

A PRACTICAL FIELD SURVEY ON EQUIPMENTS FOR PHYSICAL PROTECTION

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Presented in this paper are the results of data-gathering and evaluation tests on equipments for physical protection system, which, considering the trends in relating technologies and changing threat environments, are most likely to be used in future Japanese nuclear facilities.

Following tests are carried out as parts of this program.

(1) Out-door Sensor Test

Bistatic-Microwave Sensor, Buried-line E-field Sensor, E-field Sensor, and Tension-wire Sensor were selected and tested in Detection-Performance Tests and Environmental(False-Alarm)tests. Detection-Probability was provided as the results of Detection-Performance Tests (live- intrusion test), in which Detection-Probability was represented as a function of behavior mode of intruders (covert / overt) and the number of intruders. The Detection-Probability in these tests were fairly high, because of laboratory-test-like nature of these test. The correlation between the Detection-Probability and the number of intruders was not significant.

In Environmental Test, survey was done to clarify the correlation between False-Alarm rate of the sensors mentioned above and the atmospheric phenomena such as rainfall or direction / velocity of wind.

***) This work is sponsored by the Science and Technology Agency, Nuclear Safety Bureau (NSB), Office of Physical Protection of Nuclear Material**

(2) In-door Sensor Test

2 thermic- ray Sensors(Passive-IR Sensors)were set up in test-chamber for Detection-Probability Test and Environmental (False-Alarm) Test. Detection-Probability higher than 97% (which reliability level of 80%) was recorded in the former test. In the latter test, the detection-sensitivity of the sensor was set to provide 2 levels, 'Standard ' and ' High'. In 'Standard' sensitivity test, 8 false alarm were observed during the test, but the analysis of the situation revealed that all of them were caused by imperfect construction of the test-chamber, and no false-alarm, except for once in 'High 'sensitivity test, were generated after the improvement of the test chamber.

(3) Performance Test of Entry-Control Equipment

Hand-Geometry Identifier (3- dimension type) was selected and subjected for the performance test. Over 30 men and women among the employee of our facility were randomly selected

for the test. Each of them posed their hand for 120~280 times during the test. Both of Type I Error(rejection of authorized person) and Type II Error (acceptation of un-authorized person) were estimated. In standard setting, (Type 1 Error) (Type 2 Error) but it was proved to be possible to realize the inverse situation if necessary, by shifting these setting.

(4) Breaching-Test of indoor-barrier

Reinforced-Concrete wall, general-purpose door and reinforced door were selected, and exposed for breaching by hands using portable power-tools. Breaching of the reinforced-concrete wall was completed (cut aperture with enough size for passing human) in 88 minutes using electric-hammer, 48 minutes using engine-hammer. 264 sec. needed for melting down the latch of general-purpose door, and 1,323 sec. for burning off the aperture in reinforced door.

(5) Blow-up Test of barrier

Reinforced-concrete wall(300 mm thickness), quasi-reinforced door I(50 mm thickness door composed of steel-plate with 2.3 mm thickness) and quasi-reinforced door II(50 mm thickness door composed of stainless- steel-plate with 2 mm thickness) were submitted for blow-up test using dynamite and shaped-charge block. 4~6 minute was needed for intrusion from reinforced-concrete wall, and 217 sec. /238 sec. for both type of quasi-reinforced door.

(6) Alarm-Assessment system Test

In this test, we have measured the time needed to assess and evaluate the alarm by surveillance using CCTV. The outdoor-tests were carried out under various situation such as daytime/ night, covert / overt intrusion, fair weather / rainy day, and also under combined conditions stated above. The assessments were completed in all the cases. The time needed to assess and evaluate the alarm were 4.39 sec. min. and 15.4 sec. max. after the occurrence of the alarms. Similar tests were carried out in in-door test facility using 2 thermic-ray sensors. In this test also, tests were done in daytime / night, covert / overt intrusion, fair weather / rainy day, and again the assessments were completed in all the cases.

The data gathered in these test will be valuable material for construction of database of Physical Protection.