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SPECIAL NUCLEAR MATERIAL PORTAL MONITORING AT THE NEVADA TEST SITE

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ABSTRACT:
Prior to April 2007, acceptance and performance testing of the various Special Nuclear Material (SNM) monitoring devices at the Nevada Test Site (NTS) was performed by the Radiological Health Instrumentation department. Calibration and performance testing on the PM-700 personnel portal monitor was performed, but there was no test program for the VM-250 vehicle portal monitor. The handheld SNM monitors, the TSA model 470B, were being calibrated annually, but there was no performance test program. In April of 2007, the Material Control and Accountability Manager volunteered to take over performance testing of all SNM portal monitors at NTS in order to strengthen the program and meet U.S. Department of Energy Order requirements. This paper will discuss the following activities associated with developing a performance testing program: changing the culture, learning the systems, developing and implementing procedures, troubleshooting and repair, validating the process, physical control of equipment, acquisition of new systems, and implementing the performance test program.

INTRODUCTION:

The Nevada Test Site (NTS) safeguards and security is accomplished by three different contractors: National Security Technologies, LLC (NSTec); Wackenhut Services Incorporated (WSI); and Professional Analysis Incorporated (PAI). There are many challenges to overcome when three different companies have similar and overlapping responsibilities with the same customer, but are very much autonomous organizations with separate visions and goals. Changing the mindset and culture that work could be done by a different group or shared among groups was a new concept. Helping a group complete their work, improving the way work is accomplished, and helping groups work more effectively together in a changing workplace was a huge accomplishment.

Prior to 2005, the NTS Material Control and Accountability (MC&A) department was operated on a part-time basis. MC&A functions were carried out by Radiological Health Instrumentation department and/or the various National Laboratories. In 2005 a permanent NSTec NTS MC&A department was formed, and since that time a fully staffed, compliant program has been established. One particular area of focus for the MC&A department was Special Nuclear Material (SNM) portal monitors.

These monitors are required by U.S. Department of Energy (DOE) Order to detect unshielded SNM. The types of SNM monitors at the NTS include pedestrian portal monitors, vehicle portal monitors, and handheld SNM monitors. The PM-700 model pedestrian portal monitors include a metal detector and X-ray machine that are used to detect SNM shielding material. The VM-250 model vehicle portal monitor is used for vehicles and large equipment when exiting some security areas. The TSA model 470B handheld monitor is used when a fixed portal monitor is not functioning. This equipment is operated and monitored by WSI Protective Force personnel.

In April 2007, the calibration and performance testing of the pedestrian portal monitors was being performed by the NSTec Radiological Health Instrumentation department The testing program for the SNM vehicle portal monitor and the portable handheld SNM monitors was non-existent. Because the Radiological Health Instrumentation department had the personnel qualified to do the maintenance and calibration of the SNM monitors, the decision was made for the Radiological Health Instrumentation department to continue doing the vehicle portal monitor maintenance and calibration. The MC&A department volunteered to manage the performance testing of all SNM portal monitors in order to strengthen the program and ensure DOE Order requirements were met.

DISCUSSION:
When the MC&A department took over the performance testing program, the pedestrian portal monitors were operational but had some minor maintenance issues. Radiological Health Instrumentation department personnel were able to quickly repair the pedestrian portal monitors. The vehicle portal monitor had been out of service for an extended period of time. This was the result of a 2004 DOE Headquarters Office of Independent Oversight (OIO) survey finding that had not been closed. The root cause for the finding was initially determined to be the fact that the distance between the vehicle portal monitor pillars was several feet further than the manufacturer’s recommended distance for optimum performance. Because of the added distance between the pillars, the sensitivity test failed to detect the radiological check source that was being used for testing. There was a misconception that the check source being used for the sensitivity testing of the vehicle portal monitor was the only check source that could be used.

The two solutions proposed to correct the problem were to install a completely new vehicle portal monitor system or to relocate the vehicle portal monitor pillars. Both of these options were very expensive. As a result, the OIO finding had not be closed, and the WSI Security Police Officers (SPOs) were performing SNM monitoring with the handheld SNM monitors. The MC&A supervisor recommended that the check source activity be based on a representative, worst case item from the Nuclear Material (NM) inventory. The check source needed to represent the smallest quantity of NM that requires detection. This was a significantly larger activity than the activity of the check

source that had been used for testing the vehicle portal monitor. Calculations were performed to determine the appropriate activity needed for the check source to meet the detection threshold.

To prove the concept and verify there were no other problems with the vehicle portal monitor, check sources with the new calculated value were collected from organizations such as Radiological Health Instrumentation department. These sources were then used to test and confirm the vehicle portal monitor met the detection threshold. While testing the vehicle portal monitor, some minor maintenance issues were discovered. Radiological Health Instrumentation department personnel were able to troubleshoot and repair these minor problems and establish a list of spare parts needed to adequately maintain the system in the future.

New radiological check sources and spare parts were procured. When the new check sources arrived, MC&A personnel informally tested the vehicle portal monitors to ensure the vehicle portal monitor functioned as required. Once the operability was verified, calibration and testing procedures were performed to verify the probability of detection and operability of all SNM portal monitors. Radiological Health Instrumentation department had approved calibration testing procedures in place for the pedestrian portal monitors only. These procedures were outdated and needed to be revised. Calibration and testing procedures for the vehicle and handheld SNM monitors were non-existent and would need to be developed. Using the ASTM International Standard Guides, vendor manuals, and other related documentation, Radiological Health Instrumentation department personnel developed new calibration procedures, and MC&A personnel developed new testing procedures. The procedures were officially approved and validated. Calibration and testing is now performed on a routine basis.

Other issues were discovered in the process of implementing the program. The handheld SNM monitors were not being physically controlled to prevent unauthorized access. DOE Orders and the NTS MC&A Plan require that access to SNM monitoring equipment be restricted to personnel that participate in the Human Reliability Program (HRP). In years past, SPOs did not perform official duties prior to being cleared and HRP certified. Because of new protection strategies for the site, some of the newly hired SPOs are performing official duties while awaiting their HRP certification. These SPOs and some non-HRP certified Radiological Health Instrumentation department personnel had physical access to the SNM handheld monitors. WSI and Radiological Health Instrumentation department agreed to implement administrative controls so that only HRP personnel have access to the SNM handheld monitors. Each unit, when not in use, is marked “HRP Only” and is in an authorized location that cannot be accessed by an unauthorized person. Also, the procurement and installation of a MT-220 portal monitoring system in a Category I facility was performed without input from the MC&A

department. Once notified, the MC&A department assisted the WSI Project Manager with developing procedures and performing acceptance testing so that the MT-220 could be placed into service. While testing the portal monitor, Radiological Health Instrumentation department, WSI, and MC&A personnel identified issues that were not previously identified during the design phase. WSI electronic technicians were able to correct the problems. Radiological Health Instrumentation department and MC&A personnel were able to develop a test procedure to ensure the system functioned properly. This allowed the new system to be validated and put into service on schedule.

CONCLUSION:

The SNM portal monitoring performance testing program is now fully implemented. All actions to implement the SNM portal monitoring performance test program were successfully completed in December 2007. The efforts of individuals from all contractor companies resulted in a substantial cost avoidance for NTS. The vehicle portal monitor did not have to be modified or replaced. By clarifying individual's roles and how they relate to each other, old paradigms are beginning to shift. The Corrective Action Closure package for the finding against the vehicle portal monitor has now been submitted for closure and validation by the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office (NNSA/NSO). NNSA/NSO validated the operation of the vehicle portal monitor, and it was put into operation for the first time since 2004. In a recent OIO inspection, there were no findings on the portal monitoring program.