

# **THE GERMAN CATALOGUE OF COUNTERMEASURES - A SUITABLE AND NECESSARY TOOL IN EMERGENCY SITUATIONS**

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## **1. Introduction**

The "overview of countermeasures to reduce the exposure to radiation after events of considerable radiological impact" (here briefly: Catalogue of Countermeasures) is a useful manual for selecting protective measures on the basis of simple calculations. The first version of the Catalogue of Countermeasures was duly submitted in the summer of 1992. A new and more synaptical version of the Catalogue of Countermeasures is currently in preparation.

## **2. Valid range of the Catalogue of Countermeasures**

### **2.1 Target group**

Users of the Catalogue of Countermeasures will be those who need to evaluate the information from an event of considerable radiological impact and possibly resulting consequences. These are experts from competent governmental and state fields of authority and persons belonging to the respective advisory and supporting panels.

### **2.2 Limits of the Catalogue of Countermeasures**

In consequence of the manual-like character of the Catalogue, its universality is considerably limited compared to computer programs.

- For pre-calculation, it is necessary to establish specific model parameters. Under certain circumstances, such model parameters can be changed, if this should result in a better estimation of their actual value.
- By a computer program such essential quantities as contamination and radiation exposure can be determined by one process for all involved sites and points of time. By manual, however, these can be determined for always only one site and one point of time. Therefore, on hand of measurement results it is essential to first gain an overview of the sites and points of time for which estimates are to be prepared.
- A particularly important restriction applies to the reference dose value. In the Catalogue of Countermeasures, the dose that corresponds with the reference dose is assumed to be fully exhausted by one exposure pathway. In practice, however, it must be assumed that next to one pathway there may also be others that play a more or less important role. Accordingly, the derived reference value that corresponds

with the respective reference dose value is generally too high. Nevertheless, this approach seems to be justified by the fact that the derived reference value is calculated by basing it on the lower reference dose value of the ICRP bandwidth concept. In addition, the proportions of the various exposure pathways contributing to the total exposure by one single nuclide may be determined by prepared nomograms.

### 3. Content of the Catalogue of Countermeasures

On the basis of evaluations taken from literature, measures were compiled in the Catalogue of Countermeasures which are discussed in reference to avoiding or reducing the radiation exposure after events of considerable radiological impact. The necessity for this compilation arose from the consequences of the Chernobyl event.

When using the Catalogue it must principally be presumed that not all of the measures will apply to all situations. Still, an attempt was made to provide a comprehensive overview as a basis for possible argumentation if, for example, a specific measure should not be initiated on account of its low effectiveness.

The main criterion for initiating and executing a protective measure is the radiation dose expected to be received from each of the considered pathways (external radiation, internal radiation after inhalation or ingestion). Since radiation is generally not directly measurable, for practical purposes it is not the radiation dose itself but the derived and directly measurable quantities that are used for decision-making.

To calculate derived reference values, models must be used which e.g. include the circumstances of the release due to the condition of the nuclear installation, the dispersion of radioactive substances in the atmosphere, the radioecology as well as the incorporation-related metabolism of the radioactive substance.

The following derived reference values are used:

- time-integrated air concentration in  $\text{Bq h/m}^3$ ,
- surface and skin contamination in  $\text{Bq/m}^2$ ,
- specific activity in  $\text{Bq/kg}$  or  $\text{Bq/l}$ .

On the basis of the derived reference values, the Catalogue of Countermeasures is an aid in deciding on the initiation of measures by indicating the type of effectiveness, the effectivity and the possible problems that may occur from the application of countermeasures.

## 4. Structure of the revised Catalogue of Countermeasures

The revised Catalogue of Countermeasures will consist of two parts. The first part, in form of models and tables, will allow for shortterm decisions on initiating precautionary measures on the basis of available data and includes:

### Chapter 1 Introduction

A condensed description of essential general data on the purpose and use of the catalogue.

### Chapter 2 Orientation tables and models

The orientation models in this chapter are serving as guide for the use of orientation tables, including criteria for the selection of required measures. On the basis of actually available information, e.g. measured or prognosed data on the time-integrated air concentration of specific nuclides or tracer nuclides, the measurement table of relevance for these data can be determined from this chapter and identified on hand of a model. For each countermeasure, the table refers to relevant additional information and data contained in other chapters of the catalogue.

### Chapter 3 Graphic aids

In this chapter, all measures are graphically compiled. This - in addition to chapter 2, although differently demonstrated - is a rapid means of countermeasure orientation on hand of barred diagrams demonstrating the areas where countermeasures need to be applied.

### Chapters 4 to 6 compilation of commentaries on all countermeasures

Based on each area where countermeasures apply, the compilation is divided into respective focal points:

- catastrophe protection measures (chapter 4)
- precautionary radiological protection measures (chapter 5)
- measures in the agricultural area (chapter 6)

The text and tables summarize important information on countermeasures, particularly emphasizing on pre-conditions, feasibility, effectiveness, advantages and disadvantages.

The second part of the catalogue contains supplemental information that may be of use in working with the catalogue. This includes, among others, data on nuclear power plants in Europe and tables in reference to sites and inventories. The second part of the Catalogue of Countermeasures contains also a summary of theoretical principles together with the most important equations on which the catalogue is based. This section should provide the background for a more specific familiarization with the catalogue.