lecture on these issues for all employees that will be made available on our intranet.

As we know, asbestos is a challenge to many in the public and private sectors, including the Federal Government and its many buildings in the Nation's capital. The Smithsonian owns or leases hundreds of buildings, in total about 12 million square feet of space. Some of our buildings are new, the oldest is more than 150

years old, and more than half are over 25 years old. My office is in the Smithsonian Castle, which was completed in 1855.

Since 1990, the Smithsonian has spent more than $15.5 million in asbestos abatement processes. And since 2000, the Smithsonian has spent more than $170 million in safety and security improvements to protect visitors, volunteers, and workers. So I want to assure you and the public that our museums are safe. We have 6,000 employees and an equal number of volunteers. More than 25 million visits, in total, are made to our museums annually. The safety of all of these individuals is our primary concern.

We will continue to listen to our workers, visitors, and oversight committees and respond to all safety concerns as quickly as possible. We will take the actions that I have indicated, and they will be done promptly.

Again, thank you for this opportunity, and I am pleased to answer any questions.

I have several other colleagues from the Smithsonian who work in the safety area and the facilities area. In particular, General Jack Dailey, U.S. Marine Corps, retired, who is director of the Air and Space Museum, is also here to answer questions.

Thank you very much.

[The statement of Dr. Clough follows:]

Committee on House Administration
Written Testimony
Smithsonian Institution Secretary G. Wayne Clough
1 April 2009

Chairman Brady and members of the committee, thank you for this opportunity to testify on the important issue of asbestos and hazardous materials management at the Smithsonian Institution and to explain what happened, what we've done to address the problems, and how we will proceed in the future.

I want to assure the committee and the American people that our museums are safe, open and free as always. We have never had an indication of unacceptable levels of asbestos risk to the public in any of our museums. The safety of our employees and volunteers and visitors remains our highest priority. We have 6,000 employees and an equal number of volunteers working at the Smithsonian. More than 25 million visits are made to our museums annually.

The Smithsonian has an excellent and improving safety record and we work diligently to comply with Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) regulations and standards. Based on our calculations, the Smithsonian's total recordable injury rate for our combined Federal and trust work force is below the Bureau of Labor Statistics' national average of all museums, historical sites and similar institutions. For the past four years, we have been below that national average benchmark by 60%. And for the same time period, we are 45% below the Federal government average. (Note attached chart.) Even though there are reasons to be pleased with where we are, our goal is zero injuries and illnesses and we will continue to seek to improve.

We take the National Air and Space Museum (NASM) complaint about asbestos very seriously, and have conducted a thorough investigation. Any worker at the Smithsonian has the right to call attention to safety issues on the job and always will. We are certainly concerned about Mr. Pullman's health and well being. I assure you he has been and will continue to be treated fairly and equitably.

I know from personal experience what the working men and women of this country contribute to their families and communities. My dad never went to college; he was a construction worker and traveled the country installing industrial HVAC systems for York Air Conditioning. He broke his leg in a fall from a ladder. I worked my way through college as a surveyor for the railroad and also delivering furniture for Sears—it was heavy lifting. In my professional life as a civil engineer I am an expert at underground construction. I have spent time underground with the "sand hogs." I know what hard work is. I respect and value it.

I am a father and grandfather. My wife, my children, my grandson and I have all visited NASM over the last two months, and I would visit the Air and Space Museum with them again tomorrow – or any of our museums. They are all safe.

To respond to concerns about asbestos exposure and preclude problems in the future, I have taken the following steps.

1) I have directed a complete review of our asbestos safety policies and procedures, to include interviews with workers and oversight by an independent outside workplace safety expert to ensure that our program is being followed and is consistent with current best practices, and stipulated that the process be completed within 120 days of contract award. The independent expert will report directly to the Office of the Secretary, and, to ensure candor, our workers will be free to make comments anonymously.

2) We regularly conduct our own annual environmental safety assessments. In addition, I have directed an independent assessment of this process to doubly reassure the public that the museums are safe. Again, this independent expert will report directly to the Office of the Secretary.

3) For all members of the exhibition production group in which Mr. Pullman works as well as other current and former museum employees who believe they might have been exposed to asbestos-containing material in the performance of their work, we will offer free medical screening evaluations as well as consultation with an outside expert on asbestos related disease. The screenings and consultations will be done during normal duty hours.

4) All our safety coordinators meet bi-monthly; the topic of asbestos safety will be an agenda item at every meeting. Safety coordinators will keep museum directors apprised of safety issues and will work with each museum's safety committee to address concerns.

5) In addition to the carpenters, plumbers, welders, pipe fitters, electricians and others who have already received mandatory asbestos safety training, all exhibits production employees are now mandated to undergo similar training, and we are reviewing the entire staff to identify any other possible workers who may be exposed to asbestos during the course of their work.

6) Any current or former Smithsonian employee or volunteer concerned about asbestos related disease is welcome to visit Smithsonian Occupational Health Services, which is free of charge, to discuss any questions that he or she might have. Also, the Smithsonian will bring in a medical expert on asbestos related disease to provide an educational lecture for all employees followed by a question and answer session. This lecture will be recorded and made available on the Smithsonian's intranet.

We will be as thorough as possible in addressing the current issues as well as all safety concerns. As I mentioned, the Smithsonian has a long record of assuring the safety of all its workers, volunteers and visitors. The Smithsonian Institution (SI) works diligently to comply with all Federal regulatory requirements that pertain to worker safety and health. Over the past five years, we have improved our safety, health and environmental programs. I have attached details of our safety record for the Committee.

Today, the Smithsonian owns or leases hundreds of buildings and structures. Some of our buildings are new, the oldest is more than 150 years old, and more than half are over 25 years old. My office is in the Smithsonian Castle, a structure completed in 1855. The Smithsonian is unique in both the architectural variety and functional diversity of its buildings. The Smithsonian

is not unique in having to deal with asbestos; it is a challenge to many in the public and private sectors—including the Federal government. Since 1990, more than $15.5 million has been spent from the Smithsonian's capital program for asbestos abatement.

Now, I would like to address the allegations that have been made regarding the National Air and Space Museum.

There are roughly 250-300 workers across the Smithsonian, carpenters, plumbers, welders, pipe fitters, sheet metal workers, machine shop workers, electricians and others who work around asbestos-containing building materials. This group has regularly been identified and targeted with relevant asbestos training for such work. The audio visual department of the exhibits production staff at the National Air and Space Museum was not identified as a part of the group that received extensive training. This was an oversight. We have corrected it. In addition, we are conducting an internal review to ensure that no other staff may have been overlooked.

As recently as February 2009, the Smithsonian hired independent licensed asbestos inspectors to conduct tests at the museum. All tests showed levels well below the permissible exposure level set by OSHA and EPA, and there is no danger to the public and staff.

For the past year, the museum's exhibition production staff has followed OSHA-approved work practices when cutting into walls that contain asbestos in the joint compound. Today, orientation of all new Smithsonian employees includes a session on OSHA regulations, including hazardous materials and asbestos. In addition, the Smithsonian safety office offers quarterly asbestos awareness training programs to all staff.

By way of background…

- In 1992, an asbestos survey and hazard assessment of 22 Smithsonian buildings (including NASM) was conducted by Versar Inc., an environmental risk management firm. The report identified asbestos containing materials (ACMs) in a number of Smithsonian buildings. At the National Air and Space Museum, ACMs were found in several areas, including vinyl floor tiles and joint compound in drywall. The report's recommended response action regarding the compound was to monitor it for a change in composition, which may occur during construction work and cause the fibers to become airborne. The report was shared with building managers, directors and safety officers at the time. Training was conducted at NASM in 1997 for Building Management Division (BMD) staff. Attendees included 17 members of BMD for a two-hour asbestos awareness training session conducted by the certified asbestos inspectors from the Smithsonian's central safety, health and environmental management office. Asbestos awareness training has been conducted throughout the SI annually, including NASM, with more than 1,300 staff trained since 1993.

- All air-sampling done by independent contractors (2006, 2007, 2008, February 2009) and the Smithsonian's certified asbestos inspectors (April 2008 through February 2009) has yielded results significantly below the permissible exposure limit standards set by OSHA for asbestos.

- When the museum's exhibits chief learned of potential hazards in drywall joint compound in late February 2008, he took immediate, proactive steps—calling the museum's safety officer and the Smithsonian's safety office. Asbestos awareness training sessions for all employees in the Division of Exhibits Production and Maintenance were held on March 7th and 26th, 2008. In addition, staff members took an intensive two-day program (April 2 and 3, 2008) qualifying them to perform Class III asbestos work which covers relatively low-risk operations and maintenance work, not demolition. Higher level (Class I and II) asbestos projects are done by contractors. To be clear, our exhibits chief had begun arranging for the two-day training session prior to Mr. Pullman's first complaint.

- On April 9 and 10, 2008, OSHA conducted an inspection (no air sampling) that determined Class III asbestos work in the museum's Gallery 113 in February 2008 was conducted without 1) initial exposure assessment; 2) informing employees; and 3) training before work was conducted. The report noted all three violations were grouped together and categorized as "other" than serious because OSHA found no evidence of overexposures. Each violation was noted "Corrected During Inspection." While OSHA cannot fine other Federal organizations, if this same citation had been issued to a private employer, there probably would not have been any penalty assessed.

- Beginning in the fall of 2008, orientation of all new Smithsonian employees has included a session on OSHA regulations, including internal communication regarding hazardous materials.

- KEM (Kynoch Environmental Management) was brought into the building in October 2008 by Mr. Pullman. KEM analyzed samples collected from undisclosed locations by Mr. Pullman. KEM also collected its own samples of dust. They found asbestos in the joint drywall compound (as we already knew) and in dust. The KEM report alleged that its dust and drywall samples indicated that the air in NASM is or has been unsafe. The allegation is speculative because KEM did not perform air sampling.

- Ambient air monitoring was conducted by Aerosol Monitoring and Analysis (AMA) throughout NASM on December 9th and 11th of 2008 to determine if airborne asbestos hazards existed. Based upon laboratory analyses of the samples taken, levels were below the permissible exposure level.

- Mr. Pullman conducted his testing in secret. The Smithsonian took a more open and inclusive approach. The Smithsonian invited Mr. Pullman to send a representative of KEM to observe its December 2008 air monitoring. We again invited Mr. Pullman to send a representative of KEM to observe the February 2009 clean up of the dust found by KEM in undisclosed locations, whose location had to be pinpointed and which was cleaned by a licensed contractor. We made those invitations to him through his counsel. He declined each invitation.

- Although Mr. Pullman had identified to KEM certain "areas of concern" within the museum by October 2, 2008, he did not inform the Smithsonian of these areas. The

Smithsonian first learned of the "areas of concern" when it received the KEM report in December 2008.

- A 7-day dust cleaning project (HEPA vacuuming and wet wiping) was completed on March 5th 2009 in four museum galleries at NASM. Air monitoring was done throughout the week. Results were reported as less than or equal to the EPA's safe occupancy limit of 0.01 fibers per cubic centimeter and below OSHA's permissible exposure level of 0.1 fibers per cubic centimeter of air over eight hours.

- In 2007 we began to plan for an updated asbestos assessment by another contractor. This survey is currently underway in 17 Smithsonian buildings (including all museums); the study began at NASM Tuesday, March 10, 2009; and the survey will conclude in November 2009.

- Beginning in 2009, the Smithsonian's Office of Safety, Health and Environmental Management is offering quarterly asbestos awareness training programs to all staff.

I know that exposure to asbestos is a legitimate health concern. But, again, I want to assure you and the public that our museums are safe. Independent tests are under way; the results of these tests will be made accessible and we are confident they will confirm our point. As I mentioned, we have more than 6,000 employees and 6,000 volunteers working at the Smithsonian, and more than 25 million visitors annually. The safety of each and every one of them is our highest priority.

Again, thank you for this opportunity. I would be pleased to answer any questions you may have. General John Dailey, USMC Ret., Director of the National Air and Space Museum is also here to answer your questions.

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Smithsonian Institution Safety Record

Today, the Smithsonian owns or leases more than 700 buildings and other structures in the District of Columbia, nine states, Panama, Belize, and Chile, about 12 million square feet of space. This includes 19 museums, many research laboratories, and the National Zoo. Some of these buildings are new, the oldest is more than are 150 years old, and more than half are over 25 years old. Six buildings are designated as National Historic Landmarks, and about 24 are listed on the National Register of Historic Places or are eligible for special consideration under Federal guidelines for historic buildings. The Smithsonian is unique in both the architectural variety and functional diversity of its buildings. The Smithsonian is not unique in having to deal with asbestos; it is a challenge to many in the public and private sectors—including the Federal government.

The Smithsonian Institution (SI) works diligently to comply with all Federal regulatory requirements that pertain to worker safety and health. Over the past five years we have improved our safety, health and environmental programs by adopting a risk-based management approach, revising our Safety and Laboratory Safety Manuals, and developing fully automated accident, injury, and illness reporting and analysis. Consequently, we have an exemplary record, as indicated by statistics from our *FY 2008 Annual Occupational Safety and Health Report to the Secretary of Labor.*

Office of Workers' Compensation Programs (OWCP) Statistics

- Injury and Illness Trends — Compared to last year:
  - OWCP Lost Time Cases are down almost 29%
  - Continuation of Pay is down 23%
  - Lost Work Day Rate is down over 14%

Occupational Safety and Health (OSH) Initiatives

- The Safety, Health and Return-to-Employment (SHARE) Initiative sets safety challenge goals for each Federal agency to meet. In that regard---
  - Exceeded SHARE/SI goal for the Lost Time Case Rate by more than 28%
  - Exceeded SHARE/SI goal for the Total Case Rate by more than 33%
  - Exceeded SHARE/SI goal for Lost Production Day Rate by 5.7%.

The Smithsonian promotes a full spectrum of safety, health, and environmental awareness activities and functions through its National Safety Month (NSM) initiative, Fire Prevention Week, an exercise physiology and "free" pedometer program, blood drives, active involvement with SI employee wellness and fitness projects and an extensive influenza-vaccination program. In addition, many SI units and Museums conduct focused programs to promote employee involvement and engagement in safety, and health and environmental functionality.

Over the past five years, overall injury and illness rates have shown a progressive downward trend. This is illustrated by the Smithsonian's performance exceeding three of the President's four SHARE goals. Results with respect to the Timeliness Goal for occupational injuries and illnesses, though below our SHARE goal standard, have shown improvement over the past few

quarters. This is the result of implementing a recently developed and fielded automated reporting system for injuries and worker's compensation claims.

By our calculations, the Smithsonian's total recordable injury rate for our combined Federal and trust work force is below the Bureau of Labor Statistics' national average of all museums, historical sites and similar institutions. In fact, for the past four years we have been below that national average benchmark by 60%. And for the same period, we are 45% below the Federal government average.

During FY 2009, the SI will continue to build upon the overall goal of "Zero Injuries." Increased emphasis is being placed on the Health Risk Management Program which is directed at improving occupational health and employee productivity through the examination and identification of job related hazards, risk factors, and their mitigation.

We have achieved this success through the following on-going initiatives and policies:

1. A targeted training program. Worker training is provided to SI staff and volunteers working with hazardous materials and/or in hazardous areas to ensure the safe conduct of their tasks, the safety of the visiting public and our collections pursuant to regulatory requirements mandated by OSHA. An asbestos awareness training program implemented in 1990 targeted workers who might disturb asbestos-containing materials (ACM) as part of their routine duties. Crafts and trades workers were identified as the segment of the SI workforce who would need this type of training.

   OSHA regulations promulgated in October 11, 1994 mandated training for all employees who may be exposed to asbestos during the course of their work. Two-hour asbestos awareness training is required for staff conducting maintenance and custodial activities during which ACM may be contacted or where clean up of ACM debris and waste is necessary. A program to train Smithsonian crafts/trades staff that may disturb ACM was implemented in 1990 and is ongoing. Since 1993, more than 1,300 employees SI-wide have received asbestos awareness training. In addition, quarterly asbestos awareness training is now being offered to any SI employee who wishes to learn more about ACM that may be in their facility, precautions to safeguard against accidental disturbance of the materials and actions to be taken in the event of an accidental release.

2. Design and Construction Projects. Since 1990, more than $15.5 million has been spent from the Smithsonian's capital program for asbestos abatement. All SI asbestos abatement projects adhere to strict OSHA and EPA regulatory requirements, which are also incorporated in comprehensive SI asbestos abatement specifications. In addition, all abatement projects are reviewed by in-house SI staff to ensure the adequacy of all health, fire protection and environmental management controls and compliance with applicable regulatory requirements. All asbestos-related work is completed by licensed asbestos abatement contractors. Contractor work practices are monitored by an independent environmental contractor and air monitoring is conducted for the duration of the work to ensure that all non-work areas are free of asbestos contamination. All SI abatement projects have met or exceeded standard

3. Management Evaluations and Technical Reviews (METRs). Comprehensive METRs are conducted annually in each SI facility to assess fire, occupational safety, industrial hygiene, radiation safety and environmental management compliance requirements. Recommendations to correct cited deficiencies and programmatic failures identified in each facility are made based on regulatory requirements and best management practices. Visual inspections of asbestos-containing materials are made during the METR process to assess the condition and accessibility of the materials. Materials demonstrating evidence of deterioration or that are subject to disturbance by staff or contractors are targeted for abatement (encapsulation, enclosure, or removal). Additionally, all museum safety coordinators and safety committees conduct annual independent inspections of their entire facilities.

4. Health hazard assessments/exposure monitoring program. The SI developed a comprehensive health hazard assessment and exposure monitoring program in 1987 that is fully compliant with all applicable occupational safety and health regulations mandated by OSHA, EPA, the Nuclear Regulatory Commission, etc. Staff who are exposed to hazardous materials are enrolled in applicable medical surveillance programs.

5. Routine safety coordinator meetings. Bi-monthly safety coordinator meetings are held to ensure that all coordinators are fully apprised of mandated regulatory requirements affecting their respective facilities. Adherence to asbestos-related regulatory requirements is a standing topic of discussion at the meetings.

6. Competent, trained safety and health staff. The SI has an office entirely dedicated to the safety and health of SI staff, volunteers and the visiting public. This staff has eight industrial hygienists who are trained and certified as asbestos inspectors, supervisors and management planners. The industrial hygiene staff routinely inspects and assesses ACM throughout the SI and conducts air monitoring to ensure the safety of the indoor environment and workers performing a wide variety of asbestos-related tasks. Extensive monitoring has been conducted while NASM exhibits staff performed various tasks that impacted ACM, all with results well below occupational and environmental exposure limits established by OSHA and EPA.

7. SI Safety Manual. The SI published a completely updated comprehensive safety manual in 2007. This document details all actions needed to ensure that our employees work in and maintain safe and healthful working environments. The manual addresses fire protection, occupational safety and health, industrial hygiene and environmental management requirements. An entire chapter in the manual is dedicated to asbestos, to include hazard identification and control, waste disposal, training and recordkeeping requirements.

As you all well know, we live in a post 9/11 world where security is a major concern. In June 2004, the Smithsonian received a safety award from the Protecting People First Foundation for "the investment made by the Smithsonian Institution in lifesaving technology for the benefit of

its employees, the visiting public and our treasured National Collections." The Foundation was created by Aren Almon-Kok, mother of one-year-old Oklahoma City bombing victim Baylee Almon, one of 19 children killed in the Oklahoma City bombing. Almon-Kok created the Foundation to honor the memory of her daughter and other bombing victims by promoting the lessons learned in the Oklahoma City bombing through a national education campaign.

Specifically, we installed safety film and window systems that would mitigate the impact of a bomb blast (or potentially another extreme event) at many of our facilities. The various technologies prevent "flying shards of glass" which are the leading cause of death and injury during bomb blasts. We are still in the process of planning, designing, and installing more systems throughout SI. The systems are either part of regular facility renovations and/or specific projects on the SI Capital Program (several projects in various years).

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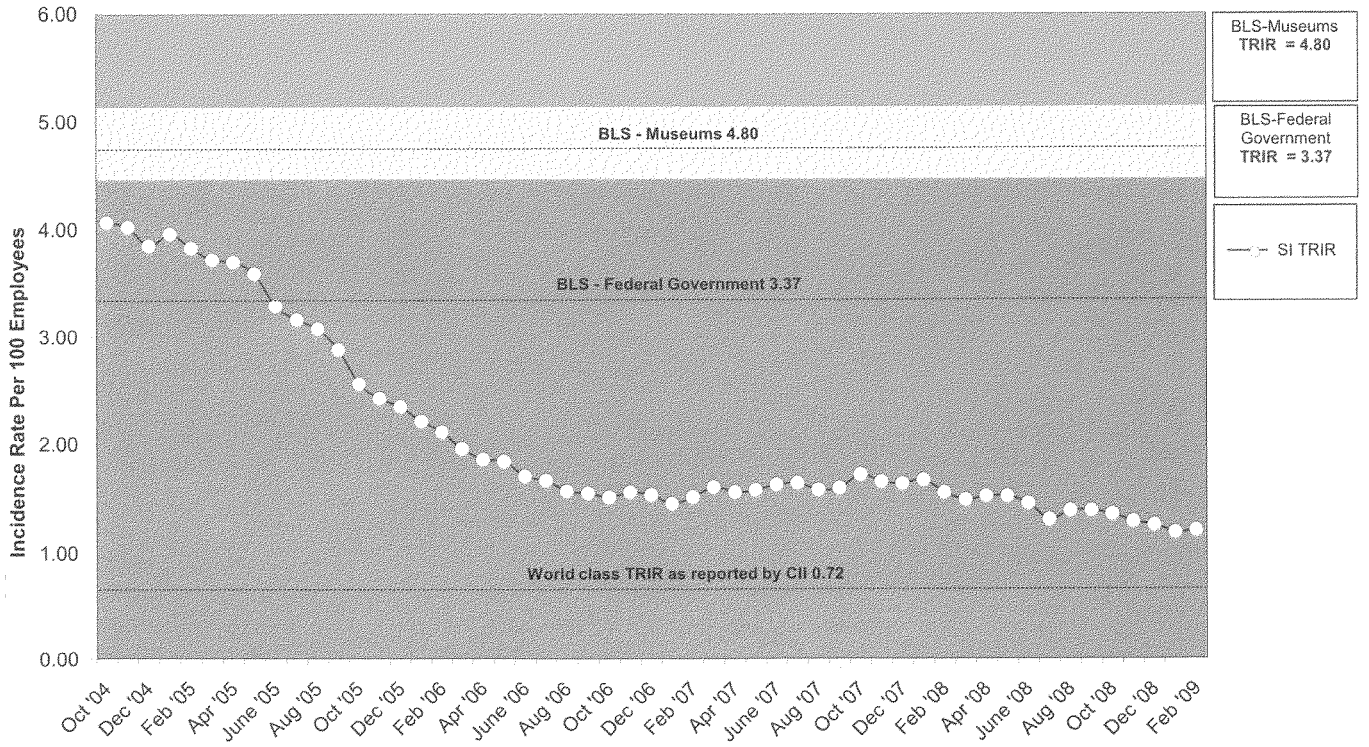
SMITHSONIAN INSTITUTION
TOTAL RECORDABLE INJURY RATES



ASBESTOS AWARENESS TRAINING FOR SI STAFF

SI Units	Number Trained
1993	
National Museum of the American Indian (NMAI)	4
National Museum of American History (NMAH)	29
Office of Physical Plant (OPP)	5
National Gallery of Art (NGA)	3
Total	41
1994	
National Museum of American History (NMAH)	15
Total	15
1995	
National Museum of American History (NMAH)	13
Office of Physical Plant (OPP)	92
Total	105
1996	
National Air and Space Museum (NASM)-Garber/NMAH	24
Total	24
1997	
National Air and Space Museum (NASM)	17
American Art and Portrait Gallery (AAPG)	23
Office of Physical Plant (OPP)	101
National Zoological Park (NZP)	63
National Zoological Park (NZP)- Conservation Research Center	8
Hirshhorn Museum and Sculpture Garden (HMSG)	19
Total	231
1998	
Hirshhorn Museum and Sculpture Garden (HMSG)	22
National Air and Space Museum (NASM)	18
Office of Physical Plant (OPP)	26
Total	66
1999	
Office of Physical Plant (OPP)	33
National Air and Space Museum (NASM)-Mall	8
American Art and Portrait Gallery (AAPG)	19
Total	60

ASBESTOS AWARENESS TRAINING FOR SI STAFF

SI Units	Number Trained
2000	
South Group (Arts & Industry Bldg, SI Bldg)	25
National Museum of American History (NMAH)	8
SI Support Center (SISC)	11
American Art and Portrait Gallery (AAPG)	18
Hirshhorn Museum and Sculpture Garden (HMSG)	19
National Air and Space Museum (NASM)-Garber	32
National Air and Space Museum (NASM)-Mall	1
National Museum of Natural History (NMNH)	65
Total	179
2001	
National Air and Space Museum (NASM)-Garber	35
Hirshhorn Museum and Sculpture Garden (HMSG)	19
National Museum of American History (NMAH)	24
South Group (Arts & Industry Bldg, SI Bldg)	22
NMNH	5
Total	105
2002	
Hirshhorn Museum and Sculpture Garden (HMSG)	6
National Zoological Park (NZP)- Conservation Research Center	9
South Group (Arts & Industry Bldg, SI Bldg)	24
Total	39
2003	
South Group (Arts & Industry Bldg, SI Bldg)	19
Total	19
2004	
National Air and Space Museum (NASM)-Garber	54
National Zoological Park (NZP)- Conservation Research Center	4
Total	58
2005	
F.L.Whipple Observatory (FLWO)	6
Office of Chief Information Officer (OCIO)	1
National Zoological Park (NZP)- Conservation Research Center	17
Total	24

ASBESTOS AWARENESS TRAINING FOR SI STAFF

SI Units	Number Trained
2006	
National Air and Space Museum (NASM)-Garber	41
Cooper Hewitt National Design Museum (CH-NDM)	3
Museum Support Center (MSC)/NMAI-CRC	7
National Museum of American History (NMAH)	12
National Zoological Park-Rock Creek	29
F.L.Whipple Observatory (FLWO)	7
National Zoological Park (NZP)- Conservation Research Center	11
Total	110
2007	
F.L.Whipple Observatory (FLWO)	5
National Zoological Park-Rock Creek	54
Office of Facilities Maintenance Reliability (OFMR)	278
Total	337
2008	
SI Environmental Research Center (SERC)	15
Office of Facilities Maintenance Reliability (OFMR)	107
Office of Protection Services (OPS)	52
National Air and Space Museum (NASM)-Mall	32
Total	206
2009	
National Zoological Park-Rock Creek	40
SI-wide	21
National Air and Space Museum (NASM)-Mall	27
Office of Protection Services (OPS)	22
National Museum of Natural History (NMNH)	8
Total	118
GRAND TOTAL	1737

The CHAIRMAN. Thank you, Mr. Secretary.

Mr. Secretary, you said all this training started. When did it start? On your watch, since you started?

Dr. CLOUGH. No. The training process overhaul, I would say, was begun in about 2006, and in 2007 a new program was instituted. So that started with the development of a new safety manual and set of policies, and it is a very large document, but that was put in place. Building coordinators were identified. They began to have these regular meetings that I referred to and, gradually, that branched out into a broader set of policies for discussion of issues with employees.

The CHAIRMAN. But prior to 2006, there wasn't that intensive training?

Dr. CLOUGH. There was a different kind of training, and I am not familiar with that, but we do have people here who can help you with that. But, at that point, that is when you begin to see significant improvement in our safety processes.

The CHAIRMAN. You see, the contractors are trained themselves, especially the pipefitters, steamfitters. They deal with this all the time, and they have their own training. But I am more concerned about the staff and some things that are in the building or have been in the building for a long period of time that they don't know about, the asbestos. You know, it is something that is extremely dangerous, knowing myself, being in the construction field. And even though the contractors, most of them, all do have their training, they don't know until they actually come across it, you know. And the men and women that have been working there all those years maybe don't know it until there is some work being done.

I would hope that you would look at some of those issues, you know, inspect your buildings and have the staff have as much knowledge about the asbestos as a contractor would because they are trained for it. And include that in your training, and maybe even take a look at some of these buildings that have not been broken into, the walls. You don't know if there is asbestos beyond these walls until you put a hammer through it.

A lot of it is encapsulated anyway, maybe not properly, but it is encapsulated and it does leak out. And that is not an excuse why we shouldn't encapsulate it even further. But if you could have some of the staff people that are there all the time, train them, let them be knowledgeable in case they run into something and protect them.

Dr. CLOUGH. That is a good point. There is a training program for employees. You start with a very intensive program for a small number of people who literally are on the site of asbestos abatement activities, because we have some sort of renovation going on in some museum all the time. So there is a set of our employees who are certified to be there and to work under those circumstances and work with certified contractors. Of course, contractors, to work at the Smithsonian, have to be certified to deal with asbestos.

So we have that group of employees who have mandated training. Now we have moved that mandated training up to include another category of employees that we did not include before, and that would be those who work in exhibits. So they don't do the

heavy work, they are not working necessarily directly with contractors, but they do, indeed, come in contact with the walls and with facilities attached to the wall. And those people will get mandated training from now on.

We, in addition, have a Hazardous Materials Awareness briefing process for our employees, particularly if we know we are going to do work in a museum. And that happens from time to time. So they will be given the opportunity to come into a briefing to understand what will happen to that building and how they should protect themselves should there be an issue and what we will do to protect them, what measurements we will take, what actions we will take should there be an incident, those kinds of things.

So that level of training and that level of briefing has been ramped up. In addition, on our Web site there is always a statement about these processes and procedures. So that has been improved, as well.

The CHAIRMAN. Most of this current focus is on the Air and Space Museum. Are you also having this training and all this letting the employees be knowledgeable with what their surroundings are in all the other museums also?

Dr. CLOUGH. Every one of the museums, as well as all the other facilities. As I mentioned, we have facilities in a number of different countries as well, and a number of different locations. And in all those cases, this information is available, that level of training is made available to them.

The CHAIRMAN. Your contractors—I know you have some special big contracts, I am sure you have some emergency contractors, but are they supervised by staff?

Dr. CLOUGH. I am sorry. Say that again?

The CHAIRMAN. The contractors themselves doing work, who are they supervised by?

Dr. CLOUGH. The contractors, their services—if I get this correct, let me answer it, and then you can tell me if I got it. The contractors obviously go through a bid process to work for us. But when you say "contractors," I may have misunderstood——

The CHAIRMAN. We have some emergency contractors that are on a certain list, I am sure, when an emergency comes up, you can't put out the bid, when you've got a pipe leaking flooding the building——

Dr. CLOUGH. We do, we do. We have contractors who we work with regularly who do monitoring for us and who come in and do safety work for us and prepare for abatement processes with us at all times.

And then, in addition, when we contract with a contractor, they have to be certified that they are prepared to deal with asbestos issues.

We have a study that was done back in the 1990s that you referred to that identified the likely location of asbestos in museums. We are in the process of updating that study because, as a result of the $15.5 million that we used in abatement, we took out a lot of asbestos. And so we are documenting now where that no longer exists and where the likelihood still exists that it would be there.

And so, when we contract with someone, they are informed about that information that we have, as to where they might encounter asbestos.

The CHAIRMAN. So are you telling me that contractors, all staff employees, people that are supervising contractors, all of them will have this—contractors, more or less, have the knowledge in their own right, but they can also come into these training sessions, and all your employees, all of them, even though they are exhibitors, they are going to be trained too? Because you never know when you bump into asbestos with an exhibit that may have hit a wall or something, or there could be asbestos in the building and they don't even know about it. They are all being trained? You are going to be training everybody that walks into that building so we can secure the safety of these people coming in?

Dr. CLOUGH. That is correct. As I mentioned, the group that was left out in the last category at the Air and Space Museum were exhibits people. And those are folks who put up exhibits but don't necessarily operate heavy machinery, that kind of thing. That group of people was not included in the mandatory training.

The CHAIRMAN. Okay. Thank you, Mr. Secretary.

Mr. Lungren.

Mr. LUNGREN. I think we just had a call for votes, so let me just be very, very quick on this.

Mr. Secretary, can you tell us how you communicate to your employees when any asbestos work is about to begin? Do you send e-mails out? Is there official notification? How do you make sure it is done, that sort of thing?

Mr. CLOUGH. There is a process that we follow now to let people know that there will be work in a museum. Obviously if it is a minor project, like just putting up a new exhibit, then the public is prohibited from accessing that exhibit, so there is no access by the public at all times. If it is a major renovation project, then we literally isolate that section of the building to prevent people from wandering in or being able to access that part of the building.

And, in addition, the employees are informed about the work and what will happen and how we will respond to any issues that we might have.

Mr. LUNGREN. How do you know they are informed?

Dr. CLOUGH. As I mentioned, we are bringing in an independent consultant, who will report to the Office of the Secretary, who will survey our employees and ask them if they feel they have been properly informed. Although we think we have pretty good processes in place, I am going to take a second look at it, and we are going to ask them, and they can respond anonymously if they think they have not been well-served. And we will look to improve that process.

Mr. LUNGREN. Now, you were chosen in this spot after—you had a tough assignment there at Georgia Tech, didn't you? I visited down there, actually. It was a good night. Notre Dame went down there and played them a couple of years ago.

Dr. CLOUGH. Oh, I see. It was a close game, if I remember.

Mr. LUNGREN. It was. In fact, we had to come from behind. And, boy, it was hot and humid there, but I enjoyed it, and thank you for the hospitality then.

Then you had all these different priorities; you had fundraising, you had academic awareness, you had faculty, all that sort of thing. Right now you have fundraising, you have governance, research, education, et cetera. Where does safety line up with those priorities?

Dr. CLOUGH. Well, safety is one of those issues you always have to keep in front of you. And that is why your processes have to be good, to constantly bring safety up to the fore. Another issue like that is diversity. You have to bring it up because it tends to fall off the table if you are not careful because there are so many daily things that get in your way.

And so it is important for us to have a process that brings that to the fore in every way. And I am committed to see that happen. The folks who are behind me here at the Institution are committed to seeing that happen. And I think, as I look at the Smithsonian, it is an institution with many moving parts. It has had a history of almost independence of some of these units, because of the historical way they developed. And it is time for us now to recognize that we need a coherent, consistent approach to all these issues. So we are trying to ensure that we have a centralized place where we can collect information and we can remind ourselves of these kinds of issues.

Now, the person who works with our facilities and is in charge of all of those things, Alison McNally, is in my cabinet. And so, each cabinet meeting, she will be expected, if there are any kind of issues, to bring these things to us at that point.

Mr. LUNGREN. Thank you very much, Mr. Secretary.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Mr. Harper.

Mr. HARPER. Thank you, Mr. Chairman.

There are 22 buildings in the Smithsonian that work as museums; is that correct?

Dr. CLOUGH. We have 19 museums and the National Zoo, but there are over 700 buildings, structures and leased spaces in total.

Mr. HARPER. Okay. The ones that people visit as museums, how many of those would be asbestos-free, that people go to visit on the Mall? Do all of them contain asbestos materials?

Dr. CLOUGH. No. And I might get a little backup on this. But I would say any building built recently would not have asbestos in it. It is more the older buildings, when people didn't know the hazards of asbestos, so they put asbestos in as insulation around the pipes, in the tapes that they used and, in the case of the Air and Space Museum, with some of the masking material that they used on the drywall joints.

Mr. HARPER. What process do you have where you notify employees that work is going to be done? What is that process?

Dr. CLOUGH. The process would be, again, that we have briefings for anyone who we think will come into contact with these materials, to have broad information briefings for anyone who wants to learn about these materials. And if we are going to start a renovation project in a building, all of the building employees would be informed of this.

You start with those who do this work on a regular basis. And those have traditionally had mandated training. It is a small number of people who do this on a regular basis. Keep in mind that we have hundreds of contract personnel who come to the museum, as well, and do work for us.

Mr. HARPER. So if you are going to do the work, then every employee will know in some form that that is going to be done.

Dr. CLOUGH. That is correct, in that building, if they are in any way impacted by it.

Mr. HARPER. Since Mr. Pullman's news came to light, have you had other employees—or, tell me how many employees have come forth with similar concerns since him.

Dr. CLOUGH. No one has yet come forth with an explicit health issue. There have been a number of people who have said, "I wonder if there may be something in my background that I should be concerned about." And that is why we have these free consultations they can go to and get health screenings and get health advice on these issues.

Mr. HARPER. Have you identified any other material besides asbestos that could be considered a hazardous material in these buildings?

Dr. CLOUGH. There are. And lead is one of those, as you know, in the older buildings, in the paint and sometimes in the pipes. And so lead is an issue for us.

And at the Smithsonian, because we are a scientific institution, we have storage of materials like alcohol for specimens. And we have taken great precautions with that alcohol to move it off the Mall, as much as we can, into some of our collection centers out in Maryland and to put that into a protective facility.

Mr. HARPER. Do you make an effort to do some of the necessary repair work that has to be done from time to time, to do that after museum hours?

Dr. CLOUGH. Oh, yes, absolutely, as much as possible. And obviously if it is a major project, we are going to seal it off.

Mr. HARPER. And the policy book that you indicated that was a large policy book, I assume there is just a portion of that that deals with safety issues.

Dr. CLOUGH. Yes.

Mr. HARPER. And is every employee required to read that? Or is it just a reference guide that they can read if they want to but they are not required to?

Dr. CLOUGH. Well, that is a very good question. We already are getting much more rigorous about who is mandated to go through those processes and be briefed. And, for example, it will include all exhibition people in the future.

Now, at the Smithsonian, there are different categories of exhibition people—not to bore you with too many details, but there is Exhibits Central, which does much of the exhibits work at our museums. It just turned out, at Air and Space, they had their own exhibits group, so it was a little bit of a unique category. And Exhibits Central has always been part of the asbestos safety training.

Mr. HARPER. Would it be a problem to say that every employee should read—I am sure it is just a relatively small portion that would deal specifically with safety issues. Would there be a prob-

lem to say every employee is required to read that and sign something that says they have read it and are familiar with that? Would that be a hardship or a problem?

Dr. CLOUGH. That is a good suggestion, and let me take a look at that. I know the safety manual is about that. But there are certain portions you would like everyone to have a look at and to understand. So maybe we can condense it in some way to that small amount of material that really affects everybody.

Mr. HARPER. Thank you very much.

I yield back.

The CHAIRMAN. Thank you.

Any other follow-up?

Thank you, Mr. Secretary. We appreciate your appearing in front of us.

And we do need to go vote. It will probably be about an hour. I know maybe your schedule may be full. If you can stay, that would be fine. If not, we would ask maybe some of your staff people can stay in case there may be some questions through the other panels.

Dr. CLOUGH. I will be glad to do that.

The CHAIRMAN. So thank you all. And we are going to adjourn for at least an hour.

Dr. CLOUGH. Thank you.

[Recess.]

The CHAIRMAN. I would like to call our committee hearing back in session, and thank you all for your patience. And sorry that we had to break away, but we live our life through a bell, and they didn't like living it through bells, so we changed it to buzzers. Now we live our life by the sound of a buzzer, then we had a round vote, but I thank you all for being here. And I thank the panel.

First, James August was previously Director of Occupational Health and Safety Programs for the American Federation of State, County and Municipal Employees, AFSCME. He is a Senior Policy Adviser to the Lippy Group, an occupational safety and health consulting firm.

Daniel O. Chute is President of Atrium Environmental Health and Safety Services, which provides technical direction, project support, field investigations, and subject matter expertise on environmental health and safety matters for industrial and commercial clients.

Gary Urban is a Certified Hazardous Materials Manager and Vice President—Consulting Services of Aerosol Monitoring & Analysis, Inc. He is currently under contract with the Smithsonian and is in the process of conducting environmental assessments in 17 of the Smithsonian Museum buildings.

William M. Brennan is Executive Vice President of Turner Construction Company that has worked on construction projects at the Smithsonian, including remodeling and asbestos abatement at the National Museum of American History Star Spangled Banner exhibit which opened this fall.

We thank you for your participation, and we would ask you to just push your mikes closer, push your button, and, Mr. August, we will start with you.

STATEMENT OF JAMES AUGUST, SENIOR POLICY ADVISER, LIPPY GROUP

Mr. AUGUST. Thank you, Mr. Chairman. I will attempt to answer this committee's question, or at least draw reasonable conclusions that can be substantiated on the available information. I did not speak to any of the individuals involved as to whether the Smithsonian's treatment of asbestos and other hazardous materials at the National Air and Space Museum put employees and visitors in an unsafe environment.

Before I go into my conclusions I want to state briefly a few things about asbestos to put this discussion into context. First of all, all forms of asbestos, including chrysotile, which is the form that was found in the drywall compound throughout the Smithsonian, is a serious hazard. All forms of asbestos cause cancer and other serious diseases.

Secondly, there is no safe level of exposure—legal does not mean safe. There is no established safe threshold of exposure to asbestos. OSHA stated as much when it issued its proposed rule in 1990, and it said that continued exposure to asbestos at the permitted level and action level presents residual risks to employees which are still significant.

Third, the key to protecting building service workers and by extension everybody else in the building, staff and visitors, is to have a program that starts with inspection, communication of hazards, and procedures in place that prevent the uncontrolled disturbance of asbestos.

And lastly, there is a very, very detailed legal framework established by OSHA and the Environmental Protection Agency, as well as guidance, that goes back to the 1980s. And I am a dinosaur that was involved in most of the develop of that, so I have firsthand experience of how it came to be and all the hard lessons that were learned in order to realize how this hazardous material needed to be handled to prevent unnecessary exposure.

I have five opinions to offer about the asbestos situation at the Air and Space Museum. First, it certainly appears that there have been serious deficiencies in the implementation of the Smithsonian's policies for addressing the presence of ACM over a prolonged period of time. Based on the asbestos survey performed by Versar, the Smithsonian knew in 1992 at the very latest that the Air and Space Museum was constructed with ACM. They identified several types of building materials, including the drywall joint compounds, throughout the building, and they classified it as Code E, to be monitored for change in their condition and recommended, "maintenance and custodial personnel should be alerted to the presence of this material and instructed not to disturb it."

Chapter 22 of the Smithsonian Institution's safety policy contains a very comprehensive program to protect everybody from asbestos. However, it appears there has been a very, very serious disconnect between the stated policies and the actual practices at the NASM for a very long time.

According to the March 15, 2009, Washington Post article Mr. Richard Pullman, a lighting specialist who has worked at the museum for 27 years, was informed by the museum safety coordinator during a briefing on asbestos awareness that there was asbestos in

the museum walls. In answer to your question, an effective asbestos operation and maintenance program begins with identification of the locations of asbestos and notification to the employees.

My second conclusion is that the failure to notify building service workers of the locations of ACM, provide training and equipment violate Smithsonian's policy and OSHA Regulations. OSHA requires wet methods, local exhaust ventilation, mini-enclosures, respirators, exposure monitoring, all intended to, "minimize the exposure to employees performing the asbestos work and bystander employees." They also require 16-hour training for those involved in maintenance activities in order to do the work safely. In fact, OSHA cited the Smithsonian on July 8, 2008, for unsafe and unhealthful working conditions at the Air and Space Museum. They were cited for a failure to monitor workers' exposure, not notifying the employees of the presence and locations of the ACM and a lack of proper training.

My third conclusion is that building service workers likely have been repeatedly exposed to significant asbestos exposure as a result of uncontrolled disturbances of ACM. The exposure of building service workers is episodic in nature. To determine that exposure it is necessary to conduct personal air sampling while the maintenance activity is taking place. Personal air sampling involves the worker wearing a pump on his or her waist that draws air through a tube with an opening near the workers breathing zone, the mouth and nose. Asbestos fibers that are in the air are collected in the cassette and then sent off to a laboratory for analysis. I have not seen any personal air sampling data if it exists that was conducted during maintenance activities that disturbed ACM at the Smithsonian. However, studies that I am familiar with show that maintenance work does disturb ACM, and that in the absence of controls have shown significant exposure during such activities.

The only sampling data I have seen are the measurements obtained by Aerosol Monitoring Analysis on December 9th and 11th of 2008. They performed a different kind of monitoring called ambient air monitoring, which means sampling of an area, and did so in 25 places at the museum. These data are irrelevant for making any determination of building service workers' exposure to asbestos and should not be used to reassure the workers about the hazards that might be present. The eight-hour samples were conducted between approximately 6:00 p.m. and 2:00 a.m., when the museum was closed. There is nothing in AMA's narrative that indicates that any maintenance work involving the disturbance of ACM was being conducted at the time the samples were collected. And since the museum was closed, potential air movement generated by a crowd of visitors was also probably diminished.

OSHA requires clearance sampling after asbestos work is performed. This entails utilizing aggressive air sampling to create a worst case scenario before the plastic containment area is disassembled. The air is stirred up with blowers to make asbestos fibers that may have settled become airborne. Only when asbestos levels are below established exposure limits while aggressive sampling is performed is an area considered clean and safe to be reentered without utilizing protective measures. Taking passive ambient air samples in areas where there is settled dust and no work

or other activities being performed that could disturb the dust, therefore fails to yield useful determinations of workers or anybody else's exposure.

Rather than drawing comfort from AMA's results I find the situation quite disconcerting. Sampling was done in areas where there was an accumulation of settled dust, which raises disturbing questions such as: For how long and how often have employees and contractors conducted uncontrolled disturbances of ACM? How long has the asbestos containing dust and debris been accumulating? Have ordinary vacuums and brooms been used to clean up dust and debris instead of HEPA vacuums and wet methods as prescribed by law?

My fourth observation is that the diagnosis of asbestosis of a long-term employee whose jobs involved the disturbance of drywall joint compound that contained asbestos should be regarded as a sentinel health event, and medical screening should be immediately conducted to identify the extent, if any, of asbestos-related signs, symptoms or disease among other NAS employees and probably other Smithsonian facilities.

Mr. Pullman's claim for workers compensation is under appeal, and I am not commenting on the validity of that claim. I am not familiar with Mr. Pullman's occupational or exposure history. However, the diagnosis of asbestosis in a 27-year employee whose duties involved the uncontrolled disturbance of ACM with saws and drills should be an impetus to determine if other employees are similarly affected. There are well established protocols for conducting medical surveillance and to identify individuals with these signs of disease or impairment.

The last issue concerns whether the treatment of asbestos has put any visitors at the Air and Space Museum in an unsafe environment. As I have just explained, it is my opinion that previous activities of building service workers and contractors that involved the uncontrolled disturbance of ACM would have released fibers into the surrounding environment. There is insufficient data to characterize the exposure to the workers. Nor do I think there is any adequate data to make any definitive qualitative or quantitative estimates of any additional risk posed to visitors that resulted from the activities of building service workers and contractors.

The AMA sampling data represent a snapshot of conditions they tested for on December 9th and 11th, and that is all they represent. For the reasons stated above the AMA results do not provide a useful assessment of worker exposure during their normal activities. As for exposure to visitors I did not see any other data to evaluate whether the sampling results were representative.

Given the information I have reviewed considering the handling of asbestos at the Air and Space Museum, I have questions and concerns about possible exposure situations to asbestos in other Smithsonian facilities. Many of the Smithsonian buildings are much older than the Air and Space Museum and much more likely to have been constructed with a far greater quantity and variety of asbestos materials for purposes of fireproofing, surfacing, thermal insulation, and other uses. And due to their age, they might be in worse shape and more easily disturbed.

I request that my entire statement be put into the record, and I would be happy to answer any questions that the committee members might have.

[The statement of Mr. August follows:]

Statement of
James August, MPH

Before the
U.S. House of Representatives
Committee on House Administration

Regarding the
Management of Asbestos and Hazardous Materials
at the Smithsonian Institution

April 1, 2009

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Statement of James August, MPH
Before the U.S. House of Representatives Committee on House Administration
Regarding the Management of Asbestos and Hazardous Materials
at the Smithsonian Institution

I will attempt to answer this Committee's question, or at least draw reasonable conclusions that can be substantiated on available information, as to whether the Smithsonian's treatment of asbestos and other hazardous materials at the National Air and Space Museum (NASM) put employees and visitors in an unsafe environment.

1. Based on the documents I have reviewed, it appears that there have been serious deficiencies in the implementation of the Smithsonian's policies for addressing the presence of asbestos-containing materials (ACM) over a prolonged period of time.
2. OSHA regulations and the Smithsonian's own policies require notification to building service workers of the locations of ACM, providing training and appropriate equipment, conducting worker exposure monitoring, and ensuring work practices and procedures to prevent uncontrolled disturbances of asbestos.
3. Uncontrolled disturbances of asbestos-containing drywall joint compounds and other ACM that have not been performed in a manner that is prescribed by OSHA regulations and Smithsonian Institution safety policies have in all likelihood resulted in significant, albeit avoidable asbestos exposure to building service workers.
4. The diagnosis of asbestosis of a long-term employee whose job duties involved the disturbance of drywall joint compound that contained asbestos should be regarded as a sentinel health event, and the Smithsonian Institution should conduct medical screening to identify asbestos-related signs, symptoms or disease among other NASM employees, and possibly at other Smithsonian facilities.

5. Activities of building service workers and contractors that result in the uncontrolled disturbance of ACM release asbestos fibers into the surrounding environment, but there is inadequate data to make any definitive quantitative or qualitative estimates of any additional risk posed to visitors as the result of such work at the NASM.

It is easy to quickly become mired in the complexities of regulations, scientific and medical considerations, and the conflicting accounts contained in the correspondence between the parties involved in the story that was reported in the Washington Post on March 15, 2009. Therefore, it is helpful to begin with a brief overview of what is known about the risks of asbestos, protective measures to prevent exposure, and laws governing asbestos-containing materials in buildings to provide some context for assessing the situation at the NASM.

All forms of asbestos, including chrysotile, the most common form of asbestos, and the type of asbestos found in the NASM, pose a serious health risk. Exposure to asbestos can cause a range of signs, symptoms and diseases. Serious and fatal diseases caused by asbestos include asbestosis, lung cancer, and mesothelioma.

No safe threshold of exposure for asbestos has been established. The Occupational Safety and Health Administration's permissible exposure limit (PEL) for asbestos, which means the amount of asbestos that workers can legally be exposed to in the course of their work, is an 8-hour time weighted average (TWA) of 0.1f per cubic centimeter. However, it is critical to emphasize that legal does not mean safe. In its 1990 notice of proposed rulemaking for asbestos, OSHA stated that there would be a serious health risk to workers who were exposed below a proposed lower PEL of 0.1f/cc TWA:

> *OSHA's risk assessment also showed the persistence of a significant risk at the 0.1f/cc action level. The excess cancer risk remaining at that level is a lifetime risk of 3.4 per 1,000 workers. OSHA concludes therefore that continued exposure to asbestos at the TWA permitted level and action level presents residual risks to employees which are still significant.* (Federal Register Vol. 55 No.140, July 20, 1990, p.29,714)

The key to protecting building service workers, and by extension other staff and visitors, is to prevent the uncontrolled disturbance of ACM by custodians, maintenance workers, and contractors. The regimen to accomplish this goal involves a building inspection to identify the locations of ACM, an assessment to evaluate the existing and potential for exposure, notification to staff, training of staff appropriate to their likelihood to disturb ACM, work practices and equipment to avoid uncontrolled disturbances of ACM, exposure monitoring and medical surveillance for employees whose duties require them to disturb asbestos, and other measures. There has been a long, and for some of us, an almost torturously protracted regulatory history and development of guidance that has firmly established the necessary and required framework to protect building service workers and other occupants from asbestos. Some of the key events in creating the framework for addressing asbestos hazards in buildings include:

- 1982:

  Under Section 6 of the Toxic Substances Control Act, the Environmental Protection Agency (EPA) issued its Final Rule (40 CFR Part 763), Friable Asbestos-Containing Materials in Schools: Identification and Notification. The preamble included this finding:

  > *EPA finds that the presence of unidentified friable asbestos-containing materials in schools and the absence of notice of their presence and of instructions on proper handling and maintenance procedures to reduce exposure constitute and unreasonable risk to school employees. These unreasonable risks can occur when school employees unknowingly disturb friable asbestos materials or such materials are allowed to deteriorate. When activities of school employees disturb or promote deterioration of friable asbestos materials, risk to users of school buildings may be elevated.* (Federal Register Vol. 47 No. 103, May 27, 1982, p.23364).

  1985:

  EPA published its *Guidance for Controlling Asbestos-Containing Materials in Buildings* (The "Purple Book"). The Purple Book provides comprehensive recommendations on the identification, notification, and various options to remove or contain asbestos-containing materials in buildings.

1986:

OSHA issued Final Rules for Occupational Exposure to Asbestos, Tremolite, Anthophylite, and Actinolite. Appendix G of OSHA's Construction Standard for Asbestos (29 CFR 1926.58) covered Work Practices and Engineering Controls for Small-Scale Short-Duration Asbestos Renovation and Maintenance Activities. Appendix G detailed work practices for maintenance activities, including "installation or removal of a small section of drywall." The work practices described in the Appendix included using wet methods to reduce dust, mini-enclosures, and high-efficiency particulate air (HEPA) filtered vacuums. The Appendix also contained a list of "Prohibited Activities" that included but was not limited to:

- *Not to drill holes in asbestos-containing materials.*
- *Not to dust floors, ceilings, molding, or other surfaces in asbestos-containing environments with a dry brush or sweep with a dry broom.*
- *Not to use an ordinary vacuum to clean up asbestos-containing debris.*

Also in 1986, Congress passed Public Law 99-519, the Asbestos Hazard Emergency Response Act (AHERA), which addressed asbestos in schools and directed EPA to issue regulations.

1987

EPA issued its Asbestos-Containing Materials in Schools Final Rule (40 CFR Part 763). EPA established strict and specific requirements for building inspections, hazard assessment, notification, training, air monitoring, work practices, protective equipment, disposal and other measures to address existing and potential asbestos hazards in schools.

In 1987 EPA also issued its Asbestos Abatement Projects; Worker Protection; Final Rule. EPA's action extended the protections in OSHA's 1986 asbestos standards to state and local government workers not covered by OSHA.

1988

EPA released its *Study of Asbestos-Containing Materials in Public Buildings – A Report to Congress*, which was required as part of Asbestos Hazard Emergency Response Act). The Report included an estimate of the number of buildings in the United States with ACM, a discussion of risk assessment and management, and recommendations to address asbestos hazards in buildings.

1990

EPA published its *Managing Asbestos in Place – A Building Owner's Guide to Operations and Maintenance Programs for Asbestos-Containing Materials* (The "Green Book"). This document expanded upon but did not replace EPA's Purple Book. The guidance in this document was designed to assist individuals involved in facilities maintenance how to establish and implement an operations and maintenance program to prevent the uncontrolled disturbance of asbestos, the type of program that covers the NASM.

An important conference was also held in this year under the auspices of the Collegium Ramazzini. A report on the proceedings of the conference, *The Third Wave of Asbestos Disease – Asbestos in Place*, included studies that found evidence of exposure and/or asbestos disease in custodial and maintenance workers who were exposed to asbestos when performing their job duties.

1994

OSHA issued revised Final Rules for Asbestos (29 CFR 1910.1001, 1926.1101, and 1915.1001). OSHA's rules established a lower exposure limit and included stricter requirements for notification and work practices. The OSHA Construction Standard created four categories of asbestos work. [29 CFR 1926.1101(b)]:

> *Class III asbestos work means repair and maintenance operations, where, "ACM", including thermal system insulation and surfacing material, is likely to be disturbed.*

Class IV asbestos work means maintenance and custodial activities during which employees contact ACM and PACM and activities to clean up waste and debris containing ACM and PACM.

2000

EPA revised its Worker Protection Rule to make it consistent with OSHA's 1994 asbestos regulations.

Now I will return to the opinions I expressed at the beginning of my statement and explain the reasons that led me to these conclusions. First, it certainly appears that there have been serious deficiencies in the implementation of the Smithsonian's policies for addressing the presence of ACM over a prolonged period of time. Based on the asbestos survey report performed by Versar, the Smithsonian knew in 1992, at the very latest, that the National Air and Space Museum was constructed with asbestos-containing building materials. Versar identified several types of building materials containing asbestos, including drywall joint compound. Versar reported (pp.3-4) that the joint compound is found throughout the building where seams and nails are present in drywall.

...drywall joint compound in stairways 1, 2, 3, 4, 5, 6, 7, rooms P700, P703A, P703D, P703E,...3779, 3783-3790.

Versar designated the drywall joint compound as "Code E" – Materials To Be Monitored For Change in their Condition," and made the following recommendation:

Drywall joint compound is not a friable material nor is it high in asbestos content. It is unlikely to release asbestos fibers during normal building activities or in the absence of physical disturbance. The majority of this material is classified in Response Code E and therefore should be monitored for change and included in the building's O&M plan. Twenty-four rooms in the NASM have drywall joint compound classified in Response Code F for which no action is required at this time. ***Maintenance and custodial personnel should be alerted to the presence of this material and instructed not to disturb it.*** (emphasis added)

I do not know what year the Smithsonian Institution Safety Manual was issued. Chapter 22 of this Manual is a very comprehensive program to protect all building occupants from asbestos. However, it appears there has been a disconnect between stated

policies and actual practices in the NASM for a very long time. I have quoted below selected sections from Chapter 22 that appear not to have been followed:

C. CHAPTER-SPECIFIC ROLES AND RESPONSIBILITIES

1. Directors of buildings containing ACM or PACM shall:

b. Be responsible for communicating the Plan to all building occupants.

2. Safety Coordinators shall:

a. Coordinate with their respective Building Manager to develop, implement and maintain an Asbestos Management Plan per Section E.4. of this Chapter. This plan should contain a record of ACM or PACM in the buildings, including information on the type of asbestos and percentage of each type identified, and sampling and analytical documentation, in accordance with this Chapter.

b. Identify all other sources of, or tasks which could result in, asbestos exposure within facility operations (such as brake work or collections handling).

c. In coordination with project COTRs, ensure that all contracted work in their facility be assessed as to whether it will impact ACM, and if so, ensure that contractor work involving disturbance of ACM in their facilities is properly reviewed for compliance with the SI Construction Specification 13280, "Asbestos Abatement".

d. Ensure that staff within their organization who are assigned tasks that may involve exposure to asbestos are identified to the Office of Safety, Health, and Environmental Management (OSHEM) for exposure assessment and development of exposure controls.

e. Ensure SI staff members who work in or near ACM areas are notified of ACM locations and measures to prevent its disturbance. Notify SI staff of asbestos abatement work scheduled near their work areas, in accordance with OSHA requirements.

f. Assist supervisors in implementing the hazard controls specified by this Chapter, and by OSHEM, to maintain exposure levels to below those specified in this Chapter.

g. Ensure that the training requirements of this Chapter are met.

h. Ensure that identified ACM areas are posted with signage when appropriate.

3. *Supervisors shall:*

   a. *Identify, with the assistance of the Safety Coordinator, work tasks under their control that involve working with or around ACM. Identify employees who may be exposed to asbestos to OSHEM for exposure assessment.*

   b. *Ensure that OSHEM-recommended engineering and other control measures are implemented to reduce asbestos exposures as low as reasonably achievable but, as a minimum, at or below the OSHA Permissible Exposure Limit (PEL) of 0.1 fiber per cubic centimeter of air (f/cc) as an 8-hour time-weighted average (TWA) concentration.*

   c. *Ensure that all employees under their control who are potentially exposed to asbestos concentrations equal to or greater than the OSHA PEL are enrolled, per OSHEM recommendation, in the SI medical surveillance program specified in this Chapter.*

   d. *Suspend work activities when materials suspected of containing asbestos are encountered and likely to be disturbed without proper controls and personal protective equipment (PPE) in place.*

   e. *Ensure that all employees, including themselves, working on or around ACM whose work may disturb ACM, receive initial and annual refresher training in accordance with the requirements of this Chapter.*

   f. *Ensure employees comply with the provisions of this Chapter, including the use of PPE and approved work practices.*

Attachment 1 – Recommended Safe Practices When Working On or Around ACM

Attachment 8 –Asbestos Work Classifications and Training Requirements

The Washington Post reported on March 15, 2009 that Mr. Richard Pullman, a lighting specialist who had worked in the NASM for 27 years was first informed by the museum's safety coordinator during a briefing on "asbestos awareness" that there was asbestos in the museum walls. The article quoted Mr. Pullman saying, "Are you telling me that I've been working this stuff for that long, drilling into these walls, sawing, and sanding, unprotected?" Pullman recalls asking. "Why didn't you guys say anything?" An effective asbestos operations and maintenance program cannot be executed unless the locations of asbestos have been identified and employees are notified as to the presence of asbestos and how to avoid uncontrolled disturbance of ACM.

My second conclusion is that a failure to notify building service workers of the locations of ACM, provide training and appropriate equipment, conduct worker exposure monitoring, and ensure work practices and procedures violate OSHA regulations and the Smithsonian's own policies. I have just provided a list of procedures from the Smithsonian Institute's Safety Policy that appears to have been disregarded. There are provisions in the OSHA asbestos standards that correspond to these sections of Chapter 22 of the Safety Manual. As I explained above, OSHA defines Class III work as repair and maintenance operations where ACM is likely to be disturbed. Class IV work refers to maintenance and custodial activities during which employees contact ACM and presumed asbestos-containing materials to clean up waste and debris containing ACM.

OSHA's Construction Standard for Asbestos includes requirements for Class III work 29:

> ***1926.1101(g)(9)***
> ***Work Practices and Engineering Controls for Class III asbestos work.*** *Class III asbestos work shall be conducted using engineering and work practice controls which minimize the exposure to employees performing the asbestos work and to bystander employees.*
>
> ***1926.1101(g)(9)(i)***
> *The work shall be performed using wet methods.*
>
> ***1926.1101(g)(9)(ii)***
> *To the extent feasible, the work shall be performed using local exhaust ventilation.*
>
> ***1926.1101(g)(9)(iii)***
> *Where the disturbance involves drilling, cutting, abrading, sanding, chipping, breaking, or sawing of thermal system insulation or surfacing material, the employer shall use impermeable dropcloths, and shall isolate the operation using mini-enclosures or glove bag systems pursuant to paragraph (g)(5) of this section or another isolation method.*
>
> ***1926.1101(g)(9)(iv)***
> *Where the employer does not produce a "negative exposure assessment" for a job, or where monitoring results show the PEL has been exceeded, the employer shall contain the area using impermeable dropcloths and plastic barriers or their equivalent, or shall isolate the operation using a control system listed in and in compliance with paragraph (g)(5) of this section.*

1926.1101(g)(9)(v)
Employees performing Class III jobs, which involve the disturbance of thermal system insulation or surfacing material, or where the employer does not produce a "negative exposure assessment" or where monitoring results show a PEL has been exceeded, shall wear respirators which are selected, used and fitted pursuant to provisions of paragraph (h) of this section.

OSHA further requires that:

1926.1101(k)(8)(iv) Training for Class III employees shall be the equivalent in curriculum and training method to the 16-hour operations and maintenance course developed by EPA for maintenance and custodial workers who conduct activities that will result in the disturbance of ACM.

OSHA's requirements for Class IV work are as follows:

1926.1101(g)(10)
***Class IV asbestos work**. Class IV asbestos jobs shall be conducted by employees trained pursuant to the asbestos awareness training program set out in paragraph (k)(9) of this section. In addition, all Class IV jobs shall be conducted in conformity with the requirements set out in paragraph (g)(1) of this section, mandating wet methods, HEPA vacuums, and prompt clean up of debris containing ACM or PACM.*

1926.1101(g)(10)(i)
Employees cleaning up debris and waste in a regulated area where respirators are required shall wear respirators which are selected, used and fitted pursuant to provisions of paragraph (h) of this section.

1926.1101(g)(10)(ii)
Employers of employees who clean up waste and debris in, and employers in control of, areas where friable thermal system insulation or surfacing material is accessible, shall assume that such waste and debris contain asbestos.

OSHA inspected the NASM on April 9 and 10 of 2008 and issued citations on July 8, 2008 for unsafe and unhealthful working conditions.

Citation 1 Item 1a:
29 CFR 1926.1101(f))(1)(i): Where exposure monitoring is required under this section the employer did not perform monitoring to determine accurately the airborne concentrations of asbestos to which employees were exposed.

Citation 1 Item 1b:
29 CFR 1926.1101(k)(3)(ii)(B): Before work subject to this standard had begun, the employer did not notify employees who performed work subject to the standard, of the presence, location and quantity of asbestos or presumed asbestos containing materials.

Citation 1 Item 1c:
29 CFR 1926.1101(k)(9)(i): The employer did not institute a training program for all employees who performed class I and class IV work.

My third conclusion is that building service workers have likely been repeatedly exposed to significant asbestos exposure as the result of uncontrolled disturbances of ACM. I cannot answer with any certainty the question of what levels of asbestos workers have been exposed to. Exposure to asbestos in a building where activities disturb ACM is dynamic rather than static. The exposure of building service workers to asbestos is episodic in nature. To determine exposure it is necessary to conduct personal air sampling while the maintenance activity involving ACM is taking place. Personal sampling involves a worker wearing a pump on his or her waste that draws air through a tube with the opening near the workers' nose and mouth, or breathing zone. Asbestos fibers are collected in a cassette and sent off to a lab for analysis. I have not seen any personal sampling data, if it exists, conducted during maintenance activities that disturb ACM at the Smithsonian. However, studies of maintenance tasks which disturb ACM that do not involve proper work wet methods have shown significant exposure during such activities.

The only sampling data I have seen are the measurements obtained by Aerosal Monitoring & Analysis, Inc. (AMA) on December of 9 and 11, 2008. AMA performed ambient air monitoring, which means sampling of an area, in this case 25 areas of the NASM, not personal sampling of workers. The data are irrelevant for making any determination of building service worker's exposure to asbestos, and should not be used to reassure workers about there exposure or risks. The 8-hour samples were collected between approximately 6:00 p.m. and 2:00 a.m. when the museum was closed. There is nothing in AMA's narrative that indicates that any maintenance work involving the disturbance of ACM was being conducted at the time the samples were collected. Since the museum was closed, potential air movement generated by a crowd of visitors was also probably diminished.

OSHA requires clearance sampling after asbestos work is performed. This entails utilizing aggressive air sampling to create a worst case scenario before the plastic containment area is disassembled. The air is stirred up with blowers to make asbestos fibers that may have settled become airborne. Only when asbestos levels are below established exposure limits while aggressive sampling is performed is an area considered clean and safe to reenter without utilizing protective measures. Taking passive ambient air samples in areas where there is settled dust and no work or other activities being performed that could disturb the dust therefore fails to yield useful determinations of worker exposure.

Rather than drawing comfort from AMA's results, I find the situation quite disconcerting. Sampling was done in areas where there was an accumulation of settled dust, which raises disturbing questions such as: For how long and how often have employees and contractors conducted uncontrolled disturbances of ACM? How long has the asbestos containing dust and debris been accumulating? Have ordinary vacuums and brooms been used to clean up dust and debris instead of HEPA-vacuums and wet methods?

My fourth observation is that the diagnosis of asbestosis of a long-term employee whose job duties involved disturbance of drywall joint compound that contained asbestos should be regarded as a sentinel health event, and medical screening should be conducted to identify the extent, if any, of asbestos-related signs, symptoms or disease among other NASM employees or staff at other Smithsonian facilities. Mr. Pullman's claim for workers compensation is under appeal and I am not commenting on the validity of his claim. I am not familiar with Mr. Pullman's occupational or exposure history. However, the diagnosis of asbestosis in a 27-year worker whose duties involved the uncontrolled disturbance of ACM with saws and drills should be an impetus to determine if other employees are similarly affected. There are well established protocols for conducting medical surveillance programs to identify individuals with signs of asbestos exposure, disease, and impairment.

The last issue concerns whether the treatment of asbestos has put any visitors to the NASM is an unsafe environment. As I have just explained, it is my opinion that previous activities of building service workers and contractors that involved the uncontrolled disturbance of ACM would have released fibers into the surrounding environment. There is insufficient data to characterize the exposures to the workers. Nor do I think there is

adequate information to make any definitive quantitative or qualitative estimates of any additional risk posed to visitors that resulted from the activities of building service workers and contractors. The AMA sampling data represent a snapshot of conditions they tested for on December 9 and 11, 2008. For the reasons stated above, the AMA results do not provide a useful assessment of worker exposure during their normal job activities. As for exposure to visitors, I did not see other data to evaluate whether the sampling results were representative.

Given the information I have reviewed concerning the handling of asbestos at the NASM, I have questions and concerns about possible exposure situations to asbestos in other Smithsonian facilities. Many of the Smithsonian's buildings are much older than the NASM and therefore much more likely to have been constructed with a far greater quantity and variety of asbestos-containing materials for fireproofing, surfacing, thermal insulation, and other purposes.

I thank you for the opportunity to testify and hope that the Committee finds this information useful.

James August, MPH

James August is an occupational health and safety consultant. He previously served as the director of heath and safety for the American Federation of State, County and Municipal Employees (AFSCME). Mr. August participated in the development of OSHA's asbestos regulations as well the EPA's Asbestos in Schools Rule and the EPA Worker Protection Rule. He also played a major role in OSHA, EPA, HHS rulemakings and policy forums on a wide range of issues including lead, ergonomics, pandemic influenza, smallpox vaccination, tuberculosis, bloodborne pathogens, and personal protective equipment. He has written numerous articles and educational materials on health and safety issues. Mr. August served on the CDC expert panel to revise its Tuberculosis Infection Control Guidelines and was an external reviewer of the 2001 Institute of Medicine Report: Tuberculosis in the Workplace. He holds a Master of Public Health from the University of California – Los Angeles

The CHAIRMAN. Thank you. Mr. Chute.

STATEMENT OF DANIEL O. CHUTE, CIH, CSP, PRESIDENT, ATRIUM ENVIRONMENTAL HEALTH AND SAFETY SERVICES

Mr. CHUTE. Thank you. I have been invited to provide testimony to summarize my views and opinions on the management of asbestos containing materials in the Smithsonian Air and Space Museum, and my testimony will be based upon my education and experience gained in over 30 years of professional practice in evaluation and control of asbestos in both public and commercial buildings, and my review of pertinent materials on the Smithsonian's practices and procedures which have been provided to me by committee staff in advance of this hearing. I have organized my testimony to address the general requirements and standard practices for asbestos management in public buildings, asbestos management practices and procedures as documented by the Smithsonian for their Air and Space Museum, and then a comparison of those to see how the Smithsonian measures up to current practices.

Well, first, of course, asbestos is a common ingredient in many materials found in buildings constructed prior to 1980. That would include things such as floor tile, pipe insulation, wall materials, it is possible roofing and so forth. But in order to prevent illnesses which may be associated with asbestos exposure, the handling, removal and disposal of asbestos has been subject to strict Federal regulations implemented by both the EPA and OSHA since the early 1970s. Many States, localities, agencies and private employers have enacted much stricter requirements for task specific items which they may encounter.

Also, it is important to note that the presence of asbestos in a building does not mean that the health of building occupants is in danger. As long as asbestos containing materials remain in good condition and are not disturbed or damaged, exposure is unlikely. And in fact the U.S. EPA generally recommends in place management and maintenance to prevent exposure in areas where asbestos is discovered. Don't mess with it.

Most facilities today follow a site specific written asbestos management plan with assigned duties and responsibilities. The U.S. General Services Administration has cited the key elements of an asbestos management plan to include manage the asbestos in place as long as it is in good visual condition, abating or removing asbestos that is damaged or subject to disturbance, comply with applicable OSHA and EPA regulations and standards for the handling, transportation and disposal of the material, use products that do not contain asbestos for new construction and renovation or repair, require that trained and qualified persons do the work in your facilities, and then also promote openness in communication with your customers, regulatory agencies, the public and other interested parties during renovation, repair or other activities which may encounter asbestos.

Now, in a review of the Smithsonian's policies they have a very, as their Director cited in his earlier testimony, they have a comprehensive safety manual which includes chapter 22 for asbestos. The asbestos control procedure in the Smithsonian safety manual appears to be very detailed and comprehensive and has defined

roles and responsibilities for building managers, for safety coordinators, supervisors, their employees, facilities management design and construction offices, the real estate division and the health, safety and environmental management group. In addition, they have a series of attachments to that which have site or task specific procedures outlined defining training requirements and checklists for the safe work practices on regular routine operations which they may encounter.

It is also important to note that all levels of training require an annual update and review within their policy.

In summary, this evaluation has compared Smithsonian policy for asbestos management and control to the regulations and practices in place for similar facilities in a workplace or construction setting. Based upon a review of the written Smithsonian policies, reports and materials provided by committee staff, a comparative analysis of applicable regulations and standards and my 30 years of professional experience in this area of technical specialization, I found the Smithsonian Institution asbestos control policy as written to be quite complete and comprehensive. Please be aware that this evaluation has not included an on-site evaluation in their facilities or audits to determine how effectively these policies have been implemented in daily practice. But by fully implementing an asbestos control procedure as written in their safety manual, the Smithsonian should be able to maintain a safe and healthy work environment for its employees and the general public that is consistent with the current standards and practices in the field.

[The statement of Mr. Chute follows:]

ATRIUM ENVIRONMENTAL HEALTH AND SAFETY SERVICES, LLC

March 31, 2009

The Honorable Robert Brady
Chairman
Committee on House Administration
1309 Longworth House Office Building
Washington, DC 20515

Subject: Testimony for April 1 Hearing, "Management of Asbestos and Hazardous Materials at the Smithsonian Institution"

Dear Chairman Brady,

I have been invited to provide testimony to summarize my views and opinions on the management of asbestos-containing materials (ACM) in the Smithsonian Air and Space Museum. My testimony will be based upon my education and experience gained in over 30 years of professional practice in the evaluation and control of ACM in public and commercial buildings and my review of pertinent materials on the Smithsonian's practices and procedures which have been provided by Committee Staff in advance of this hearing. I have attached a short bio statement outlining my professional experience (Attachment 1) and a summary of documents reviewed in preparation of my testimony (Attachment 2).

I have organized my testimony to address the following topics:

1. Asbestos Management in Public Buildings – General Requirements and Standard Practices
2. Asbestos Management Practices and Procedures for the Smithsonian Air and Space Museum
3. Comparison of Smithsonian Practices to Current Standards
4. Summary and Recommendations

1. <u>Asbestos Management in Public Buildings – General Requirements and Standard Practices</u>

Asbestos is a general name for a group of naturally occurring minerals composed of small fibers. It makes an excellent insulation material and is heat, fire and corrosion resistant. It is a common ingredient in many materials found in buildings constructed prior to 1980 including floor tiles, ceiling tiles, insulation on pipes and ducts, acoustical and decorative coatings and roofing materials. Under current Federal regulations these type of building materials are ***presumed*** to contain asbestos if installed before 1980 unless testing has proven otherwise.

Asbestos exposure, when fibers are released and inhaled, may cause several serious illnesses including asbestosis, lung cancer and mesothelioma. These diseases are often associated with a long latency period, so that symptoms may not be evident until 20 or more years after exposure. In order to prevent such illness among the workforce and the general public, asbestos use,

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handling, removal and disposal has been subject to strict Federal regulations implemented by the EPA and OSHA since the early 1970's. Many states, localities, agencies and private employers have enacted site-specific or task-specific rules and procedures which follow more detailed and restrictive policies.

The presence of asbestos in a building does not mean that the health of building occupants is endangered. As long as asbestos-containing materials remain in good condition and are not disturbed or damaged, exposure is unlikely. EPA only requires asbestos removal (abatement) in order to prevent significant public exposure during planned activities such as renovation or demolition. EPA generally recommends in-place management and maintenance to prevent exposure in areas where asbestos is discovered.

In accordance with current regulatory requirements and established practices for effective asbestos control, most facilities follow a site-specific Asbestos Management Plan (Plan). This Plan will typically address the types of asbestos (ACM), the quantity, location and define the duties and responsibilities of the persons who are required to take action, verify performance and document results. Some of the actions routinely cited in such a Plan include periodic surveillance and inspection of building areas, air testing and laboratory analysis, training of maintenance staff and contractors, scheduling of abatement and corrective actions and the periodic review and update of the written plan and its performance documentation. Many of the most effective protective measures are practical, low-cost actions to reduce dust generation. For example, cleaning by wet wiping is preferred to dry sweeping. Vacuums must have special high-efficiency particulate (HEPA) filters to trap small particles. Some power tools may be equipped with vacuum attachments to eliminate dust emissions while drilling or cutting.

Training requirements applicable to persons working in facilities operation and maintenance organizations are defined under 29 CFR 1926.1101, OSHA's Asbestos in Construction Standard.

OSHA defines repair and maintenance activities where small amounts of ACM are likely to be damaged or disturbed as Class III work. OSHA requires that workers who perform Class III repair and maintenance activities receive a 2-day (16-hour) training class that covers working safely with the materials. The course must include hands-on training on proper respirator use and work practices. OSHA requires that this training be provided prior to or at the time of assignment and annually thereafter.

OSHA defines maintenance and custodial activities where workers may contact but do not disturb ACM and activities to clean up dust, waste and debris resulting from other activities that disturb ACM as Class IV work. OSHA requires that workers who perform Class IV clean up or custodial receive a 2-hour training class that covers working safely around ACM. OSHA requires that this training be provided prior to or at the time of assignment and annually thereafter.

The US General Services Administration cites key elements of Asbestos Management Plans to include:

- Managing ACM in place as long as it is in good visual condition;
- Abating ACM that is damaged or subject to disturbance;

- Complying with OSHA and EPA regulations, standards and guidance on the management, handling, transportation and disposal of ACM.
- Using products that do not contain ACM in new construction, renovation or repair projects;
- Requiring qualified persons to do the initial and follow up visual inspections in determining the location and condition of ACM; and
- Promoting openness in communication with customers, regulatory agencies, the public and other interested parties during asbestos related repair, renovation and abatement projects.

2. Asbestos Management Practices and Procedures for the Smithsonian Air & Space Museum
The Smithsonian Institution Safety, Health and Environmental Management Program is defined by Smithsonian Directive 419 (SD419) and is implemented through the companion document, The Smithsonian Institution Safety Manual. The objective of this program, with the accompanying policies and procedures, is to "create a comprehensive, self-sustaining culture of safety performance in each museum, research institute, and office that enables employee effectiveness, productivity and professional fulfillment in executing the SI mission." Within the written Safety Manual is a section on Hazardous Materials Management which includes Chapter 22 – ASBESTOS.

The ASBESTOS control procedure in the SI Safety Manual is detailed and comprehensive with defined roles and responsibilities for:

- Building Managers
- Safety Coordinators
- Supervisors
- Employees
- Facilities Management, Design and Construction Offices
- Real Estate Division
- Safety, Health and Environmental Management

Specific sections are provided to address:

- Hazard Control Requirements for Specific Jobs and Activities
- Asbestos Waste Disposal
- Training Requirements for Staff
- Recordkeeping to maintain compliance documentation
- References, including current OSHA and EPA Regulations and SI policy documents

In addition, a series of Attachments (1-8) provide additional detail, training requirements and checklists for required safe work practices on tasks which may encounter ACM in routine daily operations, such as floor stripping, abatement work area preparation, inspections and cleaning.

Attachment 8 summarizes Training Requirements for various tasks which may encounter asbestos, including:

- Class I and II (Abatement and full removal work) requires a 4-day EPA-accredited training program;

- Class III (Repair and Maintenance for small tasks under 25 square feet) requires a 16-hour Operations and Maintenance Training Class
- Class IV (Housekeeping) requires a 2-hour awareness training program

All levels of training require an annual update and review.

3. Comparison of Smithsonian Practices to Current Standards

Current standards and regulations for safe and effective asbestos management require adherence to a comprehensive program of defined duties which must be fully integrated in all aspects of facility and real estate management, project design, maintenance, construction, demolition and employee supervision and training. These requirements are nothing new – they have been known and effectively applied over many decades of experience in order to protect the health of employees, contractors and the general public. The employer and the building owner are responsible for ensuring that these program elements are in place and effectively followed.

Many highly varied but effective examples of facility-wide asbestos control programs are available for comparison, since implemented programs will typically conform to the function and administrative structure of the responsible organization. That is, there is not a "one size fits all." The SI has developed a comprehensive asbestos control policy in accordance with the written procedures in the Hazardous Materials Management section of their Safety Manual. Upon review of the written program, it appears to be thorough and complete with detailed requirements for specific routine operations. Ultimately the effectiveness of the program will be determined by how closely these requirements are followed in regular operations.

4. Summary and Recommendations

This evaluation has compared Smithsonian policy for asbestos management and control to the regulations and practices in place for similar facilities in a workplace or construction setting. Based upon a review of the written Smithsonian policies, reports and materials provided by Committee Staff, a comparative analysis of applicable regulations and standards and my 30 years of professional experience in this area of technical specialization, I have found the Smithsonian Institution asbestos control policy, as written, to be quite complete and comprehensive. Please be aware that this evaluation has not included any on-site evaluation or audits to determine how effectively these policies have been implemented in daily practice. By fully implementing an asbestos control procedure as written in the SI Safety Manual, the Smithsonian should be able to maintain a safe and healthy work environment for its employees and the general public that is consistent with the current standards and practices in the field.

Sincerely,

Daniel O. Chute, CIH, CSP

Attachment 1

Summary of Technical and Professional Experience in Asbestos Programs

Daniel O. Chute, CIH, CSP
Atrium Environmental Health and Safety Services, LLC
11495 Sunset Hills Road, Suite 210
Reston, VA 20190
Phone (703)689-9482, ext. 104
Fax (703)689-3998
Email: dchute@atriumehs.com
Website: www.atriumehs.com

Summary

Mr. Chute has approximately 30 years of broad-based professional experience in the recognition, evaluation and control of exposures to asbestos, through work in public buildings, schools, housing, construction, manufacturing, shipbuilding and defense industries. He is a Certified Industrial Hygienist (CIH) and for more than 20 years has maintained EPA accreditation as an asbestos Inspector, Management Planner and Project Designer. His experience includes a history of successful development, implementation and management of many programs which have demonstrated highly specialized and detailed requirements for:

- Inspection and Air Monitoring
- Risk Assessment
- Cost and Feasibility Analysis
- Training
- Abatement Design and Oversight
- Logistics and Information Management
- Research and Special Studies

Asbestos-related Experience

- Has conducted asbestos inspections, testing and delivered training in accordance with established industry protocol since 1980.
- Completed McCrone Institute training in optical microscopy for PLM analysis of bulk samples.
- EPA-accredited training credentials maintained continuously since 1987. Currently maintain EPA-accredited certificates as Inspector, Management Planner and Project Designer.
- Active licensure as Inspector, Management Planner, Project Designer and Project Monitor.
- Prepared abatement project design specifications for over 20 major abatement projects in VA Medical Centers.
- Project Manager for asbestos testing and inspection contract for National Capitol Region, US General Services Administration (Federal Facilities in Washington, DC area)
- Asbestos Training Instructor, US Department of State Domestic Environmental and Safety Division
- Served as Instructor in University-based EPA-accredited Asbestos Training Programs since 1988

- Conducted FEMA Asbestos Inspections and Damage Reports, 1988-1992
- Managed Maryland's first Statewide Industrial Hygiene Services Contracts for inspection and testing during asbestos removal operations, 1987-1990.
- Technical management of first statewide asbestos inspection contract in US, conducted in Maryland, 1986-1988. Received letter of commendation from Maryland DGS Program Manager, Joel Matz, for successful effort.
- Conducted over 100 comprehensive Loss Control Surveys of Asbestos Abatement Contractors throughout US for Reliance National Insurance, 1995-2000.
- Managed and completed first comprehensive asbestos inspection and survey for US Capitol and Architect of the Capitol facilities, 2000-2002.
- Extensive inspection experience in public and private facilities, schools, hospitals, industrial sites, military, laboratory, historical buildings and ships for construction, renovation or demolition.

EDUCATION

M.S., Industrial Hygiene, *Texas A&M University*
B.S., Environmental Health, *Old Dominion University*

CERTIFICATION AND LICENSURE

Certified Industrial Hygienist, Comprehensive Practice, American Board of Industrial Hygiene
Certified Safety Professional, Comprehensive Practice, Board of Certified Safety Professionals

Asbestos Licensure: Inspector, Management Planner, Project Designer, Project Monitor

Attachment 2

Daniel O. Chute, CIH, CSP – List of References Relied Upon for Opinions (April 2009)

1.	Versar, Inc., Final Asbestos Survey Report for National Air and Space Museum, Volume 1, November 25, 1992.
2.	KEM, Letter from J. Brent Kynoch to Mr. David Marshall, Katz, Marshall and Banks, LLP, December 1, 2008; RE: Richard Pullman – National Air and Space Museum KEM Project 3 21351
3.	KEM, Letter from J. Brent Kynoch to Mr. David Marshall, Katz, Marshall and Banks, LLP, December 2, 2008; RE: Richard Pullman – National Air and Space Museum Comments regarding Smithsonian Office of General Counsel Responses 11-12-2008 KEM Project # 21351
4.	AMA, Inc., Letter from Gary L. Urban to Ms. Rachel L. Gregory, Smithsonian Institution, January 26, 2009; RE: Ambient air sample collection and analysis performed at the Smithsonian Institution (SI), national Air and Space Museum (NASM) located at 6th and Independence Avenue, SW, Washington, D.C.
5.	Smithsonian Institution, Letter from Cristian Samper, to Colleagues; 11/07.
6.	Smithsonian Institution, Directive 419, October 30, 2006, Smithsonian Institution Safety and Health Program
7.	Smithsonian Institution, Chapter 22 Asbestos,
8.	Smithsonian Institution, Chapter 22 Asbestos, Attachment 1 – Recommended Safe Practices When Work on or Around ACM
10.	Smithsonian Institution, Chapter 22 Asbestos, Attachment 2 – EPA Guidelines for Striping Asbestos-Containing Floors
11.	Smithsonian Institution, Chapter 22 Asbestos, Attachment 3 – Sample Asbestos Management Plan
12.	Smithsonian Institution, Chapter 22 Asbestos, Attachment 4 – Re-Inspection of Asbestos-Containing Materials
13.	Smithsonian Institution, Chapter 22 Asbestos, Attachment 5 – Sample Asbestos Notification Fact Sheet for Building Occupants
14.	Smithsonian Institution, Chapter 22 Asbestos, Attachment 6 – Sample Abatement Notification to Occupants
15.	Smithsonian Institution, Chapter 22 Asbestos, Attachment 7 – ACM Area General Cleaning Procedures
16.	Smithsonian Institution, Chapter 22 Asbestos, Attachment 8 – Asbestos Work classifications and Training Requirements (OSHA 29 CFR 1926.1101)
17.	Environmental Protection Agency (EPA) National Emission Standards for Hazardous Air Pollutants , 40 CFR Part 61, Subparts A and M.
18.	Environmental Protection Agency (EPA)Document 560/5-85-024 (June 1985) *Guidance for Controlling Asbestos – Containing Materials in Buildings*
19.	Environmental Protection Agency (EPA) Document 20T-2003 (July 1990) *Managing Asbestos in Place: A Building Owner's Guide to Operations and Maintenance Programs for Asbestos Containing Materials*
20.	Environmental Protection Agency (EPA) Asbestos Hazard Emergency Response Act (AHERA), 1986; 40 CFR Part 763 Asbestos, Subpart E – Asbestos Containing Materials in Schools
21.	Environmental Protection Agency (EPA), Asbestos School Hazard Abatement

Daniel O. Chute, CIH, CSP – List of References Relied Upon for Opinions (April 2009)

	Reauthorization Act (ASHARA), 1990: (Summary)
22.	Smithsonian (SI) Guide specifications for Asbestos Abatement, Section 13280, and Mechanical System Insulation, Section 15080
23.	US Department of Labor, Occupational Safety and Health Administration (OSHA), General Industry Standards, 29 CFR 1910.1001, Asbestos
24.	US Department of Labor, Occupational Safety and Health Administration (OSHA), General Industry Standards, 29 CFR 1910.134, Respiratory Protection
25.	US Department of Labor, Occupational Safety and Health Administration (OSHA), Construction Standards, 29 CFR 1910.1101, Asbestos

The CHAIRMAN. Thank you. Mr. Urban.

STATEMENT OF GARY L. URBAN, VICE PRESIDENT, AEROSOL MONITORING & ANALYSIS

Mr. URBAN. Good afternoon. My name is Gary Urban. I am a Vice President for Aerosol Monitoring & Analysis, which is located here in Hanover, Maryland. Aerosol Monitoring & Analysis has been in business for 27 years providing environmental industrial hygiene and health and safety consulting and training services. We are a full service company whose capabilities include consulting, laboratory and training services, including but not limited to asbestos. Our staff include a certified industrial hygienist, a certified safety professional, certified hazardous materials manager, as well as EPA accredited asbestos inspectors, management planners and project designers who provide multi-functional environmental consulting services, design support and hazardous materials management to our clients. Our firm provides services to government, industry, building owners and managers, architects, engineers and contractors.

I have been employed by the firm for the past 17 years, during which time I have provided consulting services to such government agencies as the General Services Administration, Architect of the Capitol, Smithsonian, and DOD. Professionally I am a certified hazardous materials manager with 21 years of experience in hazardous materials management, primarily involving asbestos surveys, asbestos abatement design, asbestos abatement remediation oversight and asbestos management and asbestos operations and maintenance programs. I am trained and licensed as an EPA asbestos inspector, management planner, supervisor competent person and project designer.

During the past several years our firm has provided a variety of consulting and laboratory and training services to the Smithsonian Institution at several facilities. Past projects have included work at the Castle building, the Arts and Industries building, the Garber Facility, as well as the Museum Support Center, to name a few. These projects involved inspection, testing, design for abatement, hazard assessments, including but not limited to asbestos.

Recently our firm was awarded a contract in August of 2008 to reassess Smithsonian facilities to provide an update to existing asbestos survey reports in a majority of the buildings, facilities, and museums. The work involves a review of the available asbestos documentation for each specific site, field inspections to verify site conditions pertaining to the presence, quantity and location and condition of the previously identified asbestos materials. The work also includes assessing, documenting, and in some cases testing additional suspect materials not previously identified so as to provide a more complete picture of the asbestos situation within a given facility.

At the completion of the inspection we provide a summary report of findings, results of any testing conducted, an electronic copy of the available documentation and input the field inspection data into an SI-generated geospatial database that interfaces with the SI facility center version 8I. This database will enable SI to better manage the presence, quantity and location of asbestos within a

given facility. I am the project manager for this contract and serve as the single point of contact for the Smithsonian Institution. This assignment has provided me with a unique and extensive knowledge of the challenges posed by the Smithsonian, the types and locations and extent of asbestos materials in the institution, as well as insights on how these materials can best be managed to ensure safety to staff, contractors and visitors.

In most recent past our firm provided asbestos general area air monitoring for SI at the National Air and Space Museum on the Mall in response to a claim that the air was unsafe as asbestos was identified in bulk and settled dust samples collected by others. At the time of our testing we provided evidence that the airborne fiber concentration observed throughout the museum in both public and nonpublic spaces identified fiber concentrations of less than or equal to 0.005 fibers per cc of air by phase contrast microscopy. For comparison purposes the OSHA has established a permissible exposure limit of .1 fibers per cc over an eight-hour time weighted average. Furthermore, the reoccupancy level for an asbestos removal project where PCM is utilized is less than 0.01 fibers per cc.

Thank you for inviting me here today. I will be pleased to address any questions that you have on what I have stated here. Thank you.

[The statement of Mr. Urban follows:]

Committee on House Administration
Biography and Testimony
Gary L. Urban
1 April 2009

Good afternoon, my name is Gary Urban and I am a Vice President for Aerosol Monitoring & Analysis, which is located in Hanover, Maryland. Aerosol Monitoring & Analysis, Inc. has been in business for 27 years providing environmental, industrial hygiene, and health and safety consulting and training services. We are a full service company whose capabilities include consulting, laboratory and training services including but not limited to asbestos. Our staff includes Certified Industrial Hygienists, a Certified Safety Professional, a Certified Hazardous Materials Manager as well as EPA accredited Asbestos Inspectors, Management Planners and Project Designers who provide multifunctional environmental consulting services, design support and hazardous materials management to our clients. Our firm provides services to government, industry, building owners & managers, architects, engineers and contractors. I have been employed by the firm for the past 17 years, during which time I have provided consulting services to such government agencies as the General Services Administration, Architect of the Capitol, Smithsonian and DOD.

Professionally, I am a Certified Hazardous Materials Manager with 21 years of experience in hazardous materials investigations, primarily involving asbestos surveys, asbestos abatement design, asbestos abatement remediation oversight, asbestos management and asbestos operations and maintenance programs. I am trained and licensed as an EPA AHERA Asbestos Inspector/Management Planner, EPA AHERA Asbestos Abatement Supervisor/Competent Person, and EPA AHERA Asbestos Project Designer.

During the past several years our firm has provided a variety of consulting, laboratory and training services to the Smithsonian Institution at several facilities. These past projects have included work at the Smithsonian Castle Building, the Arts & Industries Building, as well as the Garber Facility, and the Museum Support Center, both in Suitland Maryland. These projects involved inspection, testing, design for abatement, hazard assessments including but not limited to asbestos

Recently, our firm was awarded a contract in August of 2008 to reassess Smithsonian Facilities to provide an update to existing asbestos survey reports in the majority of the Smithsonian buildings, facilities and museums. The work involves a review of available asbestos documentation for each specific site, field inspections to verify site conditions pertaining to the presence, quantity, location and condition of the previously identified asbestos materials. The work also includes assessing, documenting and in some cases testing, additional suspect materials not previously identified, so as to provide and more complete picture of the asbestos situation within a given facility. At the completion of the inspection, we provide a summary report of findings, results of any testing conducted, an electronic copy of the available documentation and input the field inspection data into a SI generated geospatial data base that interfaces with SI Facility Center, version 8i. This database will enable SI to better manage the presence, quantity and location of asbestos within a given facility. I am the project manager for this contract and serve as

the single point of contact to the Smithsonian Institution. This assignment is providing me with unique and extensive knowledge of the challenges posed to the Smithsonian by the types, locations and extent of asbestos materials in the Institution as well as insights into how these materials can best be managed to ensure the safety of staff, contractors and visitors.

In the most recent past, our firm has provided asbestos general area air monitoring for SI at the National Air and Space Museum on the Mall in response to claims that the air was unsafe as asbestos was identified in bulk and settled dust samples collected by others. At the time of our testing, we provided evidence that the airborne fiber concentrations observed throughout the museum, in both public and non-public spaces identified fiber concentrations of less than or equal to ($\leq$) 0.005 fibers per cubic centimeter (f/cc) of air by phase contrast microscopy (PCM). For comparison purposes, the Occupational Safety and Health Administration (OSHA) has established a permissible exposure limit (PEL) of 0.1 f/cc as an 8-hour time weighted average for asbestos fibers. Furthermore, the re-occupancy levels for asbestos removal projects within SI, where PCM is utilized is <0.01 f/cc.

Thank you for inviting me to be here today. I will be pleased to address any questions the committee might have on this information or other issues relating to survey, analysis, handling or management of asbestos containing materials in facilities like the Smithsonian.

The CHAIRMAN. Thank you. Mr. Brennan.

STATEMENT OF WILLIAM M. BRENNAN, EXECUTIVE VICE PRESIDENT, TURNER CONSTRUCTION COMPANY

Mr. BRENNAN. Mr. Chairman, thank you, Mr. Lungren and Harper and attendees. Turner was engaged in 2006 to undertake the renovation of the Star Spangled Banner exhibit, which as Mr. Clough described earlier was coincident with their starting to establish——

The CHAIRMAN. I am sorry, could you push your mike a little further toward you maybe.

Mr. BRENNAN [continuing]. Coincident with their beginning to upgrade and expand on their OSHA safety procedures and manual. And we were glad to participate along with a number of other contractors to bring to them our experience of 105 years in the business from the construction point of view as it relates to operating in an existing facility such as the Smithsonian.

So we worked closely with the Smithsonian staff, our own professional designers and architects and specialty subcontractors to participate in writing an overall program, as well as doing an investigation of the space that we were going to conduct the renovation work in. We did not investigate outside of our defined construction area, but we did go in and investigate the areas that we were going to be contacting to determine the types of materials that we would encounter.

Throughout the complete development of that plant I never ever felt we did not have the complete highest level of support from the institution toward safety of our staff, our employees, the tradesmen, the employees of the Smithsonian, and the eventual visitors to the facility. Safety was always the paramount driver to the protocols and procedures that we developed.

I would like to just give you a quick overview of the methodology that we used in arriving at the procedures, manuals and policies that we employed throughout the construction period.

So we worked closely with Smithsonian, we employed an accredited licensed professional consulting firm named Maytech to come in and help investigate and identify all the materials throughout the facility. Part of our procedures were to also identify subcontractors that would actually do the abatement. All of those firms had to be OSHA certified, EPA accredited, licensed to do business in the District of Columbia, and all the credentials had to be at the highest level of standards. We then went on to set up a policy for selecting subcontractors that were knowledgeable about working in a facility such as this. It is an occupied facility, it is a renovation. We wanted contractors who had the experience and expertise, having done similar complex renovation work such as this in a building that we knew was going to have hazardous materials of a variety of types.

In the survey, which took about two months in 2006, we thought we might encounter asbestos, we thought we might encounter lead, we thought we might encounter PCBs, and we encountered two of the three. We did not find any PCBs but we did find a variety of lead containing and asbestos containing materials. So those were the substances around which we wrote the protocols and proce-

dures that we would use throughout the construction period when and if these substances were encountered. We estimated that we might encounter 40 to 50 episodes of containment materials and the protocol in construction is, as the chairman has stated, if you are not going to disrupt it leave it alone. But if you are going to disrupt it then there is a protocol for what the methodology is, the type of bagging, the type of masking, the type of safing off, the type of shutting down air system procedures and protocols that have to be employed. The testing, professional testing firm then comes in and certifies that the area is clean after the abatement is done, and at that point and only that point are our people engaged to go back into the area and do traditional construction work.

Around that time frame there were a variety of safing off and restrictions, and hanging of polyethylene and putting various types of fans and filters in place to positively or negatively pressurize the areas that are being worked in, so as to completely prevent the material from getting outside the containment abatement area.

All of that was written up. We preselected subcontractors who had experience exercising protocol such as this. We wrote into their subcontract a very rigorous procedure should they encounter any materials such as tile or mastic, what they were to do, and I will walk through that in a second. But every award of a subcontract we sat down with their senior management and made sure that they understood the procedures and properly priced them and could carry them out effectively. We made sure that they would have an OSHA 30-hour certified professional on-site at any time when their staff was working. We set up training programs for each individual employee who was going to come on the job to make sure each employee understood the requirements and the protocols.

And to summarize it, basically every subcontractor had a policy in his contract which stated the following: If you should encounter any material which you believe could be either lead or asbestos or in any way hazardous material, you are to immediately stop work, notify one of our supervisors or one of the owner's supervisors or the on-site asbestos containment professional. We then would go in, test it, if it was a hazardous material, we would set up the appropriate protocols to abate it, come back within a few days and verify that the containment had worked, there were no extraneous fibers left in the area, and then the professional would say the area is clear for you to go back in and work. And that was a part of every subcontract.

To summarize, as I said, throughout both the development of these procedures, as well as the implementation, as I said, we thought we might encounter 30 or 40, we ended up encountering 250 situations that required abatement. And despite excessive additional costs on the institution's part they never once backed off, holding us to the highest standards of safety, notification, abatement, adjust the schedule later on, but don't compromise any of the procedures as were set up in the manual.

Thank you.

The CHAIRMAN. Thank you. Thank all of you. I would like to ask just a few questions. Mr. August, what kind of tests are the most reliable tests in your opinion to find whether a building has asbestos or not in it?

Mr. AUGUST. Well, there are different tests for different——

The CHAIRMAN. I am sorry, is there a way of doing that without exposing it? Is there a way of doing it without bothering it? Because when asbestos is concealed it could probably stay that way as long as it is not interrupted, bothered, hit or broken into.

Mr. AUGUST. Right. There are different tests for different situations. If you want to find out, for example, in this room if any of these walls, the ceiling, the floor tiles or whatever have asbestos, you can, number one, check to see the records and maybe that will tell you, if those are available. Or if you have to actually sample, then what we do is called bulk sampling. In a controlled way we take a core sample all the way through the material. And then that is sent to a laboratory where they will use—there are two types of, I don't want to get into the technicalities, there are two types of microscopes. There is polorized light microscopy, which was referred to, and there is a much more sophisticated kind, which is transmission electron microscopy, and that is the more definitive test. But that will tell you whether or not there is asbestos present. And the legal definition is point one percent. If that amount is present, then the material is considered asbestos containing.

I mention another type of testing though, which is if you want to find out what somebody is exposed to then you have to find out what is in the air. And the personal sampling device is the most useful because that is taking air from right where somebody is breathing while something is happening. So that is going to give you the most accurate exposure monitoring.

The CHAIRMAN. Thank you.

Mr. Chute, what in your opinion is the top priority that the Smithsonian should focus on to ensure the safety of its workers, the safety of its construction people and the safety of its guests?

Mr. CHUTE. I think by adhering to the written policies that are in place they would be able to demonstrate that they are properly following I guess the goals and also the legal intent of those programs; that is, make sure they have proper documentation, that people are trained, that they receive the right level of training, and also having good access to the monitoring data to show that they have done the correct type of testing to identify the location of asbestos and verify that air quality meets current standards.

The CHAIRMAN. Thank you, sir.

Mr. Urban, you are looking at our Smithsonian buildings as we speak?

Mr. URBAN. Yes, sir.

The CHAIRMAN. How many have you looked into?

Mr. URBAN. Right now, we have gone through, I believe, nine, maybe eight. But we are on the ground right now.

The CHAIRMAN. Any results you can share with us?

Mr. URBAN. You know, in the beginning, we had a 1992 report which we were going to go through. And, quite frankly, I have been pleasantly surprised that a lot of the Versar reports are fairly complete.

Now, we do find additional materials, and that is standard practice in a lot of the inspections that we conduct. A lot of the materials have been removed, and that is what we are doing.

We are going to be able to provide Smithsonian—in my little speech there, I indicated the geospatial database, which basically will enable the Smithsonian to go room by room and identify the presence, quantity, and location of the materials that are in each one of those rooms. So that is a big deal right there, you know, to communicate that hazard to the employees and contractors alike.

The CHAIRMAN. Just to be fair, Mr. Brennan, what do you do when you encapsulate—I mean, I know what you do. When you encapsulate—it is your job to encapsulate it also—and you encapsulate it, you bag it. Do you take that to a special recycling area?

Mr. BRENNAN. Yes.

The CHAIRMAN. And let me tell you why. I have been involved in construction myself. And I know that early on you encapsulate, you put it into a certain type of bag that is provided to you, and they take it to a certain disposal. I see those bags laying in the disposal, just laying there and getting broken up, getting banged around by other people dumping other stuff on there.

Is that the case? I mean, I am not saying you do that. But when it is left at some of these disposal plants, what are they supposed to do, burn it? What happens with it?

Mr. BRENNAN. Congressman, I am not sure how they actually treat it at the plants. Our job is to make sure it gets to an EPA-certified disposal facility.

And it is a challenging process. It is a difficult business to monitor. But our company, we go through bills of lading, sign offs, verification. We have an online system where the actual receipt of the materials at the disposal, they have to log in and confirm the bill of lading, the proper tag numbers so that we can verify that what left our site, got there. We measure comparable weights of the vehicle and tonnage in the truck to make sure it wasn't half here, half there.

It is something that you have to create a culture of continuous attention to detail and monitoring and just entertain no transgressions, zero tolerance for any sort of transgressions of the rule. Once you have good policies set up, you have to enforce them rigorously.

The CHAIRMAN. Does anyone know what happens to them? How they dispose of them?

Mr. URBAN. Well, after an abatement is completed, they bag the waste, and it is taken to a landfill, at which time the landfill covers up the material in specified cells.

The CHAIRMAN. Do they mix it with all the other landfills? Are they supposed to mix it with all the other landfills?

Mr. URBAN. My understanding—and I probably shouldn't even speak on it because I am not 100 percent sure, but they go in cells and designated areas of permitted landfills.

The CHAIRMAN. You are shaking your head.

Mr. AUGUST. I don't know the exact procedures, but there are registered places within landfills that are to receive it. It doesn't just go out with the trash. So presumably it is being segregated and handled in a way that it really is buried.

The CHAIRMAN. Presumably. But there are only certain landfills or certain disposals that are qualified to receive?

Mr. AUGUST. Yes. There is another regulation, the NESHAPs, the air pollution standard. That regulation has been in place for a long time. And before any abatement takes place even, there has to be a notification to EPA of what is going to happen, how dust is going to be controlled, how much is going to be removed, what type of material, and then how it is going to be disposed of. And then you have to get a permit before you can even take it there.

Am I correct, from the people in the field?

That you have NESHAPs regulations, so that you have a way to track, even before the work begins, that in fact it is being disposed of according to the regulations.

Mr. BRENNAN. The trucking company has to be permitted and licensed, as does the designated landfill. It has to be permitted all the way along. The remover, the trucker, the disposal landfill all have special permits.

The CHAIRMAN. Is that the same for residential buildings?

Mr. BRENNAN. Yes.

The CHAIRMAN. Thank you.

Any questions from Mr. Lungren?

Mr. LUNGREN. I will just ask a couple.

And I hope folks down there didn't think by my closing my eyes or anything, I was not paying attention. For some reason, these lights are very irritating, and we are going to have to do something about the environment of the lights in here. Because, otherwise, I will be sitting up here with sunglasses. And that is not a California deal, it actually hurts my eyes. And we were told they couldn't do anything about it. So we will find out how to do that.

For all of you, based on your backgrounds in environmental health and safety in the workplace—I think you were all here when Secretary Clough testified—is there anything that you would add to what he outlined in terms of what the Smithsonian is doing and he intends it to do?

Mr. August.

Mr. AUGUST. Yeah, I was actually quite impressed with the seriousness with which he took the situation. And I agree with the other panelists that, in fact, on paper, there are very good procedures in place, and, in fact, if they had been followed, we wouldn't be having these hearings.

But his problem is, as you mentioned, the cleaning up after the elephant. I don't know how many years this has been going on, where the policy may not have been worth the paper it was written on.

Mr. LUNGREN. But based on what he said, in terms of what he outlined, you would believe that that sounds responsible?

Mr. AUGUST. I would add this to what he has done. He mentioned something to the effect that employees could visit—or should visit the employee health center. I would go a step further, and I would look at records of current and even former employees at the Air and Space Museum, as well as other Smithsonian facilities, and I would look at their job classifications and their years of service, and I would set up a screening program to find out, in fact, how many other Mr. Pullmans there are.

I fear that he is the tip of the iceberg and that these people are going to fall through the cracks. They are going to go to their personal doctors, they are going to file their own insurance claims——

Mr. LUNGREN. So you would recommend setting up some sort of formal screening process to see if there is anybody else out there.

Mr. AUGUST. Absolutely, absolutely. And that is because all the sampling that is being done is fine for prospectively, but we have no way retrospectively to go back and find out. All we have, unfortunately, are signs of exposure, which is disease.

Mr. LUNGREN. Anyone else have any recommendations beyond what Secretary Clough said?

Mr. BRENNAN. The policy is great. Our business, just like his staff, you have constant turnover every year. You have people coming into the museum, or pedestrians. The enforcement aspect of it is really critical. You can train somebody one day, and the next day somebody else is in that position doing the same job that you have to train all over again. It is just ongoing. It is a cultural thing that you have to create so that everybody is conscious of what needs to be done. That is really what supports a healthy policy.

Mr. LUNGREN. Thank you.

Mr. Chute.

Mr. CHUTE. Well, again, it appears that the Secretary cannot speak back into the past for what might have happened in years past, but, from listening to both Mr. Urban and Mr. Brennan, it appears that there has been a history of close attention to asbestos, at least during design, construction, and various phases of abatement. So possibly the Secretary would be able to retrieve some of the historical data that might be compartmentalized in the design and construction and the other divisions, which might be able to paint a more complete picture of how things really are.

Because, at this point, nobody can really tell you what the air fiber levels were one day 5 years ago or 10 years ago. But if you have a demonstrated history of monitoring at various phases of design and construction which show you that these things have been well-controlled, you may be in a better position to respond as an organization to say, "We have monitored it at various phases along the way, and this shows a history of effective control," which might soothe some of the concerns about some of the employees, if they are able to demonstrate that level of positive enforcement of the policies.

Mr. LUNGREN. Mr. Brennan, I think I heard, in your testimony, you say something to the effect that you expected to maybe have 40 instances where you would run into asbestos, and you had multiples of that.

Mr. BRENNAN. 250.

Mr. LUNGREN. To what do you attribute that difference in assessment versus what actually occurred? And were there some real surprises over and above the number?

Mr. BRENNAN. There were two things that contributed.

One, at the point in time that we did the above-the-ceiling investigation, we were still in the process of designing the actual work that we were going to install. So where the drawings may have said we were going to tie into a piece of ductwork here, when we actually got the design completed maybe we were 10 feet away.

And that 10 feet could have meant a difference between an incident and not an incident.

The second was a major surprise, in that all the steel beams in the building were encased in concrete. And we looked up at that and saw no exposure whatsoever. And when we got in there and we starting taking the concrete off to attach new steel, on the steel was lead-based paint underneath the concrete. So that alone was probably 60 or 70 of the incidents.

And the third one was a lead-based paint that we looked at—it was gold leaf, actually. And we thought it was what is called a peel-and-stick removal. Just put this paper over it, the adhesive peels it off, and you take it and dispose of it. And it turned out that the paint had actually impregnated the underlying plaster. It is now a dust-laden material. So it became a complete drop the tarps, negative pressure—a much more complicated incident to deal with.

So those are the three areas that I would say magnified it even beyond our expectations. A complex renovation like that, phase by phase, you can't go in all areas at the same time, we knew it would be tricky, but it more than doubled and caught us by surprise.

Mr. LUNGREN. Thank you very much.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Thank all of you for your testimony. Thank you for your interest, your insight, and your expertise. We do appreciate it. And we do appreciate you being here today. So thank you.

I would like to now ask unanimous consent to place various materials in the record. I ask unanimous consent to place in the hearing record reports by Aerosol Monitoring & Analysis, Inc., a document dated January 6, 2009; a report by Kynoch Environmental Management dated December 1, 2008; and a report by Versar dated November 25, 1992.

[The information follows:]

Aerosol Monitoring & Analysis, Inc.
Environmental Consultants

January 6, 2009

Smithsonian Institution
Office of Safety, Health and Environmental Management
600 Maryland Avenue, SW, Suite 7106
MRC 514, P.O. Box 37012
Washington, D.C. 20013-7012

Attn: Ms. Rachel L. Gregory, Associate Director for Environmental Management

RE: Ambient air sample collection and analysis performed at the Smithsonian Institution (SI), National Air and Space Museum (NASM) located at 6th and Independence Avenue, SW, Washington, D.C.

AMA Job No. 09063

Dear Ms. Gregory:

On December 9 and 11, 2008, Aerosol Monitoring & Analysis, Inc. (AMA) representatives, Gary Urban and Korey Rubeling were on-site at the NASM to perform ambient air sample collection in various areas of the facility. The work was performed to determine the ambient fiber concentrations throughout the NASM, based on the presence of asbestos in settled dust samples indicated by Kynoch Environmental Management, Inc. (KEM), in their report dated November 25, 2008.

In order to determine if airborne asbestos hazards exists at NASM, AMA representatives collected a total of twenty-five (25) air samples plus (4) four blanks. The air samples were collected using standard industrial hygiene methods. Air was drawn through 25-millimeter (mm) diameter, 3 piece filter cassettes with 50-mm extension cowls made from non-conductive, carbon-filled polypropylene. The filter was made from 0.8 micrometer porosity, mixed cellulose ester (MCE), supported by a cellulose pad fitted into the base section of the cassettes. Battery operated low volume air sampling pumps were used for the majority of the samples (20), while high volume air sampling pumps with variable flow adjusters were utilized for the remaining samples (5). The air sampling pumps were calibrated prior to and following the air sampling with a rotometer, which was calibrated against a primary standard on December 8, 2008. Air samples were each collected for a period of at least 8 hours.

Sampling locations included public exhibit/open spaces and non-public storage, projection areas (exhibit support) on the 1st and 2nd floors as well as office, cubicle and corridor spaces on the 3rd floor. A minimum of one sample was collected from each area identified in the KEM report as having asbestos in settled dust present.

The air samples were analyzed by phase contrast microscopy (PCM) following the National Institute of Occupational Safety and Health (NIOSH) Method 7400 by AMA Analytical Services, Inc., an American Industrial Hygiene Association (AIHA) accredited laboratory (# 100470).

The results of the analysis of the 25 ambient air samples collected throughout the NASM facility identified fiber concentrations of less than or equal to ($\leq$) 0.005 fibers per cubic centimeter (f/cc) of air. For comparison purposes, the Occupational Safety and Health Administration (OSHA) has established a permissible exposure limit (PEL) of 0.1 f/cc as an 8 hour time weighted average for asbestos fibers. Furthermore, the re-occupancy levels for asbestos removal projects within SI, where PCM is utilized is <0.01 f/cc. See table 1.

Based on the results of the air samples collected by AMA, no airborne asbestos hazards were found at the time of the sample collection. In fact, the airborne levels referenced above (OSHA and SI) are based on either Federal or State regulatory levels, whereas, the surface dust levels have no regulatory standards to support the conclusions made within the KEM report regarding surface dust.

To further support this argument, the paper; R.J. Lee, D.R. Van Orden, I.M. Stewart, **"Dust and Airborne Concentrations - Is There a Correlation ?"**, *Advances in Environmental Measurement Methods for Asbestos, ASTM STP 1342*, M. E. Beard Rook, Eds., American Society for Testing and Materials, West Conshohocken, PA, 2000, concludes that the presence of asbestos in airborne dust is independent of the presence of asbestos in surface dust.

In addition, the paper; E. J Chatfield, **"Correlated Measurements of Airborne Asbestos-Containing Particles and Surface Dust"**, *Advances in Environmental Measurement Methods for Asbestos, ASTM STP 1342*, M. E. Beard Rook, Eds., American Society for Testing and Materials, West Conshohocken, PA, 2000, by concludes that the surface dust measurements made by ASTM D5755 do not provide a valid scientific basis for prediction of airborne chrystotile concentrations.

Based on these two scientific papers, it is AMA's considered opinion that it would be difficult for KEM to defend their report conclusion that, "levels of asbestos in settled dust that exceed 100,000 s/cm2 indicate that airborne exposures of asbestos at the time the material was being disturbed would have been well in excess of the OSHA Permissible Exposure Limit (PEL) for asbestos", as there is no valid air sampling data or site observations to support such a statement.

The conclusion statement made by KEM that, "There is a strong likelihood that the lack of engineering controls to prevent the spread of dust during demolition/dismantling activities has resulted in significant exposures to the general public that visit the museum.", does not consider the fact that no observations were made of such conditions, no air sampling data was utilized to support this argument, and that surface dust samples are not used to determine exposure or clearance for asbestos activities.

Enclosed please find the air monitoring data sheets, which identify the locations of sampling, the pump flow rates, volume of air collected, chain of custody and the certificates of analysis. If you have any questions regarding this report please contact our office at (410) 684-3327.

Sincerely,

Gary L. Urban, CHMM
Vice President-Consulting Services

Table I
Phase Contrast Microscopy (PCM)
Air Sampling Data
Smithsonian
National Air and Space Museum
December 9 and 11, 2008

Sample ID	General Sample Location	Sample Duration (minutes)	Sample Results (f/cc)
December 9, 2008			
090631209-01	NASM, 203, Upper Level, SW Projection Room, non-public space	480	<0.005
090631209-02	NASM, 203, Upper Level, NW Projection Room, non-public space	480	<0.005
090631209-03	NASM, 203, Gallery, Main Level, public space	480	<0.005
090631209-04	NASM, 207, Gallery, Main Level, public space	480	<0.005
090631209-05	NASM, 207, Upper Level, SW Area, non-public space	481	0.005
090631209-06	NASM 207, Main Level, NW Storage Area, non-public space	480	<0.005
090631209-07	NASM 213, Gallery, Main Level, North, public space	481	<0.005
090631209-08	NASM 213, Upper Level, Above Theater, non-public space	482	<0.005
090631209-09	NASM 210, Gallery, Main Level, Apollo 17 Case, public space	482	<0.005
090631209-10	NASM 113, Gallery, Main Level, NE Area, public space	480	<0.005
090631209-11	NASM 113, Gallery, Main Level, SW Area, public space	480	<0.005
090631209-12	NASM 1st Floor, Main Hall East, outside 111 Gallery, public space	480	<0.005
090631209-13	NASM 1st Floor, Main Hall Center, on 108 column (NE), public space	480	<0.005
090631209-14	NASM 1st Floor, Main Hall West, outside 103 Gallery, public space	480	<0.005
090631209-15	Field Blank	N/A	0/100
090631209-16	Sealed (lab) Blank	N/A	0/100

Table I
Phase Contrast Microscopy (PCM)
Air Sampling Data
Smithsonian
National Air and Space Museum
December 9 and 11, 2008

Sample ID	General Sample Location	Sample Duration (minutes)	Sample Results (f/cc)
December 11, 2008			
090631211-01	NASM 3rd Floor, NW Area-Library Area, 300c8A	480	<0.005
090631211-02	NASM 3rd Floor, SW Area-Office Area, 3106D	480	<0.005
090631211-03	NASM 3rd Floor, West Hall, Corridor 300C10	480	<0.005
090631211-04	NASM 3rd Floor, West Center-North-Office Area, 3359A	480	<0.005
090631211-05	NASM 3rd Floor, West Center-South-Office Area, 3333A	480	<0.005
090631211-06	NASM 3rd Floor, Center Hall, Corridor 300C21	480	<0.005
090631211-07	NASM 3rd Floor, East Center-North-Office Area, 3550a	480	<0.005
090631211-08	NASM 3rd Floor, East Center-South-Office Area outside 3512	480	<0.005
090631211-09	NASM 3rd Floor, East Hall, Corridor 300C34	480	<0.005
090631211-10	NASM 3rd Floor, NE Area-Office Area, outside 3759	480	<0.005
090631211-11	NASM 3rd Floor, SE Area-Office Area Hall, outside 3726 stairwell.	480	<0.005
090631211-12	Field Blank	N/A	0/100
090631211-13	Sealed (lab) Blank	N/A	0/100

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

ACCREDITED LABORATORY AIHA Industrial Hygiene

100470

NY ELAP 10920

Client:	Aerosol Monitoring & Analysis, Inc	**Job Name:**	SI-NASM	**Chain Of Custody:**	183910		
Address:	PO Box 646, 1331 Ashton Road	**Job Location:**	NASM	**Date Submitted:**	12/10/2008		
	Hanover, Maryland 21076	**Job Number:**	09063	**Person Submitting:**	Gary Urban		
		P.O. Number:	Not Provided	**Date Analyzed:**	12/10/2008	**Report Date:**	12/10/2008

Attention: Gary Urban

Summary of Phase Contrast Microscopy

AMA Sample Number	Client Sample Number	Volume Sampled (Liters)	Fibers Per Millimeter Squared		Fibers Per Cubic Centimeter		Analyst I.D.	Sample Type	Comments
0914781	090631209-01	960	< 7.0	*	< 0.005	*	CK	N/P	
0914782	090631209-02	960	< 7.0	*	< 0.005	*	CK	N/P	
0914783	090631209-03	960	< 7.0	*	< 0.005	*	CK	N/P	
0914784	090631209-04	960	< 7.0	*	< 0.005	*	CK	N/P	
0914785	090631209-05	962	12.1		0.005		CK	N/P	
0914786	090631209-06	960	< 7.0	*	< 0.005	*	CK	N/P	
0914787	090631209-07	962	< 7.0	*	< 0.005	*	CK	N/P	
0914788	090631209-08	964	< 7.0	*	< 0.005	*	CK	N/P	
0914789	090631209-09	964	< 7.0	*	< 0.005	*	CK	N/P	
0914790	090631209-10	960	< 7.0	*	< 0.005	*	CK	N/P	
0914791	090631209-11	1440	< 7.0	*	< 0.005	*	CK	N/P	
0914792	090631209-12	1440	< 7.0	*	< 0.005	*	CK	N/P	
0914793	090631209-13	1440	7.6		< 0.005	*	CK	N/P	
0914794	090631209-14	1440	< 7.0	*	< 0.005	*	CK	N/P	
0914795	090631209-15	0	< 7.0	*	*****		CK	BLK	0 fiber(s) per 100 fields

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

AIHA Accredited Laboratory — Industrial Hygiene — 100470

NY ELAP 10920

Client:	Aerosol Monitoring & Analysis, Inc	**Job Name:**	SI-NASM	**Chain Of Custody:**	183910		
Address:	PO Box 646, 1331 Ashton Road	**Job Location:**	NASM	**Date Submitted:**	12/10/2008		
	Hanover, Maryland 21076	**Job Number:**	09063	**Person Submitting:**	Gary Urban		
		P.O. Number:	Not Provided	**Date Analyzed:**	12/10/2008	**Report Date:**	12/10/2008

Attention: Gary Urban

Summary of Phase Contrast Microscopy

AMA Sample Number	Client Sample Number	Volume Sampled (Liters)	Fibers Per Millimeter Squared		Fibers Per Cubic Centimeter	Analyst I.D.	Sample Type	Comments
0914796	090631209-16	0	< 7.0	*	*****	CK	BLK	0 fiber(s) per 100 fields

* The Reporting Limit for AMA Laboratory is 7.0 fibers per square millimeter of filter. The reporting limit for the air concentration of fibers (f/cc) is dependent on the sampled air volume. Fibers counts were determined by the methods described in NIOSH Analytical Method 7400, 'Fibers' (Revision 3, Issue 2, 8/15/94). All personnel samples were analyzed following the OSHA Reference Method.

Sample results shown here have been corrected for any field blank(s) submitted with this sample set

Note: All samples were received in good condition unless otherwise noted.

Uncertainty: for fibers/mm² in the range of 7-25 the CV is 0.385, 26-64 CV=0.264, 64-127 CV=0.302, >127 CV=0.344

Analyst: Crystal Kelham

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AIR MONITORING DATA SHEET

PROJECT: SI - NASM
ADDRESS: 16th & Independence Ave, SW
CONTRACTOR: N/A
DATE: 12/9/08
ACTIVITY: Ambient Air Monit
AMA JOB #: 09063

SAMPLED FOR: METHOD (☐ 7400 ☐ TEM ☒ 35mm ☐ 37mm ☒ MCE ☐ PC) CASSETTE FILTER
- ☒ Asbestos
- ☐ Airborne Dust
- ☐ Gas
- ☐ Vapor
- ☐ Other
- ☐ Analytical Method ____ ☐ Ambient Temp. ____

Protection Worn During Sampling:
- ☐ Full Body Coveralls
- ☐ Respirator-Air Purifying N/A
- ☐ Respirator-Power Air Purifying
- ☐ Respirator-Supplied Air

PERSONAL AIR SAMPLING
Employee Sampled
Social Security No.
Smoker: ☐ Yes ☐ No N/A
Job Function
Description of Activity:

Signature of Employee:

SAMPLE NO.	SAMPLE DATE	SAMPLE LOCATION
09063 12-09 01	12/9/08	NASM 203 Upper Level SW Projection Rm 8' W of E wall, 6' N of S wall, 5' from floor
09063 12-09 02	12/9/08	NASM 203 Upper level NW Projection Rm 2' E of W wall, 4' S of N wall 5' from floor
09063 12-09 03	12/9/08	NASM Gallery 203 Main floor 20' N of S wall, 20' E of W wall 6' from floor on top of case
09063 12-09 04	12/9/08	NASM Gallery 207 Main floor 13' E of W wall, 30' 5" S of N wall 5' from floor on Pedestal Case
09063 12-09 05	12/9/08	NASM 207 SW corner, 2nd level, 10' E of W wall, 4' N of S wall on projection case in loft
09063 12-09 06	12/9/08	NASM 207 NW corner storage, 6' E of W wall, 2' 5" S of N wall, 6' from floor on Shelf.
09063 12-09 07	12/9/08	NASM Gallery 213, 8' 6" S of N wall, 38' W of E wall on Revolving Data Case, 5' from floor

FIELD SAMPLE NO. 090631209	TEST PERIOD START	TEST PERIOD STOP	TEST PERIOD TOTAL (MIN.)	FLOW RATE SETTING START (LITERS/MIN.)	FLOW RATE SETTING STOP (LITERS/MIN.)	INSTRUMENT SERIAL NO.	SAMPLE TYPE AMBIENT	SAMPLE TYPE AREA	SAMPLE TYPE PERSONAL	SAMPLE TYPE FINAL	SAMPLE LOCATION IN WORK AREA	SAMPLE LOCATION OUTSIDE WORK AREA	VOLUME
01	1802	0202	480	2.0	2.0	08-13	✓						960
02	1805	0205	480	2.0	2.0	08-14	✓						960
03	1156	0156	480	2.0	2.0	08-11	✓						960
04	1810	0210	480	2.0	2.0	08-12	✓						960
05	1817	0218	481	2.0	2.0	08-15	✓						962
06	1816	0216	480	2.0	2.0	08-16	✓						960
07	1826	0227	481	2.0	2.0	08-18	✓						962

COMMENTS
EE(0.8µm MCE) Cat #5250 80
Lot T8208808212
EMS VFA 55-194588-00 - 5012
(Rotameter) calibrated 12/8/08

Inspector: Greg Urban (Print)
(Signature)
Date: 12/9 12/10/08

Revised 11/15/02

1 of 3

AIR MONITORING DATA SHEET

PROJECT: SI - NASM
ADDRESS: 6th & Independence Ave, SW
CONTRACTOR: N/A
DATE: 12/9/08
ACTIVITY: Ambient Air Monit
AMA JOB #: 09063

SAMPLED FOR: METHOD CASSETTE FILTER
☑ Asbestos ☐ 7400 ☐ TEM ☑ 25mm ☐ 37mm ☑ MCE ☐ PC
☐ Airborne Dust
☐ Gas
☐ Vapor
☐ Other
☐ Analytical Method ____ ☐ Ambient Temp. ____

Protection Worn During Sampling:
☐ Full Body Coveralls
☐ Respirator-Air Purifying N/A
☐ Respirator-Power Air Purifying
☐ Respirator-Supplied Air

PERSONAL AIR SAMPLING
Employee Sampled
Social Security No. N/A
Smoker: ☐ Yes ☐ No
Job Function
Description of Activity:
Signature of Employee:

SAMPLE NO.	SAMPLE DATE	SAMPLE LOCATION
09063 1209 08	12/9/08	NASM 213, Second floor above theatre, 18' W of E wall 16 N of S wall, on Board Rail VD
09063 1209 09	12/9/08	NASM 210 Gallery, 36' E of W wall, 50 N of S wall on Rail Apollo 17 Core, 4' from floor.
09063 1209 10	12/9/08	NASM 113, NE corner 16' W of E wall, 8' S of N wall, on spacecraft assemble Core, 4' from floor
09063 1209 11	12/9/08	NASM 113, SW corner, 16' N of S. Entrance, 20' E of W wall 4' from floor
09063 1209 12	12/9/08	NASM 1st Floor, Main Hall East/South, 50' W of E wall on S. wall of Mainhall by elevator outside 111 5' from floor *
09063 1209 13	12/9/08	NASM 1st floor Main Hall 108 column, 20' W of E wall at NE collm, 4' from floor
09063 1209 14	12/9/08	NASM 1st floor Main Hall outside 103, on SE corner of entrance to 103, 5' from floor

FIELD SAMPLE NO. 09063 1209	TEST PERIOD START	STOP	TOTAL (MIN.)	FLOW RATE SETTING START (LITERS/MIN.)	STOP	INSTRUMENT SERIAL NO.	SAMPLE TYPE AMBIENT	AREA	PERSONAL	FINAL	SAMPLE LOCATION IN WORK AREA	OUTSIDE WORK AREA	VOLUME
08	1827	0229	482	2.0	2.0	08-17	✓						964
09	1832	0234	482	2.0	2.0	08-19	✓						964
10	1841	0241	480	2.0	2.0	08-20	✓						960
11	1441	0241	480	3.0	3.0	HV08-09	✓						1440
12	1845	0245	480	3.0	3.0	HV08-10	✓						1440
13	1854	0254	480	3.0	3.0	HV08-12	✓						1440
14	1900	0300	480	3.0	3.0	HV08-05	✓						1440

COMMENTS
EE(0.8um MCE) Cat CSA5080
Lot T820808212
SMS VFB 55-194588-00-S01J
Crotometer Calibrated 12/8/08

Inspector: Gary Upton (Print) (Signature)
Date: 12/9-12/10/08

Revised 11/15/02

2 of 3

AIR MONITORING DATA SHEET

PROJECT: SI - NASM
ADDRESS: 6th & Independence Ave, SW
CONTRACTOR: N/A
DATE: 12/9/08
ACTIVITY: Ambient Air Monit
AMA JOB #: 09063

SAMPLED FOR: METHOD — CASSETTE — FILTER
- ☑ Asbestos — ☐ 7400 ☐ TEM ☑ 25mm ☐ 37mm ☑ MCE ☐ PC
- ☐ Airborne Dust
- ☐ Gas
- ☐ Vapor
- ☐ Other
- ☐ Analytical Method ____ ☐ Ambient Temp. ____

Protection Worn During Sampling:
- ☐ Full Body Coveralls
- ☐ Respirator-Air Purifying N/A
- ☐ Respirator-Power Air Purifying
- ☐ Respirator-Supplied Air

PERSONAL AIR SAMPLING
Employee Sampled
Social Security No. N/A
Smoker: ☐ Yes ☐ No
Job Function
Description of Activity:

Signature of Employee:

SAMPLE NO.	SAMPLE DATE	SAMPLE LOCATION
09063 12-09 15	12/9/08	FIELD BLANK
09063 1209 16	12/9/08	SEALED BLANK

FIELD SAMPLE NO.	TEST PERIOD START	TEST PERIOD STOP	TEST PERIOD TOTAL (MIN.)	FLOW RATE SETTING START (LITERS/MIN.)	FLOW RATE SETTING STOP (LITERS/MIN.)	INSTRUMENT SERIAL NO.	SAMPLE TYPE AMBIENT	SAMPLE TYPE AREA Blank	SAMPLE TYPE PERSONAL	SAMPLE TYPE FINAL	SAMPLE LOCATION IN WORK AREA	SAMPLE LOCATION OUTSIDE WORK AREA	VOLUME
0906312109													
15	N/A						✓	X					
16	N/A						✓	X					

COMMENTS
EE(0.8um MCE) Cat CSA50-80
lot T820880821Z
EMSL UFA 55-194588-00-501J
Rotameter calibrated 12/8/08

Inspector: Gz Ulza (Print)
(Signature)
Date: 12/9 - 12/10/08

Revised 11/15/02

f ` Analytical Services, Inc.
f d on Results
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.analab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 183910

No. 2107 P. 6/6

Mailing/Billing Information:
1. Client Name: AMA Hanover
2. Address 1: PO BOX 646
3. Address 2: Hanover, MD
4. Address 3:
5. Phone #: 4106843327 Fax #: 4106843384

Submittal Information:
1. Job Name: SI - NASM
2. Job Location: NASM
3. Job #: 09063 P.O. #:
4. Contact Person: Gary Urban @ phone # 410 428-2576
5. Submitted by: GU Signature:

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
☐ Immediate Date Due: 12/11/08	☐ Immediate ☐ 3 Day	X Include COC/Field Data Sheets with Report
X 24 Hours Time Due: 8 Am	☐ Next Day ☐ 5 Day	X Email: gary u @ amacorp of troy.com
Comments:	☐ 2 Day Date Due: 12/11/08	X Fax: 410 684-3327 3384
	☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)	☐ Verbals: GARY

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity in a 25mm 37mm
☐ NIOSH 7400 (QTY)
☐ Fiberglass (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity in a 25mm 37mm
☐ AHERA (QTY)
☐ NIOSH 7402 (QTY)
☐ Other (specify) (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate (QTY)
☐ EPA Point Count (QTY)
☐ NY State Friable 198.1 (QTY)
☐ Grav. Reduction ELAP 198.6 (QTY)
☐ Other (specify) (QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield (QTY)
☐ NY State PLM/TEM (QTY)
☐ Residual Ash (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust (QTY)
☐ Quan. (s/area) Vacuum D5755-95 (QTY)
☐ Quan. (s/area)Dust D6480-99 (QTY)
TEM Water
☐ Qual. (pres/abs) (QTY)
☐ ELAP 198.2/EPA 100.2 (QTY)
☐ EPA 100.1 (QTY)
☐ All samples received in good condition unless otherwise noted. (TEM Water samples °C)

Lead Analysis
☐ Paint Chip (QTY)
☐ Dust Wipe (wipe type) (QTY)
☐ Air (QTY)
☐ Soil/Solid (QTY)
☐ TCLP (QTY)
☐ Drinking Water (QTY)
☐ Waste Water (QTY)
☐ Dust Wipe Furnace (wipe type) (QTY)
Mold - Direct Microscopic Analysis
☐ Collection Apparatus for Spore Traps:
☐ Spore-Trap (QTY) ☐ Bulk (QTY)
☐ Surface Swab (QTY) ☐ Surface Vacuum Dust (QTY)
☐ Surface Tape (QTY) ☐ Other (Specify) (QTY)

• HOLD for upgrade

SAMPLE INFORMATION					ANALYSIS					MATRIX						CLIENT CONTACT (LABORATORY STAFF ONLY)
CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WIPE (SPECIFY)	SPORE TRAP	TAPE	SWAB	
09063 1209-01 thru	NASM	12/9	Varies			X				X							Date/Time: Contact: By:
09063 1209-16	"	"	"			"				"							
	FAX/EMAIL DATA SHEETS w/ REPORT																Date/Time: Contact: By:
																	Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 12/10/08 @ 730 Via: DIB By (Print): M. Sampson Sign:
2. Date/Time Analyzed: 12/10/08 @ By (Print): Crystal Kellam Sign:
3. Results Reported To: Gary Urban Via: Email/Fax Date: 12/10/08 Time: Initials: GU
4. Comments:

Dec. 10. 2008 3:00PM

Received Time Dec. 10. 9:17PM

78

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

100470

NY ELAP 10920

Client:	Aerosol Monitoring & Analysis, Inc	**Job Name:**	SI NASM	**Chain Of Custody:**	183911		
Address:	PO Box 646, 1331 Ashton Road	**Job Location:**	NASM	**Date Submitted:**	12/12/2008		
	Hanover, Maryland 21076	**Job Number:**	09063	**Person Submitting:**	Gary Urban/Korey Rubelin		
		P.O. Number:	Not Provided	**Date Analyzed:**	12/12/2008	**Report Date:**	12/12/2008

Attention: Gary Urban

Summary of Phase Contrast Microscopy

AMA Sample Number	Client Sample Number	Volume Sampled (Liters)	Fibers Per Millimeter Squared		Fibers Per Cubic Centimeter		Analyst I.D.	Sample Type	Comments
0915343	090631211-01	960	< 7.0	*	< 0.005	*	CK	N/P	
0915344	090631211-02	960	< 7.0	*	< 0.005	*	CK	N/P	
0915345	090631211-03	1440	< 7.0	*	< 0.005	*	CK	N/P	
0915346	090631211-04	960	< 7.0	*	< 0.005	*	CK	N/P	
0915347	090631211-05	960	< 7.0	*	< 0.005	*	CK	N/P	
0915348	090631211-06	960	< 7.0	*	< 0.005	*	CK	N/P	
0915349	090631211-07	960	< 7.0	*	< 0.005	*	CK	N/P	
0915350	090631211-08	960	< 7.0	*	< 0.005	*	CK	N/P	
0915351	090631211-09	960	< 7.0	*	< 0.005	*	CK	N/P	
0915352	090631211-10	960	< 7.0	*	< 0.005	*	CK	N/P	
0915353	090631211-11	960	< 7.0	*	< 0.005	*	CK	N/P	
0915354	090631211-12	0	< 7.0	*	*****		CK	BLK	0 fiber(s) per 100 fields
0915355	090631211-13	0	< 7.0	*	*****		CK	BLK	0 fiber(s) per 100 fields

An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

100470

NY ELAP 10920

Client:	Acrosol Monitoring & Analysis, Inc	**Job Name:**	SI NASM	**Chain Of Custody:**	183911		
Address:	PO Box 646, 1331 Ashton Road	**Job Location:**	NASM	**Date Submitted:**	12/12/2008		
	Hanover, Maryland 21076	**Job Number:**	09063	**Person Submitting:**	Gary Urban/Korey Rubelin		
		P.O. Number:	Not Provided	**Date Analyzed:**	12/12/2008	**Report Date:**	12/12/2008
Attention:	Gary Urban						

Summary of Phase Contrast Microscopy

AMA Sample Number	Client Sample Number	Volume Sampled (Liters)	Fibers Per Millimeter Squared	Fibers Per Cubic Centimeter	Analyst I.D.	Sample Type	Comments

* The Reporting Limit for AMA Laboratory is 7.0 fibers per square millimeter of filter. The reporting limit for the air concentration of fibers (f/cc) is dependent on the sampled air volume. Fibers counts were determined by the methods described in NIOSH Analytical Method 7400, 'Fibers' (Revision 3, Issue 2, 8/15/94). All personnel samples were analyzed following the OSHA Reference Method.

Sample results shown here have been corrected for any field blank(s) submitted with this sample set.

Note: All samples were received in good condition unless otherwise noted.

Uncertainty: for fibers/mm² in the range of 7-25 the CV is 0.305, 26-64 CV=0.264, 64-127 CV=0.302, >127 CV=0.344

Analyst: Crystal Kellam

An AIHA (#100470), NVLAP (101143-0), and NY ELAP (#10920) Accredited Laboratory

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AIR MONITORING DATA SHEET

PROJECT: SI - NASM
ADDRESS: 6th & Independence Ave, SW
CONTRACTOR: N/A
DATE: 12/11/08
ACTIVITY: Ambient Air Monit
AMA JOB #: 09063

SAMPLED FOR: METHOD: ☐ 7400 ☐ TEM ☑ 25mm ☐ 37mm ☑ MCE ☐ PC
- ☑ Asbestos
- ☐ Airborne Dust
- ☐ Gas
- ☐ Vapor
- ☐ Other
- ☐ Analytical Method ____ ☐ Ambient Temp. ____

Protection Worn During Sampling:
- ☐ Full Body Coveralls
- ☐ Respirator-Air Purifying N/A
- ☐ Respirator-Power Air Purifying
- ☐ Respirator-Supplied Air

PERSONAL AIR SAMPLING
Employee Sampled
Social Security No. N/A
Smoker: ☐ Yes ☐ No
Job Function
Description of Activity:
Signature of Employee:

SAMPLE NO.	SAMPLE DATE	SAMPLE LOCATION
09063 1211 01	12/11/08	NASM 3rd Floor, NW Corner 300C8A ~28' S. of 3174 ~5.5' up From Floor ~19' E. of W. wall (Lobbying Conversation Pit)
09063 1211 02	12/11/08	NASM 3rd Floor, SW Corner ~2' W. of Closet 3106D ~5.5' up From Floor ~28' S. of 3101 Entrance (Office Area)
09063 1211 03	12/11/08	NASM 3rd Floor W. Hall Outside 3204 ~20' W. of E. wall (Corridor) ~7' N. of S. wall ~3.5' up From Floor
09063 1211 04	12/11/08	NASM 3rd Floor Closet 3359A ~4' W. of 3355 Entrance ~3.5' up From Floor ~8' S. of 3356 Entrance (Help Desk)
09063 1211 05	12/11/08	NASM 3rd Floor Closet 3553A ~2' E. of W. wall ~8' N of S. wall (Office Area) ~5.5' up From Floor
09063 1211 06	12/11/08	NASM 3rd Floor 300C2I Corridor ~9' E. of W. wall ~10' S. of N. wall (Center Corridor) ~5.5' up From Floor
09063 1211 07	12/11/08	NASM 3rd Floor ~10' E. of 3549 Entrance (Office Area) ~11' S. of 3552 ~5.5' up From Floor

FIELD SAMPLE NO. 09063 1211	TEST PERIOD START	TEST PERIOD STOP	TEST PERIOD TOTAL (MIN.)	FLOW RATE SETTING START (LITERS/MIN.)	FLOW RATE SETTING STOP	INSTRUMENT SERIAL NO.	SAMPLE TYPE AMBIENT	SAMPLE TYPE AREA	SAMPLE TYPE PERSONAL	SAMPLE TYPE FINAL	SAMPLE LOCATION IN WORK AREA	SAMPLE LOCATION OUTSIDE WORK AREA	VOLUME
01	1757	0157	480	2.0	2.0	08-14	✓						960
02	1800	0200	480	2.0	2.0	08-13	✓						960
03	1804	0204	480	3.0	3.0	HV0805	✓						1440
04	1808	0208	480	2.0	2.0	08-19	✓						960
05	1809	0209	480	2.0	2.0	08-20	✓						960
06	1811	0211	480	2.0	2.0	08-15	✓						960
07	1815	0215	480	2.0	2.0	08-11	✓						960

COMMENTS
EE (0.8um MCE) Cat CS250-80
Lot 82088 08212
EMS VFB 55-194588-00 - S01J
Rota Calib 12/8/08

Inspector: Kasey Rubbelke (Print) (Signature)
Date: 12/11/08

Revised 11/15/02

1/2

AIR MONITORING DATA SHEET

PROJECT: SI - NASM
ADDRESS: 6th & Independence Ave, SW
CONTRACTOR: N/A
DATE: 12.11.08
ACTIVITY: Ambient Air Monit
AMA JOB #: 09063

SAMPLED FOR: METHOD: ☐ 7400 ☐ TEM ☒ 25mm ☐ 37mm ☒ MCE ☐ PC

- ☒ Asbestos
- ☐ Airborne Dust
- ☐ Gas
- ☐ Vapor
- ☐ Other
- ☐ Analytical Method ____ ☐ Ambient Temp. ____

Protection Worn During Sampling:
- ☐ Full Body Coveralls
- ☐ Respirator-Air Purifying N/A
- ☐ Respirator-Power Air Purifying
- ☐ Respirator-Supplied Air

PERSONAL AIR SAMPLING
Employee Sampled
Social Security No.
Smoker: ☐ Yes ☐ No N/A
Job Function
Description of Activity:

Signature of Employee:

SAMPLE NO.	SAMPLE DATE	SAMPLE LOCATION
09063 1211 08	12/11/08	NASM 3rd Floor ~4'N. of 3512 ~2' up from floor ~24'W. of 3515 Entrance (Disabled's Corridor)
09063 1211 09	12/11/08	NASM 3rd Floor ~1'S. of 3004 Entrance (E. Corridor) ~30' E. of W. wall ~4' up from floor
09063 1211 10	12/11/08	NASM 3rd Floor, NE corner ~4'S. of 3757 Entrance ~5.5' up from floor ~17'E of 3756 Entrance (Offices Main Corridor)
09063 1211 11	12/11/08	NASM 3rd Floor, SE corner ~7'S. of 3726 stairwell ~4' up from floor ~30'E. of W. wall (Offices Main Corridor)
09063 1211 12	12/11/08	FIELD BLANK
09063 1211 13	12/11/08	SEALED BLANK
AND NO OTHERS		

FIELD SAMPLE NO. 09063 1211	TEST PERIOD START	STOP	TOTAL (MIN.)	FLOW RATE SETTING START (LITERS/MIN.)	STOP	INSTRUMENT SERIAL NO.	SAMPLE TYPE AMBIENT	AREA	PERSONAL	FINAL	SAMPLE LOCATION IN WORK AREA	OUTSIDE WORK AREA	VOLUME
08	1818	0218	~~480~~ 960	2.0	2.0	08-17	✓						960
09	1821	0221	~~480~~ 960	2.0	2.0	08-18	✓						960
10	1824	0224	~~480~~ 960	2.0	2.0	08-12	✓						960
11	1826	0226	~~480~~ 960	2.0	2.0	08-16	✓						960
12	FIELD	BLANK											
13	SEALED	BLANK											
	AND	NO	OTHERS										

COMMENTS
EE (0.8 µm MCE) CAT CS 250-80
LOT 8208808212
EMSVFB 55-194588-00-5015
Photo Calcs. 12/8/08

Inspector: Kelley Rountree (Print) (Signature)
Date: 12/11/08

Revised 11/15/02

2/2

AMA Analytical Services, Inc.
Focused on Results
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643
www.amalab.com

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 183911

Mailing/Billing Information:
1. Client Name: AMA Hanover
2. Address 1: PO Box 644
3. Address 2: Hanover, MD 21076
4. Address 3:
5. Phone #: 410 684-3327 Fax #: 684-3384

Submittal Information:
1. Job Name: SI NAS M
2. Job Location: NASM
3. Job #: 09063 P.O. #:
4. Contact Person: Gary Urban @ phone # 410 684-3327
5. Submitted by: Gary Urban Kasey Dustman Signature:

Reporting information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)
☐ Immediate Date Due:
☐ 24 Hours Time Due:
Comments:

NORMAL BUSINESS HOURS
☐ Immediate ☐ 3 Day
☒ Next Day ☐ 5 Day +
☐ 2 Day Date Due: 12/15/08 8AM
☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)

REPORT TO:
☒ Include COC/Field Data Sheets with Report
☒ Email: Gary @ amaconsulting.com
☒ Fax:
☐ Verbals:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
PC MCE Porosity = 8 in a 25mm 37mm SAVE FOR UPGRADE
☒ NIOSH 7400 13 (QTY)
☐ Fiberglass (QTY)
TEM Air – Please Indicate Filter Type:
PC MCE Porosity in a 25mm 37mm
☐ AHERA (QTY)
☐ NIOSH 7402 (QTY)
☐ Other (specify) (QTY)
PLM Bulk
☐ EPA 600 – Visual Estimate (QTY)
☐ EPA Point Count (QTY)
☐ NY State Friable 198.1 (QTY)
☐ Grav. Reduction ELAP 198.6 (QTY)
☐ Other (specify) (QTY)

TEM Bulk
☐ ELAP 198.4/Chatfield (QTY)
☐ NY State PLM/TEM (QTY)
☐ Residual Ash (QTY)
TEM Dust
☐ Qual. (pres/abs) Vacuum/Dust (QTY)
☐ Quan. (s/area) Vacuum D5755-95 (QTY)
☐ Quan. (/area)Dust D6480-99 (QTY)
TEM Water
☐ Qual. (pres/abs) (QTY)
☐ ELAP 198.2/EPA 100.2 (QTY)
☐ EPA 100.1 (QTY)
☐ All samples received in good condition unless otherwise noted. (TEM Water samples °C)

Lead Analysis
☐ Paint Chip (QTY)
☐ Dust Wipe (wipe type) (QTY)
☐ Air (QTY)
☐ Soil/Solid (QTY)
☐ TCLP (QTY)
☐ Drinking Water (QTY)
☐ Waste Water (QTY)
☐ Dust Wipe Furnace (wipe type) (QTY)

Mold - Direct Microscopic Analysis
☐ Collection Apparatus for Spore Traps:
☐ Spore-Trap (QTY) ☐ Bulk (QTY)
☐ Surface Swab (QTY) ☐ Surface Vacuum Dust (QTY)
☐ Surface Tape (QTY) ☐ Other (Specify) (QTY)

CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	MATRIX: AIR	BULK	DUST	WATER (DRINKING)	WATER (OTHER)	TAPE	SWAB
09063121I – 01	NASM	12/11	See	DATA		X										
Thru	↓		SHEETS													
09063121I – 13	↓		↓			↓										

AND NO OTHERS

CLIENT CONTACT (LABORATORY STAFF ONLY)
Date/Time: Contact: By:
Date/Time: Contact: By:
Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 12/12/08 @ 730 Via: DHL By (Print): M. Grayson Sign:
2. Date/Time Analyzed: 12/12/08 @ By (Print): Crystal Keller Sign:
3. Results Reported To: Gary Urban Via: Email Date: 12/12/08 Time: Initials:
4. Comments:

KEM
Kynoch Environmental Management
6935 Wisconsin Avenue
Suite 306
Chevy Chase, MD 20815

December 1, 2008

Mr. David Marshall
Katz, Marshall and Banks, LLP
1718 Connecticut Avenue, NW
6th Floor
Washington, DC 20009

Re: Richard Pullman – National Air and Space Museum
KEM Project #21351

Dear Mr. Marshall:

Kynoch Environmental Management, Inc. (KEM) has been retained by Katz, Marshall and Banks (KMB) on behalf of Mr. Richard Pullman to provide testing for bulk asbestos and asbestos dust hazards that might be present in the National Air and Space Museum (NASM), where Mr. Pullman is employed. KEM's efforts have consisted of the following:

- Review of documents provided by KMB;
- Analysis of samples collected by Mr. Pullman and submitted to KEM for analysis;
- Investigation, sampling and analysis provided by KEM.

KEM's review and sampling have concluded that asbestos hazards exist at NASM, that asbestos-containing materials have been handled inappropriately in the past which likely resulted in exposures to workers and the public, and that lack of notification regarding asbestos to workers and contractors may still be occurring today, which could result in continuing exposure to employees, contractors and the public.

Background

The National Air and Space Museum is a four level, approximately 600,000 square foot facility constructed of reinforced concrete walls and decks. The building was constructed in the early 1970's and officially opened in July of 1976. Exhibit spaces are on the Levels 1 and 2 of the building. Level 3 consists of office spaces, a dining area and a library. The basement level contains garage/parking, utility, storage and gymnasium spaces.

Mr. Pullman has worked in this facility in excess of 20 years as an exhibit builder. In this capacity, he is responsible for demolishing or deconstructing existing exhibits and constructing new ones. Generally, the work involved in demolishing/deconstructing exhibits and building new ones involves the removal and replacement of drywall partitions and providing necessary electrical and mechanical services to the renovated spaces.

Review of Documents

KEM has reviewed an "Asbestos Survey Report for National Air and Space Museum" prepared by Versar, Inc. (Versar), and dated November 25, 1992. The report details a thorough survey of the building for

suspect asbestos-containing materials by Versar, including the results of sample analysis and Versar's recommendations regarding the handling and disposition of materials found to contain asbestos.

Of particular interest to Mr. Pullman's work is Versar's section on "Conclusions and Recommendations" regarding drywall and drywall joint compound found on pages 50 and 51 of the report. The report concludes that asbestos was found in drywall joint compound throughout the NASM. The recommendations note that drywall joint compound is "unlikely to release asbestos fibers during normal building activities or in the absence of physical disturbance." However this section goes on to state that "Maintenance and custodial personnel should be alerted to the presence of this material and instructed not to disturb it."

Samples collected by Mr. Pullman and submitted to KEM for analysis

Because of his access, Mr. Pullman collected a number of samples of suspect materials and submitted them to KEM for analysis. The analytical results of these samples collected by Mr. Pullman can be found as Attachment A of this report.

The first set of samples provided by Mr. Pullman consisted of eight (8) bulk samples. The description of these materials can be found on Attachment A. KEM submitted these samples to an independent, accredited laboratory for analysis via Polarized Light Microscopy (PLM), EPA Method EPA/600/R-93/116 dated July 1993. One of the samples in this set, sample #8, was found to contain a trace amount of asbestos (less than 1%). Based on these results, and because joint compound is known to contain smaller asbestos fibers that often are not detected by PLM, KEM requested the laboratory provide a Transmission Electron Microscopy (TEM) analysis on the same sample. TEM analysis of bulk samples first analyzed by PLM and found to be between trace and 10% is an industry-wide common practice. TEM analysis can see smaller fibers than PLM analysis and is a more definitive analysis.

TEM analytical results indicated that the joint compound in sample #8, collected from Gallery 207, was found to contain 15.3% asbestos by weight.

On October 2, 2008, Mr. Pullman provided KEM with three (3) samples of dust and debris collected from various locations in NASM. KEM submitted these samples to the same independent, accredited laboratory for a Qualitative TEM analysis. KEM chose qualitative analysis since the samples were heterogeneous in nature and there was no indication of the area of surface from which the dust samples were collected. Analytical results revealed that Sample #9, collected from dust and debris beneath the monitor in Gallery 108 was positive for asbestos.

Investigation and sampling by KEM

On October 2, 2008, KEM visited NASM to investigate areas of concern pointed out by Mr. Pullman. During this visit, KEM visited several galleries to obtain information for a later visit that would include sampling. Mr. Pullman showed KEM areas of dust and debris in Galleries 203, 207, 113 and 213. During this visit, KEM made note of these areas in order to prepare for subsequent sampling.

On October 9, 2008, KEM visited NASM specifically to collect samples from targeted suspect asbestos-containing materials and targeted suspect asbestos-containing dust and debris identified during the first visit. KEM's Environmental Specialist, Mr. Tim Oehling, and Brent Kynoch selected the materials and locations for sampling. In total, KEM collected three (3) bulk samples, two (2) settled dust samples for qualitative analysis and five (5) settled dust samples for quantitative analysis. The samples collected for qualitative analysis were collected in areas or from locations that did not permit a defined layout of a specified surface area for collection. A defined surface area is required for a quantitative surface dust analysis by TEM. All sample results from samples collected by KEM can be found as Attachment B to this report.

Surface dust samples collected for quantitative analysis are collected using a vacuum technique utilizing a low volume air sampling pump and a 25mm TEM cassette to capture the material that is collected with

the pump. A template is utilized that lays out a 10cm x 10cm area for collection. The pump is operated at approximately 2 liters/minute and the cassette is fitted to the pump and to a collection tube on the open end of the cassette. The collection tube is used to "vacuum" the 100 square centimeter area thoroughly into the 25mm cassette.

Analytical results from KEM's sampling revealed that drywall joint compound in Gallery 203 was found to be asbestos containing. In addition, qualitative analysis of dust collected in Gallery 213 was positive for asbestos. Quantitative analytical results from surface dust samples collected in Gallery 203 revealed elevated concentrations of asbestos in the dust. The results from two dust samples collected in this gallery showed concentrations of 625,000 structures per square centimeter (s/cm^2) in one sample and 36,800 s/cm^2 in a second sample.

There are no regulatory guidelines or limits regarding asbestos in settled dust. However, industry guidelines and experience indicate that asbestos levels are considered low if less than 1,000 s/cm^2. Levels above 10,000 s/cm^2 are considered generally above background. Levels above 100,000 s/cm^2 are considered high and in the range of a significant accidental release from an abatement site. (Page 50 – *Settled Asbestos Dust – Sampling and Analysis* by Millette and Hays)

Conclusions

KEM's sampling and Mr. Pullman's sampling confirmed the presence of asbestos in drywall joint compound in several locations throughout NASM. These findings are consistent with the report provided by Versar in 1992.

Versar's report indicated that these materials were located throughout the building and that they should not be disturbed, because disturbance might render them friable.

According to discussions with Mr. Pullman, the drywall joint compound has been disturbed numerous times in NASM. Specifically, demolition/dismantling and renovation work associated with exhibits has been performed without engineering controls until recently. Electrical, mechanical and other contractors have routinely drilled holes through walls with asbestos-containing joint compound without any engineering or safety controls in place to prevent exposure to asbestos or to prevent the spread of asbestos fibers.

Based on the results of KEM's settled dust testing and analysis, it is apparent that there has been or have been disturbances of the asbestos-containing drywall joint compound in NASM that can be likened to a significant accidental release from an abatement site. The disturbance of drywall joint compound during the demolition/dismantling of exhibits would result in levels of asbestos in settled dust that are consistent with the results obtained by KEM. Further, levels of asbestos in settled dust that exceed 100,000 s/cm^2 indicate that airborne exposures of asbestos at the time the material was being disturbed would have been well in excess of the OSHA Permissible Exposure Limit (PEL) for asbestos. Thus, the results of the settled dust testing and analysis obtained by KEM are consistent with the assertions by Mr. Pullman that work has been performed on asbestos-containing drywall joint compound with no engineering controls in place.

If demolition/dismantling of exhibits with asbestos-containing joint compound has occurred without engineering controls in place, it is certain that persons performing the work have been exposed to extremely high levels of airborne asbestos. There is also a strong likelihood that the lack of engineering controls to prevent the spread of dust during demolition/dismantling activities has resulted in significant exposures to the general public that visit the museum. If the lack of engineering controls includes a failure to isolate the HVAC system during the demolition/dismantling activities, then asbestos fibers have also been spread via the HVAC system to other parts of the building, resulting in exposures at the time of the disturbance and continuing. After dust has settled from demolition/dismantling activities, it can be spread to public areas of the building via foot traffic entering and leaving the contaminated area.

It should be noted that NASM's failure to notify employees, contractors and building maintenance personnel of the presence of asbestos is a violation of EPA National Emissions Standard (NESHAP) rules and OSHA rules regarding notification. In addition, simply stated, the disturbance of materials known to contain asbestos that results in "visible emissions" or in airborne levels that exceed the OSHA PEL for asbestos are violations of the NESHAP and OSHA regulations, respectively.

KEM's experience indicates that disturbance of asbestos-containing drywall joint compound results in significant airborne concentrations of asbestos at the time of disturbance, and will result in significant concentrations of asbestos in settled dust after the disturbance event. In order to comply with federal and District of Columbia regulations, such disturbances require that persons conducting demolition/dismantling efforts of drywall with asbestos-containing joint compound must be outfitted with proper personal protective gear to prevent the inhalation of asbestos fibers. In addition, engineering controls must be implemented to assure that asbestos fibers are contained in the regulated work area and are not allowed to escape to other areas of the gallery, including public areas.

Disturbance of asbestos-containing drywall joint compound causes this material to become friable, which results in an activity that is regulated as an OSHA Class II Asbestos Abatement Activity. Any large-scale effort to disturb asbestos-containing drywall joint compound should only be conducted by a licensed, qualified asbestos abatement contractor.

Based on the results of the asbestos in settled dust sampling conducted by KEM, all access to the upper deck in Gallery 203 should be limited only to persons properly outfitted in respirators and other personal protective equipment. Also, care should be taken to provide for proper decontamination of persons exiting this area to prevent the spread of asbestos contamination to the public areas of Gallery 203. The entire area of the upper deck in Gallery 203 should be considered significantly contaminated with asbestos, and a licensed, qualified asbestos contractor should be engaged to clean this area as soon as possible.

Sincerely,

J. Brent Kynoch
President

Attachment A
Attachment B

ANALYTICAL RESULTS
FOR SAMPLES COLLECTED BY RICHARD PULLMAN
9/23/08 – 11/11/08

Attachment A

Attachment A

Asbestos Bulk Sample Analysis Results

KEM, Inc.
Kynoch Environmental Management

KEM Project Number: 21351
KEM Project Name: Richard Pullman Samples - NASM
Date Collected: 09/23/2008
Date Analyzed: 09/30/2008

Collected By: Richard Pullman
Analyzed by: AMA Analytical Services

Sample No.	Sample Description	Analysis	Asbestos Type and Percent	Result	Other Materials
9/23/08-NASM-**B/2**	Building Steel Insulation – Gallery 105	PLM	NAD	Negative	Mineral Wool – 30% Organic – 20% Particulate – 100%
9/23/08-NASM-**B/3**	Remnant dust from recent construction on duct – Gallery 113	PLM	NAD	Negative	Organic – 30% Synthetic – 5% Particulate – 65%
9/23/08-NASM-**B/4**	Debris inside duct – Gallery 105	PLM	NAD	Negative	Organic – 25% Synthetic – TR Particulate – 75%
9/23/08-NASM-**B/5**	Debris inside duct – Gallery 105	PLM	NAD	Negative	Organic – TR Particulate – 100%
9/23/08-NASM-**B/6**	Debris atop ceiling tile – Gallery 208	PLM	NAD	Negative	Organic – 30% Particulate – 70%

Asbestos is reported as positive via PLM if concentration is greater than 1% of the sample analyzed
Asbestos types include: *Chrysotile, Amosite, Crocidolite, Tremolite, Actinolite, Anthophyllite*
NAD = no asbestos detected
SCF = suspected ceramic fibers
TR = Trace equals less than 1% of this component
Bulk asbestos samples analyzed via Polarized Light Microscopy, EPA Method 600/R-93/116, July 1993

AMA Analytical Services, Inc. is fully accredited through AIHA, NVLAP, and New York ELAP

Attachment A

Asbestos Bulk Sample Analysis Results

KEM, Inc.
Kynoch Environmental Management

KEM Project Number: 21351
KEM Project Name: Richard Pullman Samples - NASM
Date Collected: 09/23/2008
Date Analyzed: 09/30/2008

Collected By: Richard Pullman
Analyzed by: AMA Analytical Services

Sample No.	Sample Description	Analysis	Asbestos Type and Percent	Result	Other Materials
9/23/08-NASM-B/7	Drywall – Gallery 207 behind false wall – exhibit storage area	PLM	NAD	Negative	Fiberglass – TR Organic – 10% Particulate – 90%
9/23/08-NASM-B/8	Joint Compound associated with drywall – Gallery 207 behind false wall – exhibit storage area	PLM	TR Chrysotile	Trace	Particulate – 100%

Asbestos is reported as positive via PLM if concentration is greater than 1% of the sample analyzed
Asbestos types include: *Chrysotile, Amosite, Crocidolite, Tremolite, Actinolite, Anthophyllite*
NAD = no asbestos detected
SCF = suspected ceramic fibers
TR = Trace equals less than 1% of this component
Bulk asbestos samples analyzed via Polarized Light Microscopy, EPA Method 600/R-93/116, July 1993

AMA Analytical Services, Inc. is fully accredited through AIHA, NVLAP, and New York ELAP

Attachment A

Asbestos Bulk Sample Analysis Results

KEM, Inc.
Kynoch Environmental Management

KEM Project Number: 21351
KEM Project Name: NASM – Samples Collected by Richard Pullman
Date Collected: 09/23/2008
Date Analyzed: 10/09/2008

Collected By: Richard Pullman
Analyzed by: AMA Analytical Services

Sample No.	Sample Description	Sample Type	Analysis	Asbestos Type and Percent	Result	Other Materials
09/23/08-NASM-B/8	Joint Compound associated with drywall – Gallery 207 behind false wall – exhibit storage area	Whole	TEM	15.3% Chrysotile	Positive	Organics – 6.1% Acid Soluble – 70.3% Other –8.3%

Whole = Whole sample submitted and gravimetric reduction performed by AMA Analytical Services.
Residue = Gravimetric reduction of sample performed by client and residue only submitted for analysis.
Asbestos types include: *Chrysotile, Amosite, Crocidolite, Tremolite, Actinolite, Anthophyllite*
NAD = no asbestos detected
TR = Trace, less than 1% of this component
TEM = Transmission Electron Microscopy after gravimetric reduction (NY ELAP Method 198.4

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Attachment A

Qualitative Asbestos Analysis of Settled Dust Samples

KEM, Inc.
Kynoch Environmental Management

KEM Project Number: 21351
KEM Project Name: NASM – Samples Collected By Richard Pullman
Date Collected: 10/02/2008
Date Analyzed: 10/08/2008

Collected By: Richard Pullman
Analyzed by: AMA Analytical Services

Sample No.	Sample Description	Analysis	Asbestos Present	Type(s) of Asbestos Detected	Comments
10/2/08-NASM-B/9	Dust/Debris Collected from below monitor – Gallery 108	TEM	Yes	Chrysotile	
10/2/08-NASM-B/10	Dust/Debris Collected from above ceiling tile just below hole in drywall compound – Gallery 113	TEM	No	NAD	
10/2/08-NASM-B/11	Dust/Debris Collected from atop ceiling tile below hole in ACM seam	TEM	No	NAD	

The sample(s) were analyzed for the presence or absence of asbestos. If asbestos was detected, the amount detected was not quantified.
Asbestos types include: *Chrysotile, Amosite, Crocidolite, Tremolite, Actinolite, Anthophyllite*
NAD = no asbestos detected
TEM = Transmission Electron Microscopy

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Attachment A

Asbestos Bulk Sample Analysis Results

KEM, Inc.
Kynoch Environmental Management

KEM Project Number: 21351
KEM Project Name: Richard Pullman Samples - NASM
Date Collected: 10/09/2008
Date Analyzed: 10/16/2008

Collected By: Richard Pullman
Analyzed by: AMA Analytical Services

Sample No.	Sample Description	Sample Type	Analysis	Asbestos Type and Percent	Result	Other Materials
10/9/08-NASM-B/12	Dust from core drilling – collected by Richard Pullman	Whole	TEM	NAD	Negative	Organics – 10.6% Other – 89.4%

Whole = Whole sample submitted and gravimetric reduction performed by AMA Analytical Services.
Residue = Gravimetric reduction of sample performed by client and residue only submitted for analysis.
Asbestos types include: *Chrysotile, Amosite, Crocidolite, Tremolite, Actinolite, Anthophyllite*
NAD = no asbestos detected
TEM = Transmission Electron Microscopy after gravimetric reduction (NY ELAP Method 198.4

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Attachment A

Qualitative Asbestos Analysis of Settled Dust Samples

KEM, Inc.
Kynoch Environmental Management

KEM Project Number: 21351
KEM Project Name: NASM – Samples Collected By Richard Pullman
Date Collected: 11/11/2008
Date Analyzed: 11/17/2008

Collected By: Richard Pullman
Analyzed by: AMA Analytical Services

Sample No.	Sample Description	Analysis	Asbestos Present	Type(s) of Asbestos Detected	Comments
11/11/08-NASM-**Dust/01**	Dust on Lamp Part	TEM	No	NAD	
11/11/08-NASM-**Dust/02**	Dust on Lamp Part	TEM	No	NAD	

The sample(s) were analyzed for the presence or absence of asbestos. If asbestos was detected, the amount detected was not quantified.
Asbestos types include: *Chrysotile, Amosite, Crocidolite, Tremolite, Actinolite, Anthophyllite*
NAD = no asbestos detected
TEM = Transmission Electron Microscopy

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ANALYTICAL RESULTS
FOR SAMPLES COLLECTED BY
KYNOCH ENVIRONMENTAL MANAGEMENT
10/9/08

Attachment B

Attachment B

Asbestos Bulk Sample Analysis Results

KEM, Inc.
Kynoch Environmental Management

KEM Project Number: 21351
KEM Project Name: NASM – Samples Collected by KEM
Date Collected: 10/09/2008
Date Analyzed: 10/16/2008

Collected By: KEM
Analyzed by: AMA Analytical Services

Sample No.	Sample Description	Sample Type	Analysis	Asbestos Type and Percent	Result	Other Materials
10/9/08-NASM-TRO-B/1	Drywall Joint Compound collected in Gallery 203 – Upper Deck, north side	Whole	TEM	2.5% Chrysotile	Positive	Organics – 38.7% Acid Soluble – 49.1% Other – 9.8%
10/9/08-NASM-TRO-B/2	Drywall Joint Compound collected in Gallery 203 – Upper Deck, north side, west wall	Whole	TEM	13.7% Chrysotile	Positive	Organics – 5.8% Acid Soluble – 39.5% Other – 15.2%
10/9/08-NASM-TRO-B/3	Drywall Joint Compound collected in Gallery 207 – west wall	Whole	TEM	TR Chrysotile	Trace	Organics – 38.3% Acid Soluble – 45.9% Other – 15.2%

Whole = Whole sample submitted and gravimetric reduction performed by AMA Analytical Services.
Residue = Gravimetric reduction of sample performed by client and residue only submitted for analysis.
Asbestos types include: *Chrysotile, Amosite, Crocidolite, Tremolite, Actinolite, Anthophyllite*
NAD = no asbestos detected
TR = Trace, less than 1% of this component
TEM = Transmission Electron Microscopy after gravimetric reduction (NY ELAP Method 198.4

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Attachment B

Qualitative Asbestos Analysis of Settled Dust Samples

KEM, Inc.
Kynoch Environmental Management

KEM Project Number: 21351
KEM Project Name: NASM – Samples Collected By KEM
Date Collected: 10/09/2008
Date Analyzed: 10/16/2008

Collected By: KEM
Analyzed by: AMA Analytical Services

Sample No.	Sample Description	Analysis	Asbestos Present	Type(s) of Asbestos Detected	Comments
10/9/08-NASM-TRO-B/4	Dust/Debris Collected from Gallery 213 atop ceiling above theater	TEM	Yes	Chrysotile	
10/9/08-NASM-TRO-B/5	Dust/Debris Collected from Gallery 113 from inside air shaft	TEM	No	NAD	

The sample(s) were analyzed for the presence or absence of asbestos. If asbestos was detected, the amount detected was not quantified.
Asbestos types include: *Chrysotile, Amosite, Crocidolite, Tremolite, Actinolite, Anthophylite*
NAD = no asbestos detected
TEM = Transmission Electron Microscopy

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Attachment B

Asbestos-in-Settled Dust by ASTM Method D5755-95

KEM, Inc.
Kynoch Environmental Management

Sample Analysis Results

KEM Project Number: 21351
KEM Project Name: NASM
Date Collected: 10/09/2008
Date Analyzed: 10/16/2008

Collected By: KEM
Analyzed by: AMA Analytical

Sample Number	Sample Location	Surface Area Sampled (cm^2)	Sample Aliquot (ml)	Filter Collection Area (mm^2)	Dilution Factor	Filter Area Analyzed (mm^2)	Analytical Sensitivity (s/cm^2)	# of Asbestos Structures and Asbestos Type	Asbestos Concentration (s/cm^2)
MV/01	Gallery 203 – Upper Deck	100	0.50	1260	200.0	0.137	18394.2	34 chrysotile	625,000
MV/02	Gallery 203 – Upper Deck South Side	100	1.00	1260	100.0	0.137	9197.1	4 chrysotile	36,800
MV/03	Gallery 207 – West Wall (corner)	100	0.50	1260	200.0	0.137	18394.2	NAD	< 18,400
MV/04	Gallery 207 – West Wall (on wood behind façade wall)	100	0.10	1260	1000.0	0.137	91970.8	NAD	< 92,000
MV/05	Gallery 113 – Inside Air Shaft	100	1.00	1260	100.0	0.137	9197.1	NAD	< 9,200

Method of Analysis:	ASTM Method D5755-03 "Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Analysis (TEM) for Asbestos Structure Number Concentrations."
Limit of Detection:	The Limit of Detection (LOD) for this method has been determined by the ASTM D6620. Therefore, if fewer than one (1) structure was observed, the asbestos concentration is reported as less than the analytical sensitivity.
Analytical Sensitivity:	An analytical sensitivity of 1000 asbestos structures per square centimeter has been designed for this method. Occasionally, this analytical sensitivity cannot be achieved due to high particulate loading or high asbestos concentrations invoking the stopping rules.
Stopping Rules:	The analysis is terminated for a sample when an analytical sensitivity of 1000 s/cm^2 is achieved, ten (10) grid openings have been analyzed, or upon completion of the grid opening in which the 100 confirmed asbestos structures was documented.
Significant Figures:	Final results are reported to three (3) significant figures.

NAD = No asbestos detected
TEM = Transmission Electron Microscopy

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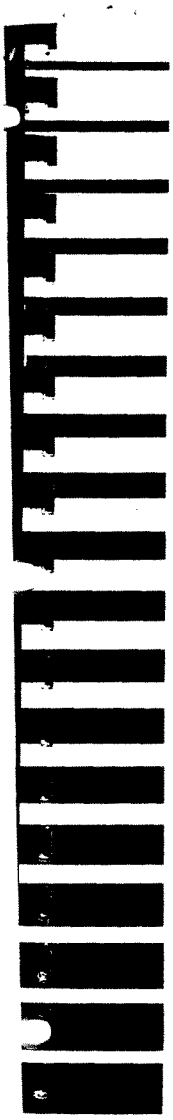
"Economic results through environmental excellence"



FINAL

ASBESTOS SURVEY REPORT
FOR
NATIONAL AIR AND SPACE MUSEUM

VOLUME I

Versar INC.

Versar INC

TABLE OF CONTENTS

LIST OF FIGURES

Versar INC

TABLE OF CONTENTS (Cont.)

Page

LIST OF TABLES

Versar INC

FINAL

ASBESTOS SURVEY REPORT FOR NATIONAL AIR AND SPACE MUSEUM

VOLUME I

Prepared For:

Smithsonian Institution
Office of Design and Construction
955 L'Enfant Plaza, Suite 3230
Washington, D.C. 20060

Prepared By:

Versar, Inc.
6850 Versar Center
Springfield, Virginia 22151

Versar Job No. 1039.024

November 25, 1992

Versar INC

1.0 EXECUTIVE SUMMARY

Versar, Inc., conducted an asbestos survey and hazard assessment under contract to the Smithsonian Institution at the National Air and Space Museum (NASM) located at 6th Street and Independence Avenue, SW, Washington, D.C., on April 6, 8, 9, 17, 27, 28, 29 & 30, 1992. Versar inspector Kevin C. Foley conducted the inspection. The survey was performed to document the types, locations, conditions, and extent of asbestos-containing building materials (ACM) in the building and to provide a hazard assessment of these materials as they affect the population of the building.

Recommendations for control measures and estimated removal costs for each asbestos-containing building material are provided from information gathered during the inspection.

The survey was performed in two phases. The first phase involved a thorough visual inspection of the facility to identify suspect ACM. This phase was conducted in December of 1991. All accessible areas of the building were inspected. Typical suspect materials include vinyl floor tile, acoustical ceiling tile, wallboard, drywall joint compound, mastics, pipe and fitting insulation, boiler and breeching insulation, tank insulation, and wall and ceiling plaster. Information gathered during the visual inspection was then used to develop the bulk sampling plan. This plan followed the guidelines of the Asbestos Hazard Emergency Response Act (AHERA) developed by the Environmental Protection Agency (EPA) to address asbestos-containing materials in public schools nationwide. The AHERA sampling protocol includes the following requirements:

- Random sampling based on the number of samples to be collected from each homogeneous suspect material.

- Collection of three samples from each homogeneous surfacing material covering less than 1,000 square feet; collection of five samples from each homogeneous surfacing material covering between 1,000 and 5,000 square feet; collection of seven samples from each homogeneous surfacing material covering more than 5,000 square feet.

- Collection of at least three bulk samples from homogeneous thermal system insulation that is damaged.

- Collection of one or more bulk samples from undamaged homogeneous thermal system insulation.

- Collection of one or more samples from patched insulation on thermal systems.

- Collection of one or more bulk samples from suspect ACM such as vinyl floor tile, mastic, wallboard, vibration dampers, acoustical ceiling tile, etc.

The second phase of the survey included the bulk sampling and a thorough assessment of each suspect material. The assessment included the material's physical description, condition, spatial extent, potential for damage, and friability. Friable materials are those which can be crushed by hand pressure. Friable materials are generally of greater concern than nonfriable materials because they are more likely to release airborne asbestos fibers. Typical friable ACM includes pipe and fitting insulation, spray-on materials, and acoustical ceiling tile. Examples of nonfriable ACM includes vinyl floor tile, mastic, and vibration dampers.

An integral step in the asbestos survey is to provide recommendations for control measures for identified ACM. In general, recommendations include immediate removal, planned removal, repair, encapsulation, partition enclosure, and inclusion in a monitoring program.

1.1 Overview of Asbestos-Containing Materials in the NASM

The ACMs identified in the NASM included:

- Drywall Joint Compound ← Code F
- Vinyl Floor Tile — Code E
- Roofing Materials
- Red Duct Mastic — Code E
- Skylight Gaskets Code E
- Pipe Penetrations Rope Gasket ← Code B

These materials were identified in various locations and quantities throughout the building and are summarized below:

Drywall Joint Compound: Drywall joint compound is found throughout the building where seams and nails are present in the drywall.

Vinyl Asbestos Floor Tile: Vinyl asbestos floor tile is found in rooms P703A, P704, P705, P719A, the loading dock hallway, security offices hallway, employee gym entrance and room 3346.

Roofing Materials: Asbestos-containing perimeter roofing cant is present on the exterior roof platforms over connecting halls labeled 3200, 3400 and 3600. Interior built up roofing material and tar was not sampled due to the destructive nature of this sampling activity.

Red Duct Mastic: Red duct mastic is located in the parking garage, loading dock, above the ceiling of the Langley Theatre, in mechanical spaces (limited use in these rooms) and above the drop ceilings on the mezzanine level and third floor offices/rooms.

Skylight Gasket Material: Skylight gaskets are present in exhibit halls/galleries 100, 102, 106, 108, 110, 114, the library reading room and room 3755.

Rope Gasket Material: Rope gasket is found in pipe penetrations into the walls of rooms P102, P204, P405, P606 and the main Chiller Room. All are located on the parking level.

1.2 ACM by Response Code (Response Codes are defined in Section 4.0)

Response Code A - Materials Requiring Immediate Removal

No materials in the NASM require immediate removal.

Response Code B - Materials To Be Removed As Soon As Possible

Rope gasket found in the pipe penetrations into rooms P204, P405 and P606 have response code B.

Response Code C - Materials for Which Removal Should Be Planned

No materials in the NASM fall into this category.

Response Code D - Materials To Be Encapsulated or Repaired

None of the materials in the NASM have Response Code D.

Response Code E - Materials To Be Monitored For Change In Their Condition

The following ACM have Response Code E: Perimeter roofing cant on the exterior platforms over connecting hallways 3200, 3400 and 3600; red duct mastic in the loading dock and in the parking garage on air handling units 29 and 30 and exhaust unit 11, above the Langley Theatre ceiling and the drop ceilings on the mezzanine level, and 3rd floor offices and in mechanical spaces; floor tile in rooms P703A, P704, P705, P719A, the loading dock hallway area, security offices hallway, employee gym entrance lobby and room 3346; skylight gasket in the ceilings of galleries 100, 102, 106, 108, 110, 114, the library reading room and room 3755; drywall joint compound in stairways 1, 2, 3, 4, 5, 6, 7, rooms

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P700, P703A, P703D, P703E, P719B, P719C, P719E, Briefing Room, Briefing Room Office, Education Resource Center, escalator pit/lobby, loading dock hallway area, security hallway area, Galleries 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113 and 114, rooms 1103, 1104, property checkroom, museum store escalator, rooms 2103, 2104, gallery 200 porch, planetarium, planetarium control room, mezzanine offices, theatre projection room, Langley Theatre (interior and exterior), Gallery 213 steps, Gallery 202 steps, Galleries 202, 203, 205, 206, 207, 208, 209, 210, 211, and 213, planetarium porch, rooms 3101-3115, south library stacks, library entrance (includes room 3116), rooms 3117-3119, 3121, 3122, 3123, 3124, 3125, 3126, 3127, 3128, 3129, 3131, 3132, north library stacks, rooms 3134, 3136, 3138, 3140, 3164, 3165, 3166, 3200, 3203, 3204, 3207, 3300, 3301, 3302, 3303, 3306-3324, 3326-3343, computer services area, rooms 3344-3350, 3400-3405, 3500-3503, 3505A, 3505B, 3506-3513, Director's office kitchen, 3514-3537, Space History Department area, 3600, 3604-3608, 3724, 3726, 3727-3735, 3737, 3738, 3740, 3742A, 3742B, 3743-3746, 3748, 3755, 3757, 3758, 3761, 3763-3765, 3767, 3768, 3768A, 3771, 3773-3777, 3779, 3783-3790.

Response Code F - Materials For Which No Action Is Required At This Time

The following ACM has Response Code F: Drywall joint compound in rooms P302, P305C, P703, P704, P705, P719A, Museum Shop, Museum Shop Offices, rooms 1091, 1101, 1102, 1151, 1152, 1157, 1157A, 1157C, 2061-2064, 2071, 2091, 2101 and 2102.

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2.0 DESCRIPTION OF FACILITY

The NASM, located at 6th Street and Independence Avenue, SW, Washington, DC is a four level, 600,000 (approximate) square foot building constructed of reinforced concrete walls and decks. Interior finishes include drywall sheeting, masonry block wall in the exhibit galleries, concrete floors with carpet or tile coverings and suspended acoustical ceiling tile in the administrative/office areas as well as gallery 108 (main entrance). The third floor of this museum consists of employee office space, library and an employee dining area. Levels one and two are publicly accessed areas and house aeronautical and space exhibits. The basement level, or garage/parking level, contains some offices as well as utility, storage and gymnasium spaces in addition to the garage and loading dock. The east end of the building has a tourist restaurant addition (1988) that occupies space on level one and the basement level.

Heating is provided by reheating hot water in a series of mechanical rooms (containing large air handling units). Steam enters the building through room P405 where large steam lines are located. The NASM does not have a boiler room. It obtains steam from a central generating plant via an underground tunnel (both exterior). Cooling is provided by a central air conditioning system.

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3.0 INSPECTION ACTIVITIES

3.1 Introduction

Versar conducted an asbestos inspection and collected bulk samples in the NASM on April 6, 8, 9, 17, 27, 28, 29 and 30, 1992. The Versar representative was Kevin Foley. The collection of bulk samples followed the bulk sampling plan submitted previously to the Smithsonian Institution as an indication of those materials suspected of containing asbestos. However, additional samples were collected as necessary.

Versar's asbestos inspection was designed to thoroughly examine and sample suspect ACM in the building. Physical aspects of each area of the building were taken into consideration as well as any building use factors that might affect the physical integrity of the suspect ACM.

Versar's asbestos inspection included the collection of bulk samples from suspect friable and nonfriable materials in the building. Representative samples were collected from thermal system insulation, surfacing material, and miscellaneous materials. Factors such as air movement due to thermal draft, supply or exhaust ventilation, vibration, area maintenance, and population were evaluated. The physical condition of the material in terms of damage by impact, maintenance, water leakage, or other damage was assessed in relation to possible air re-entrainment of asbestos fibers. These factors were evaluated during formulation of the risk assessment and remedial alternatives.

3.2 Bulk Sampling

The purpose of collecting bulk samples was to determine if building materials observed during the inspection contained asbestos. Bulk samples were collected from materials commonly known to contain asbestos and from materials used in applications that commonly employ asbestos-containing products.

The bulk sampling procedures required collecting a representative sample of the suspect material. The collection procedure used a small sampling tool to remove a sample of approximately 2 cubic centimeters from the suspect material. The sample material was placed into a clean plastic canister, labeled, and temporarily stored in the sampling personnel's bag. Sample locations of friable materials were sprayed with an aerosol adhesive to prevent future fiber release. At each sampling location, a complete description of the sample and the surrounding area was recorded in the field notebook. Detailed descriptions included physical condition of material, the presence of damage, the type of material, and the potential for human contact. The general location of the materials and the potential for personal exposure were

carefully evaluated for future analyses. As samples were collected, the sample number was entered onto Versar's standard chain of custody forms to accurately reflect all changes in the possession and location of the sample canisters. The samples were delivered to the Versar asbestos laboratory for analysis to determine the presence of asbestos in each sample.

A total of 86 bulk samples were collected from thermal insulation, surfacing materials, and miscellaneous materials. The samples were analyzed by the Versar, Inc., asbestos laboratory using polarized light microscopy with dispersion staining. Sample descriptions and results are listed in Table 1 in Section 5.0.

3.3 Bulk Sample Analysis

Bulk asbestos samples were analyzed by trained microscopists, using polarized light microscopy with dispersion staining. Samples were analyzed using the EPA Interim Method for the Determination of Asbestos in Bulk Insulation Samples, EPA-600/M4-82-020. The analyst provided a gross description of the sample by color and appearance, and the percentage asbestos content of each type of asbestos identified. For quality assurance, field information relating to each individual sample was not made available to the laboratory personnel.

The Smithsonian Institution has requested that every 20th sample be sent to an outside laboratory for conformational analysis. Samples were sent to R.J. Lee Group in Manassas, Virginia, for analysis. The results from the two laboratories are consistent and are found in Appendix A. Laboratory and analyst certifications for R.J. Lee Group are included in Appendix D, along with Versar's laboratory and analyst certifications.

The Smithsonian requested that Versar reanalyze each sample found to contain 5% asbestos by weight or less and supply documentation of the reanalysis. For quality control, it is Versar's policy to have each sample slide analyzed by a second Versar analyst. The quality control analysis record sheets, or benchsheets, are included in Appendix A for each sample found to contain 5% asbestos by weight or less.

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4.0 EXPLANATION OF RESPONSE CODE AND HAZARD PRIORITY

The hazard priority and response code for each identified asbestos-containing material are significant factors in determining feasible methods for managing and controlling asbestos-containing materials in buildings. Both the hazard priority and response code are related to the likelihood of personnel exposure to asbestos fibers released from these materials. The hazard priority and response codes for ACM are included on Figure 1 of this report. A detailed explanation of the methodology used to derive the concepts of hazard priority and response code is found in Appendix F.

The hazard priority is a numerical system used to rank asbestos-containing building materials in each area of the building based on each material's potential for releasing asbestos fibers. The material having the highest potential for fiber release is numbered one and increases numerically to the material with the lowest potential. This ranking system prioritizes publicly-accessed building areas before non-publicly accessed building areas since the potential personnel exposure is a function of the building area population. In addition to personnel exposure, the parameters on which the hazard priority are determined include current damage, potential for damage, proximity to ventilation systems or direct airstream, presence of physical barriers to accessing material, and the type of activity in the area.

The response code signifies the action recommended for each ACM (i.e., immediate removal, planned removal, encapsulation, etc.). The response code is determined using the Exposure Risk Assessment/Evaluation Forms, found in Appendix C, to numerically rate damage and exposure factors. The numerical summations for damage and exposure are then plotted on the hazard graph, found in Appendix F, to determine the response code. The curves on the hazard graph indicating the response codes are fixed and were determined by Versar asbestos specialists after review of field data for several hundred ACM exposure situations.

Response codes are defined as follows:

A Immediate Removal - The ACM in this situation is such in terms of both damage and exposure potential to warrant immediate removal.

B Remove As Soon As Possible - Like the area above, this is a guide to management that the ACM should be removed as soon as possible, not waiting for the normal repair and maintenance cycle. In a museum, for instance, it can be accomplished at night over a period of days. Prior to and during actual removal, it is standard procedure to restrict access to that part of the building.

C Planned Removal - The hazard involved in these areas is such that removal should take place as part of the normal maintenance.

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D Repair - The most damaged areas should be repaired by proper enclosure or encapsulation.

E Monitoring - Periodic monitoring of these areas should be undertaken to insure that no further damage or changes to the physical condition of the material occurs.

F No Immediate Action - These situations exhibit little or no damage to the ACM and minimal exposure potential. In most cases, the ACM is protected so that fiber release is very unlikely. No current action should be undertaken.

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5.0 USER'S GUIDE TO THIS REPORT

The Versar asbestos inspection report provides all information necessary to recognize and manage asbestos-containing materials in individual Smithsonian Institution properties. The information is presented in several formats varying in depth from a line item summary to narrative discussions detailing Versar's findings and recommendations. Supporting documentation including field information, assessment criteria, and laboratory data is also included as appendices to the report.

The sheer volume of each report may initially intimidate the reader; however, once the reader becomes familiar with the information included in each section, the report will become useful as both a quick reference and a detailed description of ACMs in the facility. Although the individual sections of this report vary in detail, Versar recommends that the user read the entire report before conducting any activities which will directly impact ACM in the facility. Individual sections of this report, in particular the ACM data summary, are not meant to be used independently of the entire report.

Section 1.0 of this report contains the Executive Summary, the synopsis of the inspection activities and results. The results are presented by material type (Section 1.1) and by response code (Section 1.2), and provide the reader with an overview of the locations and control recommendations for each ACM. Section 2.0 is a description of the facility, including the building's layout and mechanical systems. Section 3.0 is an account of the inspection activities, bulk sampling procedure, and laboratory analysis.

Section 4.0 is an introduction to the concepts of hazard rank and response code, which are related to the relative exposure hazard of each ACM. These concepts are described in detail in Appendix F.

Section 5.0, this section, provides information for the report user and contains the ACM data summary (Figure 1), a list of all samples collected in the NASM (Table 1.0), and building floor plans (Figure 2).

Figure 1 is the computer spreadsheet summary of ACMs with removal and replacement costs for the facility. The summary is arranged to show ACMs in each room. The room numbers are arranged alpha-numerically. Rooms with no ACM are included in the summary but are followed only by "no ACM". Not all sample numbers are listed; rather, only representative sample numbers for each material or homogeneous sampling area are used.

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The spreadsheet is arranged from the left with the building identification, the room number, and the type of ACM. The summary of quantities follows with the total quantity of material in the room, the exposed quantity in the room (i.e., some material may be enclosed in a pipe chase or covered with carpet, etc.), the quantity of damaged material in the room, and the quantity of exposed, damaged material in the room. The next column indicates the unit of measure for each material.

The ninth and tenth columns list the hazard priority and response code for each material. The response codes A to F signify the designated response action recommended for each ACM. The next two columns list a representative sample number and asbestos content, respectively, associated with the ACM.

The last five columns in the spreadsheet pertain to removal of the ACMs and replacement with nonasbestos materials. This includes the estimated unit removal cost and the estimated total removal cost for the ACM in each room, the unit replacement costs and total replacement costs, and the total cost of removal and replacement of each ACM. These costs do not include the costs for monitoring and oversight during the removal.

The legend on the last page of the summary lists the abbreviations used in the building and room columns for the units of measure and the asbestos contents. Also included are the response codes for each letter designation.

A list of all samples collected in the NASM is shown in Table 1. The table includes the sample number, sample location, material description, and asbestos content of the sample. Each sample location is shown on the building floor plans (Figure 2). The Smithsonian Institution requires that one sample out of 20 be sent to an outside laboratory for Quality Control (QC) analysis. The QC samples are denoted in Table 1 with an asterisk (*), and the outside laboratory results are found in Appendix A. Sample results from the outside laboratory correspond to Versar's laboratory results in relation to each sample collected during the NASM survey.

Reviewing each column for the first entry on the spreadsheet shows that in the NASM, on the parking level, elevators 4 and 5 lobby, there is a total of 225 square feet of floor tile. All 225 feet of the material is exposed, and none of the material is damaged. The unit of measurement is SF, or square feet. The hazard priority is 123 and the response code is E or "Monitor". The representative sample from this homogeneous group is sample 77291A and contains 1-5% chrysotile. The estimated unit removal cost for this ACM is $11.20 per linear foot. The estimated unit replacement cost is $2.40. The total removal and replacement cost is $2,520 plus $540 or $3,060.00.

Section 6.0 is an in-depth discussion of the inspection results and includes the type of ACM identified and recommendations for control and management of the ACM in each location. This information is also summarized in the ACM data summary (Figure 1.0) in Section 5.0.

The appendices present supporting documentation for the inspection activities and report preparation. These include:

Appendix A -Chain of Custody Forms, Laboratory Results, Quality Control Results, and Lab Bench Sheets.

Appendix B - Field Assessment Worksheets which are completed during bulk sampling

Appendix C - Laboratory Certifications

Appendix D - Inspector Certifications

Appendix E - Detailed descriptions of hazard ratings, hazard priority, hazard rank, and response code

Appendix F - Costing worksheets used to compute removal and replacement costs

Appendix G - Photographs of sampling sites

As an example of how specific information may be obtained from this report, the following scenarios are provided.

SCENARIO #1

A building wing will be renovated. What spaces and building materials contain asbestos, in what quantity, and how much will removal cost?

Approach: After review of the entire report, the reader should first identify which rooms are located in the wing to be renovated. This is easily accomplished by checking the floor plan (Figure 2) in Section 5.0. The room numbers listed on the floor plan correspond to those in the spreadsheet. Note that these numbers were obtained from ODC floor plans and do not reflect later number changes that may have been made by the facility. Actual room numbers may need to be verified before proceeding. Working with the floor plan and spreadsheet, each room in the wing can then be checked for asbestos-containing materials. The spreadsheet provides the quantities, sample information, response code, and removal and replacement costs. Once the various types of ACM are identified on the spreadsheet, the reader should proceed to the appropriate subsection of Section 6.0 (Conclusions and Recommendations) for more detailed information regarding the material condition, sample information, and recommended control

measures for each type of ACM in each room in the wing. Back-up information for the samples associated with each ACM may be helpful to the reader and is found in Appendices A, B, and C. Back-up information for the costing estimates may also assist the reader, and is found in Appendix G.

SCENARIO #2

Repairs need to be made to a 3-room length of steam pipe and its fittings. The S.I. Plumber wants to know if any of this material contains asbestos. The plumber also wants to know the condition of the material and the surrounding area in the order to best plan protective work measures.

Approach: The reader should first check the floor plan (Figure 2, Section 5.0) to verify that the room numbers on the work order are the same as listed on the official floor plan (the facility may have renumbered the rooms). Once the job location is verified, the reader should first check the computer spreadsheet (Figure 1, Section 5.0) for room numbers on the work order to verify the asbestos content, if any, of pipe and fitting insulation in each room. The spreadsheet also provides an estimated removal cost should removal be required prior to start of work. Next, the appropriate subsections of Section 6.0 (Conclusions and Recommendations) such as "Pipe Insulation" and "Elbow/Fitting Insulation" should be read for more detailed information on the amount and condition of these materials in each room. Based on the condition of the materials, appropriate protection and work procedures will be needed. Obviously, any maintenance activity likely to damage known ACM should be coordinated with Smithsonian OEMS.

Garage Level

Figure 1. Smithsonian Institution - Summary of ACM at National Air and Space Museum

			SUMMARY OF QUANTITIES													
BLDG	ROOM	Material Type	Total Quant.	Exposed Quant.	Damaged Quantity	Expose Damage	Unit of Measure	Haz. Prior.	Resp. Code	Repr. Sample No.	Sample Conc.	Est. Unit Removal Cost	Est. Total Removal Cost	Est. Unit Repl. Cost	Est. Total Repl. Cost	Estimated Cost of Removal and Re-insulation
NASM	ELV LOBY	FLOOR TILE	225	225	0	0	SF	123	E	^77291 A	CHRYS 1-5%	$11.20	$2,520	$2.40	$540	$3,060.00
NASM	BRIEFNG	DRYWALL JOINT COMPOUND	1008	0	0	0	SF	253	E	^57737	CHRYS 1-5%	$11.20	$11,290	$2.40	$2,419	$13,708.80
NASM	BRIEFOF	DRYWALL JOINT COMPOUND	615	0	0	0	SF	255	E	^57737	CHRYS 1-5%	$11.20	$6,888	$2.40	$1,476	$8,364.00
NASM	CHL PLT	ROPE GASKET	70	70	0	0	LF	5	B	57735	CHRYS 65-70%	$14.00	$980	$1.90	$133	$1,113.00
NASM	EMP GYM	DRYWALL JOINT COMPOUND	567	0	0	0	SF	125	E	^57737	CHRYS 1-5%	$11.20	$6,350	$2.40	$1,361	$7,711 [illegible]
NASM	EMPGENT	FLOOR TILE	275	275	0	0	SF	35	E	77291 A	CHRYS 1-5%	$11.20	$3,080	$2.40	$660	$3,74[illegible]
NASM	ESCLPIT	DRYWALL JOINT COMPOUND	2200	0	0	0	SF	201	E	^57737	CHRYS 1-5%	$11.20	$24,640	$2.40	$5,280	$29,92[illegible]
NASM	E.R.C.	DRYWALL JOINT COMPOUND	1440	0	0	0	SF	224	E	^57737	CHRYS 1-5%	$11.20	$16,128	$2.40	$3,456	$19,584.00
NASM	GARAGE	RED DUCT MASTIC	20	20	0	0	SF	211	E	^57736	CHRYS 10-15%	$15.40	$308	$3.30	$66	$374.00
NASM	GARAGE	STORAGE	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	GARAGE	STORAGE	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	GARAGE	STORAGE	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	GARAGE	STORAGE	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	GARAGE	STORAGE	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	GARAGE	STORAGE	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	GARAGE	STORAGE	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	GARAGE	STORAGE	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	GARAGE	STORAGE	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	GYM MEN RM	DRYWALL JOINT COMPOUND	375	0	0	0	SF	37	E	^57737	CHRYS 1-5%	$11.20	$4,200	$2.40	$900	$5,100.00
NASM	GYM WOM	DRYWALL JOINT COMPOUND	375	0	0	0	SF	191	E	^57737	CHRYS 1-5%	$11.20	$4,200	$2.40	$900	$5,100.00
NASM	LD DOCK	RED DUCT MASTIC	50	50	0	0	SF	212	E	^57736	CHRYS 10-15%	$15.40	$770	$3.30	$165	$935.00
NASM	LDDK HL	DRYWALL JOINT COMPOUND	1550	0	0	0	SF	31	E	^57737	CHRYS 1-5%	$11.20	$17,360	$2.40	$3,720	$21,080.00
NASM	N MECH RM	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	P102	ROPE GASKET	20	20	0	0	LF	1	B	^57735	CHRYS 65-70%	$14.00	$280	$1.90	$38	$318.00
NASM	P204	ROPE GASKET	15	15	0	0	LF	2	B	^57735	CHRYS 65-70%	$14.00	$210	$1.90	$29	$238.50
NASM	P302	DRYWALL JOINT COMPOUND	428	0	0	0	SF	296	F	^57737	CHRYS 1-5%	$11.20	$4,794	$2.40	$1,027	$5,820.80
NASM	P305A	DRYWALL JOINT COMPOUND	1620	0	0	0	SF	299	F	^57737	CHRYS 1-5%	$11.20	$18,144	$2.40	$3,888	$22,032.00
NASM	P305C	DRYWALL JOINT COMPOUND	1220	0	0	0	SF	298	F	^57737	CHRYS 1-5%	$11.20	$13,664	$2.40	$2,928	$16,592.00
NASM	P405	ROPE GASKET	12	12	0	0	LF	4	B	^57735	CHRYS 65-70%	$14.00	$168	$1.90	$23	$190.80
NASM	P606	ROPE GASKET	15	15	0	0	LF	3	B	^57735	CHRYS 65-70%	$14.00	$210	$1.90	$29	$23[illegible]
NASM	P700	DRYWALL JOINT COMPOUND	3150	0	0	0	SF	215	E	^57737	CHRYS 1-5%	$11.20	$35,280	$2.40	$7,560	$42,84[illegible]
NASM	P703	DRYWALL JOINT COMPOUND	450	0	0	0	SF	294	F	^57737	CHRYS 1-5%	$11.20	$5,040	$2.40	$1,080	$6,120.00
NASM	P703A	DRYWALL JOINT COMPOUND	470	0	0	0	SF	257	E	^57737	CHRYS 1-5%	$11.20	$5,264	$2.40	$1,128	$6,392.00
NASM	P703A	FLOORTILE	30	30	0	0	SF	259	E	^72291A	CHRYS 1-5%	$11.20	$336	$2.40	$72	$408.00
NASM	P703D	DRYWALL JOINT COMPOUND	168	0	0	0	SF	261	E	^57737	CHRYS 1-5%	$11.20	$1,882	$2.40	$403	$2,284.80
NASM	P703E	DRYWALL JOINT COMPOUND	312	0	0	0	SF	265	E	^57737	CHRYS 1-5%	$11.20	$3,494	$2.40	$749	$4,243.20
NASM	P704	FLOOR TILE	360	360	0	0	SF	216	E	^72291 A	CHRYS 1-5%	$11.20	$4,032	$2.40	$864	$4,896.00
NASM	P704	DRYWALL JOINT COMPOUND	680	0	0	0	SF	274	F	^57737	CHRYS 1-5%	$11.20	$7,616	$2.40	$1,632	$9,248.00
NASM	P705	DRYWALL JOINT COMPOUND	680	0	0	0	SF	276	F	^57737	CHRYS 1-5%	$11.20	$7,616	$2.40	$1,632	$9,248.00
NASM	P705	FLOOR TILE	360	360	0	0	SF	213	E	^72291A	CHRYS 1-5%	$11.20	$4,032	$2.40	$864	$4,896.00
NASM	P719A	FLOOR TILE	558	558	0	0	SF	244	E	57747A	CHRYS 1-3%	$11.20	$6,250	$2.40	$1,339	$7,588.80
NASM	P719A	DRYWALL JOINT COMPOUND	455	0	0	0	SF	275	F	^57737	CHRYS 1-5%	$11.20	$5,096	$2.40	$1,092	$6,188.00
NASM	P719B	DRYWALL JOINT COMPOUND	252	0	0	0	SF	256	E	^57737	CHRYS 1-5%	$11.20	$2,822	$2.40	$605	$3,427.20
NASM	P719C	DRYWALL JOINT COMPOUND	252	0	0	0	SF	223	E	^57737	CHRYS 1-5%	$11.20	$2,822	$2.40	$605	$3,427.20
NASM	P719E	DRYWALL JOINT COMPOUND	672	0	0	0	SF	237	E	^57737	CHRYS 1-5%	$11.20	$7,526	$2.40	$1,613	$9,139.20
NASM	P722	DRYWALL JOINT COMPOUND	720	0	0	0	SF	245	E	^57737	CHRYS 1-5%	$11.20	$8,064	$2.40	$1,728	$9,792.00
NASM	RM P101	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM P101A	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM P101B	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM P101C	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM P101D	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Garage Level

Figure 1. Smithsonian Institution - Summary of ACM at National Air and Space Museum

BLDG ROOM	Material Type	SUMMARY OF QUANTITIES: Total Quant.	Exposed Quant.	Damaged Quantity	Expose Damage	Unit of Measure	Haz. Prior.	Resp. Code	Repr. Sample No.		Sample Conc.	Est. Unit Removal Cost	Est. Total Removal Cost	Est. Unit Repl. Cost	Est. Total Repl. Cost	Estimated Cost of Removal and Re-insulation
NASM RM P102	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P201	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P201A	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P201B	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P202	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P203	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P204	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P301	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P304	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P305C	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P307	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P307A	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P401A	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P404	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P405	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P501	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P601	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P602	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P604	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P605	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P606	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P714	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM RM P715	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM S MECH RM	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM SEC HL	DRYWALL JOINT COMPOUND	750	0	0	0	SF	33	E	^57737		CHRYS 1-5%	$11.20	$8,400	$2.40	$1,800	$10,200.00
NASM SEC HL	FLOOR TILE	225	225	0	0	SF	169	E	^77292	A	CHRYS 1-5%	$11.20	$2,520	$2.40	$540	$3,060.00
NASM SPCHISDE	DRYWALL JOINT COMPOUND	1220	0	0	0	SF	61	E	^57737		CHRYS 1-5%	$11.20	$13,664	$2.40	$2,928	$16,592.00
NASM STAIR 1	DRYWALL JOINT COMPOUND	3165	3165	0	0	SF	12	E	^57737		CHRYS 1-5%	$11.20	$35,448	$2.40	$7,596	$43,044.00
NASM STAIR 2	DRYWALL JOINT COMPOUND	3165	3165	0	0	SF	10	E	^57737		CHRYS 1-5%	$11.20	$35,448	$2.40	$7,596	$43,044.00
NASM STAIR 3	DRYWALL JOINT COMPOUND	2110	2110	0	0	SF	8	E	^57737		CHRYS 1-5%	$11.20	$23,632	$2.40	$5,064	$28,696.00
NASM STAIR 4	DRYWALL JOINT COMPOUND	8320	8320	0	0	SF	7	E	^57737		CHRYS 1-5%	$11.20	$93,184	$2.40	$19,968	$113,152.00
NASM STAIR 5	DRYWALL JOINT COMPOUND	3165	3165	0	0	SF	11	E	^57737		CHRYS 1-5%	$11.20	$35,448	$2.40	$7,596	$43,044.00
NASM STAIR 6	DRYWALL JOINT COMPOUND	3165	3165	0	0	SF	13	E	^57737		CHRYS 1-5%	$11.20	$35,448	$2.40	$7,596	$43,044.00
NASM STAIR 7	DRYWALL JOINT COMPOUND	3165	3165	0	0	SF	9	E	^57737		CHRYS 1-5%	$11.20	$35,448	$2.40	$7,596	$43,044.00
NASM STR ESC	DRYWALL JOINT COMPOUND	605	0	0	0	SF	240	E	^57734		CHRYS 1-5%	$11.20	$6,776	$2.40	$1,452	$8,228.00
NASM TRSH RM	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^ This sample was not collected in the room number shown, but is representative of the ACM in the room.
A Indicates sample taken from floor tile material.
B Indicates sample taken from floor tile mastic.

Legend:

BriefOf - Briefing Office
ChlPlt - Chiller Plant
ElvLoby - Elevator Lobby
EmpGym - Employee's Gym
LdDock - Loading Dock
LdDkHall - Loading Dock Hall
NMechRm - North Mechanical Room
SecHL - Security Hallway

Response Codes:
A - Remove immediately
B - Remove as soon as possible
C - Schedule removal

Garage Level

Figure 1. Smithsonian Institution - Summary of ACM at National Air and Space Museum

BLDG ROOM	Material Type	SUMMARY OF QUANTITIES: Total Quant.	Exposed Quant.	Damaged Quantity	Expose Damage	Unit of Measure	Haz. Prior.	Resp. Code	Repr. Sample No.	Sample Conc.	Est. Unit Removal Cost	Est. Total Removal Cost	Est. Unit Repl. Cost	Est. Total Repl. Cost	Estimated Cost of Removal and Re-insulation
EmpGEnt - Employee's Gym Entrance ERC - Education Resource Center EsclPit - Escalator Pit S Mech Rm- South Mechanical Room nasmgarg.			SpcHisDe - Space History Dept. StrEsc - Stair Escalator TrshRm - Trash Room Gym Wom - Womens Gym					D - Repair or encapsulate E - Mohitor F - No immediate action							

Level 1

Figure 1. Smithsonian Institution - Summary of ACM at National Air and Space Museum

BLDG	ROOM	Material Type	SUMMARY OF QUANTITIES: Total Quant.	Exposed Quant.	Damaged Quantity	Expose Damage	Unit of Measure	Haz. Prior.	Resp. Code	Repr. Sample No.	Sample Conc.	Est. Unit Removal Cost	Est. Total Removal Cost	Est. Unit Repl. Cost	Est. Total Repl. Cost	Estimated Cost of Removal and Re-insulation
NASM	CHEKRM	DRYWALL JOINT COMPOUND	625	0	0	0	SF	254	E	^57734	CHRYS 1-5%	$11.20	$7,000	$2.40	$1,500	$8,500.00
NASM	EXH SHP	DRYWALL JOINT COMPOUND	2850	0	0	0	SF	290	E	^57734	CHRYS 1-5%	$11.20	$31,920	$2.40	$6,840	$38,760.00
NASM	GLRY100	SKYLIGHT GASKET	2870	2870	0	0	LF	268	E	^57942	CHRYS 5-10%	$14.28	$40,984	$3.20	$9,184	$50,167.60
NASM	GLRY102	SKYLIGHT GASKET	2870	2870	0	0	LF	271	E	57942	CHRYS 5-10%	$14.28	$40,984	$3.20	$9,184	$50,167.60
NASM	GLRY103	DRYWALL JOINT COMPOUND	5600	0	0	0	SF	251	E	^57734	CHRYS 1-5%	$11.20	$62,720	$2.40	$13,440	$76,160.00
NASM	GLRY104	DRYWALL JOINT COMPOUND	5590	0	0	0	SF	249	E	^57734	CHRYS 1-5%	$11.20	$62,608	$2.40	$13,416	$76,024.00
NASM	GLRY105	DRYWALL JOINT COMPOUND	5600	0	0	0	SF	247	E	^57734	CHRYS 1-5%	$11.20	$62,720	$2.40	$13,440	$76,160.00
NASM	GLRY106	SKYLIGHT GASKET	240	240	0	0	LF	270	E	^57942	CHRYS 5-10%	$14.28	$3,427	$3.20	$768	$4,195.20
NASM	GLRY106	DRYWALL JOINT COMPOUND	8640	0	0	0	SF	243	E	^57734	CHRYS 1-5%	$11.20	$96,768	$2.40	$20,736	$117,504.00
NASM	GLRY107	DRYWALL JOINT COMPOUND	7860	0	0	0	SF	241	E	^57734	CHRYS 1-5%	$11.20	$88,032	$2.40	$18,864	$106,896.00
NASM	GLRY108	DRYWALL JOINT COMPOUND	4550	0	0	0	SF	239	E	^57734	CHRYS 1-5%	$11.20	$50,960	$2.40	$10,920	$61,880.00
NASM	GLRY108	SKYLIGHT GASKET	240	240	0	0	LF	272	E	^57942	CHRYS 5-10%	$14.28	$3,427	$3.20	$768	$4,195.20
NASM	GLRY109	DRYWALL JOINT COMPOUND	7860	0	0	0	SF	235	E	^57734	CHRYS 1-5%	$11.20	$88,032	$2.40	$18,864	$106,896.00
NASM	GLRY110	SKYLIGHT GASKET	240	240	0	0	LF	266	E	^57942	CHRYS 5-10%	$14.28	$3,427	$3.20	$768	$4,195.20
NASM	GLRY110	DRYWALL JOINT COMPOUND	8640	0	0	0	SF	233	E	^57734	CHRYS 1-5%	$11.20	$96,768	$2.40	$20,736	$117,504.00
NASM	GLRY111	DRYWALL JOINT COMPOUND	5600	0	0	0	SF	221	E	^57734	CHRYS 1-5%	$11.20	$62,720	$2.40	$13,440	$76,160.00
NASM	GLRY112	DRYWALL JOINT COMPOUND	5590	0	0	0	SF	219	E	^57734	CHRYS 1-5%	$11.20	$62,608	$2.40	$13,416	$76,024.00
NASM	GLRY113	DRYWALL JOINT COMPOUND	5600	0	0	0	SF	217	E	^57734	CHRYS 1-5%	$11.20	$62,720	$2.40	$13,440	$76,160.00
NASM	GLRY114	SKYLIGHT GASKET	2870	2870	0	0	LF	273	E	^57942	CHRYS 5-10%	$14.28	$40,984	$3.20	$9,184	$50,167.60
NASM	GLRY114	DRYWALL JOINT COMPOUND	1740	0	0	0	SF	214	E	^57734	CHRYS 1-5%	$11.20	$19,488	$2.40	$4,176	$23,664.00
NASM	MUS SHP	DRYWALL JOINT COMPOUND	6100	0	0	0	SF	292	E	^57734	CHRYS 1-5%	$11.20	$68,320	$2.40	$14,640	$82,960.00
NASM	MUSSHPOF	DRYWALL JOINT COMPOUND	5205	0	0	0	SF	288	E	^57734	CHRYS 1-5%	$11.20	$58,296	$2.40	$12,492	$70,788.00
NASM	RESTRAUNT	NO ACM	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM 1091	DRYWALL JOINT COMPOUND	572	0	0	0	SF	286	E	^57734	CHRYS 1-5%	$11.20	$6,406	$2.40	$1,373	$7,779.20
NASM	RM 1101	DRYWALL JOINT COMPOUND	1365	0	0	0	SF	284	E	^57734	CHRYS 1-5%	$11.20	$15,288	$2.40	$3,276	$18,564.00
NASM	RM 1102	DRYWALL JOINT COMPOUND	460	0	0	0	SF	282	E	^57734	CHRYS 1-5%	$11.20	$5,152	$2.40	$1,104	$6,256.00
NASM	RM 1103	DRYWALL JOINT COMPOUND	845	0	0	0	SF	263	E	^57734	CHRYS 1-5%	$11.20	$9,464	$2.40	$2,028	$11,492.00
NASM	RM 1104	DRYWALL JOINT COMPOUND	845	0	0	0	SF	242	E	^57734	CHRYS 1-5%	$11.20	$9,464	$2.40	$2,028	$11,492.00
NASM	RM 1151	DRYWALL JOINT COMPOUND	990	0	0	0	SF	280	E	^57734	CHRYS 1-5%	$11.20	$11,088	$2.40	$2,376	$13,464.00
NASM	RM 1152	DRYWALL JOINT COMPOUND	412	0	0	0	SF	278	E	^57734	CHRYS 1-5%	$11.20	$4,614	$2.40	$989	$5,603.00
NASM	RM 1157	DRYWALL JOINT COMPOUND	340	0	0	0	SF	289	E	^57734	CHRYS 1-5%	$11.20	$3,808	$2.40	$816	$4,624.00
NASM	RM 1157A	DRYWALL JOINT COMPOUND	325	0	0	0	SF	277	E	^57734	CHRYS 1-5%	$11.20	$3,640	$2.40	$780	$4,420.00
NASM	RM 1157C	DRYWALL JOINT COMPOUND	340	0	0	0	SF	287	E	^57734	CHRYS 1-5%	$11.20	$3,808	$2.40	$816	$4,624.00

^ This sample was not collected in the room number shown, but is representative of the ACM in the room.
A Indicates sample taken from floor tile material.
B Indicates sample taken from floor tile mastic.

Legend:
Chekrm - Checkroom
ExhShop - Exhibit Shop
Glry - Gallery Shop
MusShop - Museum Shop
MusShopOf - Museum Shop Office
Restraun - Restaurant

Response Codes:
A - Remove immediately
B - Remove as soon as possible
C - Schedule removal
D - Repair or encapsulate
E - Monitor
F - No immediate action

Level 2

Figure 1. Smithsonian Institution - Summary of ACM at National Air and Space Museum

BLDG	ROOM	Material Type	SUMMARY OF QUANTITIES: Total Quant.	Exposed Quant.	Damaged Quantity	Expose Damage	Unit of Measure	Haz. Prior.	Resp. Code	Repr. Sample NO.	Sample Conc.	Est. Unit Removal Cost	Est. Total Removal Cost	Est. Unit Repl. Cost	Est. Total Repl. Cost	Estimated Cost of Removal and Re-insulation
NASM	GLRY202	DRYWALL JOINT COMPOUND	1870	0	0	0	SF	218	B	^57734	CHRYS 1-5%	$11.20	$20,944	$2.40	$4,488	$25,432.00
NASM	GLRY202ST	DRYWALL JOINT COMPOUND	400	0	0	0	SF	225	B	^57734	CHRYS 1-5%	$11.20	$4,480	$2.40	$960	$5,440.00
NASM	GLRY203	DRYWALL JOINT COMPOUND	7965	0	0	0	SF	220	B	^57734	CHRYS 1-5%	$11.20	$89,208	$2.40	$19,116	$108,324.00
NASM	GLRY205	DRYWALL JOINT COMPOUND	7965	0	0	0	SF	227	B	^57734	CHRYS 1-5%	$11.20	$89,208	$2.40	$19,116	$108,324.00
NASM	GLRY206	DRYWALL JOINT COMPOUND	5898	0	0	0	SF	222	B	78401	CHRYS 1-5%	$11.20	$66,058	$2.40	$14,155	$80,212.80
NASM	GLRY207	DRYWALL JOINT COMPOUND	10611	0	0	0	SF	229	B	57749	CHRYS 1-5%	$11.20	$118,843	$2.40	$25,466	$144,309.60
NASM	GLRY208	DRYWALL JOINT COMPOUND	5574	0	0	0	SF	246	B	^57734	CHRYS 1-5%	$11.20	$62,429	$2.40	$13,378	$75,806.40
NASM	GLRY209	DRYWALL JOINT COMPOUND	10611	0	0	0	SF	226	B	57734	CHRYS 1-5%	$11.20	$118,843	$2.40	$25,466	$144,309.60
NASM	GLRY210	DRYWALL JOINT COMPOUND	5898	0	0	0	SF	262	B	^57734	CHRYS 1-5%	$11.20	$66,058	$2.40	$14,155	$80,212.80
NASM	GLRY211	DRYWALL JOINT COMPOUND	5945	0	0	0	SF	228	B	^57734	CHRYS 1-5%	$11.20	$66,584	$2.40	$14,268	$80,852.00
NASM	GLRY213ST	DRYWALL JOINT COMPOUND	400	0	0	0	SF	230	B	^57734	CHRYS 1-5%	$11.20	$4,480	$2.40	$960	$5,440.00
NASM	GLRY213	DRYWALL JOINT COMPOUND	7965	0	0	0	SF	248	B	^57734	CHRYS 1-5%	$11.20	$89,208	$2.40	$19,116	$108,324.00
NASM	GLRY214	DRYWALL JOINT COMPOUND	1980	0	0	0	SF	258	B	^57734	CHRYS 1-5%	$11.20	$22,176	$2.40	$4,752	$26,928.00
NASM	MEZZ	DRYWALL JOINT COMPOUND	4150	0	0	0	SF	91	B	57748	CHRYS 1-5%	$11.20	$46,480	$2.40	$9,960	$56,440.00
NASM	PLNTRM	DRYWALL JOINT COMPOUND	8893	0	0	0	SF	236	B	^57734	CHRYS 1-5%	$11.20	$99,602	$2.40	$21,343	$120,944.80
NASM	PLNTRMP	DRYWALL JOINT COMPOUND	1250	0	0	0	SF	231	B	^57734	CHRYS 1-5%	$11.20	$14,000	$2.40	$3,000	$17,000.00
NASM	PROJRM	DRYWALL JOINT COMPOUND	1100	0	0	0	SF	234	B	^57734	CHRYS 1-5%	$11.20	$12,320	$2.40	$2,640	$14,960.00
NASM	RM 2061	DRYWALL JOINT COMPOUND	845	0	0	0	SF	293	B	^57734	CHRYS 1-5%	$11.20	$9,464	$2.40	$2,028	$11,492.00
NASM	RM 2062	DRYWALL JOINT COMPOUND	845	0	0	0	SF	285	B	^57734	CHRYS 1-5%	$11.20	$9,464	$2.40	$2,028	$11,492.00
NASM	RM 2063	DRYWALL JOINT COMPOUND	425	0	0	0	SF	297	B	^57734	CHRYS 1-5%	$11.20	$4,760	$2.40	$1,020	$5,780.00
NASM	RM 2071	DRYWALL JOINT COMPOUND	565	0	0	0	SF	291	B	^57734	CHRYS 1-5%	$11.20	$6,328	$2.40	$1,356	$7,684.00
NASM	RM 2091	DRYWALL JOINT COMPOUND	572	0	0	0	SF	281	B	^57734	CHRYS 1-5%	$11.20	$6,406	$2.40	$1,373	$7,779.20
NASM	RM 2101	DRYWALL JOINT COMPOUND	630	0	0	0	SF	295	B	^57734	CHRYS 1-5%	$11.20	$7,056	$2.40	$1,512	$8,568.00
NASM	RM 2102	DRYWALL JOINT COMPOUND	460	0	0	0	SF	279	B	^57734	CHRYS 1-5%	$11.20	$5,152	$2.40	$1,104	$6,256.00
NASM	RM 2103	DRYWALL JOINT COMPOUND	845	0	0	0	SF	260	B	^57734	CHRYS 1-5%	$11.20	$9,464	$2.40	$2,028	$11,492.00
NASM	RM 2104	DRYWALL JOINT COMPOUND	845	0	0	0	SF	238	B	^57734	CHRYS 1-5%	$11.20	$9,464	$2.40	$2,028	$11,492.00
NASM	THEATRE	DRYWALL JOINT COMPOUND	16445	0	0	0	SF	250	B	^57734	CHRYS 1-5%	$11.20	$184,184	$2.40	$39,468	$223,652.00
NASM	THTREEXT	DRYWALL JOINT COMPOUND	2310	0	0	0	SF	232	B	^57734	CHRYS 1-5%	$11.20	$25,872	$2.40	$5,544	$31,416.00
NASMGLRY200P		DRYWALL JOINT COMPOUND	1960	0	0	0	SF	252	B	^57734	CHRYS 1-5%	$11.20	$21,952	$2.40	$4,704	$26,656.00
NASMPLNTRMCR		DRYWALL JOINT COMPOUND	1140	0	0	0	SF	264	B	^57734	CHRYS 1-5%	$11.20	$12,768	$2.40	$2,736	$15,504.00

^ This sample was not collected in the room number shown, but is representative of the ACM in the room.
A Indicates sample taken from floor tile material.
B Indicates sample taken from floor tile mastic.

Legend:
Glry - Gallery Shop
Mezz - Mezzanine
Plntrm - Planetarium
PlntrmCR - Planetarium Control Room
PlntrmP - Planetarium Porch
ProjRm - Projection Room
ThtreExt - Theater Exterior

RESPONSE CODES
A - REMOVE IMMEDIATELY
B - REMOVE AS SOON AS POSSIBLE
C - SCHEDULE REMOVAL
D - REPAIR OR ENCAPSULATE
E - MONITOR
F - NO ACTION REQUIRED

nasmlev2.

Level 3

Figure 1. Smithsonian Institution - Summary of ACM at National Air and Space Museum

BLDG	ROOM	Material Type	SUMMARY OF QUANTITIES: Total Quant.	Exposed Quant.	Damaged Quantity	Expose Damage	Unit of Measure	Haz. Prior.	Resp. Code	Repr. Sample No.	Sample Conc.	Est. Unit Removal Cost	Est. Total Removal Cost	Est. Unit Repl. Cost	Est. Total Repl. Cost	Estimated Cost of Removal and Re-insulation
NASM	COMPSERV	DRYWALL JOINT COMPOUND	540	0	0	0	SF	172		^55737	CHRYS 1-5%	$11.20	$6,048	$2.40	$1,296	$7,344.00
NASM	DIR KIT	DRYWALL JOINT COMPOUND	270	0	0	0	SF	103		^57737	CHRYS 1-5%	$11.20	$3,024	$2.40	$648	$3,672.00
NASM	LIB EAST	DRYWALL JOINT COMPOUND	780	0	0	0	SF	30		^57734	CHRYS 1-5%	$11.20	$8,736	$2.40	$1,872	$10,608.00
NASM	LIBMSTKS	DRYWALL JOINT COMPOUND	1850	0	0	0	SF	64		^57737	CHRYS 1-5%	$11.20	$20,720	$2.40	$4,440	$25,160.00
NASM	LIBRORM	SKYLIGHT GASKET	380	380	0	0	LF	267		^57492	CHRYS 5-10%	$14.28	$5,426	$1.20	$456	$6,642.40
NASM	LIBSSTKS	DRYWALL JOINT COMPOUND	1360	0	0	0	SF	28		^57734	CHRYS 1-5%	$11.20	$15,232	$2.40	$3,264	$18,496.0
NASM	RM 3101	DRYWALL JOINT COMPOUND	780	0	0	0	SF	109		^57734	CHRYS 1-5%	$11.20	$8,736	$2.40	$1,872	$10,6 .0
NASM	RM 3102	DRYWALL JOINT COMPOUND	400	0	0	0	SF	187		^57734	CHRYS 1-5%	$11.20	$4,480	$2.40	$960	$5,440.00
NASM	RM 3103	DRYWALL JOINT COMPOUND	260	0	0	0	SF	111		^57734	CHRYS 1-5%	$11.20	$2,912	$2.40	$624	$3,536.00
NASM	RM 3106	DRYWALL JOINT COMPOUND	420	0	0	0	SF	163		^57734	CHRYS 1-5%	$11.20	$4,704	$2.40	$1,008	$5,712.00
NASM	RM 3107	DRYWALL JOINT COMPOUND	450	0	0	0	SF	113		^57734	CHRYS 1-5%	$11.20	$5,040	$2.40	$1,080	$6,120.00
NASM	RM 3108	DRYWALL JOINT COMPOUND	270	0	0	0	SF	208		^57734	CHRYS 1-5%	$11.20	$3,024	$2.40	$648	$3,672.00
NASM	RM 3109	DRYWALL JOINT COMPOUND	270	0	0	0	SF	115		^57734	CHRYS 1-5%	$11.20	$3,024	$2.40	$648	$3,672.00
NASM	RM 3110	DRYWALL JOINT COMPOUND	270	0	0	0	SF	165		^57734	CHRYS 1-5%	$11.20	$3,024	$2.40	$648	$3,672.00
NASM	RM 3111	DRYWALL JOINT COMPOUND	320	0	0	0	SF	117		^57734	CHRYS 1-5%	$11.20	$3,584	$2.40	$768	$4,352.00
NASM	RM 3112	DRYWALL JOINT COMPOUND	600	0	0	0	SF	20		^57734	CHRYS 1-5%	$11.20	$6,720	$2.40	$1,440	$8,160.00
NASM	RM 3113	DRYWALL JOINT COMPOUND	600	0	0	0	SF	22		^57734	CHRYS 1-5%	$11.20	$6,720	$2.40	$1,440	$8,160.00
NASM	RM 3114	DRYWALL JOINT COMPOUND	470	0	0	0	SF	24		^57734	CHRYS 1-5%	$11.20	$5,264	$2.40	$1,128	$6,392.00
NASM	RM 3115	DRYWALL JOINT COMPOUND	600	0	0	0	SF	26		^57734	CHRYS 1-5%	$11.20	$6,720	$2.40	$1,440	$8,160.00
NASM	RM 3117	DRYWALL JOINT COMPOUND	1160	0	0	0	SF	32		^57734	CHRYS 1-5%	$11.20	$12,992	$2.40	$2,784	$15,776.00
NASM	RM 3118	DRYWALL JOINT COMPOUND	1030	0	0	0	SF	34		^57734	CHRYS 1-5%	$11.20	$11,536	$2.40	$2,472	$14,008.00
NASM	RM 3119	DRYWALL JOINT COMPOUND	670	0	0	0	SF	36		^57734	CHRYS 1-5%	$11.20	$7,504	$2.40	$1,608	$9,112.00
NASM	RM 3121	DRYWALL JOINT COMPOUND	420	0	0	0	SF	38		^57734	CHRYS 1-5%	$11.20	$4,704	$2.40	$1,008	$5,712.00
NASM	RM 3122	DRYWALL JOINT COMPOUND	320	0	0	0	SF	40		^57734	CHRYS 1-5%	$11.20	$3,584	$2.40	$768	$4,352.00
NASM	RM 3123	DRYWALL JOINT COMPOUND	310	0	0	0	SF	42		^57734	CHRYS 1-5%	$11.20	$3,472	$2.40	$744	$4,216.00
NASM	RM 3124	DRYWALL JOINT COMPOUND	270	0	0	0	SF	46		^57734	CHRYS 1-5%	$11.20	$3,024	$2.40	$648	$3,672.00
NASM	RM 3125	DRYWALL JOINT COMPOUND	310	0	0	0	SF	48		^57734	CHRYS 1-5%	$11.20	$3,472	$2.40	$744	$4,216.00
NASM	RM 3126	DRYWALL JOINT COMPOUND	270	0	0	0	SF	50		^57734	CHRYS 1-5%	$11.20	$3,024	$2.40	$648	$3,672.00
NASM	RM 3127	DRYWALL JOINT COMPOUND	740	0	0	0	SF	52		^57734	CHRYS 1-5%	$11.20	$8,288	$2.40	$1,776	$10,064.00
NASM	RM 3128	DRYWALL JOINT COMPOUND	270	0	0	0	SF	54		^57734	CHRYS 1-5%	$11.20	$3,024	$2.40	$648	$3,67 .0
NASM	RM 3129	DRYWALL JOINT COMPOUND	420	0	0	0	SF	56		^57734	CHRYS 1-5%	$11.20	$4,704	$2.40	$1,008	$5,7 .0
NASM	RM 3131	DRYWALL JOINT COMPOUND	410	0	0	0	SF	58		^57734	CHRYS 1-5%	$11.20	$4,592	$2.40	$984	$5,576.00
NASM	RM 3132	DRYWALL JOINT COMPOUND	390	0	0	0	SF	60		^57734	CHRYS 1-5%	$11.20	$4,368	$2.40	$936	$5,304.00
NASM	RM 3134	DRYWALL JOINT COMPOUND	500	0	0	0	SF	66		^57737	CHRYS 1-5%	$11.20	$5,600	$2.40	$1,200	$6,800.00
NASM	RM 3136	DRYWALL JOINT COMPOUND	330	0	0	0	SF	68		^57737	CHRYS 1-5%	$11.20	$3,696	$2.40	$792	$4,488.00
NASM	RM 3138	DRYWALL JOINT COMPOUND	430	0	0	0	SF	70		^57737	CHRYS 1-5%	$11.20	$4,816	$2.40	$1,032	$5,848.00
NASM	RM 3140	DRYWALL JOINT COMPOUND	360	0	0	0	SF	74		^57737	CHRYS 1-5%	$11.20	$4,032	$2.40	$864	$4,896.00
NASM	RM 3164	DRYWALL JOINT COMPOUND	330	0	0	0	SF	74		^57737	CHRYS 1-5%	$11.20	$3,696	$2.40	$792	$4,488.00
NASM	RM 3165	DRYWALL JOINT COMPOUND	430	0	0	0	SF	76		^57737	CHRYS 1-5%	$11.20	$4,816	$2.40	$1,032	$5,848.00
NASM	RM 3166	DRYWALL JOINT COMPOUND	330	0	0	0	SF	17		^57737	CHRYS 1-5%	$11.20	$3,696	$2.40	$792	$4,488.00
NASM	RM 3200	DRYWALL JOINT COMPOUND	1000	0	0	0	SF	19		^57737	CHRYS 1-5%	$11.20	$11,200	$2.40	$2,400	$13,600.00
NASM	RM 3201	INACCESIBLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM 3202	INACCESIBLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM 3203	DRYWALL JOINT COMPOUND	872	0	0	0	SF	15		^57737	CHRYS 1-5%	$11.20	$9,766	$2.40	$2,093	$11,859.20
NASM	RM 3204	DRYWALL JOINT COMPOUND	872	0	0	0	SF	84		^57737	CHRYS 1-5%	$11.20	$9,766	$2.40	$2,093	$11,859.20
NASM	RM 3204B	INACCESIBLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM 3205	INACCESIBLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM 3206	INACCESIBLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM 3207	DRYWALL JOINT COMPOUND	350	0	0	0	SF	86		^57737	CHRYS 1-5%	$11.20	$3,920	$2.40	$840	$4,760.00
NASM	RM 3300	DRYWALL JOINT COMPOUND	2500	0	0	0	SF	88		^57737	CHRYS 1-5%	$11.20	$28,000	$2.40	$6,000	$34,000.00
NASM	RM 3301	DRYWALL JOINT COMPOUND	740	0	0	0	SF	90		^57737	CHRYS 1-5%	$11.20	$8,288	$2.40	$1,776	$10,064.00

Level 3

Figure 1. Smithsonian Institution - Summary of ACM at National Air and Space Museum

BLDG	ROOM	Material Type	SUMMARY OF QUANTITIES: Total Quant.	Exposed Quant.	Damaged Quantity	Expose Damage	Unit of Measure	Haz. Prior.	Resp. Code	Repr. Sample No.	Sample Conc.	Est. Unit Removal Cost	Est. Total Removal Cost	Est. Unit Repl. Cost	Est. Total Repl. Cost	Estimated Cost of Removal and Re-insulation
NASM	RM 3302	DRYWALL JOINT COMPOUND	640	0	0	0	SF	92	E	^57737	CHRYS 1-5%	$11.20	$7,168	$2.40	$1,536	$8,704.00
NASM	RM 3303	DRYWALL JOINT COMPOUND	370	0	0	0	SF	94	E	^57737	CHRYS 1-5%	$11.20	$4,144	$2.40	$888	$5,032.00
NASM	RM 3306	DRYWALL JOINT COMPOUND	350	0	0	0	SF	96	E	^57737	CHRYS 1-5%	$11.20	$3,920	$2.40	$840	$4,760.00
NASM	RM 3307	DRYWALL JOINT COMPOUND	370	0	0	0	SF	98	E	^57737	CHRYS 1-5%	$11.20	$4,144	$2.40	$888	$5,032.00
NASM	RM 3308	DRYWALL JOINT COMPOUND	370	0	0	0	SF	100	E	^57737	CHRYS 1-5%	$11.20	$4,144	$2.40	$888	$5,032.00
NASM	RM 3309	DRYWALL JOINT COMPOUND	370	0	0	0	SF	16	E	^57737	CHRYS 1-5%	$11.20	$4,144	$2.40	$888	$5,032.00
NASM	RM 3310	DRYWALL JOINT COMPOUND	350	0	0	0	SF	104	E	^57737	CHRYS 1-5%	$11.20	$3,920	$2.40	$840	$4,760.00
NASM	RM 3311	DRYWALL JOINT COMPOUND	370	0	0	0	SF	106	E	^57737	CHRYS 1-5%	$11.20	$4,144	$2.40	$888	$5,032.00
NASM	RM 3312	DRYWALL JOINT COMPOUND	730	0	0	0	SF	108	E	^57737	CHRYS 1-5%	$11.20	$8,176	$2.40	$1,752	$9,928.00
NASM	RM 3313	DRYWALL JOINT COMPOUND	420	0	0	0	SF	110	E	^57737	CHRYS 1-5%	$11.20	$4,704	$2.40	$1,008	$5,712.00
NASM	RM 3314	DRYWALL JOINT COMPOUND	200	0	0	0	SF	112	E	^57737	CHRYS 1-5%	$11.20	$2,240	$2.40	$480	$2,720.00
NASM	RM 3315	DRYWALL JOINT COMPOUND	300	0	0	0	SF	114	E	^57737	CHRYS 1-5%	$11.20	$3,360	$2.40	$720	$4,080.00
NASM	RM 3316	DRYWALL JOINT COMPOUND	200	0	0	0	SF	116	E	^57737	CHRYS 1-5%	$11.20	$2,240	$2.40	$480	$2,720.00
NASM	RM 3317	DRYWALL JOINT COMPOUND	200	0	0	0	SF	118	E	^57737	CHRYS 1-5%	$11.20	$2,240	$2.40	$480	$2,720.00
NASM	RM 3318	DRYWALL JOINT COMPOUND	420	0	0	0	SF	120	E	^57737	CHRYS 1-5%	$11.20	$4,704	$2.40	$1,008	$5,712.00
NASM	RM 3319	DRYWALL JOINT COMPOUND	370	0	0	0	SF	122	E	^57737	CHRYS 1-5%	$11.20	$4,144	$2.40	$888	$5,032.00
NASM	RM 3320	DRYWALL JOINT COMPOUND	370	0	0	0	SF	124	E	^57737	CHRYS 1-5%	$11.20	$4,144	$2.40	$888	$5,032.00
NASM	RM 3321	DRYWALL JOINT COMPOUND	370	0	0	0	SF	126	E	^57737	CHRYS 1-5%	$11.20	$4,144	$2.40	$888	$5,032.00
NASM	RM 3322	DRYWALL JOINT COMPOUND	370	0	0	0	SF	128	E	^55737	CHRYS 1-5%	$11.20	$4,144	$2.40	$888	$5,032.00
NASM	RM 3323	DRYWALL JOINT COMPOUND	150	0	0	0	SF	130	E	^55737	CHRYS 1-5%	$11.20	$1,680	$2.40	$360	$2,040.00
NASM	RM 3324	DRYWALL JOINT COMPOUND	410	0	0	0	SF	132	E	^57737	CHRYS 1-5%	$11.20	$4,592	$2.40	$984	$5,576.00
NASM	RM 3326	DRYWALL JOINT COMPOUND	520	0	0	0	SF	134	E	^57737	CHRYS 1-5%	$11.20	$5,824	$2.40	$1,248	$7,072.00
NASM	RM 3327	DRYWALL JOINT COMPOUND	1060	0	0	0	SF	142	E	^55737	CHRYS 1-5%	$11.20	$11,872	$2.40	$2,544	$14,416.00
NASM	RM 3328	DRYWALL JOINT COMPOUND	370	0	0	0	SF	138	E	^57737	CHRYS 1-5%	$11.20	$4,144	$2.40	$888	$5,032.00
NASM	RM 3329	DRYWALL JOINT COMPOUND	370	0	0	0	SF	140	E	^55737	CHRYS 1-5%	$11.20	$4,144	$2.40	$888	$5,032.00
NASM	RM 3331	DRYWALL JOINT COMPOUND	520	0	0	0	SF	144	E	^55737	CHRYS 1-5%	$11.20	$5,824	$2.40	$1,248	$7,072.00
NASM	RM 3332	DRYWALL JOINT COMPOUND	550	0	0	0	SF	146	E	^55737	CHRYS 1-5%	$11.20	$6,160	$2.40	$1,320	$7,480.00
NASM	RM 3333	DRYWALL JOINT COMPOUND	520	0	0	0	SF	148	E	^57737	CHRYS 1-5%	$11.20	$5,824	$2.40	$1,248	$7,072.00
NASM	RM 3334	DRYWALL JOINT COMPOUND	370	0	0	0	SF	150	E	^57737	CHRYS 1-5%	$11.20	$4,144	$2.40	$888	$5,032.00
NASM	RM 3335	DRYWALL JOINT COMPOUND	510	0	0	0	SF	152	E	^57737	CHRYS 1-5%	$11.20	$5,712	$2.40	$1,224	$6,936.00
NASM	RM 3336	DRYWALL JOINT COMPOUND	250	0	0	0	SF	154	E	^55737	CHRYS 1-5%	$11.20	$2,800	$2.40	$600	$3,400.00
NASM	RM 3337	DRYWALL JOINT COMPOUND	340	0	0	0	SF	158	E	^55737	CHRYS 1-5%	$11.20	$3,808	$2.40	$816	$4,624.00
NASM	RM 3338	DRYWALL JOINT COMPOUND	340	0	0	0	SF	160	E	^55737	CHRYS 1-5%	$11.20	$3,808	$2.40	$816	$4,624.00
NASM	RM 3339	DRYWALL JOINT COMPOUND	3310	0	0	0	SF	162	E	^55737	CHRYS 1-5%	$11.20	$37,072	$2.40	$7,944	$45,016.00
NASM	RM 3340	DRYWALL JOINT COMPOUND	480	0	0	0	SF	164	E	^57737	CHRYS 1-5%	$11.20	$5,376	$2.40	$1,152	$6,528.00
NASM	RM 3341	DRYWALL JOINT COMPOUND	330	0	0	0	SF	166	E	^57737	CHRYS 1-5%	$11.20	$3,696	$2.40	$792	$4,488.00
NASM	RM 3342	DRYWALL JOINT COMPOUND	440	0	0	0	SF	168	E	^57737	CHRYS 1-5%	$11.20	$4,928	$2.40	$1,056	$5,984.00
NASM	RM 3343	DRYWALL JOINT COMPOUND	460	0	0	0	SF	170	E	^55737	CHRYS 1-5%	$11.20	$5,152	$2.40	$1,104	$6,256.00
NASM	RM 3344	DRYWALL JOINT COMPOUND	340	0	0	0	SF	174	E	^55737	CHRYS 1-5%	$11.20	$3,808	$2.40	$816	$4,624.00
NASM	RM 3345	DRYWALL JOINT COMPOUND	370	0	0	0	SF	176	E	^55737	CHRYS 1-5%	$11.20	$4,144	$2.40	$888	$5,032.00
NASM	RM 3346	DRYWALL JOINT COMPOUND	620	0	0	0	SF	180	E	^55737	CHRYS 1-5%	$11.20	$6,944	$2.40	$1,488	$8,432.00
NASM	RM 3346	FLOOR TILE	100	100	0	0	SF	14	E	78414 A	CHRYS 1-5%	$11.20	$1,120	$2.40	$240	$1,360.00
NASM	RM 3347	DRYWALL JOINT COMPOUND	280	0	0	0	SF	182	E	^55737	CHRYS 1-5%	$11.20	$3,136	$2.40	$672	$3,808.00
NASM	RM 3348	DRYWALL JOINT COMPOUND	350	0	0	0	SF	184	E	^57737	CHRYS 1-5%	$11.20	$3,920	$2.40	$840	$4,760.00
NASM	RM 3349	DRYWALL JOINT COMPOUND	410	0	0	0	SF	186	E	^57737	CHRYS 1-5%	$11.20	$4,592	$2.40	$984	$5,576.00
NASM	RM 3350	DRYWALL JOINT COMPOUND	430	0	0	0	SF	188	E	^57737	CHRYS 1-5%	$11.20	$4,816	$2.40	$1,032	$5,848.00
NASM	RM 3352	INACCESSIBLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM 3400	DRYWALL JOINT COMPOUND	200	0	0	0	SF	190	E	^55737	CHRYS 1-5%	$11.20	$2,240	$2.40	$480	$2,720.00
NASM	RM 3400	RED DUCT MASTIC	-	-	-	-	-	-	-	55736	CHRYS 10-15%	-	-	-	-	-
NASM	RM 3401	DRYWALL JOINT COMPOUND	175	0	0	0	SF	192	E	^55737	CHRYS 1-5%	$11.20	$1,960	$2.40	$420	$2,380.00
NASM	RM 3402	DRYWALL JOINT COMPOUND	140	0	0	0	SF	194	E	^57737	CHRYS 1-5%	$11.20	$1,568	$2.40	$336	$1,904.00

Level 3

Figure 1. Smithsonian Institution - Summary of ACM at National Air and Space Museum

BLDG	ROOM	Material Type	SUMMARY OF QUANTITIES: Total Quant.	Exposed Quant.	Damaged Quantity	Expose Damage	Unit of Measure	Haz. Prior.	Resp. Code	Repr. Sample No.	Sample Conc.	Est. Unit Removal Cost	Est. Total Removal Cost	Est. Unit Repl. Cost	Est. Total Repl. Cost	Estimated Cost of Removal and Re-insulation
NASM	RM 3403	DRYWALL JOINT COMPOUND	200	0	0	0	SQF	196	E	^57737	CHRYS 1-5%	$11.20	$2,240	$2.40	$480	$2,720.00
NASM	RM 3404	DRYWALL JOINT COMPOUND	130	0	0	0	SQF	198	E	^57737	CHRYS 1-5%	$11.20	$1,456	$2.40	$312	$1,768.00
NASM	RM 3405	DRYWALL JOINT COMPOUND	120	0	0	0	SQF	200	E	^57737	CHRYS 1-5%	$11.20	$1,344	$2.40	$288	$1,632.00
NASM	RM 3500	DRYWALL JOINT COMPOUND	4000	0	0	0	SQF	202	E	^57737	CHRYS 1-5%	$11.20	$44,800	$2.40	$9,600	$54,400.00
NASM	RM 3501	DRYWALL JOINT COMPOUND	900	0	0	0	SQF	204	E	^57737	CHRYS 1-5%	$11.20	$10,080	$2.40	$2,160	$12,24[illegible]
NASM	RM 3502	DRYWALL JOINT COMPOUND	310	0	0	0	SQF	206	E	^57737	CHRYS 1-5%	$11.20	$3,472	$2.40	$744	$4,216.
NASM	RM 3503	DRYWALL JOINT COMPOUND	280	0	0	0	SQF	210	E	^57737	CHRYS 1-5%	$11.20	$3,136	$2.40	$672	$3,808.00
NASM	RM 3504	INACCESSIBLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM 3505A	DRYWALL JOINT COMPOUND	555	0	0	0	SQF	193	E	^57737	CHRYS 1-5%	$11.20	$6,216	$2.40	$1,332	$7,548.00
NASM	RM 3505B	DRYWALL JOINT COMPOUND	490	0	0	0	SQF	178	E	^57737	CHRYS 1-5%	$11.20	$5,488	$2.40	$1,176	$6,664.00
NASM	RM 3505C	DRYWALL JOINT COMPOUND	400	0	0	0	SQF	21	E	^57737	CHRYS 1-5%	$11.20	$4,480	$2.40	$960	$5,440.00
NASM	RM 3506	DRYWALL JOINT COMPOUND	390	0	0	0	SQF	156	E	^57737	CHRYS 1-5%	$11.20	$4,368	$2.40	$936	$5,304.00
NASM	RM 3507	DRYWALL JOINT COMPOUND	380	0	0	0	SQF	102	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3508	DRYWALL JOINT COMPOUND	390	0	0	0	SQF	62	E	^57737	CHRYS 1-5%	$11.20	$4,368	$2.40	$936	$5,304.00
NASM	RM 3509	DRYWALL JOINT COMPOUND	540	0	0	0	SQF	161	E	^57737	CHRYS 1-5%	$11.20	$6,048	$2.40	$1,296	$7,344.00
NASM	RM 3510	DRYWALL JOINT COMPOUND	660	0	0	0	SQF	107	E	^57737	CHRYS 1-5%	$11.20	$7,392	$2.40	$1,584	$8,976.00
NASM	RM 3511	DRYWALL JOINT COMPOUND	400	0	0	0	SQF	199	E	^57737	CHRYS 1-5%	$11.20	$4,480	$2.40	$960	$5,440.00
NASM	RM 3512	DRYWALL JOINT COMPOUND	380	0	0	0	SQF	105	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3513	DRYWALL JOINT COMPOUND	150	0	0	0	SQF	159	E	^57737	CHRYS 1-5%	$11.20	$1,680	$2.40	$360	$2,040.00
NASM	RM 3514	DRYWALL JOINT COMPOUND	470	0	0	0	SQF	185	E	^57737	CHRYS 1-5%	$11.20	$5,264	$2.40	$1,128	$6,392.00
NASM	RM 3515	DRYWALL JOINT COMPOUND	1200	0	0	0	SQF	101	E	^57737	CHRYS 1-5%	$11.20	$13,440	$2.40	$2,880	$16,320.00
NASM	RM 3516	DRYWALL JOINT COMPOUND	550	0	0	0	SQF	157	E	^57737	CHRYS 1-5%	$11.20	$6,160	$2.40	$1,320	$7,480.00
NASM	RM 3517	DRYWALL JOINT COMPOUND	375	0	0	0	SQF	99	E	^57737	CHRYS 1-5%	$11.20	$4,200	$2.40	$900	$5,100.00
NASM	RM 3518	DRYWALL JOINT COMPOUND	400	0	0	0	SQF	205	E	^57737	CHRYS 1-5%	$11.20	$4,480	$2.40	$960	$5,440.00
NASM	RM 3519	DRYWALL JOINT COMPOUND	375	0	0	0	SQF	97	E	^57737	CHRYS 1-5%	$11.20	$4,200	$2.40	$900	$5,100.00
NASM	RM 3520	DRYWALL JOINT COMPOUND	500	0	0	0	SQF	155	E	^57737	CHRYS 1-5%	$11.20	$5,600	$2.40	$1,200	$6,800.00
NASM	RM 3521	DRYWALL JOINT COMPOUND	380	0	0	0	SQF	95	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3522	DRYWALL JOINT COMPOUND	380	0	0	0	SQF	183	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3523	DRYWALL JOINT COMPOUND	380	0	0	0	SQF	93	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3524	DRYWALL JOINT COMPOUND	380	0	0	0	SQF	153	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3525	DRYWALL JOINT COMPOUND	380	0	0	0	SQF	197	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3526	DRYWALL JOINT COMPOUND	430	0	0	0	SQF	89	E	^57737	CHRYS 1-5%	$11.20	$4,816	$2.40	$1,032	$5,848.00
NASM	RM 3527	DRYWALL JOINT COMPOUND	280	0	0	0	SQF	151	E	^57737	CHRYS 1-5%	$11.20	$3,136	$2.40	$672	$3,808.00
NASM	RM 3528	DRYWALL JOINT COMPOUND	280	0	0	0	SQF	87	E	^57737	CHRYS 1-5%	$11.20	$3,136	$2.40	$672	$3,808.00
NASM	RM 3529	DRYWALL JOINT COMPOUND	280	0	0	0	SQF	181	E	^57737	CHRYS 1-5%	$11.20	$3,136	$2.40	$672	$3,808.00
NASM	RM 3530	DRYWALL JOINT COMPOUND	280	0	0	0	SQF	77	E	^57737	CHRYS 1-5%	$11.20	$3,136	$2.40	$672	$3,808.00
NASM	RM 3531	DRYWALL JOINT COMPOUND	430	0	0	0	SQF	145	E	^57737	CHRYS 1-5%	$11.20	$4,816	$2.40	$1,032	$5,848.00
NASM	RM 3532	DRYWALL JOINT COMPOUND	380	0	0	0	SQF	177	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3533	DRYWALL JOINT COMPOUND	380	0	0	0	SQF	69	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3534	DRYWALL JOINT COMPOUND	380	0	0	0	SQF	65	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3535	DRYWALL JOINT COMPOUND	380	0	0	0	SQF	139	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3536	DRYWALL JOINT COMPOUND	980	0	0	0	SQF	63	E	^57737	CHRYS 1-5%	$11.20	$10,976	$2.40	$2,352	$13,328.00
NASM	RM 3537	DRYWALL JOINT COMPOUND	700	0	0	0	SQF	175	E	^57737	CHRYS 1-5%	$11.20	$7,840	$2.40	$1,680	$9,520.00
NASM	RM 3600	DRYWALL JOINT COMPOUND	1050	0	0	0	SQF	137	E	^57737	CHRYS 1-5%	$11.20	$11,760	$2.40	$2,520	$14,280.00
NASM	RM 3601	INACCESSIBLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM 3602	INACCESSIBLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM 3603	INACCESSIBLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM 3604	DRYWALL JOINT COMPOUND	950	0	0	0	SQF	59	E	^57737	CHRYS 1-5%	$11.20	$10,640	$2.40	$2,280	$12,920.00
NASM	RM 3605	DRYWALL JOINT COMPOUND	882	0	0	0	SQF	136	E	^57737	CHRYS 1-5%	$11.20	$9,878	$2.40	$2,117	$11,995.20
NASM	RM 3606	DRYWALL JOINT COMPOUND	665	0	0	0	SQF	57	E	^57737	CHRYS 1-5%	$11.20	$7,448	$2.40	$1,596	$9,044.00
NASM	RM 3607	DRYWALL JOINT COMPOUND	350	0	0	0	SQF	55	E	^57737	CHRYS 1-5%	$11.20	$3,920	$2.40	$840	$4,760.00

Level 3

Figure 1. Smithsonian Institution - Summary of ACM at National Air and Space Museum

BLDG	ROOM	Material Type	SUMMARY OF QUANTITIES Total Quant.	Exposed Quant.	Damaged Quantity	Expose Damage	Unit of Measure	Haz. Prior.	Resp. Code	Repr. Sample No.	Sample Conc.	Est. Unit Removal Cost	Est. Total Removal Cost	Est. Unit Repl. Cost	Est. Total Repl. Cost	Estimated Cost of Removal and Re-insulation
NASM	RM 3608	DRYWALL JOINT COMPOUND	150	0	0	0	SF	135	E	^57737	CHRYS 1-5%	$11.20	$1,680	$2.40	$360	$2,040.00
NASM	RM 3724	DRYWALL JOINT COMPOUND	350	0	0	0	SF	53	E	^57737	CHRYS 1-5%	$11.20	$3,920	$2.40	$840	$4,760.00
NASM	RM 3725	INACCESSIBLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASM	RM 3726	DRYWALL JOINT COMPOUND	380	0	0	0	SF	133	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3727	DRYWALL JOINT COMPOUND	340	0	0	0	SF	51	E	^57737	CHRYS 1-5%	$11.20	$3,808	$2.40	$816	$4,624.00
NASM	RM 3728	DRYWALL JOINT COMPOUND	340	0	0	0	SF	173	E	^57737	CHRYS 1-5%	$11.20	$3,808	$2.40	$816	$4,624.00
NASM	RM 3729	DRYWALL JOINT COMPOUND	340	0	0	0	SF	49	E	^57737	CHRYS 1-5%	$11.20	$3,808	$2.40	$816	$4,624.00
NASM	RM 3730	DRYWALL JOINT COMPOUND	340	0	0	0	SF	131	E	^57737	CHRYS 1-5%	$11.20	$3,808	$2.40	$816	$4,624.00
NASM	RM 3731	DRYWALL JOINT COMPOUND	340	0	0	0	SF	129	E	^57737	CHRYS 1-5%	$11.20	$3,808	$2.40	$816	$4,624.00
NASM	RM 3732	DRYWALL JOINT COMPOUND	790	0	0	0	SF	171	E	^57737	CHRYS 1-5%	$11.20	$8,848	$2.40	$1,896	$10,744.00
NASM	RM 3734	DRYWALL JOINT COMPOUND	380	0	0	0	SF	41	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3735	DRYWALL JOINT COMPOUND	380	0	0	0	SF	127	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3737	DRYWALL JOINT COMPOUND	140	0	0	0	SF	39	E	^57737	CHRYS 1-5%	$11.20	$1,568	$2.40	$336	$1,904.00
NASM	RM 3738	DRYWALL JOINT COMPOUND	650	0	0	0	SF	29	E	^57737	CHRYS 1-5%	$11.20	$7,280	$2.40	$1,560	$8,840.00
NASM	RM 3740	DRYWALL JOINT COMPOUND	410	0	0	0	SF	121	E	^57737	CHRYS 1-5%	$11.20	$4,592	$2.40	$984	$5,576.00
NASM	RM 3742A	DRYWALL JOINT COMPOUND	440	0	0	0	SF	27	E	^57737	CHRYS 1-5%	$11.20	$4,928	$2.40	$1,056	$5,984.00
NASM	RM 3742B	DRYWALL JOINT COMPOUND	440	0	0	0	SF	167	E	^57737	CHRYS 1-5%	$11.20	$4,928	$2.40	$1,056	$5,984.00
NASM	RM 3743	DRYWALL JOINT COMPOUND	380	0	0	0	SF	25	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3744	DRYWALL JOINT COMPOUND	380	0	0	0	SF	119	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3745	DRYWALL JOINT COMPOUND	380	0	0	0	SF	23	E	^57737	CHRYS 1-5%	$11.20	$4,256	$2.40	$912	$5,168.00
NASM	RM 3746	DRYWALL JOINT COMPOUND	310	0	0	0	SF	189	E	^57737	CHRYS 1-5%	$11.20	$3,472	$2.40	$744	$4,216.00
NASM	RM 3748	DRYWALL JOINT COMPOUND	850	0	0	0	SF	18	E	^57737	CHRYS 1-5%	$11.20	$9,520	$2.40	$2,040	$11,560.00
NASM	RM 3755	DRYWALL JOINT COMPOUND	1050	0	0	0	SF	82	E	^57737	CHRYS 1-5%	$11.20	$11,760	$2.40	$2,520	$14,280.00
NASM	RM 3755	SKYLIGHT GASKET	380	380	0	0	LF	269	E	^57942	CHRYS 5-10%	$14.28	$5,426	$3.20	$1,216	$6,642.40
NASM	RM 3757	DRYWALL JOINT COMPOUND	1700	0	0	0	SF	44	E	^57737	CHRYS 1-5%	$11.20	$19,040	$2.40	$4,080	$23,120.00
NASM	RM 3758	DRYWALL JOINT COMPOUND	1880	0	0	0	SF	85	E	^57737	CHRYS 1-5%	$11.20	$21,056	$2.40	$4,512	$25,568.00
NASM	RM 3763	DRYWALL JOINT COMPOUND	400	0	0	0	SF	149	E	^57737	CHRYS 1-5%	$11.20	$4,480	$2.40	$960	$5,440.00
NASM	RM 3764	DRYWALL JOINT COMPOUND	300	0	0	0	SF	83	E	^57737	CHRYS 1-5%	$11.20	$3,360	$2.40	$720	$4,080.00
NASM	RM 3765	DRYWALL JOINT COMPOUND	420	0	0	0	SF	209	E	^57737	CHRYS 1-5%	$11.20	$4,704	$2.40	$1,008	$5,712.00
NASM	RM 3767	DRYWALL JOINT COMPOUND	950	0	0	0	SF	81	E	^57737	CHRYS 1-5%	$11.20	$10,640	$2.40	$2,280	$12,920.00
NASM	RM 3768	DRYWALL JOINT COMPOUND	620	0	0	0	SF	147	E	^57737	CHRYS 1-5%	$11.20	$6,944	$2.40	$1,488	$8,432.00
NASM	RM 3768A	DRYWALL JOINT COMPOUND	365	0	0	0	SF	79	E	^57737	CHRYS 1-5%	$11.20	$4,088	$2.40	$876	$4,964.00
NASM	RM 3771	DRYWALL JOINT COMPOUND	510	0	0	0	SF	179	E	^57737	CHRYS 1-5%	$11.20	$5,712	$2.40	$1,224	$6,936.00
NASM	RM 3773	DRYWALL JOINT COMPOUND	340	0	0	0	SF	75	E	^57737	CHRYS 1-5%	$11.20	$3,808	$2.40	$816	$4,624.00
NASM	RM 3774	DRYWALL JOINT COMPOUND	300	0	0	0	SF	195	E	^57737	CHRYS 1-5%	$11.20	$3,360	$2.40	$720	$4,080.00
NASM	RM 3775	DRYWALL JOINT COMPOUND	400	0	0	0	SF	73	E	^57737	CHRYS 1-5%	$11.20	$4,480	$2.40	$960	$5,440.00
NASM	RM 3776	DRYWALL JOINT COMPOUND	360	0	0	0	SF	143	E	^57737	CHRYS 1-5%	$11.20	$4,032	$2.40	$864	$4,896.00
NASM	RM 3777	DRYWALL JOINT COMPOUND	1510	0	0	0	SF	71	E	^57737	CHRYS 1-5%	$11.20	$16,912	$2.40	$3,624	$20,536.00
NASM	RM 3779	DRYWALL JOINT COMPOUND	640	0	0	0	SF	141	E	^57737	CHRYS 1-5%	$11.20	$7,168	$2.40	$1,536	$8,704.00
NASM	RM 3783	DRYWALL JOINT COMPOUND	660	0	0	0	SF	67	E	^57737	CHRYS 1-5%	$11.20	$7,392	$2.40	$1,584	$8,976.00
NASM	RM 3784	DRYWALL JOINT COMPOUND	350	0	0	0	SF	203	E	^57737	CHRYS 1-5%	$11.20	$3,920	$2.40	$840	$4,760.00
NASM	RM 3785	DRYWALL JOINT COMPOUND	350	0	0	0	SF	47	E	^57737	CHRYS 1-5%	$11.20	$3,920	$2.40	$840	$4,760.00
NASM	RM 3786	DRYWALL JOINT COMPOUND	350	0	0	0	SF	207	E	^57737	CHRYS 1-5%	$11.20	$3,920	$2.40	$840	$4,760.00
NASM	RM 3787	DRYWALL JOINT COMPOUND	350	0	0	0	SF	45	E	^57737	CHRYS 1-5%	$11.20	$3,920	$2.40	$840	$4,760.00
NASM	RM 3788	DRYWALL JOINT COMPOUND	350	0	0	0	SF	43	E	^57737	CHRYS 1-5%	$11.20	$3,920	$2.40	$840	$4,760.00
NASM	RM 3789	DRYWALL JOINT COMPOUND	350	0	0	0	SF	80	E	^57737	CHRYS 1-5%	$11.20	$3,920	$2.40	$840	$4,760.00
NASM	RM 3790	DRYWALL JOINT COMPOUND	400	0	0	0	SF	78	E	^57737	CHRYS 1-5%	$11.20	$4,480	$2.40	$960	$5,440.00
NASM	RM2064	DRYWALL JOINT COMPOUND	1365	0	0	0	SF	283	F	^57734	CHRYS 1-5%	$11.20	$15,288	$2.40	$3,276	$18,564.00

Level 3

Figure 1. Smithsonian Institution - Summary of ACM at National Air and Space Museum

BLDG	ROOM	Material Type	SUMMARY OF QUANTITIES: Total Quant.	Exposed Quant.	Damaged Quantity	Expose Damage	Unit of Measure	Haz. Prior.	Resp. Code	Repr. Sample No.	Sample Conc.	Est. Unit Removal Cost	Est. Total Removal Cost	Est. Unit Repl. Cost	Est. Total Repl. Cost	Estimated Cost of Removal and Re-insulation

^ This sample was not collected in the room number shown, but is representative of the ACM in the room.
A Indicates sample taken from floor tile material.
B Indicates sample taken from floor tile mastic.

Legend:
CompServ - Computer Services
DirKit - Director's Office Kitchen
LibEnt - Library Entrance
LibRdRm - Library Reading Room
LibSStk - Library South Stacks
LibNStk - Library North Stacks

Response Codes:
A - Remove immediately
B - Remove as soon as possible
C - Schedule removal
D - Repair or encapsulate
E - Monitor
F - No immediate action

nasmlev3.

Roof

Figure 1. Smithsonian Institution - Summary of ACM at National Air and Space Museum

BLDG	ROOM	Material Type	SUMMARY OF QUANTITIES: Total Quant.	Exposed Quant.	Damaged Quantity	Expose Damage	Unit of Measure	Haz. Prior.	Resp. Code	Repr Sample No.	Sample Conc.	Est. Unit Removal Cost	Est. Total Removal Cost	Est. Unit Repl. Cost	Est. Total Repl. Cost	Estimated Cost of Removal and Re-insulation
NASM	ROOF	ROOFING CANT	792	792	0	0	LF	6	E	78409	CHRYS 10-15%	$8.40	$6,653	$1.80	$1,426	$8,078.40

^ This sample was not collected in the room number shown, but is representative of the ACM in the room.
A Indicates sample taken from floor tile material.
B Indicates sample taken from floor tile mastic.

Response Codes:
A - Remove immediately
B - Remove as soon as possible
C - Schedule removal
D - Repair or encapsulate
E - Monitor
F - No immediate action

nasmroof.

Versar INC

TABLE 1

SUMMARY OF BULK SAMPLES COLLECTED IN THE NATIONAL AIR AND SPACE MUSEUM

Sample Number	Sample Location	Material Description	Asbestos Content
77281*	Parking Garage	Sprayed on Fireproofing	ND (None Detected)
77282	Parking Garage	Sprayed on Fireproofing	ND
77283	Parking Garage	Sprayed on Fireproofing	ND
77284	Parking Garage	Sprayed on Fireproofing	ND
77285	Parking Garage	Sprayed on Fireproofing	ND
77286	Parking Garage	Sprayed on Fireproofing	ND
77287	Parking Garage	Sprayed on Fireproofing	ND
77288A	Garage/Employee Break Area	Floor Tile	ND
77288B	Garage/Employee Break Area	Floor Tile Mastic	ND
77289A	Garage/Employee Break Area	Floor Tile	ND
77289B	Garage/Employee Break Area	Floor Tile Mastic	ND
77290A	Garage/Employee Break Area	Floor Tile	ND
77290B	Garage Employee Break Area	Floor Tile Mastic	ND
77291A	Garage/Gym Entrance	Floor Tile	1-5% Chrysotile
77291B	Garage/Gym Entrance	Floor Tile Mastic	ND
77292A	Garage/Security Office Hallway	Floor Tile	1-5% Chrysotile
77292B	Garage/Security Office Hallway	Floor Tile Mastic	ND
77293A	Garage/Loading Dock Hallway	Floor Tile	ND
77293B	Garage/Loading Dock Hallway	Floor Tile Mastic	ND
77294	Room P302	Ceiling Tile	ND
77295*	Room P302	Ceiling Tile	ND
77296	Stair #6/Level 2	Drywall	ND
77297	Stair #6/Level 2	Drywall	ND
72298	Room 3133/Library	Ceiling Tile	ND
57924	Room 3133/Library	Ceiling Tile	ND

* QC Samples

Versar INC

TABLE 1 (Cont.)

SUMMARY OF BULK SAMPLES COLLECTED IN THE AIR AND SPACE MUSEUM

Sample Number	Sample Location	Material Description	Asbestos Content
57925	Vertical Shaft/ Adjacent to Rm 3537	Sprayed on Fireproofing	ND
57926	Vertical Shaft/ Adjacent to Rm 3537	Sprayed on Fireproofing	ND
57927	Vertical Shaft/ Adjacent to Rm 3537	Sprayed on Fireproofing	ND
57928*	Vertical Shaft/ Adjacent to Rm 3537	Sprayed on Fireproofing	ND
57929	Vertical Shaft/ Adjacent to Rm 3537	Sprayed on Fireproofing	ND
57930	Vertical Shaft/ Adjacent to Rm 3537	Sprayed on Fireproofing	ND
57931	Vertical Shaft/ Adjacent to Rm 3537	Sprayed on Fireproofing	ND
57932	Stair #6/Level 1	Drywall Joint Compound	1-2% Chrysotile
57933	Stair #5/level 3	Drywall	ND
57934	Roof/Above Stair #5	Flashing	ND
57935	Roof/South Perimeter Wall	Roofing Cant	ND
57936	Stair #2/Level 1	Drywall Joint Comp.	< 1% Chrysotile
57937	Stair #1/Level 1	Drywall	ND
57938	Gallery #104/Level 1	Tread Mastic	ND
57939	Gallery #104/Level 1	Tread Mastic	ND
57940	Gallery #104/Level 1	Cove Mastic	ND
57941	Gallery #100/Wall Penetration	Truss Gasket	ND
57942	Gallery #100/Ceiling	Skylight Gasket	5-10% Chrysotile
57943	Gallery #108/Ceiling	Ceiling Tile	ND
57994	Gallery #108/Ceiling	Ceiling Tile	ND
57995	Langley Theatre/ Level 1	Peg Board	ND
57996	Langley Theatre Proj. Booth	Wall Plaster	ND
57997	Langley Theater Proj. Booth	Wall Plaster	ND
57998	Langley Theater Proj. Booth	Wall Plaster	ND
57734	Gallery 209/Level 2	Drywall Joint Compound	1-5% Chrysotile

* QC Samples

Versar INC

TABLE 1 (Cont.)

SUMMARY OF BULK SAMPLES COLLECTED IN THE AIR AND SPACE MUSEUM

Sample Number	Sample Location	Material Description	Asbestos Content
57735	Rm P402/Parking Garage Chiller Room	Pipe Penetration Gasket	65-70% Chrysotile
57736	Corridor 3400 Above Ceiling	Red Duct Mastic	10-15% Chrysotile
57737	Corridor 3300	Drywall Joint Compound	1-5% Chrysotile
57738	Rm 3748	Drywall Joint Compound	ND
57739	Rm 3774	Ceiling Tile	ND
57740	Library/Rm 3120	Drywall Joint Compound	ND
57741	Parking Garage	Pipe Hangar Support Pad	ND
57742	Parking Garage	Pipe Hangar Support Pad	ND
57743	Parking Garage	Pipe Hangar Support Pad	ND
57744	Parking Garage/Rm P301	H_2O Tank Insulation	ND
57745	Parking Garage/Rm P301	H_2O Tank Insulation	Void
57746*	Parking Garage	Grey Pipe Mastic	ND
57747A	Rm P719	Floor Tile	1-3% Chrysotile
57747B	Rm P719	Floor Tile Mastic	ND
57748	Mezzanine Level Offices	Drywall Joint Compound	1-5% Chrysotile
57749	Gallery #207/SW Corner	Drywall Joint Compound	1-5% Chrysotile
78401	Gallery #206/Entrance	Drywall Joint Compound	1-5% Chrysotile
78402	Rm P405	Pipe Insulation/Straight	ND
78403	Rm P405	Pipe Insulation/Valve	ND
78404	Rm P405	Pipe Insulation/Elbow	ND
78405	Rm P405	Pipe Insulation/Straight	ND
78406A	Parking Level Kitchen Addition	Floor Tile	ND
78406B	Parking Level Kitchen Addition	Floor Tile Mastic	ND
78407	Parking Level Kitchen Addition	Ceiling Tile	ND
78408	Roof/Cooling Tower Well	Flashing	ND
78409	Roof/Over Connecting Hall	Roofing Cant	10-15% Chrysotile
78410	Museum Shop	Ceiling Plaster	ND
78411	Museum Shop	Ceiling Plaster	ND
78412	Museum Shop	Ceiling Plaster	ND
78413	Planetarium	Partition Plaster	ND

* QC Samples

Versar INC

TABLE 1 (Cont.)

SUMMARY OF BULK SAMPLES COLLECTED IN THE AIR AND SPACE MUSEUM

Sample Number	Sample Location	Material Description	Asbestos Content
78414A	Rm 3346	Floor Tile	1-5% Chrysotile
78414B	Rm 3346	Floor Tile Mastic	ND
78415A	Level 3 Kitchen/ Rm 3757	Grey Floor Tile	ND
78415B	Level 3 Kitchen/ Rm 3757	Grey Floor Tile Mastic	ND
78416A	Level 3 Kitchen/ Rm 3757	White Floor Tile	ND
78416B	Level 3 Kitchen/ Rm 3757	White Floor Tile	ND

* QC Samples

Versar INC

TABLE 2

SUMMARY OF FLOORING MATERIALS SAMPLED IN THE NATIONAL AIR AND SPACE MUSEUM

Sample Number	Sample Location	Material Description	Asbestos Content
77288A	Garage/Employee Break Area	Floor Tile	ND
77288B	Garage/Employee Break Area	Floor Tile Mastic	ND
77289A	Garage/Employee Break Area	Floor Tile	ND
77289B	Garage/Employee Break Area	Floor Tile Mastic	ND
77290A	Garage/Employee Break Area	Floor Tile	ND
77290B	Garage Employee Break Area	Floor Tile Mastic	ND
77291A	Garage/Gym Entrance	Floor Tile	1-5% Chrysotile
77291B	Garage/Gym Entrance	Floor Tile Mastic	ND
77292A	Garage/Security Office Hallway	Floor Tile	1-5% Chrysotile
77292B	Garage/Security Office Hallway	Floor Tile Mastic	ND
77293A	Garage/Loading Dock Hallway	Floor Tile	ND
77293B	Garage/Loading Dock Hallway	Floor Tile Mastic	ND
57938	Gallery #104/Level 1	Tread Mastic	ND
57939	Gallery #104/Level 1	Tread Mastic	ND
57747A	Rm P719	Floor Tile	1-3% Chrysotile
57747B	Rm P719	Floor Tile Mastic	ND
78406A	Parking Level Kitchen Addition	Floor Tile	ND
78406B	Parking Level Kitchen Addition	Floor Tile Mastic	ND
78414A	Rm 3346	Floor Tile	1-5% Chrysotile
78414B	Rm 3346	Floor Tile Mastic	ND
78415A	Level 3 Kitchen/ Rm 3757	Grey Floor Tile	ND
78415B	Level 3 Kitchen/ Rm 3757	Grey Floor Tile Mastic	ND

* QC Samples

Versar INC

TABLE 2 (Cont.)

SUMMARY OF FLOORING MATERIALS SAMPLED IN THE NATIONAL AIR AND SPACE MUSEUM

Sample Number	Sample Location	Material Description	Asbestos Content
78416A	Level 3 Kitchen/ Rm 3757	White Floor Tile	ND
78416B	Level 3 Kitchen/ Rm 3757	White Floor Tile	ND

* QC Samples

Versar INC

TABLE 3

SUMMARY OF DRYWALL MATERIALS SAMPLED IN THE NATIONAL AIR AND SPACE MUSEUM

Sample Number	Sample Location	Material Description	Asbestos Content
77296	Stair #6/Level 2	Drywall	ND
77297	Stair #6/Level 2	Drywall	ND
57932	Stair #6/Level 1	Drywall Joint Compound	1-2% Chrysotile
57933	Stair #5/level 3	Drywall	ND
57936	Stair #2/Level 1	Drywall Joint Comp.	< 1% Chrysotile
57937	Stair #1/Level 1	Drywall	ND
57734	Gallery 209/Level 2	Drywall Joint Compound	1-5% Chrysotile
57737	Corridor 3300	Drywall Joint Compound	1-5% Chrysotile
57738	Rm 3748	Drywall Joint Compound	ND
57740	Library/Rm 3120	Drywall Joint Compound	ND
57748	Mezzanine Level Offices	Drywall Joint Compound	1-5% Chrysotile
57749	Gallery #207/SW Corner	Drywall Joint Compound	1-5% Chrysotile
78401	Gallery #206/Entrance	Drywall Joint Compound	1-5% Chrysotile

* QC Samples

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TABLE 4

SUMMARY OF PLASTER MATERIALS SAMPLED IN THE NATIONAL AIR AND SPACE MUSEUM

Sample Number	Sample Location	Material Description	Asbestos Content
57996	Langley Theatre Proj. Booth	Wall Plaster	ND
57997	Langley Theater Proj. Booth	Wall Plaster	ND
57998	Langley Theater Proj. Booth	Wall Plaster	ND
78410	Museum Shop	Ceiling Plaster	ND
78411	Museum Shop	Ceiling Plaster	ND
78412	Museum Shop	Ceiling Plaster	ND
78413	Planetarium	Partition Plaster	ND

* QC Samples

Versar INC

TABLE 5

SUMMARY OF INSULATING MATERIALS SAMPLED IN THE NATIONAL AIR AND SPACE MUSEUM

Sample Number	Sample Location	Material Description	Asbestos Content
57741	Parking Garage	Pipe Hangar Support Pad	ND
57742	Parking Garage	Pipe Hangar Support Pad	ND
57743	Parking Garage	Pipe Hangar Support Pad	ND
57744	Parking Garage/Rm P301	H_2O Tank Insulation	ND
57745	Parking Garage/Rm P301	H_2O Tank Insulation	Void
78402	Rm P405	Pipe Insulation/Straight	ND
78403	Rm P405	Pipe Insulation/Valve	ND
78404	Rm P405	Pipe Insulation/Elbow	ND
78405	Rm P405	Pipe Insulation/Straight	ND

* QC Samples

Versar INC

TABLE 6

SUMMARY OF FIREPROOFING MATERIALS SAMPLED IN THE NATIONAL AIR AND SPACE MUSEUM

Sample Number	Sample Location	Material Description	Asbestos Content
77281*	Parking Garage	Sprayed on Fireproofing	ND (None Detected)
77282	Parking Garage	Sprayed on Fireproofing	ND
77283	Parking Garage	Sprayed on Fireproofing	ND
77284	Parking Garage	Sprayed on Fireproofing	ND
77285	Parking Garage	Sprayed on Fireproofing	ND
77286	Parking Garage	Sprayed on Fireproofing	ND
77287	Parking Garage	Sprayed on Fireproofing	ND
57925	Vertical Shaft/ Adjacent to Rm 3537	Sprayed on Fireproofing	ND
57926	Vertical Shaft/ Adjacent to Rm 3537	Sprayed on Fireproofing	ND
57927	Vertical Shaft/ Adjacent to Rm 3537	Sprayed on Fireproofing	ND
57928*	Vertical Shaft/ Adjacent to Rm 3537	Sprayed on Fireproofing	ND
57929	Vertical Shaft/ Adjacent to Rm 3537	Sprayed on Fireproofing	ND
57930	Vertical Shaft/ Adjacent to Rm 3537	Sprayed on Fireproofing	ND
57931	Vertical Shaft/ Adjacent to Rm 3537	Sprayed on Fireproofing	ND

* QC Samples

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TABLE 7

SUMMARY OF CEILING TILE SAMPLED IN THE NATIONAL AIR AND SPACE MUSEUM

Sample Number	Sample Location	Material Description	Asbestos Content
77294	Room P302	Ceiling Tile	ND
77295*	Room P302	Ceiling Tile	ND
72298	Room 3133/Library	Ceiling Tile	ND
57924	Room 3133/Library	Ceiling Tile	ND
57943	Gallery #108/Ceiling	Ceiling Tile	ND
57994	Gallery #108/Ceiling	Ceiling Tile	ND
57739	Room 3774	Ceiling Tile	ND
78407	Parking Level Kitchen Addition	Ceiling Tile	ND

* QC Samples

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TABLE 8

SUMMARY OF ROOFING MATERIALS SAMPLED IN THE NATIONAL AIR AND SPACE MUSEUM

Sample Number	Sample Location	Material Description	Asbestos Content
57934	Roof/Above Stair #5	Flashing	ND
57935	Roof/South Perimeter Wall	Roofing Cant	ND
78408	Roof/Cooling Tower Well	Flashing	ND
78409	Roof/Over Connecting Hall	Roofing Cant	10-15% Chrysotile

* QC Samples

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TABLE 9

SUMMARY OF MASTIC AND GASKET MATERIALS SAMPLED IN THE NATIONAL AIR AND SPACE MUSEUM

Sample Number	Sample Location	Material Description	Asbestos Content
57940	Gallery #104/Level 1	Cove Mastic	ND
57941	Gallery #100/Wall Penetration	Truss Gasket	ND
57735	Rm P402/Parking Garage	Pipe Penetration Gasket	65-70% Chrysotile
57736	Corridor 3400 Above Ceiling	Red Duct Mastic	10-15% Chrysotile
57746*	Parking Garage	Grey Pipe Mastic	ND

* QC Samples

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FIGURE 2

DRAWINGS

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Surfacing Materials

6.1.1 Wall Plaster

Two types of plaster were observed in the NASM. The plaster wall was sampled randomly under the Theatre projection room and was found not to contain asbestos (samples 57996, 57997, 57998). Partitions on the planetarium viewing level (level 2) are covered with carpeting but are plaster underneath. This material was also sampled and does not contain asbestos (sample 78413).

6.1.2 Troweled on Ceiling Plaster

The perimeter sections of the museum store ceiling on level 1 is finished with troweled on plaster. Three samples (78410, 78411, 78412) were collected randomly from this material and do not contain asbestos.

6.1.3 Sprayed on Fireproofing

Two types of sprayed on fireproofing were observed in the NASM. The first type is located inside a vertical shaft. This shaft extends the entire height of the building and is parallel (on level 3) to the cooling tower pit on the roof. Access is gained in room 3537. The material was sampled randomly and found not to contain asbestos (samples 57924 - 57931). Similarly, seven samples of fireproofing throughout the garage level were also collected and results were negative for asbestos (samples 77281 - 77287). Elevator shafts do not contain sprayed on fireproofing.

6.2 Thermal System Insulation

6.2.1 Pipe Insulation

Room P405 contains steam vessels which are not insulated with fiberglass. Four samples of this insulation were collected (samples 78402 - 78405) and were found not to contain asbestos. Straight pipe runs in the garage, while insulated with fiberglass, contain hard, pipe hanger support pads on the underside of the pipe where hangars make contact. This material was sampled (57741, 57742, 57743) and does not contain asbestos. Other observed pipe insulation in the NASM is fiberglass.

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6.2.2 Tank Insulation

Room P301 contains a suspended hot water tank over an emergency generator. Versar collected two samples of this insulation (57744, 57745) and it was found not to contain asbestos. Other tanks observed in the NASM are insulated with fiberglass.

6.2.3 Duct Insulation Mastic

Two types of duct mastic were observed throughout the NASM. One type is grey in color and does not contain asbestos (sample 57746). The second type of duct mastic is red in color and a sample (57736) was collected above the drop ceiling in corridor 3400. This sample did contain 10-15% chrysotile asbestos.

Recommendations: Red duct mastic is found throughout the NASM. It is brushed/painted on duct work seams in strips from 5" to 6" in width and rarely thicker than 1/8". This material is not friable. Versar observed this mastic on ducts and air handling units in the garage ceiling, loading dock ceiling, mechanical room duct work, above the Langley Theatre ceiling, and on six inch diameter distribution ducts above the suspended ceilings in the administrative areas on the mezzanine and level three offices. This material above suspended ceilings was not quantified on the mezzanine or level three due to the destructive nature of moving the suspended ceiling tiles. This mastic should be included in the building's O&M plan and monitored for change in its condition. Maintenance and custodial personnel should be informed of the presence of this ACM and instructed not to disturb it (Response Code E).

6.3 Miscellaneous Materials

6.3.1 Vinyl Floor Tile, Floor Tile Mastic

Eleven different vinyl floor tiles and associated mastic compounds were observed and sampled by Versar in the NASM. Room 3346 contains 100 square feet of asbestos containing floor tile while the mastic adhering it to the floor does not. Sample 78414A of this tile contained 1-5% chrysotile while the mastic (sample 78414B) was negative. The employee food service area in room 3757 contains two separate floor tile types, neither of which contain asbestos. Samples 78415A, 78415B (mastic), 78416A, and 78416B (mastic) all were analyzed and no asbestos was detected.

On the garage level, floor tile was sampled in the kitchen addition at the east end of the building. Sample 78406A and 78406B (mastic) both resulted in no asbestos detected. Room

P719 has 558 square feet of vinyl asbestos tile. Sample 57747A of this tile was analyzed and found to contain 1-3% chrysotile asbestos while none was detected in the mastic (sample 57747B). Also on the garage level, behind the main elevator in the employee break area, three types of vinyl floor tile and associated mastics were sampled. Samples 77288A, 77288B, 77289A, 77289B, 77290A and 77290B of these materials were analyzed and all resulted in no asbestos detected.

Identical floor tile in front of the employee gymnasium entrance, in the police locker rooms, halls leading to elevators 4 and 5, and security offices (sample 77291A) contains 1-5% chrysotile asbestos while the associated mastic does not (sample 77291B). There is 1682 square feet of this material. In the hallway leading to the security offices, floor tile was found to contain 1-5% chrysotile (sample 77292A) while the mastic was analyzed and no asbestos was detected. There is 225 square feet of this material. Finally, floor tile and mastic in the loading dock hallway was sampled (samples 77293A and 77293B, respectively) and found not to contain asbestos.

Recommendations: Floor tile in rooms P703A, P704, P705, P719A, elevators 4 and 5 lobby (parking level), security hallway, employee gymnasium entrance and room 3346 is nonfriable and undamaged. It is unlikely to release asbestos fibers under normal usage activities. These ACM should be included in the O&M Plan and monitored for change in their condition (Response Code E). Maintenance and custodial personnel should be informed of its presence and instructed not to use abrasive methods while cleaning these tiles.

6.3.2 Acoustical Ceiling Tile

Versar observed and sampled two types of ceiling tile in room P302 (samples 77294, 77295). Neither sample contained asbestos. In room 3133, the museum library, two samples of the ceiling tile (identical material) were collected and analyzed. Neither sample contained asbestos (samples 72298 and 57924). In gallery 108, the main entrance from Independence Avenue, two types of ceiling tile were sampled and found not to contain asbestos (samples 57943, 57994). The ceiling tile in room 3774 was also sampled and does not contain asbestos (sample 57739). Finally, the ceiling tile in the parking level kitchen addition (sample 78407) was sampled and also does not contain asbestos.

6.3.3 Roofing Materials

The roof of the NASM consists of three separate elevations. Representative samples of perimeter roofing cant and flashing were collected. Interior built up roofing materials (roofing tar and base materials) were not sampled due to the destructive nature involved in the extraction

process. Samples 57934 and 57935 were collected from the roof platform accessed by stairway #5 (flashing and perimeter cant). Both samples did not contain asbestos. Flashing at the base of the cooling tower well was also sampled (78408) and did not contain asbestos. Roofing cant over connecting hallways 3200, 3400 and 3600, however, contains 10-15% chrysotile (sample 78409) and occupies 792 linear feet.

Recommendations: The nonfriable perimeter roofing cant is in good condition and has a low potential for contact and exposure due to its limited accessibility. Maintenance personnel should be informed of its presence and instructed not to disturb it. The material should be included in the building's O&M Plan and monitored for change in its condition (Response Code E).

6.3.4 Mastic Compounds

In addition to floor tile and duct mastics, Versar observed and sampled three additional mastic compounds. These included cove mastic under the baseboard in gallery 104, mastic under vinyl floor tread in gallery 104 and mastic under vinyl step tread (stairs) also in gallery 104 (samples 57940, 57938, and 57939, respectively). None of these samples contained asbestos.

6.3.5 Gasket Materials

Versar identified and sampled three gasket materials for asbestos content in the NASM. Trusses supporting the skylight ceilings above the galleries are anchored into penetrations in the block walls. These penetrations/holes are sealed with a material that did not contain asbestos (sample 57941). The actual skylight plexiglass sheets of this ceiling are bordered by a gasket material that contains 5-10% chrysotile (sample 57942). This material is found in ten foot sections that are 2 inches in width and separate the individual squares of plexiglass. There is a total of approximately 9850 linear feet of this material in the NASM. It is located in exhibit galleries 100, 102, 106, 108, 110, 114, the library reading room and room 3755.

Recommendations: Skylight gasket material is nonfriable, undamaged and has a low potential for occupant contact. This material should be included in the NASM O&M Plan and monitored for change in its condition. Maintenance and custodial personnel should be informed of its presence and instructed not to disturb it (Response Code E).

On the parking garage level there is a rope gasket material which has been used to stuff pipe penetrations into walls of various rooms. It occupies the space between the pipe and the wall it is passing through. Versar sampled this material (sample 57735) and found it contains 65-

70% chrysotile asbestos. Room P606 has 20 linear feet of this material, room P405-15 linear feet, room P204-12 linear feet, room P102 - 15 linear feet and the main chiller room - 70 linear feet.

Recommendations: Pipe penetration rope gasket is friable and has a high asbestos content. Any slight disturbance of this material would result in fiber release. It should be removed as soon as possible by a licensed abatement contractor (Response Code B).

6.3.6 Peg Board

Peg board behind the screen in the Langley Theatre was sampled and found not to contain asbestos (sample 57995).

6.3.7 Drywall and Drywall Joint Compound

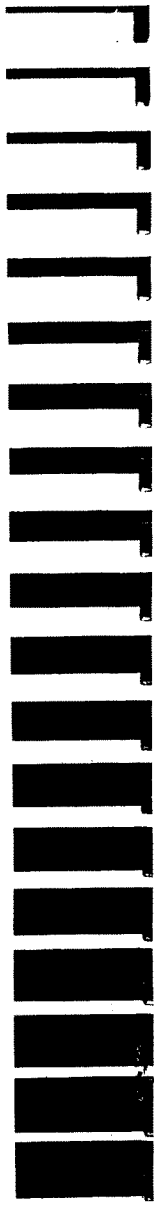
Drywall and drywall joint compound is found throughout the NASM. Versar collected four samples of drywall material and no asbestos was detected in these samples (77296, 77297, 57933 and 57937). Nine samples of the drywall joint compound were also collected. Samples 57932 (1-2% chrysotile), 57734 (1-5% chrysotile), 57737 (1-5% chrysotile), 57748 (1-5% chrysotile), 57749 (1-5% chrysotile) and 78401 (1-5% chrysotile) all contained asbestos. Samples 57936, 57738 and 57740 did not contain asbestos. Versar was informed these were collected from renovated areas but this could not be confirmed. Drywall and joint compound in the restaurant addition (1988) was not sampled and is considered not to contain asbestos.

Versar considers the drywall to be a nonasbestos containing building material. Versar does, however, consider the drywall joint compound to be an ACM. Because it is impossible to distinguish joint compound visually, this report quantifies the total drywall on a room by room basis. (Note: Because suspended ceiling tiles could not be moved in the office areas, drywall quantities may exceed these figures in those rooms). Actual joint compound quantities are substantially less than these figures. In addition, renovated sections of the NASM may possess joint compound that is not asbestos containing. The reader should refer to ACM spreadsheets for drywall quantities.

Recommendations: Drywall joint compound is not a friable material nor is it high in asbestos content. It is unlikely to release asbestos fibers during normal building activities or in the absence of physical disturbance. The majority of this material is classified in Response Code E and therefore should be monitored for change and included in the building's O&M Plan. Twenty-four rooms in the NASM have drywall

Versar INC

joint compound classified in Response Code F for which no action is required at this time. Maintenance and custodial personnel should be alerted to the presence of this material and instructed not to disturb it.



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The CHAIRMAN. And I ask unanimous consent to keep the record open to receive additional statements and material, to include answers to additional written questions members may wish to submit to the Smithsonian or to our witnesses present today.

Thank you, appreciate it.

This hearing is now adjourned.

[Whereupon, at 3:35 p.m., the committee was adjourned.]

ROBERT A. BRADY, PENNSYLVANIA
CHAIRMAN

DANIEL E. LUNGREN, CALIFORNIA
RANKING MINORITY MEMBER

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April 30, 2009

Dr. G. Wayne Clough
Secretary
Smithsonian Institution
P.O. Box 37012 MRC 016
Washington, DC 20013-7012

Dear Secretary Clough:

Thank you for testifying at the Committee's April 1 hearing on asbestos in the Smithsonian. As noted at the time, the Committee has some additional written questions that will be made part of the hearing record. Please provide your responses by the close of business on May 20, 2009.

1. When did you first learn about the complaints about safety practices at the National Air and Space Museum?
2. Have you heard similar complaints regarding other facilities of the Smithsonian?
3. Have you conducted an investigation to determine why NASM staff was not informed about the presence of asbestos for so long? Who should have told them? Are the persons responsible for this failure still employed at the Smithsonian?
4. Does each museum operate independently in implementing hazardous materials policies? How do you review the relative performance of the various facilities?
5. Who is the "independent outside workplace safety expert" mentioned in your testimony who will conduct oversight of asbestos safety practices?
6. Who will conduct the "independent assessment" of the Smithsonian's annual environmental safety assessments mentioned in your testimony, "to doubly reassure the public that the museums are safe?"

7. Another witness at our hearing testified that the Smithsonian's testing was inadequate since it did not test for possible inhalation levels during normal business days and for people performing normal activities in the museums. Do you have plans to conduct such testing?
8. How many "safety coordinators" do you have at Smithsonian facilities? What is their training, and who supervises them?
9. What specific training is required for the staff who teach asbestos safety courses in the Smithsonian?
10. Do you have any statistics about how many workers at the Smithsonian have contracted asbestosis?
11. If an employee comes to Air and Space management asking permission to bring an independent company into the Museum to do a study on asbestos, how would management handle that request?
12. Your statement says that "for the past year, the museum's exhibition production staff has followed OSHA-approved work practices when cutting into walls that contain asbestos in the joint compound." Did prior-year practices violate OSHA regulations?
13. What actions is the Smithsonian taking to ensure proper supervision of outside contractors?
14. In July, 2008, just as you were taking office, the Smithsonian was cited for three asbestos-related violations by OSHA. When did you find out about this? What was done about the July 2008 OSHA citations? How do the July citations differ from the April 9 and April 10 OSHA violations mentioned in your testimony?
15. How many asbestos awareness training sessions have been held for Smithsonian staff since 1992, how many staff were trained, and at which locations? How does the Smithsonian keep track of the asbestos training statistics?
16. Questions have been raised about the coordination of outside contractors brought into Smithsonian facilities. Who is responsible for supervising

them? Are contractors engaged separately by each facility as needed, or is there a centralized list?

17. Why weren't exhibits production employees required to undergo mandatory asbestos safety training at the same time as carpenters, plumbers, electricians, welders, pipe fitters and others? Was there a misimpression by management of the demands of their particular jobs? Did the exhibits production work come to be seen as potentially more hazardous over time?

18. After the initial Washington Post story appeared, the reporter conducted an online discussion with readers on March 16, 2009, in which he said that "the culture of the [Air and Space] museum was not to wear masks" when disturbing asbestos-containing joint compound. Are workers required to wear masks for such work, and do they in fact do so?

Thank you for your efforts on behalf of the visiting public at the Smithsonian. I look forward to reviewing your responses to these questions. If you require any clarification, please contact Matt Pinkus of the Committee staff at (202) 225-2061.

Sincerely,

Robert A. Brady
Chairman

Cc: Hon. Daniel E. Lungren
Ranking Minority Member

SMITHSONIAN INSTITUTION

"Management of Asbestos and Hazardous Materials at the Smithsonian Institution"

Questions For The Record
May 27, 2009

1. When did you first learn about the complaints about safety practices at the National Air and Space Museum?

   In late February 2008, the National Air and Space Museum (NASM) Exhibits staff was dismantling the exhibit in gallery 113 in preparation for the installation of a new exhibit, including the removal of exhibit displays from the walls. This work was observed by a Smithsonian Office of Safety, Health and Environmental Management (OSHEM) employee, who advised the staff that asbestos containing joint compound might be present in the original walls. OSHEM staff advised the Exhibits staff to suspend work pending verification of the composition of the joint compound and also recommended that the Exhibits staff complete a 2-hour asbestos awareness training session. That two-hour asbestos awareness training was conducted on March 7, 2008 for the NASM Exhibits staff. Subsequently, 24 employees of the NASM Exhibits staff took the Class III Operations and Maintenance 16 hour training course which certified them to perform Class III asbestos work.

   On March 12, 2008, a Notice of Alleged Safety or Health Hazards was issued by the Occupational Safety and Health Administration (OSHA) in response to an employee complaint regarding potential asbestos exposures. The following day, OSHA visited NASM, but no citation resulted from this visit. A second Notice was issued by OSHA on April 9, 2008, again in response to a complaint regarding potential asbestos exposures. OSHA visited NASM on April 9 and 10th. On July 8, OSHA issued SI a citation for: 1) failure to perform an initial exposure assessment for Class III asbestos operations, such as wallboard removal and drilling/cutting of wallboard identified as containing asbestos joint compound, 2) failure to inform employees of the presence and location of asbestos-containing materials before work was conducted in February 2008, and 3) failure to institute a training program for employees conducting Class III asbestos work. On July 30, OSHA provided an "informal settlement agreement" indicating that all cited conditions in these notices had been corrected at the time of the April 9th and 10th inspections.

2. Have you heard similar complaints regarding other facilities of the Smithsonian?

   We are not aware of complaints about asbestos safety practices at other Smithsonian facilities.

. Have you conducted an investigation to determine why NASM staff was not informed about the presence of asbestos for so long? Who should have told them? Are the persons responsible for this failure still employed at the Smithsonian?

The Versar asbestos survey was distributed to museum directors in 1992. All senior managers in place at NASM at that time have either resigned or retired. Therefore, we are unable to reconstruct the chain of events at that time. A 2007 Management Evaluation and Technical Review (METR) report noted the need to include all NASM staff who may access materials and building components that contain asbestos in Asbestos Awareness training which led to training in 2008, Prior to that time, NASM exhibits production staff had not been included in the SI-wide asbestos awareness training. However, were we to receive the information from the 1992 report today, the Director would develop a communications plan to inform staff, arrange appropriate training for targeted staff, ensure compliance with Smithsonian Directive 419, conduct periodic monitoring, and all work would be performed with appropriate supervision. A re-survey of asbestos-containing materials throughout the SI is currently underway and is scheduled for completion by the fall of this year. NASM was inspected in March and a draft of the report is being reviewed. All survey reports will be shared with SI staff.

ł. Does each museum operate independently in implementing hazardous materials policies? How do you review the relative performance of the various facilities?

The Office of Safety, Health and Environmental Management (OSHEM) is tasked with overall direction, planning and technical supervision of the SI Safety Program including annual audits of each line management safety performance. Smithsonian Directive 419, and its accompanying Safety Manual, have always mandated that workplace and employee safety is a line management responsibility, to ensure that each facility Director's program meet the applicable federal regulations and Smithsonian policies, standards and procedures. The Directors of each facility (museum, research and support center) are responsible for implementing an occupational safety program within their facilities, which must be consistent with Smithsonian policy and Safety Manual requirements and best practices, which include compliance with all applicable federal and local regulations. The Directors are mandated by SI policy to hire a safety coordinator, with education and training in allied occupational safety, health, fire protection and environmental management fields. Senior management is also responsible for ensuring that supervisors are adequately supported in, and held accountable for, ensuring that their workplace conditions are assessed for risks and free from recognized hazards through implementation of risk controls, and that employees receive adequate safety training and safety equipment.

Assessments of unit safety program achievements and deficiencies are performed in a variety of ways: by in-house safety committees, by unit safety coordinators, and by OSHEM teams annually through the Management Evaluation and Technical Review. Results of all safety inspections and program assessments must be assigned a risk priority code and promptly corrected by the facility within a specified time frame to eliminate or significantly reduce the risk situation. Review of asbestos management, specifically, is based against the requirements of Chapter 22 of the SI Safety Manual.

5. Who is the "independent outside workplace safety expert" mentioned in your testimony who will conduct oversight of asbestos safety practices?

   The scope of work for this contract has been developed. The SI is proceeding with the competitive contract acquisition and award process to obtain an independent outside occupational safety, health, and environmental management expert.

6. Who will conduct the "independent assessment" of the Smithsonian's annual environmental safety assessments mentioned in your testimony, "to doubly reassure the public that the museums are safe?"

   The scope of work for the contract has been developed. The SI is proceeding with the competitive contract acquisition and award process to obtain an independent outside occupational safety, health, and environmental management expert.

7. Another witness at our hearing testified that the Smithsonian's testing was inadequate since it did not test for possible inhalation levels during normal business days and for people performing normal activities in the museums. Do you have plans to conduct such testing?

   We do not agree with the testimony of the witness that the testing conducted at NASM was inadequate. The Environmental Protection Agency (EPA) does not recommend or require such random testing of any public space. In accordance with all EPA and OSHA requirements, general area and personal air monitoring is performed during all asbestos abatement projects throughout the SI to verify the efficacy of asbestos safe work practice and engineering controls in safeguarding against asbestos fiber migration into non-work areas.

8. How many "safety coordinators" do you have at Smithsonian facilities? What is their training, and who supervises them?

   The SI has 26 safety coordinators in the field (outside of OSHEM), with an additional three vacancies in the process of being filled. They have all had OSHA training and/or they meet the requirements for GS-018 safety professionals, as those requirements are set forth by Office of Personnel Management (OPM) policies. Each safety coordinator is supervised by and reports to the director or a senior level management official in their particular organization.

9. What specific training is required for the staff who teach asbestos safety courses in the Smithsonian?

   Asbestos Hazard Awareness training, required by OSHA standards for employees who are potentially exposed to asbestos hazards, or may work on or around asbestos-containing materials, is conducted by the OSHEM industrial hygiene staff that are also certified as EPA Asbestos Inspectors.

10. Do you have any statistics about how many workers at the Smithsonian have contracted asbestosis?

    One current employee has claimed to have contracted asbestosis, due to his work with asbestos containing material at the National Air and Space Museum; that claim was denied by the Department of Labor and is currently being appealed. Another employee was granted worker's compensation in 1984 for asbestos-related disease. Annual reports from the Department of Labor do not reflect any other asbestos-related worker's compensation payments. We do not have access to employees' medical records outside the worker's compensation system.

11. If an employee comes to Air and Space management asking permission to bring an independent company into the Museum to do a study on asbestos, how would management handle that request?

    No employee has ever requested permission from a National Air and Space Museum Manager to bring in an independent contractor. Should SI management receive such a request, then SI management would work with the employee to ascertain the concern and the reason for the study request. SI management, including OSHEM, would ensure that the employee has adequate knowledge of the asbestos studies that may already have been performed in the area of concern, review the Asbestos Awareness training information, and decide on a course of action to respond to the employee's concerns.

12. Your statement says that "for the past year, the museum's exhibition production staff has followed OSHA-approved work practices when cutting into walls that contain asbestos in the joint compound." Did prior-year practices violate OSHA regulations?

    The Exhibits Production staff has always been provided and were required to use personal protective safety equipment as well as follow safe work practices for normal routine exhibits tasks. Since the Exhibits staff were unaware of the presence of asbestos-containing joint compound in the museum's original perimeter walls (1976), personal protective gear and safe work practices appropriate for work that may have disturbed asbestos containing materials (e.g., drilling / cutting small holes, de-installing and installing new components) was not provided.

13. What actions is the Smithsonian taking to ensure proper supervision of outside contractors?

    Each construction project performed by an outside contractor, including those involving asbestos abatement, is supervised by an SI Contracting Officer's Technical Representative (COTR) from our central Office of Facilities Engineering and Operations (OFEO) who is trained and is knowledgeable of the provisions of the SI specifications, including hazardous materials sections, and has completed, through OSHEM, the 30-hour OSHA Occupational Safety and Health Training Course in Construction Safety and Health Standards.

    All contractors are supervised by a COTR who has been trained by our central Office of Contracting. In the case of construction contractors, the COTR is always from OFEO.

Outside contractor projects first undergo a review by a wide variety of stakeholders, including OSHEM, through the specification and drawing design stages, and then through the construction stages, to ensure that proper specifications are included and adhered to, including a standard specification on Asbestos Abatement, based on National Institute of Building Sciences (NIBS), OSHA, and EPA best-practice industry standards.

14. In July, 2008, just as you were taking office, the Smithsonian was cited for three asbestos-related violations by OSHA. When did you find out about this? What was done about the July 2008 OSHA citations? How do the July citations differ from the April 9 and April 10 OSHA violations mentioned in your testimony?

As described in the answer to question 1, an OSHA compliance officer visited NASM on April 9 and 10 in response to a notice of alleged safety or health hazards. Based on that visit, in July SI was cited for three violations in the category marked "other", which are cited in situations where the accident/incident or illness that would most likely result from a hazardous condition would probably not cause death or serious physical harm, but would have a direct and immediate relationship to the safety and health of employees. There was no date for corrective action because all violations were "corrected during inspection." The July 30 document from OSHA was called an "informal settlement agreement" which confirmed that all corrective actions had been taken. The Secretary was informed of this occurrence recently as he addressed the NASM exhibit production situation.

15. How many asbestos awareness training sessions have been held for Smithsonian staff since 1992, how many staff were trained, and at which locations? How does the Smithsonian keep track of the asbestos training statistics?

Since 1992, over 1700 SI staff have received Asbestos Hazard Awareness training in more than 70 training sessions. Training sessions have been held at all SI facilities, more frequently at those with suspected asbestos-containing building materials. In accordance with SI safety policy and federal regulations, supervisors and facility management must maintain training records for each of their employees. OSHEM maintains records of training it conducts and annually audits each facility to ensure that training is conducted where required and training records are maintained.

16. Questions have been raised about the coordination of outside contractors brought into Smithsonian facilities. Who is responsible for supervising them? Are contractors engaged separately by each facility as needed, or is there a centralized list?

As described in question 13, each construction project performed by an outside contractor, including those involving asbestos abatement, is supervised by an SI Contracting Officer's Technical Representative (COTR) from our central Office of Facilities Engineering and Operations (OFEO) who is trained and is knowledgeable of the provisions of the SI specifications, including hazardous materials sections, and has completed, through OSHEM,

the 30-hour OSHA Occupational Safety and Health Training Course in Construction Safety and Health Standards.

All contracts are entered into by the Office of Contracting (OCON).

17. Why weren't exhibits production employees required to undergo mandatory asbestos safety training at the same time as carpenters, plumbers, electricians, welders, pipe fitters and others? Was there a misimpression by management of the demands of their particular jobs? Did the exhibits production work come to be seen as potentially more hazardous over time?

    As described in question # 3, this was an oversight on our part and is unique to the NASM Exhibit Production staff.

18. After the initial Washington Post story appeared, the reporter conducted an online discussion with readers on March 16, 2009, in which he said that "the culture of the [Air and Space] museum was not to wear masks" when disturbing asbestos-containing joint compound. Are workers required to wear masks for such work, and do they in fact do so?

    It is the responsibility of the supervisor to determine the safety equipment required for each task, in accordance with SI policy. The adequacy of personal protective equipment requirements is assessed on a case-by-case basis depending on the specific task. There are work projects and techniques that do not require the use of masks.

    All NASM staff tasked with jobs that may disturb asbestos-containing materials (such as drywall joint compound) are enrolled in the SI Respiratory protection program and use proper safe work practices (wet methods), engineering controls (HEPA vacuums and equipment) and personal protective equipment (respirators, coveralls, eye protection, etc.) during all asbestos-related tasks. OSHA regulations (29 CFR 1926.1101(f)(2)(iii)), allow for the determination of a negative exposure assessment (NEA) which demonstrates that employee exposures during an operation are expected to be consistently below permissible exposure limits. Respiratory protection is required for Class III operations for which a negative exposure assessment has not been conducted. Extensive monitoring conducted for specific tasks at NASM have yielded personal exposure results significantly below current OSHA permissible exposure limits. The negative exposure assessment (NEA) determination made as a result of these job-specific monitoring episodes has allowed respirator use requirements to be relaxed, however respirator usage is recommended for all such tasks. The Supervisor of asbestos work for Exhibits-related projects always informs OSHEM staff of upcoming projects to enable monitoring of undocumented tasks. This ensures that all safe work practices are followed and verifies the adequacy of personal protective equipment (to include respirators) requirements.