

## BFN-27

### STRUCTURES AND SHIELDING

#### TABLE OF CONTENTS

12.0	STRUCTURES AND SHIELDING .....	12.1-1
12.1	Summary Description .....	12.1-1
12.2	Principal Structures And Foundations .....	12.2-1
12.2.1	Loading Considerations for Structures, Foundations, Equipment and Systems .....	12.2-1
12.2.2	Reactor Building (Class I) .....	12.2-2
12.2.3	Turbine Building (Class II) .....	12.2-43
12.2.4	Reinforced Concrete Chimney (Class I) .....	12.2-45
12.2.5	Radwaste Building (Class II) .....	12.2-51
12.2.6	Office and Service Building (Class II) .....	12.2-55
12.2.7	Condenser Cooling Water System .....	12.2-55
12.2.8	Diesel Generator Building, Units 1 and 2 (Class I) .....	12.2-66
12.2.9	Equipment Access Lock (Class I) .....	12.2-73
12.2.10	Standby Gas Treatment Building (Class I) .....	12.2-78
12.2.11	(Deleted) .....	12.2-80
12.2.12	Guardhouse (Gatehouse) (Class II) .....	12.2-80
12.2.13	Diesel Generator Building, Unit 3 (Class I) .....	12.2-80
12.2.14	Offgas Treatment Building (Class I) .....	12.2-82
12.2.15	Radwaste Evaporator Building (Class II) .....	12.2-83
12.2.16	Residual Heat Removal Service Water Intake (Class I) .....	12.2-84
12.2.17	Low Level Radioactive Waste Storage Facility (LLRWSF) .....	12.2-85
12.2.18	Independent Spent Fuel Storage Installation (ISFSI) Pad .....	12.2-85
12.3	Shielding And Radiation Protection .....	12.3-1
12.3.1	Design Basis .....	12.3-1
12.3.2	Description .....	12.3-1
12.3.3	Performance Analysis .....	12.3-4

## BFN-27

### STRUCTURES AND SHIELDING

#### LIST OF TABLES

<u>Table</u>	<u>Title</u>
12.2-1	Reactor Building Concrete Structure Base Slab Design Data
12.2-2	Reactor Building Concrete Structure Stage I Wall Design Data
12.2-3	Reactor Building Concrete Structure Stage II Slab Over Torus Design Data
12.2-4	Reactor Building Concrete Structure El. 565.0 Slab Over Torus Design Data
12.2-5	Reactor Building Concrete Structure Corner Wall Design Data
12.2-6	Reactor Building Concrete Structure HPCI System Rooms Design Data
12.2-7	Reactor Building Concrete Structure Exterior Walls
12.2-8	Reactor Building Concrete Structure Exterior Walls at Adjacent Units
12.2-9	Reactor Building Concrete Structure Floor Slabs, Beams, and Columns
12.2-10	Reactor Support Pedestal - Allowable and Actual Stresses for Principal Design Cases
12.2-11	Reactor Building Concrete Structure P-Line Wall Design Data
12.2-12	Reactor Building Concrete Structure Fuel Storage Pool and Dryer and Separator Storage Pool
12.2-13	(Deleted)
12.2-14	(Deleted)
12.2-15	(Deleted)
12.2-16	Allowable Stresses for Drywell Access Platforms
12.2-16.1	(Deleted)
12.2-16.2	(Deleted)
12.2-16.3	(Deleted)
12.2-16.4	Reactor Building Outside Drywell Containment Modal Mass Properties
12.2-17	Damping Values For the RPV, RPV Internals, Internal Structures, and Reactor Building
12.2-17.1A	Reactor Building Inside Drywell Containment Modal Properties, NS Direction
12.2-17.1B	Reactor Building Inside Drywell Containment Modal Properties, EW Direction
12.2-17.1C	Reactor Building Inside Drywell Containment Modal Properties, V Direction
12.2-18	(Deleted)
12.2-19	(Deleted)
12.2-20	(Deleted)
12.2-21	(Deleted)
12.2-22	(Deleted)
12.2-23	Turbine Building Concrete Frame Design Data
12.2-24	Turbine Foundation Design Data
12.2-25	Reinforced Concrete Chimney Design Data
12.2-26	Radwaste Building Design Data
12.2-27	Intake Building - Design Data
12.2-28	Intake and Discharge Conduits - Design Data
12.2-29	Diesel Generator Building
12.2-30	Diesel Generator Building Access Doors and Design Data
	Sheet 1
	Sheet 2
12.2-31	(Deleted)

## BFN-27

### STRUCTURES AND SHIELDING

#### LIST OF TABLES (Cont'd)

<u>Table</u>	<u>Title</u>
12.2-32	(Deleted)
12.2-33	Equipment Access Lock Doors Design Data
12.2-34	Standby Gas Treatment Building Design Data
12.2-35	Values Used in Dynamic Earthquake Analysis of Standby Gas Treatment Building
12.2-36	Results of Dynamic Earthquake Analysis of Standby Gas Treatment Building For Operating Basis Earthquake (0.10g)
12.2-37	Intake Channel Gate Structure Design Loads
12.2-38	Reactor Building - Personnel and Equipment Access Locks - Watertight Doors Design Data
12.2-39	Radwaste Building - Double Doors for Exterior Openings - Design Data
	Sheet 1
	Sheet 2
12.2-40	Radwaste Building - Personnel Access Doors - Design Data
12.2-41	Intake Structure and Equipment Access Lock Personnel Access Doors - Design Data
12.2-42	Diesel Generator Building - Portable Bulkhead Design Data
12.2-43	Equipment Access Lock - Flood Gate Design Data
12.2-44	Offgas Treatment Building - Design Data
12.2-45	Radwaste Evaporator Building - Design Data
12.2-46 Sheet 1	Gate Structure No. 2 Design Data
	Sheet 1
	Sheet 2
12.3-1	Plant Radiation Zone Classifications

## BFN-27

### STRUCTURES AND SHIELDING

#### LIST OF ILLUSTRATIONS

<u>Figure</u>	<u>Title</u>
12.2-1	(Deleted)
12.2-2	Reactor Building General Plans and Sections - Unit 1 and 2
12.2-2a	(Deleted)
12.2-2b	Access Locks, Elevations 565 and 665
12.2-2c	Access Locks
12.2-2d	Pressed Steel Door Frames
12.2-3	Reactor Building General Plans and Sections - Units 1 and 2
12.2-4	Reactor Building General Plans and Sections - Units 1 and 2
12.2-5	Reactor Building General Plans and Sections - Unit 3 - Sheet 1
12.2-6	Reactor Building General Plans and Sections - Unit 3 - Sheet 2
12.2-7	Slab Over Torus
12.2-8	Completed Structure Below El. 565.0
12.2-9	(Deleted)
12.2-10	(Deleted)
12.2-11	(Deleted)
12.2-12	(Deleted)
12.2-13	(Deleted)
12.2-14	(Deleted)
12.2-15	(Deleted)
12.2-16	(Deleted)
12.2-17	(Deleted)
12.2-18	(Deleted)
12.2-19	(Deleted)
12.2-20	(Deleted)
12.2-21	Reactor Building Structural Steel - Typical Cross Section
12.2-22a	Reactor Building Crane Runway - Plans and Sections
12.2-22b	Reactor Building Crane - General Arrangement
12.2-22c	Reactor Building Crane - General Arrangement
12.2-22d	(Deleted)
12.2-23	Reactor Building Sacrificial Shield Wall - Plans and Elevation
12.2-24 sht 1	Structural Steel Drywell Floor Framing - El. 563 ft 1/2 in.
12.2-24 sht 2	Structural Steel Drywell Floor Framing El. 563 ft 1/2 in.
12.2-24 sht 3	Reactor Building Drywell Platform El. 563 ft 1/2 in.
12.2-25 sht 1	Structural Steel Drywell Floor Framing - El. 584 ft 9-1/2 in.
12.2-25 sht 2	Reactor Building Drywell Floor Framing El. 584 ft 9-1/2 in.
12.2-25 sht 3	Reactor Building Drywell Floor Framing El. 584 ft 9-1/2 in.
12.2-26	Reactor Building, Outside Drywell Model
12.2-27	(Deleted)
12.2-27A	Lumped Gas, Multiple Stick Model of Reactor Building and Internal Structures
12.2-27B	Horizontal Model of RPV and its Internals
12.2-27C	Vertical Model of RPV and its Internals

## BFN-27

### STRUCTURES AND SHIELDING

#### LIST OF ILLUSTRATIONS (Cont'd)

<u>Figure</u>	<u>Title</u>
12.2-28	(Deleted)
12.2-29	(Deleted)
12.2-30	(Deleted)
12.2-31	(Deleted)
12.2-32	(Deleted)
12.2-33	(Deleted)
12.2-34	(Deleted)
12.2-35	(Deleted)
12.2-36	(Deleted)
12.2-37	(Deleted)
12.2-38	(Deleted)
12.2-39	(Deleted)
12.2-40	Depth of Missile Penetration for Tornado
12.2-41	Depth of Missile Penetration for Tornado
12.2-42	Turbine Building, General Plans and Sections, Sheet 1
12.2-43	Turbine Building, General Plans and Sections, Sheet 2
12.2-44	Turbine Building, General Plans and Sections, Sheet 3
12.2-45	Turbine Building, General Plans and Sections, Sheet 4
12.2-46	Turbine Building, General Plans and Sections, Sheet 5
12.2-47	Turbine Building, Concrete Floor Live Loading, Sheet 1
12.2-48	Turbine Building, Concrete Floor Live Loading, Sheet 2
12.2-49	Turbine Building, Concrete Floor Live Loading, Sheet 3
12.2-50	Turbine Building, Structural Steel, Typical Cross Section, Units 1 and 2
12.2-51	Turbine Building, Structural Steel, Typical Cross Section, Unit 3
12.2-52	Reinforced Concrete Chimney, Location Plan and Details
12.2-53	Reinforced Concrete Chimney Ultimate Moment Capacity
12.2-54	Reinforced Concrete Chimney Reinforcement
12.2-55	Reinforced Concrete Chimney Steel Stress for Various Wind Velocities
12.2-56	Reinforced Concrete Chimney, Concrete Stress for Various Wind Velocities
12.2-57	(Deleted)
12.2-58	(Deleted)
12.2-59	(Deleted)
12.2-60	Reinforced Concrete Chimney, Foundation Outline
12.2-61	Reinforced Concrete Chimney Interior Above El. 568
12.2-62	Miscellaneous Steel Offgas Stack Exhaust Vent
12.2-63	Mathematical Model for Dynamic Analysis of Offgas Piping System
12.2-64	Concrete, General Plans and Sections, Sheet 1
12.2-65	Concrete, General Plans and Sections, Sheet 2
12.2-66	Architectural Floor Plans
12.2-67	Architectural Elevations
12.2-68	(Deleted)

## BFN-27

### STRUCTURES AND SHIELDING

#### LIST OF ILLUSTRATIONS (Cont'd)

<u>Figure</u>	<u>Title</u>
12.2-69	Concrete - General Outline Features, Sheet 1
12.2-70	Concrete - General Outline Features, Sheet 2
12.2-71a	Concrete General Arrangement
12.2-71b	Intake Channel
12.2-71c	Safety Related Slopes
12.2-72a	Cooling Tower System, Concrete General Arrangement
12.2-72b	Cooling Tower System, Concrete General Arrangement
12.2-72c	Water Supply Cooling Tower System, Concrete General Arrangement
12.2-73	Diffuser Pipes from Discharge Conduits
12.2-74	Intake Channel Gate Structure
12.2-75a	Intake Channel Gate Structure - Cell Load Diagram
12.2-75b sht 1	Cooling Tower System - Concrete Arrangement
12.2-75b sht 2	Cooling Tower System Concrete Arrangement
12.2-75b sht 3	Cooling Tower System Concrete Arrangement
12.2-76	Diesel Generator Building, and Standby Gas Treatment Building, General Plans and Sections
12.2-77	(Deleted)
12.2-77a	Mathematical Model of Diesel-Generator Building With Chiller Enclosure Units 1 and 2
12.2-77b	Mathematical Model of Diesel-Generator Buildings (Original '2D' Models)
12.2-78	(Deleted)
12.2-79	Typical Frame and Loading, Standby Gas Treatment Building
12.2-80	Equipment Access Lock Doors
12.2-81	Diesel Generator Building, Unit 3, General Plans and Sections
12.2-82	Concrete - Offgas Treatment Building, General Plans and Sections
12.2-83	Concrete Pipe Plan, Slab and Walls Outline
12.2-84	Gate Structure No. 2, Sheet 1
12.2-85	Gate Structure No. 2, Sheet 2