

**CHAPTER 3—DESIGN OF STRUCTURES,
SYSTEMS, COMPONENTS, AND
EQUIPMENT
LIST OF TABLES**

Table 3.2.2-1—Classification Summary.....	3.2-10
Table 3.4-1—Water-Carrying Piping in the Reactor Building.....	3.4-18
Table 3.5-1—Spectrum of Design Basis Tornado Missiles.....	3.5-20
Table 3.5-2—Minimum Concrete Barrier Thickness Requirements for Local Damage Prediction against Tornado Generated Missiles	3.5-20
Table 3.5-3—Allowable Ductility Ratios	3.5-21
Table 3.6.1-1—High-Energy and Moderate-Energy Fluid Systems Considered for Protection of Essential Systems	3.6-12
Table 3.6.1-2—Building, Room, and Postulated Pipe Ruptures	3.6-14
Table 3.6.1-3—Building, Room, Break, Target, and Protection Required	3.6-19
Table 3.6.3-1—Main Coolant System Piping Dimensions and Operating Condition	3.6-78
Table 3.6.3-2—Surge Line Piping Dimensions and Operating Condition	3.6-79
Table 3.6.3-3—Main Steam Line Dimensions and Operating Condition	3.6-79
Table 3.6.3-4—Tensile Properties of Materials at Various Locations of Main Coolant Loop Piping	3.6-80
Table 3.6.3-5—Tensile Properties for the Surge Line Piping.....	3.6-81
Table 3.6.3-6—Surge Line Piping Locations Based on Key Geometry, Operating Conditions & Lower Bound Material Toughness	3.6-82
Table 3.6.3-7—Tensile Properties for the Main Steam Line Piping	3.6-82
Table 3.6.3-8—Minimum Moment versus Circumferential Leakage Crack Sizes for 5 gpm at Various Main Coolant Loop Piping Locations.....	3.6-83
Table 3.6.3-9—Axial Through-Wall Leakage Crack Sizes for 5 gpm at Various Main Coolant Loop Piping Locations.....	3.6-84
Table 3.6.3-10—Minimum Moment versus Circumferential Leakage Crack Sizes for 5 gpm at Two Surge Line Piping Locations	3.6-85
Table 3.6.3-11—Axial Through-Wall Leakage Crack Sizes for 5 gpm at Three Surge Line Piping Locations	3.6-85
Table 3.6.3-12—Minimum Moment versus Circumferential Leakage Crack Sizes for 1 gpm in the Main Steam Line Piping	3.6-86

Table 3.6.3-13—Main Coolant Loop Piping Locations based on Key Geometry, Operating Conditions and Lower Bound Material Toughness.....	3.6-87
Table 3.6.3-14—ALL for RV Outlet Nozzle Region at the Hot Leg (Location 1)	3.6-88
Table 3.6.3-15—ALL for Hot Leg Pipe (Location 2).....	3.6-89
Table 3.6.3-16—ALL for SG Inlet Nozzle at Hot Leg (Location 3).....	3.6-90
Table 3.6.3-17—ALL for SG Outlet Nozzle (Location 4).....	3.6-91
Table 3.6.3-18—ALL for Crossover & Cold Leg Pipe (Locations 5 & 8)	3.6-92
Table 3.6.3-19—ALL for RCP Inlet Nozzle (Location 6)	3.6-93
Table 3.6.3-20—Critical Axial Crack Size at Main Coolant Loop Piping Locations	3.6-94
Table 3.6.3-21—ALL for Pressurizer Surge Nozzle at Alloy 52 Weld.....	3.6-95
Table 3.6.3-22—ALL for Surge Line Piping	3.6-97
Table 3.6.3-23—ALL for Hot Leg Nozzle	3.6-98
Table 3.6.3-24—Critical Axial Crack Size at Surge Line Piping Locations	3.6-99
Table 3.6.3-25—ALL for the Main Steam Line Piping with Safety Factor of 2 on Flaw Size (Base Metal)	3.6-99
Table 3.6.3-26—Air Fatigue Crack Morphology Parameters	3.6-99
Table 3.6.3-27—ALL for RCP Outlet Nozzle (Location 7)	3.6-100
Table 3.6.3-28—ALL for RV Inlet Nozzle (Location 9).....	3.6-101
Table 3.7.1-1—Damping Values for Safe Shutdown Earthquake.....	3.7-15
Table 3.7.1-2—U.S. EPR Design Response Spectra – Amplification Factors for Control Points (as taken from the European Utility Requirements Document).....	3.7-18
Table 3.7.1-3—Strong Motion Duration of Synthetic Time Histories	3.7-19
Table 3.7.1-4—Values of V/A and AD/V ² for Synthetic Time Histories	3.7-20
Table 3.7.1-5—Cross-Correlation Coefficients Among Synthetic Time Histories	3.7-21
Table 3.7.1-6—Soil Profiles for the U.S. EPR Standard Plant - NI Common Basemat Structures SSI Analysis Cases.....	3.7-22
Table 3.7.1-7—Criteria for Cable Tray System Similarity with Bechtel-ANCO Test Program	3.7-23
Table 3.7.1-8—Soil Profiles for the U.S. EPR Standard Plant - EPGB SSI Analysis Cases.....	3.7-25
Table 3.7.1-9—Soil Profiles for the U.S. EPR Standard Plant - ESWB SSI Analysis Cases.....	3.7-26

Table 3.7.2-1—Frequencies and Modal Mass Ratios for NI Common Basemat Structures with All Masses Included.....	3.7-128
Table 3.7.2-2—Deleted.....	3.7-133
Table 3.7.2-3—Frequency and Modal Mass Ratios for Reactor Building Internal Structures STICK-1T with All Masses Included.....	3.7-134
Table 3.7.2-4—Modal Frequencies of the Simplified Stick Model of Reactor Coolant Loop.....	3.7-136
Table 3.7.2-5— Deleted.....	3.7-138
Table 3.7.2-6—Modal Frequencies of the Stick Model of NAB.....	3.7-139
Table 3.7.2-7—Modal Frequencies of 3D FEM of Emergency Power Generating Building.....	3.7-140
Table 3.7.2-8—Modal Frequencies of 3D FEM of Emergency Service Water Building (EUR Motions)	3.7-146
Table 3.7.2-9—Soil Properties Associated with Different Shear Wave Velocities	3.7-156
Table 3.7.2-10—NI Common Basemat Structures ZPAs.....	3.7-158
Table 3.7.2-11—Deleted.....	3.7-160
Table 3.7.2-12—Deleted.....	3.7-161
Table 3.7.2-13—Deleted.....	3.7-162
Table 3.7.2-14—Deleted.....	3.7-163
Table 3.7.2-15—Deleted.....	3.7-164
Table 3.7.2-16—Deleted.....	3.7-165
Table 3.7.2-17—Deleted.....	3.7-166
Table 3.7.2-18—Deleted.....	3.7-167
Table 3.7.2-19—Deleted.....	3.7-168
Table 3.7.2-20—Deleted.....	3.7-169
Table 3.7.2-21—Deleted.....	3.7-170
Table 3.7.2-22—Deleted.....	3.7-171
Table 3.7.2-23—Deleted.....	3.7-172
Table 3.7.2-24—Deleted.....	3.7-173
Table 3.7.2-25—Deleted.....	3.7-174
Table 3.7.2-26—Deleted.....	3.7-175
Table 3.7.2-27—Deleted.....	3.7-176
Table 3.7.2-28—Maximum Accelerations in EPGB	3.7-177

Table 3.7.2-29—Maximum Accelerations in ESWB.....	3.7-177
Table 3.7.2-30—Seismic Structural Interaction Criteria for Building Structures ...	3.7-178
Table 3.7.2-31—Deleted.....	3.7-179
Table 3.7.2-32—Modal Frequencies of 3D FEM of Essential Service Water Building (HF Motion).....	3.7-180
Table 3.8-1—Thermal Properties for Heat Transfer Analysis-Reactor Containment Building	3.8-151
Table 3.8-2—Material Properties – Reactor Containment Building	3.8-151
Table 3.8-3—Tendon Frictional Losses	3.8-151
Table 3.8-4—Thermal Properties – Reactor Containment Building.....	3.8-151
Table 3.8-5—Tendon Losses and Effective Forces with Time	3.8-152
Table 3.8-6—Containment Ultimate Pressure Capacity (P_u) at Accident Temperature of 309°F	3.8-153
Table 3.8-7—ISI Schedule for the U.S. EPR	3.8-154
Table 3.8-8—Materials for Structural Steel Shapes and Plates.....	3.8-155
Table 3.8-9—Structural Bolting Materials	3.8-157
Table 3.8-10—Structural Bolting Nut and Washer Materials	3.8-158
Table 3.8-11—Minimum Required Factors of Safety Against Overturning, Sliding, and Flotation for Foundations.....	3.8-158
Table 3.8-12—Minimum Factors of Safety Against Overturning, Sliding, and Flotation for Foundations – NI Common Basemat Structure.....	3.8-158
Table 3.8-13—Static Spring Distribution.....	3.8-159
Table 3.8-14—Deleted.....	3.8-160
Table 3.8-15—Deleted.....	3.8-161
Table 3.8-16—Deleted.....	3.8-162
Table 3.8-17—Design Report Cross-Reference Table.....	3.8-163
Table 3.8-18—Reactor Containment Building Doors.....	3.8-168
Table 3.8-19—Static Foundation Modulus Values for EPGB Soil Cases	3.8-175
Table 3.9.1-1—Summary of Design Transients.....	3.9-20
Table 3.9.2-1—Deleted.....	3.9-37
Table 3.9.2-2—Deleted.....	3.9-37
Table 3.9.2-3—Deleted.....	3.9-37
Table 3.9.2-4—Deleted.....	3.9-37
Table 3.9.2-5—Deleted.....	3.9-37

Table 3.9.3-1—Load Combinations and Acceptance Criteria for ASME Class 1 Components	3.9-49
Table 3.9.3-2—Load Combinations and Acceptance Criteria for ASME Class 2 and 3 Components	3.9-55
Table 3.9.3-3—Load Combinations and Acceptance Criteria for ASME Core Support Structures.....	3.9-56
Table 3.9.3-4—Load Combinations and Acceptance Criteria for ASME Class 1, 2, and 3 Component Supports	3.9-61
Table 3.9.4-1—Control Rod Withdrawal Sequence	3.9-70
Table 3.9.5-1—Component Classification	3.9-82
Table 3.9.6-1—Inservice Pump Testing Program Requirements	3.9-115
Table 3.9.6-2—Inservice Valve Testing Program Requirements.....	3.9-119
Table 3.10-1—List of Seismically and Dynamically Qualified Mechanical and Electrical Equipment.....	3.10-14
Table 3.10-2—List of U.S. EPR Important-to-Safety Systems Screened for the Seismic Qualification Program	3.10-211
Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment.....	3.11-25
Table 3.11-2—List of U.S. EPR Important to Safety Systems Screened for the EQ Program	3.11-157
Table 3.11-3—Equipment Distribution in Safeguard Buildings	3.11-162
Table 3.11-4—Summary Comparison of IEEE Endorsed Standards versus Latest IEEE Standards	3.11-163
Table 3.11-5—Summary of IEEE Non-Endorsed Standards.....	3.11-164
Table 3.13-1—ASME BPV Code Section III Criteria for Selection and Testing of Bolted Materials.....	3.13-5
Table 3.13-2—ASME BPV Code Section XI Examination Categories for Inservice Inspections of Mechanical Joints in ASME Code Class 1, 2, and 3 Systems that are Secured by Threaded Fasteners.....	3.13-6
Table 3A-1—HVAC Ductwork Load Combinations.....	3A-14
Table 3A-2—HVAC Support and Restraint Load Combinations.....	3A-14
Table 3A-3—Deflection Limits	3A-15
Table 3A-4—Load Combinations for Cable Trays, Conduits and Supports.....	3A-16
Table 3D-1—Typical Mild Environment Parameter Limits	3D-21
Table 3D-2—Equipment Post-Accident Operability Times	3D-22
Table 3D-3—EQ Program Margin Requirements	3D-23
Table 3D-4—Normal Operating Environments	3D-24

Table 3D-5—Pressure Requirements of Controlled Buildings.....	3D-29
Table 3D-6—Operating Temperature Ranges for Selected Components	3D-30
Table 3D-7—Abnormal Room Conditions.....	3D-30
Table 3D-8—Bounding Normal EQ Radiation Dose	3D-31
Table 3D-9—Accident EQ Radiation Dose	3D-32
Table 3D-10—Mechanical Equipment Components Requiring Environmental Qualification	3D-33
Table 3E.1-1—Independent Loads Considered in the FEM	3E-26
Table 3E.1-2—Independent Loads Not Considered in the FEM.....	3E-27
Table 3E.1-3—Summary of Governing Design Data for the Wall to Foundation Connection	3E-28
Table 3E.1-4—Summary of Typical Gusset Reinforcement	3E-30
Table 3E.1-5—Governing Design Data for the Equipment Hatch Area (Factored Loads).....	3E-31
Table 3E.1-6—Governing Design Data for the Equipment Hatch Area (Service Loads)	3E-31
Table 3E.1-7—Summary of Typical Reinforcement for the Equipment Hatch Area	3E-32
Table 3E.1-8—Accidental Torsion Loadings for the Typical Cylinder Wall and Buttress Section	3E-33
Table 3E.1-9—Reduction of Thermal Bending Moments Due to Cracked Concrete for the Typical Cylinder Wall and Buttress Section.....	3E-33
Table 3E.1-10—Governing Design Data for Tangential Shear Design (Typical RCB Wall Section).....	3E-34
Table 3E.1-11—Governing Design Data for Membrane and Bending Design (Typical RCB Wall Section).....	3E-35
Table 3E.1-12—Governing Design Data for Radial Shear Design (Typical RCB Wall Section).....	3E-36
Table 3E.1-13—Reinforcing Summary (Typical RCB Wall Section).....	3E-37
Table 3E.1-14—Governing Design Data for Tangential Shear Design (Typical RCB Narrow Buttress Section)	3E-38
Table 3E.1-15—Governing Design Data for Combined Membrane and Bending Design (Typical RCB Narrow Buttress Section).....	3E-39
Table 3E.1-16—Governing Design Data for Radial Shear Design (Typical RCB Narrow Buttress Section)	3E-40
Table 3E.1-17—Reinforcing Summary (Typical RCB Narrow Buttress Section)	3E-41

Table 3E.1-18—Governing Design Data for Tangential Shear Design (Typical RCB Wide Buttress Section)	3E-42
Table 3E.1-19—Governing Design Data for Combined Membrane and Bending Design (Typical RCB Wide Buttress Section)	3E-43
Table 3E.1-20—Governing Design Data for Radial Shear Design (Typical RCB Wide Buttress Section)	3E-44
Table 3E.1-21—Reinforcing Summary (Typical RCB Wide Buttress Section)	3E-45
Table 3E.1-22—Governing Design Cases for the SG and RCP Supports and Typical Cavity Wall	3E-46
Table 3E.1-23—Summary of Reinforcement for SG and RCP Floor Slab	3E-48
Table 3E.1-24—Typical SG and RCP Cavity Wall Reinforcement	3E-49
Table 3E.1-25—Summary of Governing Design Data	3E-51
Table 3E.1-26—Summary of Typical PZR Cubical Reinforcement	3E-52
Table 3E.1-27—Summary of Governing Design Data for the Operating Floor Area	3E-53
Table 3E.1-28—Summary of Typical Reinforcement for the Operating Floor Area	3E-54
Table 3E.1-29—Controlling Nodal Forces and Moments for FB Roof	3E-55
Table 3E.1-30—Controlling Nodal Forces and Moments for SB 2 and 3 Roof	3E-56
Table 3E.1-31—Controlling Nodal Forces and Moments for RSB Wall below FB Roof and SB 2 and 3 Roof	3E-57
Table 3E.1-32—Controlling Nodal Forces and Moments for RSB Wall above FB Roof and SB 2 and 3 Roof	3E-58
Table 3E.1-33—Specified Reinforcement Pattern for RSB Wall to Roof Connection	3E-59
Table 3E.1-34—Summary of Governing Design Data for SB External Walls Below Grade	3E-60
Table 3E.1-35—Reinforcement Design for SG Walls Below Grade (A13001, A13003, A33008, and A33003)	3E-63
Table 3E.1-36—Governing Design Data for the NI Foundation Basemat and RB Internal Structures Base Slab	3E-64
Table 3E.1-37—Reinforcement Summary for the NI Foundation Basemat and RB Internal Structures Base Slab	3E-66
Table 3E.1-38—Floor Dead and Live Loads	3E-68
Table 3E.1-39—Minimum Factors of Safety for the Nuclear Island Common Basemat Structure	3E-95

Table 3E.2-1—Governing Forces and Moments for the EPGB Basemat Foundation	3E-180
Table 3E.2-2—Governing Forces and Moments for EPGB Typical Wall at Column Line 11 for Vertical Reinforcement (Local Cut)	3E-182
Table 3E.2-3—Governing Forces and Moments for EPGB Typical Wall at Column Line 11 for Vertical Reinforcement (Shear Friction).....	3E-183
Table 3E.2-4—Governing Forces and Moments for EPGB Typical Wall at Column Line 11 for Horizontal Reinforcement (Local Cut).....	3E-184
Table 3E.2-5—Governing Forces and Moments for EPGB Typical Wall at Column Line 11 for Horizontal Reinforcement (In-Plane Shear)	3E-185
Table 3E.2-6—Summary of Reinforcement for EPGB Wall along Column Line 11	3E-186
Table 3E.3-1—Governing Forces and Moments for the ESWB Basemat Foundation	3E-206
Table 3E.3-2—Governing Design Data for ESWB Wall at Column Line 4 (Local Section Cut for Vertical Reinforcement)	3E-208
Table 3E.3-3—Governing Design Data for ESWB Wall at Column Line 4 (Local Section Cut for Horizontal Reinforcement)	3E-209
Table 3E.3-4—Governing Design Data for ESWB Wall at Column Line 4 (Local Section Cut for Shear Friction Design)	3E-210
Table 3E.3-5—Governing Design Data for ESWB Wall at Column Line 4 (Long Section Cut for Horizontal Reinforcement).....	3E-211
Table 3E.3-6—Governing Design Data for ESWB Fan Deck Slab at Elevation 63 ft – 0 in (Out-of-Plane Design, X-Axis)	3E-212
Table 3E.3-7—Governing Design Data for ESWB Fan Deck Slab at Elevation 63 ft – 0 in (Out-of-Plane Design, Z-Axis).....	3E-212
Table 3E.3-8—Governing Design Data for ESWB Fan Deck Slab at Elevation 63 ft – 0 in (Tension)	3E-213
Table 3E.3-9—Governing Design Data for ESWB Fan Deck Slab at Elevation 63 ft – 0 in (In-Plane Shear)	3E-213