

**GUIDE FOR DECONTAMINATION
IN P.W.R. POWER PLANTS**

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Nuclear power plant components or equipment often need to be more or less decontaminated before maintenance. In order to coordinate the activities of the various maintenance specialists belonging to the Corporate or Site Organizations, the Management of EDF/Nuclear and Fossil Division has created a "Decontamination Task Force". The first objective of this Task Force was to prepare this "Decontamination Guide for Nuclear Power Plants".

This document is the result of a close collaboration, within a specific working group, between representatives of Nuclear & Fossil Division (from Nuclear Power Plants & Corporate Departments) and EDF Project & Construction Group. It will provide assistance to Nuclear Plants Operators in the very specific field of decontamination.

INTRODUCTION

Human external exposures and contamination risks increase over the years, with nuclear plant operation time. This applies essentially to maintenance personnel. In order to reduce dose rate, conventional radioprotection measures can be efficiently improved by equipment decontamination.

However, decontamination should not be considered as a panacea and should only be used after an in-depth and critical evaluation of the technical, dosimetical and economical aspects (ALARA).

The objective of this Guide is to provide the operators with methods and techniques which will help them to take decisions in the decontamination field.

This Guide describes essentially decontamination techniques available for the maintenance of Pressurized Water Reactors. Some of these techniques might be applied, after evaluation, to other types of reactors.

It is not only useful to those in charge of implementing these techniques, but also to planners having to integrate decontamination techniques in maintenance and working procedures.

The Guide is divided into two parts :

- part I contains general information about decontamination techniques, and gives the basics for obtaining an acceptable level in this discipline,

- part II describes the decontamination methods and techniques available to Power Plants. It is to be considered as prescriptive ; in fact, all decontamination techniques not included in this book have to be implemented very carefully, after consulting with Company specialists.

It is an evolving Guide, as far as the prescriptive part is concerned. It depends essentially on experience feedback from all the users.

DECONTAMINATION GUIDE

PART I : PRESENTATION AND GENERAL INFORMATION

The first chapter describes the technical aspects of equipment decontamination and covers the following topics :

- Radioactive contamination cases in a PWR NPP
- Thresholds - Contamination measurement
- Contamination prevention
- The equipment to be decontaminated
- Decontamination objectives
- Description of the main decontamination methods
- Decision criteria
- Decontamination liquid treatment and waste processing
- Safety - Health Physics - Environment

The second chapter covers EDF quality organization in the decontamination field :

- Policy :
 - Decontamination activities
 - How to attain quality
 - Who is suppose to do what
 - Qualification of decontamination personnel
 - Acceptance and qualification of a decontamination process

- Implementation :
 - When planning a decontamination :
 - Responsibility of the initiator
 - Responsibility of the planner
 - Responsibility of the decontamination crew leader

Part I (and essentially chapter II) are related to the French regulations applicable to operators and contractors.

PART II : METHODS AND TECHNIQUES

This part is essentially technical and addresses the personnel actually involved in equipment decontamination. It provides a list of applicable methods, depending on the type of contamination and the basic material of the component.

The optimum method can be sought in two ways :

- by nuclear power plant component : the guide proposes 14 logical search flowcharts for the following component types :

- M1 Steam Generator
- M2 Reactor cavity and spent fuel pit walls
- M3 Reactor coolant pump
- M4 Charging pump
- M5 Residual Heat Removal (RHR) pump
- M6 CVCS regenerative heat exchanger
- M7 CVCS non-regenerative heat exchanger and RHR heat exchanger
- M8 RCS pipes
- M9 CVCS/RHR pipes
- M10 RCS valve
- M11 RHR/CVCS valves
- M12 Spent fuel element shipping cask
- M13 Electrical/electronic/optical equipment
- M14 RCS Pressurizer

- by basic material : the guide proposes 11 logical search flowcharts :

- L1 Stainless steel (high temperature contamination)
- L2 Stainless steel (low temperature contamination)
- L3 Nickel based alloys (Inconel..) (high temperature contamination)
- L4 Carbon steel
- L5 Cobalt based alloys (stellites)
- L6 Copper based alloys
- L7 Aluminium and zinc based alloys
- L8 Lead
- L9 Concrete
- L10 Plastic - Rubber
- L11 Liners - Paints

These logical flowcharts indicate a certain number of decontamination methods applicable to the relevant equipment. The methods are described in technical files indicating :

- Qualification of the process : the EDF specialists in the different fields involved (metallurgy, chemistry, etc...) have collected sufficient information and test results and can thus authorize the use of this process on the relevant equipment, as described in the file. This authorization does not necessarily cover all specific requirements prescribed by the Regulatory Bodies, since adherence to the rules is the users's responsibility.

- Applicability : a list of the materials and equipment that can be treated by the corresponding process. It also lists the materials and equipment on which it should not be used.

- Operating instructions and procedures : it describes the various chemical phases and the necessary equipment.

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- Expected results : it indicates the results usually obtained by using the process, and more specifically the expected dose rate reduction factor.

- Waste processing methods : it indicates the various methods for processing the resulting effluents. These methods are in accordance with the French regulations related to environmental protection.

- Advantages and drawbacks : it indicates the strong points of the process and also its shortcomings.

- Historical aspect : it indicates some worldwide results of previous use of the process.

- Basic diagram : it shows basic set-up and installation drawings of the process.

- List of accepted and similar commercial products : it enables a Nuclear Operator to implement the process himself, providing these products or the process are not patent protected.

- List of EDF qualified vendors and contractors : it gives the list of those contractors that have satisfied the EDF Quality Assurance requirements and are authorized to work on EDF equipment.

The guide contains 40 technical files concerning about decontamination methods.

Data and information are extracted from technical publications and EDF guarantees neither the efficiency of the methods nor the expected results. It is however now being satisfactorily used by the EDF nuclear sites.

The guide is now available in its French version. An English version could be published in 1992, depending on the results of an ongoing market survey.