

Improvements by Assessment Zone Evaluation for CCTV systems at the Nuclear Power Plant

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1. Introduction

According to "Act on the Physical Protection and Radiological Emergency"(APPRE), nuclear licensees have to install and operate physical protection system(PPS) to protect against threats to their facilities. The primary PPS functions are detection, delay, and response. Detection consists of intrusion sensing, alarm assessment. Intrusion sensing includes the activation of the sensor and the initiation of the alarm signal. Alarm assessment includes the process for reporting alarms, and determining causes of the alarms. It is a basic principle of security system that detection process is not complete unless alarm is assessed [1].

Currently, most detection systems at nuclear facilities have been installed and operated in the status which does not accurately reflect the concept about the alarm assessment. Therefore, it has been existed many blank areas of detection system for monitoring and assessment.

The major purpose of this study is to introduce the assessment zone evaluation methodology and evaluate the assessment performance of Closed-Circuit TeleVision(CCTV) equipment at nuclear facilities in operation. Then find out the problems, finally suggest improvements to enhance the assessment performance.

2. Detection System

A detection system also consists of 2 kinds of sub-systems. One is an intrusion sensing system (including sensors) for generating an alarm upon detection of intrusion. The other is an alarm assessment system (including CCTV equipment) for determining whether alarms are produced by actual intrusion or not. The reason why it includes an alarm assessment system is that it is necessary to verify whether the sensors make false alarm by itself, nuisance alarm by the environment, real alarm by the intruder. Also, CCTV equipment has not only the function to determine the alert generated by the intrusion sensing equipment, but also the function to track and monitor the intruder.

3. Methods and Results

Assessment zone refers to the horizontal and vertical distance that the user can know exactly not only the location but also the cause of alarms. Nuclear licensees

are usually considering their assessment zone with inner areas between double fences [4].

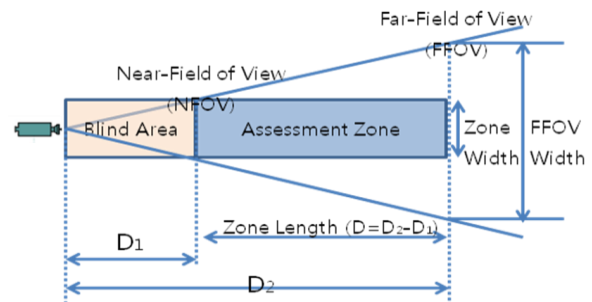


Fig.1 Perimeter Assessment Zone Geometry

Evaluating the assessment zone is very important. Because the assessment zone evaluation ensures CCTV systems to have enhanced assessment performance by minimizing blank areas for the alarm assessment. Also corresponding forces are able to conduct quick response through the exact assessment zone evaluation.

3.1 Evaluation Methodology

To evaluate the assessment zone technically, two evaluations are carried out separately by the drawing, and by the monitor screen.

The evaluation by drawing is as below. First, scaled-floor plans should be prepared. It includes roads, sensors, double fences, assessment equipment, etc. Second, it is to characterize the performance of the CCTV equipment (camera direction, distance, and angle of view) installed in actual field. Third, it is to evaluate the assessment zone. By checking the intersection and the nest of the judgment, blind spots for assessment can be discovered.

The evaluation by the monitor screen can be conducted to verify whether it matches between the real performance and the characterized performance of the assessment equipment after the completion of the evaluation by drawings. The reason for carrying out the evaluation by the monitor screen is that CCTV equipment would decrease in performance due to aging, or the natural environment, etc. For the blind spot, it is possible to evaluate sufficiently with the naked eye. For the assessment zone conformity, it should be evaluated by using the special tools in the field. In this case, a reference for evaluating the assessment zone was

required. The Sandia National Laboratories in the US have used 30Cm square, circle, triangle as a criteria that can be distinguished by the assessment equipment. They may determine that 30Cm is enough size to decide whether the intrusion by a person or not.

3.2 Evaluation Results

Results of the evaluation, the following problems are discovered [5].

1) It was derived through evaluation by drawing that the blind spots due to far long length of assessment zone are discovered. The assessment equipment could not identify well at the end of the assessment area. And it is also reaffirmed through evaluation by monitor screen that the discriminating ability of the object is reduced significantly due to the long assessment zone setup

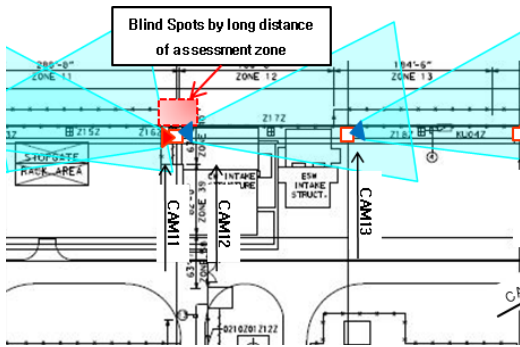


Fig.2 Blind spot by long length of assessment zone

2) It was derived through the evaluation by the monitor screen that the blind spots due to the nested fence structure and the installation position of the surveillance camera are discovered.



Fig.3 Blind Spot by the nested fence structure

3.3 Improvements

The problems that have been discovered as a result of the evaluation are improved as follows [5]:

1) The blind spot is eliminated by adding a camera and resetting the assessment zone to the location identified.

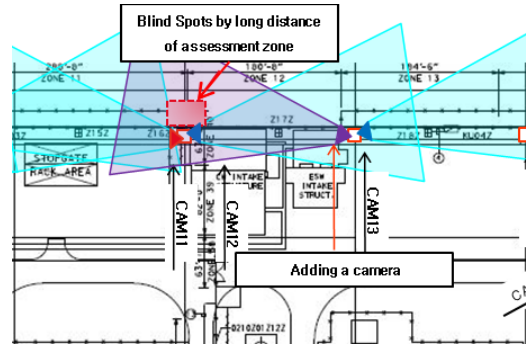


Fig.4 Installation of another camera to cover the blind spot

2) The blind spot is also solved by using the bracket camera and changing the direction of the surveillance camera.



Fig.5 Usage of a bracket to cover the blind spot

4. Conclusions

As mentioned earlier, the concept about the assessment zone has not been reflected with most CCTV systems at nuclear facilities. In some facilities, the monitor screen has the assessment blind spot until now. Or the detection performance has dropped significantly because when the assessment zone were set not to determine the exact cause of the alarms. In addition, CCTV system is exposed to the natural state, so that aging phenomenon has to be considered. Therefore, if the evaluation for the assessment zone of the CCTV system is applied according to the methodology in this paper, it would be able to improve the assessment performance better such as eliminating blind spots or enhancing current assessment ability properly

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