

CONTENTS

| | |
|-----------------------------------------------------------------------------------------------------------|-----------|
| 1. INTRODUCTION | 1 |
| Background (1.1–1.5)..... | 1 |
| Objective (1.6) | 1 |
| Scope (1.7–1.10) | 2 |
| Structure (1.11–1.12) | 3 |
| 2. SAFETY OBJECTIVES, DOSE LIMITATION AND OPTIMIZATION | 4 |
| Safety objectives (2.1) | 4 |
| Authorized dose limits and dose constraints for operational states and decommissioning (2.2–2.3) | 4 |
| Application of the optimization principle (2.4–2.6)..... | 5 |
| Design targets for operational states (2.7–2.9) | 6 |
| Design target for accidents (2.10–2.11) | 7 |
| 3. RADIATION PROTECTION ASPECTS IN DESIGN | 8 |
| Sources of radiation(3.1–3.3) | 8 |
| Design approach for operational states and decommissioning (3.4–3.29) | 9 |
| Approach to design for accident conditions (3.30–3.34) | 19 |
| 4. PROTECTION OF SITE PERSONNEL IN OPERATIONAL STATES AND DURING DECOMMISSIONING | 21 |
| Objectives (4.1)..... | 21 |
| Control of sources of radiation (4.2–4.10)..... | 21 |
| Plant layout (4.11–4.24)..... | 24 |
| System design (4.25–4.33) | 27 |
| Component design (4.34–4.39)..... | 28 |
| Remote techniques (4.40–4.41)..... | 29 |
| Decontamination (4.42–4.52) | 29 |
| Shielding (4.53–4.67) | 31 |
| Ventilation (4.68–4.74)..... | 33 |
| Waste treatment systems (4.75–4.78)..... | 34 |

| | |
|-----------------------------------------------------------------------------------------------------------|-----------|
| Storage of radioactive waste at the plant (4.79–4.87)..... | 35 |
| 5. PROTECTION OF THE PUBLIC DURING PLANT OPERATION AND DECOMMISSIONING..... | 37 |
| Discharge criteria (5.1–5.3) | 37 |
| Source reduction (5.4) | 38 |
| Effluent treatment systems (5.5–5.14) | 38 |
| Shielding (5.15)..... | 41 |
| 6. GUIDELINES FOR ESTIMATING RADIATION DOSE RATES DURING PLANT OPERATION AND DECOMMISSIONING | 41 |
| Objectives (6.1–6.2) | 41 |
| Source categories (6.3–6.4) | 42 |
| Sources and propagation of radiation: Specific shielding design (6.5–6.13) | 42 |
| Sources for which shielding is not practicable (6.14) | 45 |
| Sources that dominate decommissioning doses and waste volumes (6.15–6.18) | 45 |
| Special hazards (6.19–6.20) | 46 |
| Sources that are important contributors to doses to members of the public (6.21–6.23) | 46 |
| 7. MONITORING FOR RADIATION PROTECTION DURING PLANT OPERATION AND DECOMMISSIONING | 47 |
| General (7.1–7.10) | 47 |
| Area monitoring systems within the plant (7.11–7.16) | 49 |
| Effluent monitoring (7.17–7.19) | 50 |
| 8. PROCESS RADIATION MONITORING (8.1–8.7)..... | 51 |
| 9. AUXILIARY FACILITIES (9.1–9.2) | 53 |
| 10. PROTECTION OF SITE PERSONNEL UNDER ACCIDENT CONDITIONS (10.1–10.11) | 54 |
| 11. PROTECTION OF THE PUBLIC UNDER ACCIDENT CONDITIONS (11.1–11.9) | 57 |

| | |
|---------------------------------------------------------------------------------------------|-----|
| 12. RADIATION AND CONTAMINATION MONITORING UNDER ACCIDENT CONDITIONS (12.1–12.10)..... | 59 |
| REFERENCES | 63 |
| ANNEX I: APPLICATION OF THE OPTIMIZATION PRINCIPLE | 65 |
| ANNEX II: SOURCES OF RADIATION DURING NORMAL OPERATION AND DECOMMISSIONING | 68 |
| ANNEX III: SOURCES OF RADIATION UNDER ACCIDENT CONDITIONS..... | 83 |
| ANNEX IV: DETERMINATION OF SOURCE TERMS FOR PLANT OPERATION AND DECOMMISSIONING | 96 |
| ANNEX V: EXAMPLE OF ZONING FOR DESIGN PURPOSES ... | 102 |
| GLOSSARY | 105 |
| CONTRIBUTORS TO DRAFTING AND REVIEW..... | 111 |
| BODIES FOR THE ENDORSEMENT OF IAEA SAFETY STANDARDS | 113 |