

CONTENTS

1.	INTRODUCTION	1
1.1.	Background	1
1.2.	Objective	2
1.3.	Scope	2
1.4.	Structure	3
2.	GENERAL PHILOSOPHY	3
2.1.	Main lines of seismic evaluation	3
2.1.1.	Purpose of seismic evaluation	3
2.1.2.	Philosophy of the present Safety Report	4
2.1.3.	Seismic analysis	4
2.1.4.	Safety analysis	5
2.1.5.	Feedback experience and walkdowns	5
2.1.6.	Capacity assessment	6
2.2.	Technical findings	6
3.	DATA COLLECTION AND INVESTIGATIONS	7
3.1.	Site and plant data	7
3.1.1.	Soil data	7
3.1.2.	Collection of original design basis data	8
3.1.3.	Additional important data	9
3.2.	Earthquake experience and seismic test data	10
3.2.1.	Framework for the use of feedback experience	10
3.2.2.	Databases	10
3.3.	Seismic instrumentation	11
4.	SEISMIC HAZARDS	11
4.1.	SMA methodology: basis for RLE determination	12
4.2.	SPSA methodology	13
5.	SAFETY ASPECTS	14
5.1.	Proposed methodologies	14
5.1.1.	SMA methodology	14

5.1.2.	SPSA methodology	16
5.2.	SSSC required functions, failure modes	18
6.	PLANT SEISMIC WALKDOWN	19
6.1.	Organization	20
6.1.1.	Walkdown teams	20
6.1.2.	Scope of the walkdown	20
6.1.3.	Preliminary screening walkdown	21
6.1.4.	Detailed screening walkdown	22
6.2.	Interactions	23
6.2.1.	Spatial interactions	23
6.2.1.1.	Falling	23
6.2.1.2.	Proximity	23
6.2.2.	Spray and flood	24
7.	EVALUATION OF SEISMIC MARGIN CAPACITY	24
7.1.	Principle of the evaluation of seismic margin capacity	24
7.2.	Response analysis	26
7.2.1.	Soil-structure interaction modelling	26
7.2.2.	Structural modelling	27
7.2.3.	Parametric studies and floor response spectra	28
7.2.3.1.	Soil properties	28
7.2.3.2.	Structure properties	28
7.2.3.3.	Position of cranes	29
7.3.	Capacity evaluation	30
7.3.1.	Seismic demand	30
7.3.2.	Seismic capacity	32
7.4.	Inelastic energy absorption factor and ductile capacity	34
7.5.	Relays review	35
7.6.	Anchorage, supports and nozzles	36
8.	UPGRADING PRINCIPLES	38
8.1.	Items to be upgraded	38
8.2.	Design of modifications	39

9.	QUALITY ASSURANCE AND ORGANIZATION	39
	9.1. Organization and responsibilities	39
	9.2. Documentation	40
APPENDIX I:	EXAMPLE PWR WITH APPLICATION TO WWERS	41
APPENDIX II:	EXAMPLE OF SYSTEM CATEGORIZATION	42
APPENDIX III:	DAMPING VALUES AND F_{μ} VALUES	44
REFERENCES	45
ABBREVIATIONS AND ACRONYMS	47
ANNEX I:	EXAMPLE OF SCREENING VERIFICATION DATA SHEET	49
ANNEX II:	EXAMPLE OF SEISMIC EVALUATION WORK SHEET (FOR HORIZONTAL PUMPS)	50
ANNEX III:	SCIENTIFIC BACKGROUND, NOTATION AND TERMINOLOGY FOR THE F_{μ} FACTORS	52
CONTRIBUTORS TO DRAFTING AND REVIEW	59