

Design of nuclear power plants against seismic events - Part 4: Components

Contents

Page

		Page
Foreword		v
Introduction		vi
1 Scope		1
2 Normative references		1
3 Terms and definitions		1
4 General requirements		3
4.1 Basics		3
4.2 Verification procedure		4
4.3 Verification methods		5
5 Verification by analysis		6
5.1 Summary		6
5.2 Excitation at the location of installation		6
5.2.1 Basics		6
5.2.2 Secondary responses		6
5.2.3 Tertiary responses		7
5.2.4 Design spectra		7
5.3 Modeling		8
5.3.1 System characteristics		8
5.3.2 De-coupling of structures		9
5.3.3 Fluids		10
5.4 Analysis of mechanical behaviour and load determination		11
5.4.1 Analysis methods		11
5.4.2 Response spectrum method		11
5.4.3 Time history method		13
5.4.4 Quasi-static method		13
5.4.5 Non-linear time history analysis		14
5.4.6 Relative displacement		15
5.5 Verification of the limit conditions		15
6 Verification by testing		16
6.1 Verification objective		16
6.2 Requirements regarding the test object		16
6.3 Requirements regarding excitation		17
6.3.1 Basics		17
6.3.2 Comparison of actions		17
6.3.3 Excitation axes		17
6.3.4 Transverse motions		18
6.3.5 Single-frequency test excitations		18
6.3.6 Test excitation methods		18
6.4 System characteristics and parameters		19
6.4.1 Static parameters		19
6.4.2 Dynamic parameters		19
6.5 Analysis of mechanical behaviour and determination of stress		20
6.5.1 Methods		20
6.5.2 Base excitation		20
6.5.3 General requirements		20

6.5.4	Single-frequency excitation in case of unknown eigenfrequencies of the test object.....	21
6.5.5	Single-frequency excitation in case of known eigenfrequencies of the test object	23
6.5.6	Multiple-frequency excitation.....	24
6.5.7	Simultaneity of excitation directions.....	24
6.5.8	Centre-of-gravity excitation.....	25
6.6	Verification of limit conditions.....	25
6.7	Combination of several verification steps.....	26
6.8	Documentation.....	26
7	Verification by analogy	27
8	Verification by plausibility considerations	27
	Annex A (informative) Recommendations with comments	29
	Bibliography	36