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AN OVERVIEW OF A NEW PORTAL MONITOR TESTING CAPABILITY AT LANL

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Abstract

During the past year, Los Alamos National Laboratory (LANL) has created a portal monitor test bed that increases their ability to conduct research and testing on portal monitoring devices. The construction of the facility was a shared project between DOE and DHS. The new structure is laid out to conduct research on portal monitors such as software and hardware testing and modification as well as the possibility to conduct full characterization tests on cargo portal monitors. The test bed facility is designed to allow the simultaneous testing or research on up to 5 freight portal monitor systems. This includes both truck and rail monitors. Also, a three lane highway choke-point simulation has been incorporated to the test-bed which allows the study of parallel traffic lines and their interference with vehicle speeds up to 30 miles per hour. The tests and research can be conducted with regular check sources and CAT-4 Special Nuclar Material (SNM). This paper will present the features and abilities of the new facility.

1 INTRODUCTION

The Nuclear Nonproliferation Division at LANL has been involved in portal monitoring development and testing for over 3 decades. Two major programs expressed the need for a large testing campaign. One program needs to test a large number of cargo portal monitors in a short duration of time, the other program requires the setup of a three lane highway simulating drive-throughs with speeds of up to 30 miles per hour.

The current portal monitoring takes place in a parking lot area in TA-35. This facility is capable of testing up to 3 cargo portal monitors in parallel. However, the location is too small for the upcoming needs. In order to accommodate our growing needs a new site had to be

found or developed. The new site had to meet a variety of requirements. It had to be large enough to house both upcoming experiments. Due to budget restraints it had to be an existing place, like a parking lot or road, that did not require a 2 acre construction. It had to have building with office and storage space nearby to store special nuclear material (SNM) and non SNM sources for the experiments. The site needed the ability for a 200 A sub-panel to provide enough power. It also needed the capability of a 3-phase electrical outlet.

The search for an alternative site ended successfully in the decision to convert an existing parking lot. The lot area is about 200 feet wide and about 800 feet long. The location is a previous parking lot for a building that had been demolished, but the sub transformer for the electrical panel was still in place. This enabled easy access to electrical power.

2 DESIGN

Once the site for the new portal monitoring capability was selected, design and construction was started. Figure 1 displays the layout of the new facility (Tumbler Road Test Bed (TRTB)). The blue dashed line shows the borders of the TRTB and the old parking lot. The design of the test bed is shown in green. On the left side, the 5 cargo portal monitor station and layout is visible. The extension on the right into the lot is the foundation for mounting up to 3 portal monitors side-by-side. The green and blue solid lines represent the center of the drive lanes. The green line represents the truck lane and the blue lane represents the three lane highway simulation. The solid red line represents the undreground power line. The existing sub panel is only about 200 feet away.

As shown in Figure 2, the design shows a clear separation of the two capabilities. The cargo testing area shows 5 sets of concrete pads that will be able to support testing of up to 5 monitor in parallel. Outlets providing 120 V/20 A and 208 V/50 A are provided at each side at each concrete pad. This allows maximum flexibility for the portal monitors. In addition to the power outlets, three sets of two Trenchformer trenches were placed across the driveway to enable the rapid setup of additional power and data cables as needed. The Trenchformer trenches enable us to quickly mount and run the specific power and data cables needed for any portal monitor. The foundation for the portal monitors are concrete footings capped with steel plates. The steel plate has a set of pre-drilled and tapped holes that will mount to adaptor plates which allows us to mount a variety of portal monitors regardless of their mounting hole spacings.

The setup for parallel traffic was designed such that portal monitors can be set up with varying distances between each other. This will allow the simulation of almost any multi-lane scenario. In the parallel lane setup, the footing is continuous with metal plates providing tapped attachment holes every 12 inches. This, as in the serial application, allows for the use of adaptor plates to ensure flexibility in the setup of the experiment. Also, two Trenchformer trenches are cast in front of the mounting plates to generate a flexible environment for data and power cable needs.

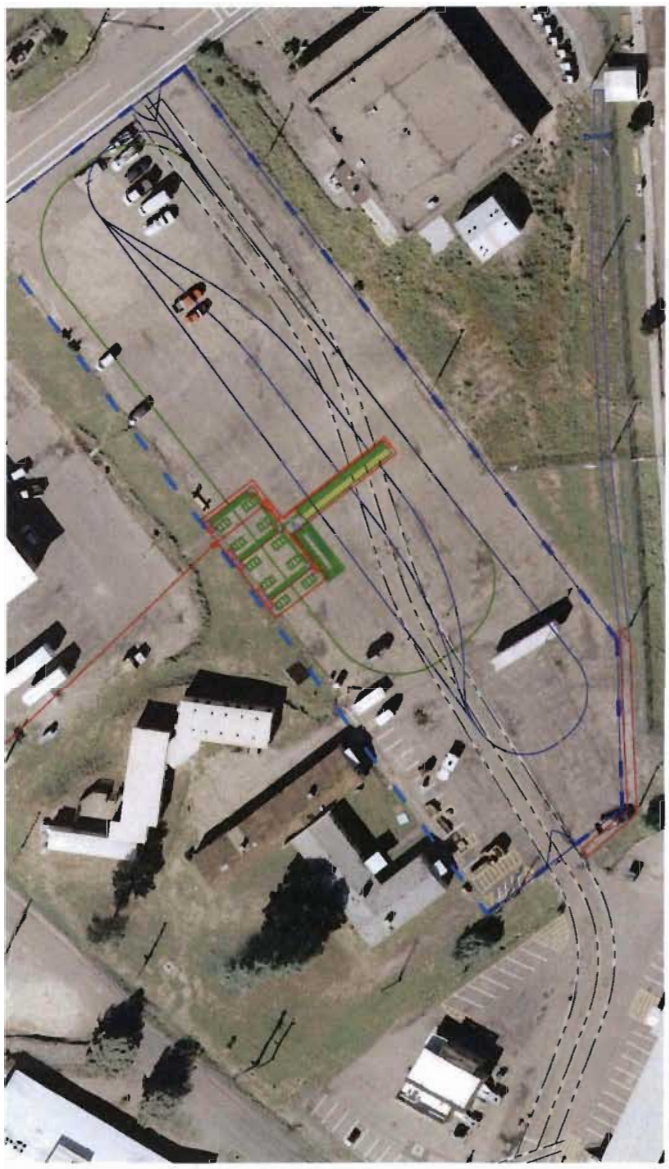

Figure 1: Layout of the TRTB.

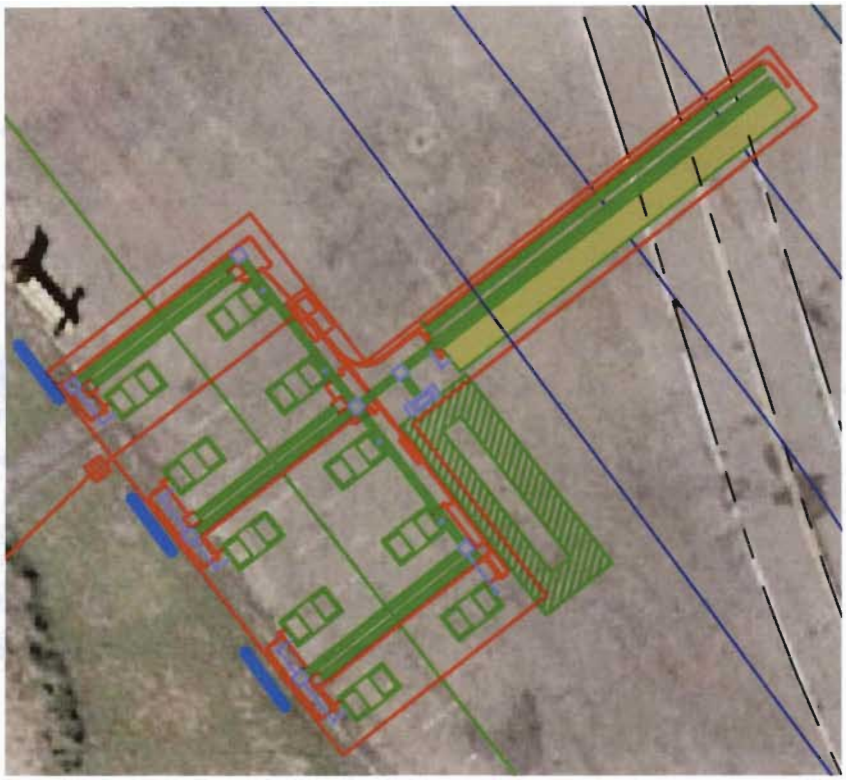

Figure 2: Zoom of layout of the TRTB.

3 THE FACILITY

Figure 3 shows the already completed parallel driving experiment of the TRTB. The gate detectors are mounted with adaptor plates to ensure maximum flexibility. This design allows us to place detectors farther apart or closer together as needed. In front of the detectors the steel plates covering the Trenchformer trenches. Having the data and power cables exiting through custom plates, generates the flexibility needed for the experiments. The cargo monitoring test-bed with 5 pairs of concrete pads for cargo monitoring experiments is located on the other side of the travel trailer in Figure 3. These pads are designed to handle portal width from 14 feet to 24 feet which allows testing to a variety of standards (i.e. road and rail, US, European, etc). The area for the cargo monitoring is, as of the date of this paper, at a 95% completion level. The five pairs of concrete pads are equipped with individual power outlets. The outlets provide 60 Hz 110 V and 208 V single phase power. Also a large 50 A 480 V three phase outlet is available for possible high energy needs. In this area of the test-bed as in the multi-lane area, Trenchformer trenches are used for auxiliary power and data cables between the concrete pad pairs.

For the cargo tests, the TRTB is equipped with experimental handling equipment for experiments. The experimental equipment consists of 12, 20 foot long cargo containers that are acting as sample holders. These sample holders are filled with naturally occurring radioactive

Figure 3: Picture of the tree lane setup with portal monitor gates.

material (NORM) to a standard amount. This setup allows us to verify detector capability for commerce with SNM hidden in NORM. The TRTB operation has access to a semi-tractor and trailer rig for driving these sample-holders through the cargo lane and owns a 25-ton fork truck to exchange the sample holders on the semi-trailer.

The fifth wheel travel trailer in the background in Figure 3 is placed between the two different test stations (serial and parallel) to act as a Mobile Command Center (MCC). The travel trailer has been redesigned and converted into a command center suitable for data acquisition work. The regular RV furniture has been replaced and workstations with desks and office chairs were mounted instead. This created the ability to operate more than 7 work stations in the MCC.

The MCC has been retrofitted with an Ethernet network. The network is powered by 1 GBit switch. This allows for large and fast data packages to be transfered and analysed on different servers and machines. To optimize security and to facilitate an easy use of vendor owned data acquisition hardware, the MCC and the TRTB are operating with a standalone IP network. Setting the MCC up as travel trailer allows its additional use at actual deployment locations in the US for testing and trouble shooting.

The entire area of the TRTB has an established safety base that is designed to handle non SNM sources and CAT-4 SNM. These sources can be used in a laboratory like fashion (i.e. on short notice, inside vehicles, etc). The safety base ties directly into the radioactive material and CAT-4 inventory of the Nuclear Nonproliferation Division at LANL.

4 CONCLUSION AND FUTURE

The TRTB offers the capability of testing and developing portal monitor systems for both personal vehicles and cargo systems. It offers a parallel setup capability (up to three lanes) and

a cargo lane where more than 5 detectors can be mounted and tested in parallel. The setup and safety base were designed and built to allow maximum flexibility for R&D testing. Currently the parallel lane is already commissioned for experiments and is in use. The cargo testing area will be ready by midle of 2011.

The safety base design is flexible enough to allow other uses of the TRTB, such as training source recovery teams, first responders and law enforcement personnel. The area could also be used for source recovery and emergency response exercises, treasure hunts and other applications. Since the TRTB is in a Limited Area, thoughts of using CAT-3 SNM can be entertained. In summary, the TRTB not only provides a capability currently needed for Global Security, but offers a large potential for future applications.

5 ACKNOWLEDGMENTS

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