2
Received by ESTH
OCT 28 1991

NUREG-1321

Testing Standards for Physical Security Systems at Category I Fuel Cycle Facilities

U.S. Nuclear Regulatory Commission

Office of Nuclear Material Safety and Safeguards

P. A. Dwyer

AVAILABILITY NOTICE

Availability of Reference Materials Cited in NRC Publications

Most documents cited in NRC publications will be available from one of the following sources:

1. The NRC Public Document Room, 2120 L Street, NW., Lower Level, Washington, DC 20555
2. The Superintendent of Documents, U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082
3. The National Technical Information Service, Springfield, VA 22161

Although the listing that follows represents the majority of documents cited in NRC publications, it is not intended to be exhaustive.

Referenced documents available for inspection and copying for a fee from the NRC Public Document Room include NRC correspondence and internal NRC memoranda; NRC bulletins, circulars, information notices, inspection and investigation notices; licensee event reports; vendor reports and correspondence; Commission papers; and applicant and licensee documents and correspondence.

The following documents in the NUREG series are available for purchase from the GPO Sales Program: formal NRC staff and contractor reports, NRC-sponsored conference proceedings, international agreement reports, grant publications, and NRC booklets and brochures. Also available are regulatory guides, NRC regulations in the *Code of Federal Regulations*, and *Nuclear Regulatory Commission Issuances*.

Documents available from the National Technical Information Service include NUREG-series reports and technical reports prepared by other Federal agencies and reports prepared by the Atomic Energy Commission, forerunner agency to the Nuclear Regulatory Commission.

Documents available from public and special technical libraries include all open literature items, such as books, journal articles, and transactions. *Federal Register* notices, Federal and State legislation, and congressional reports can usually be obtained from these libraries.

Documents such as theses, dissertations, foreign reports and translations, and non-NRC conference proceedings are available for purchase from the organization sponsoring the publication cited.

Single copies of NRC draft reports are available free, to the extent of supply, upon written request to the Office of Administration, Distribution and Mail Services Section, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

Copies of industry codes and standards used in a substantive manner in the NRC regulatory process are maintained at the NRC Library, 7920 Norfolk Avenue, Bethesda, Maryland, for use by the public. Codes and standards are usually copyrighted and may be purchased from the originating organization or, if they are American National Standards, from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

Testing Standards for Physical Security Systems at Category I Fuel Cycle Facilities

Manuscript Completed: September 1991
Date Published: October 1991

P. A. Dwyer

**Division of Safeguards and Transportation
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555**

MASTER

ABSTRACT

This NUREG is a compilation of physical security testing standards for use at fuel cycle facilities using or possessing formula quantities of strategic special nuclear material (Category I).

CONTENTS

	<u>Page</u>
ABSTRACT.....	iii
1. INTRODUCTION AND PURPOSE.....	1
2. PHYSICAL SECURITY COMPONENT STANDARDS.....	2
2.1 Active Infrared Multibeam Systems.....	2
2.2 Balanced Magnetic Switches.....	2
2.3 Breakwire Systems.....	2
2.4 Capacitance Alarms.....	2
2.5 Closed-Circuit Television Motion Detectors.....	2
2.6 Closed-Circuit Television Resolution.....	3
2.7 Electric-Field (E-Field) Perimeter Intrusion Detection Systems.....	3
2.8 Explosives Detectors.....	3
2.9 Firearms Detectors.....	4
2.10 Isolation Zones.....	4
2.11 Lighting.....	5
2.12 Line Supervision.....	5
2.13 Metal Detectors (Shielding).....	5
2.14 Microwave Motion Detectors (Interior).....	6
2.15 Microwave Perimeter Detection Systems (Exterior-Bistatic)..<	6
2.16 Passive Infrared Interior Intrusion Detectors.....	6
2.17 Pat-Down Searches.....	7
2.18 Perimeter Alarm Operability Testing.....	7
2.19 Perimeter Alarm Performance Testing.....	8
2.20 Personnel Perimeter Barrier Systems.....	9
2.21 Ported Coaxial Cable Systems.....	9
2.22 Power Sources for Interior Intrusion Alarm Systems.....	10
2.23 Special Nuclear Material Detectors.....	10
2.24 Vehicle Barriers.....	11
2.25 Vibration or Strain Detection Systems.....	11
2.26 Volumetric Interior Intrusion Detection Systems.....	11
2.27 X-Ray Equipment.....	11
3. GLOSSARY OF SELECTED TERMS.....	13
APPENDIX - SOURCE DOCUMENTS NOT PUBLICLY AVAILABLE.....	15

1. INTRODUCTION AND PURPOSE

This document was developed to provide a compilation of U.S. Nuclear Regulatory Commission (NRC) testing standards for physical security components at NRC Category I fuel cycle facilities. Category I facilities are those facilities using or possessing formula quantities of strategic special nuclear material. For the most part, such standards presently exist in various NUREGs and regulatory guides. (In those instances where the source of a standard is an unpublished NRC document, i.e., not readily available to the public, the document is included in the Appendix to this NUREG.) This NUREG presents these standards in one concise reference document. This NUREG should be of use to: (1) NRC physical security inspectors responsible for inspecting Category I fuel cycle facilities; (2) NRC licensees that operate such facilities; and (3) NRC personnel who review Category I facility physical security plans.

2. PHYSICAL SECURITY COMPONENT STANDARDS

2.1 Active Infrared Multibeam Systems

STANDARD: An infrared multibeam perimeter detection system should be capable of detecting an individual weighing a minimum of 35 kilograms (77 pounds) passing between the transmitters and receivers whether the individual is walking, running, jumping, crawling, or rolling. The system should be able to operate, as above, with a factor of 20 (13 decibels) insertion loss due to atmospheric attenuation (e.g., fog) at a maximum range of 80 meters (260 feet).

(Source: NUREG 1328, "Use of Perimeter Alarms at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material.")

2.2 Balanced Magnetic Switches

STANDARD: Balanced magnetic switches should be tested by measuring to ensure that the switch and magnet are mounted with the proper space gap between them as recommended by the manufacturer's specifications. The switch should be installed such that the introduction of an external magnet will not maintain a balanced field (no alarm) as the unit on which the switch is mounted is opened.

(Source: NUREG/CR 5722, "Interior Intrusion Detection Systems.")

2.3 Breakwire Systems

STANDARD: To test for proper operation, the wire used in a breakwire system should not be larger than 24 American wire gauge wire, should not exceed 4 pounds in tensile strength, and should be capable of carrying a current of 60 milliamperes with a temperature rise of not more than 1° C.

(Source: NUREG 0320, "Interior Intrusion Alarm Systems.")

2.4 Capacitance Alarms

STANDARD: A capacitance alarm should be capable of detecting human touch by a person wearing gloves and isolated from ground.

(Source: NUREG/CR 5722, "Interior Intrusion Detection Systems.")

2.5 Closed-Circuit Television Motion Detectors

STANDARD: A closed-circuit television motion detector should be tested with a low profile target, such as a crawler, and with a high velocity

target, such as a fast runner. Tests should be conducted under the lowest contrast lighting conditions expected, such as at night under artificial light. If any detection areas are partially covered by a shadow, testing should be performed within the shadow. All of the aforementioned tests should produce an alarm.

(Source: NUREG/CR 5722, "Interior Intrusion Detection Systems.")

2.6 Closed-Circuit Television Resolution

STANDARD: A closed-circuit television system used for assessment purposes should be capable of discerning human presence within its field of view. This may be confirmed through actual movement of an individual within the field of view or through the ability to discriminate between a one foot high circle, square, and triangle placed anywhere within the area of assessment.

(Source: NUREG/CR 5721, "Video Systems for Alarm Assessment.")

2.7 Electric-Field (E-Field) Perimeter Intrusion Detection Systems

STANDARD: An E-Field perimeter intrusion detection system should be capable of detecting an individual weighing a minimum of 35 kilograms (77 pounds) whether the individual is crawling or rolling under the lower wire or stepping or jumping between wires.

(Source: NUREG 1328, "Use of Perimeter Alarms at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material.")

2.8 Explosives Detectors

STANDARD: For either operational or performance testing of explosives detectors (hand-held or portal), the test sample should consist of one-eighth of a stick of nitrated dynamite, the wrapper from a stick of dynamite, 2 to 3 grams of double base shotgun or pistol powder, or 30cc of para-nitrotoluene (PNT) vapor. Any of the first three samples should be contained in a jar with lid. Either a glass or polycarbonate jar may be used to contain the test sample, although polycarbonate is preferred because of its non-breakable characteristics. An example of a polycarbonate jar is an unbreakable peanut butter jar. The lid of the jar should be removed before conducting the test. If a syringe is used to inject 30cc of PNT vapor into the detector, it should be injected directly into the detector's intake. Under operational testing, the detector should detect any of the test samples three times out of three trials. Performance testing should be conducted any time the device fails operational testing, is moved, adjusted, or at least quarterly (approximately once every 90 days). The detector should detect the test sample 30 out of 30 trials (or, if a failure to detect occurs, 39 out of 40, or 48 out of 50).

(Sources: NUREG 1329, "Entry/Exit Control at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material" and Sandia National Laboratories project FIN #L1388, "Security Inspection Test Kit.")

2.9 Firearms Detectors

STANDARD: With respect to operational testing, firearms detectors should be capable of detecting a .22 caliber Triumph (or equivalent) held horizontally at the waist three out of three trials. If the detector fails to detect on any of the three trials, corrective action should be taken and documented. Operational testing should be conducted at the beginning of each shift, when the unit is turned off, or when the unit is maintained. Performance testing should be conducted any time the device fails operational testing, is moved, adjusted, or at least quarterly (approximately once every 90 days). The .25 caliber Best (or equivalent) and the .22 caliber Triumph (or equivalent) should be used as test weapons. The equipment should detect 24 out of 28 trials for each weapon in seven different orientations four times each for a total of 48 alarms out of 56 trials for the two test weapons. The seven orientations are: 1) shoulder height, gun barrel horizontal and parallel to movement; 2) shoulder height, gun barrel horizontal and perpendicular to movement; 3) shoulder height, gun barrel down; 4) waist height, gun barrel horizontal and parallel to movement; 5) waist height, gun barrel horizontal and perpendicular to movement; 6) waist height, gun barrel down; and 7) at ankle, gun barrel down. Test weapons should be rendered safe by removing the firing pin or encasing in plastic. Tests should be conducted using a "clean tester."

(Source: NUREG-1329, "Entry/Exit Control at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material.")

2.10 Isolation Zones

STANDARD: For a double barrier system, the clear zone between barriers should be a minimum of twenty (20) feet. Isolation zones should be maintained adjacent to the outer and inner physical barriers at the perimeter of the protected area. Zones should be large enough to permit observation of the activities of people on either side of the PA barriers. Lighting levels in all isolation zones should meet the 0.2 footcandle requirement of 10 CFR 73.46.

(Sources: NUREG-1330, "Personnel and Vehicle Barriers at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material" and NRC Inspection Procedure 81921, Issue date: 02/19/91.)

2.11 Lighting

STANDARD: Isolation zones and all exterior areas within the protected area must be maintained at a lighting level of not less than 0.2 footcandles measured horizontally at ground level.

(Source: 10 CFR 73.46(c)(4).)

2.12 Line Supervision

STANDARD: Direct current supervisory techniques employing percentage change detection, regardless of how narrow the limits are specified, are easily compromised and should not be used. A form of line supervision should be used that will not be compromised by any of the following means:

- (1) the substitution of resistance, voltage, or current,
- (2) the substitution of equipment of the same design and manufacturer,
- (3) reintroduction by playback of signals previously recorded onto the communication path, and
- (4) the synthesizing of signals externally and the introduction of these synthesized signals onto the path.

(Source: NUREG 1328, "Use of Perimeter Alarms at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material.")

2.13 Metal Detectors (Shielding)

STANDARD: Metal detection equipment should undergo operational testing at the beginning of each shift, when the unit is turned off or when the unit is maintained. Operational testing for the metal detection system used to search for concealed, shielded strategic special nuclear material should be capable of detecting a minimum of 100 grams of metal (shielding) concealed anywhere on an individual three times out of three trials. Performance testing should be conducted any time the device fails operational testing, is moved, adjusted, or at least quarterly (approximately once every 90 days). The equipment should detect 30 out of 30 trials for the test sample (i.e., 3 different locations 10 times each). The locations are: (1) shoulder, (2) waist, and (3) ankle. If a failure occurs, 39 out of 40 trials, or 48 out of 50 trials are also acceptable performance levels. Tests should be conducted using a "clean" tester.

(Source: NUREG-1329, "Entry/Exit Control at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material.")

2.14 Microwave Motion Detectors (Interior)

STANDARD: The detector should be checked for proper mounting, typically 2 to 3 meters (6.5 to 10 feet) above the floor and at least 2 meters (6.5 feet) from fluorescent lighting. In addition, the detector should be "walk tested" to assure proper positioning and detection capability. The target person should have a height of 1.5 ± 0.3 meters (5 ± 1 feet) and a weight of 59 ± 5 kilograms (130 ± 10 pounds) and should walk with arms folded over the chest at a rate of approximately 12 centimeters/second (5 inches/second). Five walk paths should be used. Each walk path should be tested twice, in opposite directions. The five walk paths are: 1) parallel to the direction the sensor is aimed; 2) perpendicular to the direction the sensor is aimed; 3) angled $+45^\circ$ from the direction the sensor is aimed; 4) angled -45° from the direction the sensor is aimed; and 5) radial to the sensor.

(Source: NUREG/CR 5722, "Interior Intrusion Detection Systems.")

2.15 Microwave Perimeter Detection Systems (Exterior-Bistatic)

STANDARD: Typically, a long range bistatic microwave detection system should be installed to operate effectively in a range not more than 100 meters (approximately 325 feet). Each unit should be mounted rigidly at a distance above the ground so that incident and reflected signals combine positively, typically 60 centimeters (24 inches) for 100 meters (325 feet). To prevent passage under the beam, perturbations of the ground should be leveled, ditches filled, and obstructions removed so that the area between transmitter and receiver is clear of obstructions and free of rises or depressions of a height or depth greater than 10 centimeters (4 inches). To preclude jumping over a microwave beam from atop a chain link security fence, a fence with an overall height of 2.4 meters (8 feet) will necessitate a minimum of 2.4 meters (8 feet) between the fence and the center of the beam. A microwave perimeter detection system should be capable of detecting an intruder weighing a minimum of 35 kilograms (77 pounds) passing anywhere between the transmitter and receiver, including the area directly in front of either transmitter and receiver, whether walking, running, jumping, crawling, or rolling.

(Source: NUREG-1328, "Use of Perimeter Alarms at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material.")

2.16 Passive Infrared Interior Intrusion Detectors

STANDARD: The observer should visually test to ensure that incandescent lamps are not located within 0.6 meters (2 feet) of a detector's head. The detector should be "walk tested" to assure proper positioning and detection capability. The target person performing the walk

test should have a height of 1.5 ± 0.3 meters (5 ± 1 feet) and a weight of 59 ± 5 kilograms (130 ± 10 pounds) and should walk with arms folded over the chest at a rate of approximately 12 centimeters/second (5 inches/second). Five walk paths should be used. Each walk path should be tested twice, in opposite directions. The five walk paths are: 1) parallel to the direction the sensor is aimed; 2) perpendicular to the direction the sensor is aimed; 3) angled $+45^\circ$ from the direction the sensor is aimed; 4) angled -45° from the direction the sensor is aimed; and 5) radial to the sensor.

(Source: NUREG/CR 5722, "Interior Intrusion Detection Systems.")

2.17 Pat-Down Searches

STANDARD: A pat-down search should be conducted by searching the following areas: 1) shoulders to wrists, inside and outside of arms; 2) under-arm areas down torso to ankles; 3) insides, fronts, and backs of legs; 4) back torso from shoulders to back of pelvis; and 5) front lower rib cage to pelvis.

(Source: NUREG-1329, "Entry/Exit Control at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material.")

2.18 Perimeter Alarm Operability Testing

STANDARD: The perimeter alarm system should be operability tested in all segments at least once every seven days in the following manner. Testing may be conducted during routine patrols by members of the licensee's security force. The testing should be conducted by crossing the segment of the isolation zone where the detection system is located or by climbing the fence to which the system is attached to cause the system to alarm. Before the test, the individual making the test should notify the alarm stations that a test is about to be conducted. The detection system in all segments of the isolation zone should be walk-tested in a different, preferably random, order every seven days and the testing should be conducted throughout the week, rather than all tests being conducted on the same day. The testing should result in 100 percent detection on all segments each seven days. If the perimeter alarm system fails to detect an intrusion on one or more segments, corrective actions should be taken and documented.

(Source: NUREG-1328, "Use of Perimeter Alarms at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material.")

2.19 Perimeter Alarm Performance Testing

STANDARD: At least annually, as well as after each inoperative state, and after any repairs, the perimeter intrusion alarm system should be tested against the design stimulus for proper detection probability, i.e., performance tested. A sample testing method for demonstrating compliance with NRC-recommended detection probability and confidence levels follows:

- 1) Determine the most vulnerable area of each segment, and determine the method of approach most likely to penetrate that segment, i.e., walking, running, jumping, crawling, rolling, or climbing. This determination will, in most cases, be sensor and location dependent.
- 2) Test all segments using a combination of all the applicable penetration approaches at the most vulnerable area a total of 30 times. All 30 tests must have resulted in successful detections of the intrusion to have at least a 90 percent probability of detection, with 95 percent confidence. If the minimum number of successful detections is not achieved, the system should be checked. If no problems with the system are discovered, ten more tests should be made and if the minimum number of successful detections is achieved for the new number of tests (given in the following table), in this case, 39 out of 40, the testing can be ended for this segment. If no problems with the system can be discovered and the minimum number of successful detections is not achieved after one more test of ten intrusions, the system would need to be upgraded to increase the detection probabilities to the required level. If problems with the system are discovered, the system should be repaired and 30 new tests performed. If there are 30 successful detections, testing can be ended.
- 3) The penetration approach most difficult to detect should be attempted more frequently if an equal number of tests per approach is not possible.
- 4) The order in which the segments are tested should be random. This will protect against the possibility that environmental effects and other unknown factors that may affect the test results (detection or non-detection) always favor or handicap the same segment or method of approach. Random testing can be accomplished by using a random numbers table to assign the order in which the segments will be tested.
- 5) Maintain records of the results of all tests performed. Included in these records should be the segment number, date, time, and relevant environmental conditions when tests were performed.

Detection Testing

Total No. of Tests	Minimum No. of Successful Detections	Maximum No. of Failures to Detect
30	30	0
40	39	1
50	48	2
60	57	3
70	67	3
80	76	4
90	85	5
100	95	5
110	104	6
120	114	6

(Source: NUREG-1328, "Use of Perimeter Alarms at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material.")

2.20 Personnel Perimeter Barrier Systems

STANDARD: A personnel perimeter barrier system should have a design goal of delaying an adversary for 5 seconds after the exterior alarm protecting it has initiated an alarm. By definition, a perimeter barrier system means fences constructed of No. 11 American wire gauge or heavier wire fabric, topped by three stands or more of barbed wire or similar material on brackets angled inward or outward between 30° and 45° from the vertical, with an overall height of not less than eight feet, including the barbed topping.

(Sources: NUREG-1330, "Personnel and Vehicle Barriers at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material." Also, 10 CFR 73.2.)

2.21 Ported Coaxial Cable Systems

STANDARD: The detection system should be restricted to zones of 100 meters (325 feet) or less to facilitate assessment. The two lines of the system are generally buried approximately 18 centimeters (seven inches) deep and 1 to 3 meters (3 to 10 feet) apart. To prevent an individual from avoiding detection by jumping over the detection field, a chain link security fence with an overall height of 2.4 meters (8 feet) will necessitate a minimum of 2.4 meters (8 feet) between the fence and

the center of the detection zone. A ported coaxial cable perimeter detection system should be capable of detecting an intruder weighing a minimum of 35 kilograms (77 pounds) passing between the transmitter and receiver wires, whether the individual is walking, running, jumping, crawling, or rolling. The electromagnetic field should be modulated, and the receiver should be frequency selective to decrease susceptibility to receiver "capture."

(Source: NUREG-1328, "Use of Perimeter Alarms at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material.")

2.22 Power Sources for Interior Intrusion Alarm Systems

STANDARD: Alarms required pursuant to 10 CFR 73.46(e) must remain operable from independent power sources in the event of loss of normal power. Switchover to standby power must be automatic and must not cause false alarms on annunciator modules. The system should be tested to ensure that:

- 1) the emergency battery, when fully charged, is capable of maintaining full operation of the system for 24 hours at 0° C (32° F);
- 2) an indication exists for system primary power failure;
- 3) Nicad batteries are constant current charged and never fully discharged;
- 4) all other batteries are arranged so that they are fully charged at all times when primary power is available; and
- 5) chargers have sufficient capacity to recharge batteries from a fully discharged state to more than 90% of capacity in 12 hours.

(Sources: 10 CFR 73.46(e)(6). Also, NUREG/CR 5722, "Interior Intrusion Detection Systems.")

2.23 Special Nuclear Material Detectors

STANDARD: Special nuclear material detection equipment should be capable of detecting plutonium, uranium-233, or uranium enriched to 90 percent in the uranium-235 isotope.

(Source: NUREG-1329, "Entry/Exit Control at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material.")

2.24 Vehicle Barriers

STANDARD: Vehicle barriers should provide complete perimeter coverage and be protected by the required perimeter intrusion alarm system. To be effective against the design basis threat vehicle, the following criteria should be met: (1) Cable: one cable of one inch diameter installed 30 inches above grade; two cables of 3/4 inch diameter at 24 inches and 32 inches above grade or equivalent; (2) Bollards: 8 inch diameter, 36 inches above grade, 100 foot spacing with cable, 5 foot on center without cable, 4 feet in ground, or equivalent. In addition, gate barriers should fail in a closed position.

(Source: Memo dated March 21, 1991 from T. Sherr to W. Cline,
SUBJECT: UPGRADE CONSTRUCTION APPROVAL.)

2.25 Vibration or Strain Detection Systems

STANDARD: Vibration or strain detection systems used for fence protection should detect an intruder weighing a minimum of 35 kilograms (77 pounds) attempting to climb the fence. The system should also detect any attempt to cut the fence or lift the fence fabric more than 15 centimeters (6 inches) above grade.

(Source: NUREG-1328, "Use of Perimeter Alarms at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material.")

2.26 Volumetric Interior Intrusion Detection Systems

STANDARD: The detector should be "walk tested" to ensure proper positioning and detection capability. The target person performing the walk test should have a height of 1.5 ± 0.3 meters (5 ± 1 feet) and a weight of 59 ± 5 kilograms (130 ± 10 pounds) and should walk with arms folded over the chest at a rate of approximately 12 centimeters/second (5 inches/second). Five walk paths should be used. Each walk path should be tested twice, in opposite directions. The five walk paths are: 1) parallel to the direction the sensor is aimed; 2) perpendicular to the direction the sensor is aimed; 3) angled $+45^\circ$ from the direction the sensor is aimed; 4) angled -45° from the direction the sensor is aimed; and 5) radial to the sensor.

(Source: NUREG/CR 5722, "Interior Intrusion Detection Systems.")

2.27 X-Ray Equipment

STANDARD: X-ray equipment should undergo operational testing at the beginning of each shift, when the unit is turned off or maintained. The detector should be capable of detecting a 24 American wire gauge wire

viewed under step 5 of a step wedge constructed in accordance with American Society of Testing and Materials (ASTM) Standard 792-82, "Standard Practice for Design and Use of Ionizing Radiation Equipment for the Detection of Items Prohibited in Controlled Access Areas" for three out of three trials. Copies of this standard are available from ASTM, 1916 Race Street, Philadelphia, PA 19103. Performance testing for X-ray detectors is not considered necessary if operational testing is conducted as described above.

(Source: NUREG-1329, "Entry/Exit Control at Fuel Fabrication Facilities Using or Possessing Formula Quantities of Strategic Special Nuclear Material.")

3. GLOSSARY OF SELECTED TERMS

BISTATIC: When used in conjunction with an active microwave detector, this term means that the transmitter and receiver are located in separate units or "heads."

CLEAN TESTER: This term means an individual performing operational or performance testing of explosives or metal detecting equipment who is devoid of metal or explosives other than a test sample or test weapon.

CRAWLING: This term means entering and leaving a zone of detection by lying prone to the ground, perpendicular to the zone of detection with a low profile, at an approximate velocity of 0.03 meter (1 inch) per second.

JUMPING: This term means leaping from a height above the zone of detection to a point at ground level across the zone of protection, e.g., standing on the fence and attempting to leap across the zone of detection.

OPERABILITY TESTING: This term means testing performed at least once every seven days to ensure system operation.

PERFORMANCE TESTING: This term means testing conducted at least quarterly, after each inoperative state, or after repairs to ensure maintenance of proper equipment performance.

ROLLING: This term means entering and leaving the zone of detection prone to the ground with a low profile, parallel to the zone of detection, and rolling slowly at an approximate velocity of 0.03 meter (1 inch) per second.

RUNNING: This term means entering and leaving the zone of detection at an approximate velocity of 5 meters (16 feet) per second.

WALKING: This term means entering and leaving the zone of detection with a normal stride, i.e., two 30 inch steps per second.

APPENDIX

SOURCE DOCUMENTS NOT PUBLICLY AVAILABLE

UNITED STATES NUCLEAR REGULATORY COMMISSION SECURITY INSPECTION TEST KIT

Items:

- ***Analog/Digital Tape Measure***
- ***Binoculars***
- ***Closed Circuit Television (CCTV) Target Shapes***
- ***Light Meter w/Tripod***
- ***Mini-Flashlight***
- ***Mini-Recorder w/Microphone***
- ***Opaque Test Object***
- ***Pocket Tool***
- ***Potted Test Weapons w/Harness***
- ***Simulated Explosive Test Sample***
- ***Simulated Gun***
- ***Step Wedge w/Extra Plate***
- ***Stop Watch***

INSTRUCTIONS FOR USE (Selected Items)

(NOTE: The following test criteria describe general levels of performance that systems designed to meet 10 CFR 73.45 and 73.46 should be capable of achieving. Individual security plans should be reviewed to determine if failure to meet these performance levels constitutes non-compliance. While failure to meet these performance levels may not constitute non-compliance, it may be indicative of the need for corrective action or maintenance. Further, when transporting this kit on commercial aircraft, the kit must be "checked baggage," i.e., not handcarried onto the aircraft by the inspector, and the weapons must be declared.)

CCTV TARGET SHAPES:

(1) Determine area(s) within the protected area where CCTV assessment capability may be questionable. (2) Using plastic nut and wing-nut, assemble each of the three shapes (the circle, square, and triangle) with the same faceplate color, either white or black. (3) Stand shapes adjacent to each other and view via CCTV. (4) Ability to discern human presence is approximately equivalent to the ability to discriminate between the three target shapes on the CCTV monitor.

SIMULATED EXPLOSIVE TEST SAMPLE:

The test sample uses para-nitrotoluene in a wax paraffin solution. Two syringes are provided. One is a spare and should be kept sealed to verify failure of the other syringe. (The two syringes are guaranteed for a period of one year.) Any person who uses the test sample should read the Material Safety Data Sheet (MSDS) provided in the kit. The sample should be at room temperature for the test. For ITI Model 85 units only, the selector switch should be in the A position for testing.

PORTAL UNIT TEST: (1) Conduct trial entry without sample to assure "no explosives" signal is received. (2) While outside the portal, remove cap from syringe and draw plunger back to 60 cc mark. (3) Enter portal and depress plunger to the 30 cc mark directly into intake. (4) Replace cap.

HAND-HELD UNIT TEST: (1) Conduct trial test without explosive sample to assure "no explosives" signal is received. (2) Remove cap and draw plunger to the 60 cc mark. (3) Depress plunger to the 30 cc mark directly in vicinity of detector nozzle. (4) Replace cap.

NOTE: Store the test sample in the plastic zip-lock bag provided.

LIGHT METER:

(1) Follow instructions printed on meter for calibration and testing. (2) Detach readout and connect to meter using cord. (3) Attach meter to tripod. (4) Take reading. All exterior areas within the protected area are required to be maintained at 0.2 footcandles.

OPAQUE TEST OBJECT:

The purpose of this object is to test the x-ray operator's monitoring abilities. The test object should be covertly placed in a handcarried package prior to search. The object will appear on the x-ray monitor as an unidentifiable rectangular shape which the operator should question by conducting a visual (hands-on) search.

STEP WEDGE

The step wedge is used to test the operational capability of x-ray equipment. It is provided in the kit with two base plates, one with the standard configuration per ASTM F 792 and one with wires embedded in random order. When viewed on the x-ray monitor, the wire gauge AWG 24 should be visible under step 5 of the wedge. If there is some discrepancy about what is actually being viewed, the alternate base plate with wires in random order may be used.

STOP WATCH:

The stop watch may be used to measure rates of movement in detection rate testing and, once issued, certain physical fitness standards at Category I fuel cycle facilities.

POTTED TEST WEAPONS:

The two test weapons (.38 cal. American derringer and .25 cal. EXCAM) are intended to provide an overt test of metal detection equipment. In 3 out of 3 passes, each weapon should be detected when located anywhere on the body. The velcro harness may be used with either gun to attach the gun to an ankle; belt loop; or, when used with optional velcro length, the back of the waist.

SIMULATED GUN:

The simulated gun is included to test performance in vehicle and x-ray searches. The gun is NOT for use in testing metal detecting equipment. With respect to vehicle searches, the gun should be placed in a reasonable location on a vehicle to test the search capabilities of the security force. With respect to x-ray equipment, the gun may be placed in handcarried packages and subjected to x-ray search, also, to test the search capabilities of the security force. The gun should NOT be secreted on personnel to test portal metal detection units or pat-down searches conducted by security force members.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

NRC INSPECTION MANUAL

NMSS

INSPECTION PROCEDURE 81921

ISOLATION ZONE

PROGRAM APPLICABILITY: 2681

81921-01 PERFORMANCE OBJECTIVE

The inspector should verify that isolation zones are maintained adjacent to the outer and inner physical barrier at the perimeter of the PA.

81921-02 PERFORMANCE CAPABILITIES

The inspector should verify that each isolation zone is large enough to permit observation of the activities of people on either side of the PA barriers.

81921-03 EFFECTIVENESS VALIDATION

The inspector should verify that:

03.01 The lighting in all isolation zones meets the 0.2 foot-candle required by the regulations.

03.02 All isolation zones widths meet the licensee's physical security plan commitment.

03.03 Isolation zones are maintained free of clutter. (See procedure 81928 - Protected Area Housekeeping)

81921-04 DEMONSTRATION OF ADEQUACY

The inspector should verify that:

04.01 The inner and PA isolation zones can be assessed by CCTV or from a guard tower.

04.02 All isolation zones meet the housekeeping requirements of procedure 81928.

NRC INSPECTION PROCEDURE 81921

Issue Date: 02/19/91

81921-05 FREQUENCY

This procedure should be completed during each FY inspection cycle.

END

Issue Date: 02/19/91

- 2 -

MAR 21 1991

UPGRADE CONSTRUCTION APPROVAL

- 1 -

MEMORANDUM FOR: William E. Cline, Chief
Nuclear Materials Safety
and Safeguards Branch
Division of Radiation Safety
and Safeguards, RII

FROM: Theodore S. Sherr, Chief
Domestic Safeguards Branch
Division of Safeguards
and Transportation, NMSS

SUBJECT: UPGRADE CONSTRUCTION APPROVAL

The Category I Fuel facilities are in the final stages of their comparability upgrades. Upon completion, it will be necessary for both inspection and licensing to agree that the licensee has met certain requirements. Enclosed is a set of inspection criteria to be jointly used for this final approval. It is anticipated that the B&W inspection will be the week of March 25, 1991 with Dave Thompson of your office and Charles Gaskin of my office. The date for NFS completion is not certain, but a mid-April time frame is anticipated. The inspection report for each facility should specifically address acceptance based upon the enclosed criteria.

If you or your staff have any questions, please contact W. Floyd (FTS 492-0480).

Original Signed by
Theodore S. Sherr

Theodore S. Sherr, Chief
Domestic Safeguards Branch
Division of Safeguards
and Transportation, NMSS

Enclosure: As stated

cc: C. Gaskin
R. Castaneira

MEMO DATED MARCH 21, 1991 FROM T. SHERR TO W. CLINE,
SUBJECT: UPGRADE CONSTRUCTION APPROVAL

INSPECTION CRITERIA
FOR
COMPARABILITY UPGRADES

Vehicle Barriers

- Complete perimeter coverage
- Protected by Intrusion Alarms
- Effective design for DBTV
 - Cable size, number, spacing.
[1 @ 1" diameter @ 30" above grade, or 2 @ 3/4" diameter @ 24" & 32" above grade]
 - Bollard size, height, depth, spacing.
[8" diameter, 36" above grade, 100 ft with cable, 5 ft on centers without cable, 4 ft in ground]
 - Traffic control barriers size, joining, angle of impact.
[Not acceptable if used alone against a 90° attack]
 - Moveable barriers performance specifications
[Must withstand DBTV unless other barriers force entering vehicles to slow down]
 - Reduced barriers due to terrain.
[Licensee to demonstrate effectiveness]
- Effective installation
 - Support members embedded in concrete below frost line.
 - Full strength cable clamps and brackets.
 - Gate barriers kept closed
[Must fail in closed position]
 - Follows design details.
 - Dead men or equivalent used to anchor cables (or equivalent)
 - Protected by intrusion alarm at all points along perimeter.

Personnel Barriers

- Complete coverage around perimeter with two barriers.
- Intrusion alarm between barriers.
- At least 20 ft between barriers for a clear zone
[If less than 20 ft compensation required, such as razor ribbon, or a higher inner barrier]
- Isolation zones on each side of each barrier.
- 0.02 footcandles illumination in all isolation zones.
- Secured fence bottoms.
- Outrigger modifications to prevent hand holds.
- Posts embedded in concrete.
- Absense of objects on structures that would assist breaching or overclimbs.
- Adequate alarm assessment capability.

BIBLIOGRAPHIC DATA SHEET

(See instructions on the reverse)

1. REPORT NUMBER
(Assigned by NRC, Add Vol., Supp., Rev.,
and Addendum Numbers, if any.)

NUREG-1321

2. TITLE AND SUBTITLE

TESTING STANDARDS FOR PHYSICAL SECURITY SYSTEMS
AT CATEGORY I FUEL CYCLE FACILITIES

3. DATE REPORT PUBLISHED

MONTH YEAR
October 1991

4. FIN OR GRANT NUMBER

5. AUTHOR(S)

PRISCILLA A. DWYER

6. TYPE OF REPORT

Technical

7. PERIOD COVERED (Inclusive Dates)

8. PERFORMING ORGANIZATION - NAME AND ADDRESS (If NRC, provide Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address, if contractor, provide name and mailing address.)

DIVISION OF SAFEGUARDS AND TRANSPORTATION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

9. SPONSORING ORGANIZATION - NAME AND ADDRESS (If NRC, type "Same as above"; if contractor, provide NRC Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address.)

SAME AS ABOVE.

10. SUPPLEMENTARY NOTES

11. ABSTRACT (200 words or less)

THIS NUREG IS A COMPILATION OF PHYSICAL SECURITY TESTING STANDARDS
FOR USE AT FUEL CYCLE FACILITIES USING OR POSSESSING FORMULA
QUANTITIES OF STRATEGIC SPECIAL NUCLEAR MATERIAL.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)

PHYSICAL SECURITY
TESTING STANDARDS
SAFEGUARDS
CATEGORY I FACILITIES

13. AVAILABILITY STATEMENT

UNLIMITED

14. SECURITY CLASSIFICATION

(This Page)

Unclassified

(This Report)

Unclassified

15. NUMBER OF PAGES

16. PRICE

END

**DATE
FILMED**

01/108192