Development of DB on Radiological Terror in a Metropolitan Area

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1. Introduction

Since the September 11th, 2001 terrorist attacks in New York City, the possibility of a radiological attack has become a prime concern. Many countries are developing measures for preventing against and response to such use a situation. The use of radiological device is very attractive to terrorist because they are relatively easy to obtain and they could cause large scale damage. The damage due to radiological terror can be more severe in a metropolitan area than in a remote area. Therefore metropolitan areas are more susceptible to a radiological dispersal device (RDD). A RDD attack should be prevented before it occurs, but it is not an easy task in a metropolitan area. If a RDD were to explode in a densely populated area, a prompt response would be required to minimize the damage--especially to human life. In order to make proper response measures (i.e., such as how far people should be moved) quick and accurate information about the explosion needs to be provided. This is especially true when considering the effects of radiation on human health and the environment. Such information would include: the type and quantity of radioactive material used is in a radiological attack. Data on atmospheric conditions at the time of the radiological contamination are also required in order to determine the TEDE (Total Effective Dose Equivalent). However, it takes a lot of time to obtain these results. Time is the most crucial factor for those who are trying to determine proper response measures. The best way to decrease the time for needed to obtain these results is to establish a data base that includes a list of the damages obtained from all possible scenarios. The consequences of attack may be easily provided by just clicking a button on an up to date and well maintained data base. This paper will present a risk analysis of a dirty bomb attack on a metropolitan area. The paper will also introduce a data base constructed by the results obtained from this analysis.

2. Attack scenarios

Reliable attack scenarios are required in order to analyze the aftermath of a radiological explosion. There are various parameters that comprise these scenarios; and they may be different according to the purpose of the analysis. In this study, three parameters: radioactive material, explosive types and meteorological conditions are selected.

2-1 Metropolitan Area

Metropolitan areas where a radiological terror is likely to occur are selected based on the survey results on the quantity of radioactive materials used and population density. Through this process, six large cities were selected as target areas.

2-2 Radioactive Material

Many kinds of radioactive materials are used, stored and produced in the nuclear facilities. Their quantity is also significant. In order to select radioactive materials to be used as source for evaluation, the current status of radioactive materials that are used near a metropolitan area, and a history of accidents related to them were surveyed. Based on these results, seven radioactive materials were chosen.

2-3 Explosive Types

Two types of explosives are considered in this study--hand carried bombs and bombs loaded in a cars. A guide table published by the DHS (Department of Homeland Security) was used to determine the power of explosives. Fifty (hand carried) and 500 (loaded in a car) lbs explosives were selected.

2-4 Meteorological Condition

Meteorological conditions play a decisive role in determining how large an area contamination could be spread, and how harmful the radiological effects can be to the public. Three factors such as: direction and intensity of winds and the stability of the atmosphere were selected for evaluation. In order to obtain credible data, meteorological data for the last 20 years were obtained for analysis.

Table. 1 Input parameters for evaluation

Metropo-litan Area	Radio-active materials	Explo-sive	Intensity of wind	Stability of Atmo-sphere
Seoul Busan Taegu Gwangju Daejeon Incheon	Am-241 C0-60 Cs-137 Ir-192 Ni-63 LEU Pu-239	50 lbs 500lbs	1.3 ~ 4.5 m/sec	A (Stable) F (Unstable)

3. Evaluation of the scenario

The scenarios that are established have been evaluated using a computer code--“Hot spot”. The radiological consequences of 336 scenarios were derived from the

evaluation. It includes the TEDE value and surface deposition of radioactive materials with distances as shown in Fig 1.

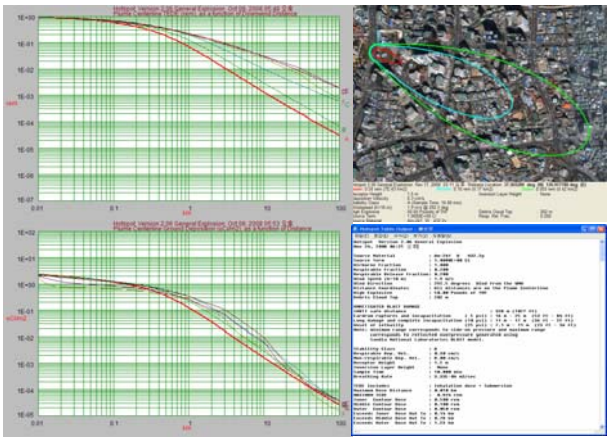

Fig.1 Results of evaluation

4. Development of DB

Data obtained from the evaluation should be organized in order to provide appropriate information to a decision maker in a quick manner. For this purpose, a data base program was developed in this study, as can be seen in Fig. 2. All the results were grouped, and five categories were created. A specific scenario can be easily selected by just clicking the category button in this program. After the scenario is determined, evaluation results can be seen by selecting the button.

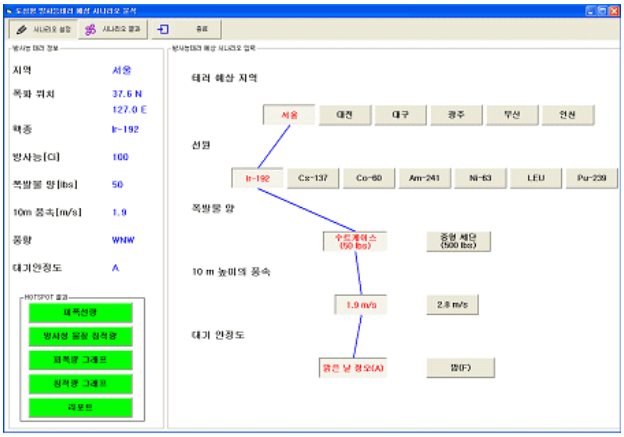

Fig.2 DB program

5. Conclusion

The DB program that provides information on radiological effects on humans and the environment has been developed. In order to obtain data, a total of 336 scenarios were developed and evaluated. The parameters used as such as: radioactive material, explosive types and meteorological conditions were derived by analyzing all the related factors in order to get tangible results. Radioactive materials to be used were selected after investigating the most frequently used materials and the accident history in selected metropolitan areas. Meteorological conditions were determined by analyzing climate data for the last 20 years. It is expected that the developed DB program can be a useful tool to provide reliable information during emergencies. However, data on the 336 cases are not enough to cover all the possible scenarios. Therefore, that further study is required.

Acknowledgement

This work has been carried out under the Nuclear Research and Development program supported by MEST

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