
CHAPTER 3—DESIGN OF STRUCTURES, SYSTEMS, COMPONENTS, AND EQUIPMENT

LIST OF FIGURES

Figure 3.6.2-1—Representative Mathematical Model of a Piping System and its Restraints	3.6-43
Figure 3.6.2-1—Representative Mathematical Model of a Piping System and its Restraints	3.6-41
Figure 3.6.3-1—Plain View of U.S. EPR RCS Primary Piping	3.6-102
Figure 3.6.3-2—Elevation View of U.S. EPR RCS Primary Piping	3.6-103
Figure 3.6.3-3—Plan, Elevation, and Isometric View of the U.S. EPR Surge Line.....	3.6-104
Figure 3.6.3-4—Isometric View of the Main Steam Line.....	3.6-105
Figure 3.6.3-5—Minimum Moment versus Circumferential Leakage Crack Sizes for 5 gpm at Various Main Coolant Loop Locations	3.6-106
Figure 3.6.3-6—Minimum Moment versus Circumferential Leakage Crack Sizes for 5 gpm at Three Surge Line Locations	3.6-107
Figure 3.6.3-7—Pressure Only Leakage Rate versus Crack Length for Both Axial and Circumferential Crack Morphologies in Main Steam Line	3.6-108
Figure 3.6.3-8—Minimum Moment versus Circumferential Leakage Crack Sizes for 1 gpm in Main Steam Line Piping	3.6-109
Figure 3.6.3-9—Schematics of Analyzed Crack Geometries Considered for Straight Pipe Section	3.6-110
Figure 3.6.3-10—Schematic of J-Tearing Instability Diagram	3.6-111
Figure 3.6.3-11—Typical Allowable Load Limit (ALL) Diagram Considering Various Axial Loadings	3.6-112
Figure 3.6.3-12—ALL for Reactor Vessel Outlet Nozzle Region at Hot Leg (Location 1)	3.6-113
Figure 3.6.3-13—ALL for Hot Leg Pipe (Location 2).....	3.6-114
Figure 3.6.3-14—ALL for Steam Generator Inlet Nozzle at Hot Leg (Location 3)	3.6-115
Figure 3.6.3-15—ALL for Steam Generator Outlet Nozzle (Location 4)	3.6-116
Figure 3.6.3-16—ALL for Crossover & Cold Leg Pipe (Locations 5 & 8).....	3.6-117

Figure 3.6.3-17—ALL for RCP Inlet Nozzle (Location 6).....	3.6-118
Figure 3.6.3-18—ALL for Pressurizer Surge Nozzle at Alloy 52 Weld.....	3.6-119
Figure 3.6.3-19—ALL for Surge Line Piping	3.6-120
Figure 3.6.3-20—ALL for Hot Leg Nozzle.....	3.6-121
Figure 3.6.3-21—Comparison of Base and Weld Metal ALL in Main Steam Line Piping	3.6-122
Figure 3.6.3-22—ALL for Main Steam Line Piping with Safety Factor of 2 on Flaw Size (Base Metal)	3.6-123
Figure 3.6.3-23—Deleted.....	3.6-124
Figure 3.6.3-24—ALL for RCP Outlet Nozzle (Location 7).....	3.6-125
Figure 3.6.3-25—ALL for RV Inlet Nozzle (Location 9).....	3.6-126
Figure 3.7.1-1—Design Response Spectra for EUR (hard, medium and soft sites) and HF Control Motions.....	3.7-27
Figure 3.7.1-2—Comparison of CSDRS to RG 1.60 and the Minimum Required Spectrum, Horizontal Motion	3.7-28
Figure 3.7.1-3—Comparison of CSDRS to RG 1.60, Vertical Motion.....	3.7-29
Figure 3.7.1-4—EUR Design Ground Spectra for Hard Conditions Normalized to 0.3g	3.7-30
Figure 3.7.1-5—EUR Design Ground Spectra for Medium Conditions Normalized to 0.3g	3.7-31
Figure 3.7.1-6—EUR Design Ground Spectra for Soft Conditions Normalized to 0.3g	3.7-32
Figure 3.7.1-7—Synthetic Acceleration Time Histories for EUR Hard CSDRS	3.7-33
Figure 3.7.1-8—Synthetic Velocity Time Histories for EUR Hard CSDRS	3.7-34
Figure 3.7.1-9—Synthetic Displacement Time Histories for EUR Hard CSDRS	3.7-35
Figure 3.7.1-10—Synthetic Acceleration Time Histories for EUR Medium CSDRS	3.7-36
Figure 3.7.1-11—Synthetic Velocity Time Histories for EUR Medium CSDRS	3.7-37
Figure 3.7.1-12—Synthetic Displacement Time Histories for EUR Medium CSDRS	3.7-38
Figure 3.7.1-13—Synthetic Acceleration Time Histories for EUR Soft CSDRS.....	3.7-39
Figure 3.7.1-14—Synthetic Velocity Time Histories for EUR Soft CSDRS.....	3.7-40
Figure 3.7.1-15—Synthetic Displacement Time Histories for EUR Soft CSDRS....	3.7-41
Figure 3.7.1-16—Damping Values for Cable Tray Systems	3.7-42

Figure 3.7.1-17—Response Spectrum of Time History H1 vs. Target Spectrum for EUR Hard Motion (TH1 Target, 1.30*Target and 0.90* Target at 5% Damping).....	3.7-44
Figure 3.7.1-18—Response Spectrum of Time History H2 vs. Target Spectrum for EUR Hard Motion (TH2 Target, 1.30*Target and 0.90* Target at 5% Damping).....	3.7-45
Figure 3.7.1-19—Response Spectrum of Time History H3 (Vertical) vs. Target Spectrum for EUR Hard Motion (TH3 Target, 1.30* Target and 0.90*Target at 5% Damping)	3.7-46
Figure 3.7.1-20—Response Spectrum of Time History H1 vs. Target Spectrum for EUR Medium Motion (TH1 Target, 1.30*Target and 0.90* Target at 5% Damping).....	3.7-47
Figure 3.7.1-21—Response Spectrum of Time History H2 vs. Target Spectrum for EUR Medium Motion (TH2 Target, 1.30*Target and 0.90* Target at 5% Damping).....	3.7-48
Figure 3.7.1-22—Response Spectrum of Time History H3 (Vertical) vs. Target Spectrum for EUR Medium Motion (TH3 Target, 1.30* Target and 0.90*Target at 5% Damping)	3.7-49
Figure 3.7.1-23—Response Spectrum of Time History H1 vs. Target Spectrum for EUR Soft Motion (TH1 Target, 0.90* Target and 1.30* Target at 5% Damping).....	3.7-50
Figure 3.7.1-24—Response Spectrum of Time History H2 vs. Target Spectrum for EUR Soft Motion (TH2 Target, 1.30*Target and 0.90* Target at 5% Damping).....	3.7-51
Figure 3.7.1-25—Response Spectrum of Time History H3 (Vertical) vs. Target Spectrum for EUR Soft Motion (TH3 Target, 1.30* Target and 0.90*Target at 5% Damping)	3.7-52
Figure 3.7.1-26—Cumulative Energy Ratio Plot for Time History H1, H2, and H3 for EUR Hard Motion	3.7-53
Figure 3.7.1-27—Cumulative Energy Ratio Plot for Time History H1, H2, and H3 for EUR Medium Motion	3.7-54
Figure 3.7.1-28—Cumulative Energy Ratio Plot for Time History H1, H2, and H3 for EUR Soft Motion	3.7-55
Figure 3.7.1-29—Deleted.....	3.7-56
Figure 3.7.1-30—Deleted.....	3.7-57
Figure 3.7.1-31—U.S. EPR Standard Plant Soil Profiles - Shear Wave Velocity for NI Common Basemat Structures for SSI Analysis Cases (EUR)	3.7-58

Figure 3.7.1-32—U.S. EPR Standard Plant Soil Profile- Shear Wave Velocity for NI Common Basemat Structures for SSI Analysis Cases (HF).....	3.7-59
Figure 3.7.1-33—Input Motion for Structures not on the Nuclear Island Common Basemat, Horizontal Motion 5% Damping (EUR).....	3.7-60
Figure 3.7.1-34—Input Motion for Structures not on the Nuclear Island Common Basemat, Vertical Motion 5% Damping (EUR).....	3.7-61
Figure 3.7.1-35—Synthetic Acceleration, Velocity, and Displacement Time Histories for Structures not on the Nuclear Island Common Basemat, Horizontal (SSSI1) Motion	3.7-62
Figure 3.7.1-36—Synthetic Acceleration, Velocity, and Displacement Time Histories for Structures not on the Nuclear Island Common Basemat, Horizontal (SSSI2) Motion	3.7-63
Figure 3.7.1-37—Synthetic Acceleration, Velocity, and Displacement Time Histories for Structures not on the Nuclear Island Common Basemat, Vertical (SSSI3) Motion	3.7-64
Figure 3.7.1-38—Time History Response Spectrum vs. Input Spectrum for Structures not on the Nuclear Island Common Basemat, Horizontal (SSSI1) Component.....	3.7-65
Figure 3.7.1-39—Time History Response Spectrum vs. Input Spectrum for Structures not on the Nuclear Island Common Basemat, Horizontal (SSSI2) Component.....	3.7-66
Figure 3.7.1-40—Time History Response Spectrum vs. Input Spectrum for Structures not on the Nuclear Island Common Basemat, Vertical (SSSI3) Component.....	3.7-67
Figure 3.7.1-41—Cumulative Energy Plot for Time Histories for Structures not on the Nuclear Island Common Basemat (EUR)	3.7-68
Figure 3.7.1-42—Synthetic Acceleration Time Histories for HF CSDRS	3.7-69
Figure 3.7.1-43—Synthetic Velocity Time Histories for HF CSDRS	3.7-70
Figure 3.7.1-44—Synthetic Displacement Time Histories for HF CSDRS	3.7-71
Figure 3.7.1-45—Response Spectrum of Time History H1 vs. Target Spectrum for HFH Motion (TH1 Target, 090° Target and 1.30°-Target at 5% Damping)	3.7-72
Figure 3.7.1-46—Response Spectrum of Time History H2 vs. Target Spectrum for HFH Motion (TH2 Target, 1.30° Target and 0.90°-Target at 5% Damping)	3.7-73
Figure 3.7.1-47—Response Spectrum of Time History H3 (Vertical) vs. Target Spectrum for HFV Motion (TH3 Target, 1.30° Target and 0.90°-Target at 5% Damping)	3.7-74

Figure 3.7.1-48—Cumulative Energy Ratio Plot for Time History H1, H2, and H3 for HF Motion.....	3.7-75
Figure 3.7.1-49—Input Motion for Structures Not on the NI Common Basemat, Horizontal (SSSIHF)	3.7-76
Figure 3.7.1-50—Input Motion for Structures Not on the NI Common Basemat, Vertical (SSSIHF)	3.7-77
Figure 3.7.1-51—Deleted.....	3.7-78
Figure 3.7.1-52—Deleted.....	3.7-79
Figure 3.7.1-53—Synthetic Acceleration, Velocity, and Displacement Time Histories for Structures not on the Nuclear Island Common Basemat, Horizontal (SSSI1HF) Motion	3.7-80
Figure 3.7.1-54—Synthetic Acceleration, Velocity, and Displacement Time Histories for Structures not on the Nuclear Island Common Basemat, Horizontal (SSSI2HF) Motion	3.7-81
Figure 3.7.1-55—Synthetic Acceleration, Velocity, and Displacement Time Histories for Structures not on the Nuclear Island Common Basemat, Vertical (SSSI3HF) Motion	3.7-82
Figure 3.7.1-56—Time History Response Spectrum vs. Input Spectrum for Structures not on the Nuclear Island Common Basemat, Horizontal (SSSI1HF) Component	3.7-83
Figure 3.7.1-57—Time History Response Spectrum vs. Input Spectrum for Structures not on the Nuclear Island Common Basemat, Horizontal (SSSI2HF) Component	3.7-84
Figure 3.7.1-58—Time History Response Spectrum vs. Input Spectrum for Structures not on the Nuclear Island Common Basemat, Horizontal (SSSI3HF) Component.....	3.7-85
Figure 3.7.1-59—Cumulative Energy Plot for Time Histories for Structures not on the Nuclear Island Common Basemat (HF).....	3.7-86
Figure 3.7.1-60—U.S. EPR Standard Plant Soil Profiles - Shear Wave Velocity for EPGB and ESWB SSI Analysis Cases (EUR).....	3.7-87
Figure 3.7.1-61—U.S. EPR Standard Plant Soil Profiles - Shear Wave Velocity for EPGB SSI Analysis Cases (HF)	3.7-88
Figure 3.7.1-62—U.S. EPR Standard Plant Soil Profiles - Shear Wave Velocity for ESWB SSI Analysis Cases (HF).....	3.7-89
Figure 3.7.2-1—Decoupling of the Nuclear Island Common Basemat Interior Structures from the Outer Shield Walls.....	3.7-181
Figure 3.7.2-2—Deleted.....	3.7-182
Figure 3.7.2-3—Schematic Elevation View of Stick Model for Reactor Building Internal Structures in Global Y-Z Plane.....	3.7-183

Figure 3.7.2-4—Deleted.....	3.7-184
Figure 3.7.2-5—Static 3D Finite Element Model of Balance of NI Common Basemat Structures Perspective View.....	3.7-185
Figure 3.7.2-6—Static 3D Finite Element Model of Balance of NI Common Basemat Structures Cutoff View on Y-Z Plane	3.7-186
Figure 3.7.2-7—Static 3D Finite Element Model of Balance of NI Common Basemat Structures Cutoff View on X-Z Plane	3.7-187
Figure 3.7.2-8—Static 3D Finite Element Model of Reactor Containment Building	3.7-188
Figure 3.7.2-9—Static 3D Finite Element Model of Reactor Building Internal Structures.....	3.7-189
Figure 3.7.2-10—Deleted.....	3.7-190
Figure 3.7.2-11—Deleted.....	3.7-191
Figure 3.7.2-12—Deleted.....	3.7-192
Figure 3.7.2-13—Stick Model STICK-1T for Reactor Building Internal Structure - Perspective View.....	3.7-193
Figure 3.7.2-14—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +200 ft, 5 in (+61.09m) (Dome Apex) of Reactor Shield Building, 5% Damping, X-Direction.....	3.7-194
Figure 3.7.2-15—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +200 ft, 5 in (+61.09m) (Dome Apex) of Reactor Shield Building, 5% Damping, Y-Direction.....	3.7-195
Figure 3.7.2-16—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +200ft, 5 in (+61.09m) (Dome Apex) of Reactor Shield Building, 5% Damping, Z-Direction	3.7-196
Figure 3.7.2-17—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +95 ft, 1-3/4 in (+29.00m) - Safeguard Building 1, 5% Damping, X-Direction.....	3.7-197
Figure 3.7.2-18—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +95 ft, 1-3/4 in (+29.00m) - Safeguard Building 1, 5% Damping, Y-Direction.....	3.7-198
Figure 3.7.2-19—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +95 ft, 1-3/4 in (+29.00m) - Safeguard Building 1, 5% Damping, Z-Direction	3.7-199
Figure 3.7.2-20—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 1, 5% Damping, X-Direction.....	3.7-200

Figure 3.7.2-21—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 1, 5% Damping, Y-Direction.....	3.7-201
Figure 3.7.2-22—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 1, 5% Damping, Z-Direction	3.7-202
Figure 3.7.2-23—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +95 ft, 1-3/4 in (+29.00m) - Safeguard Building 4, 5% Damping, X-Direction.....	3.7-203
Figure 3.7.2-24—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +95 ft, 1-3/4 in (+29.00m) - Safeguard Building 4, 5% Damping, Y-Direction.....	3.7-204
Figure 3.7.2-25—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +95 ft, 1-3/4 in (+29.00m) - Safeguard Building 4, 5% Damping, Z-Direction	3.7-205
Figure 3.7.2-26—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 4, 5% Damping, X-Direction.....	3.7-206
Figure 3.7.2-27—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 4, 5% Damping, Y-Direction.....	3.7-207
Figure 3.7.2-28—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 4, 5% Damping, Z-Direction	3.7-208
Figure 3.7.2-29—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +68 ft, 10-3/4 in (+21.00m) - Safeguard Building 2/3, 5% Damping, X-Direction.....	3.7-209
Figure 3.7.2-30—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +68 ft, 10-3/4 in (+21.00m) - Safeguard Building 2/3, 5% Damping, Y-Direction.....	3.7-210
Figure 3.7.2-31—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +68 ft, 10-3/4 in (+21.00m) - Safeguard Building 2/3, 5% Damping, Z-Direction	3.7-211
Figure 3.7.2-32—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 2/3, 5% Damping, X-Direction.....	3.7-212
Figure 3.7.2-33—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 2/3, 5% Damping, Y-Direction.....	3.7-213

Figure 3.7.2-34—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 2/3, 5% Damping, Z-Direction	3.7-214
Figure 3.7.2-35—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +62 ft, 4-1/4 in (+19.00m) - Fuel Building, 5% Damping, X-Direction	3.7-215
Figure 3.7.2-36—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +62 ft, 4-1/4 in (+19.00m) - Fuel Building, 5% Damping Y-Direction	3.7-216
Figure 3.7.2-37—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +62 ft, 4-1/4 in (+19.00m) - Fuel Building, 5% Damping, Z-Direction	3.7-217
Figure 3.7.2-38—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +23 ft, 7-1/2 in (+7.20m) - Fuel Building, 5% Damping, X-Direction	3.7-218
Figure 3.7.2-39—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +23 ft, 7-1/2 in (+7.20m) - Fuel Building, 5% Damping, Y-Direction	3.7-219
Figure 3.7.2-40—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +23 ft, 7-1/2 in (+7.20m) - Fuel Building, 5% Damping, Z-Direction	3.7-220
Figure 3.7.2-41—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +190 ft, 3-1/2 in (+58.00m) - Containment Dome Apex, 5% Damping, X-Direction	3.7-221
Figure 3.7.2-42—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +190 ft, 3-1/2 in (+58.00m) - Containment Dome Apex, 5% Damping, Y-Direction	3.7-222
Figure 3.7.2-43—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +190 ft, 3-1/2 in (+58.00m) - Containment Dome Apex, 5% Damping, Z-Direction	3.7-223
Figure 3.7.2-44—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +123 ft, 4-1/4 in (+37.60m) - Containment Building, 5% Damping, X-Direction	3.7-224
Figure 3.7.2-45—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +123 ft, 4-1/4 in (+37.60m) - Containment Building, 5% Damping, Y-Direction	3.7-225
Figure 3.7.2-46—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +123 ft, 4-1/4 in (+37.60m) - Containment Building, 5% Damping, Z-Direction	3.7-226
Figure 3.7.2-47—Deleted	3.7-227

Figure 3.7.2-48—Deleted.....	3.7-228
Figure 3.7.2-49—Deleted.....	3.7-229
Figure 3.7.2-50—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +63 ft, 11-3/4 in (+19.50m) - Reactor Building Internal Structure, 5% Damping, X-Direction	3.7-230
Figure 3.7.2-51—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +63 ft, 11-3/4 in (+19.50m) - Reactor Building Internal Structure, 5% Damping, Y-Direction	3.7-231
Figure 3.7.2-52—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +63 ft, 11-3/4 in (+19.50m) - Reactor Building Internal Structure, 5% Damping, Z-Direction	3.7-232
Figure 3.7.2-53—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +16 ft, 10-3/4 in (+5.15m) - Reactor Building Internal Structure, 5% Damping, X-Direction	3.7-233
Figure 3.7.2-54—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +16 ft, 10-3/4 in (+5.15m) - Reactor Building Internal Structure, 5% Damping, Y-Direction	3.7-234
Figure 3.7.2-55—Static FEM vs. Dynamic FEM Spectrum Comparison at Elev. +16 ft, 10-3/4 in (+5.15m) - Reactor Building Internal Structure, 5% Damping, Z-Direction	3.7-235
Figure 3.7.2-56—Simplified Stick Model of Reactor Coolant Loop.....	3.7-236
Figure 3.7.2-57—Isometric View of GTSTRUDL FEM for Emergency Power Generating Building (EUR Motions).....	3.7-237
Figure 3.7.2-58—Section View of GTSTRUDL FEM for Emergency Power Generating Building (EUR Motions).....	3.7-238
Figure 3.7.2-59—Isometric View of GTSTRUDL FEM for Essential Service Water Building (EUR Motions).....	3.7-239
Figure 3.7.2-60—Section View of GTSTRUDL FEM for Essential Service Water Building (EUR Motions)	3.7-240
Figure 3.7.2-61—Deleted.....	3.7-241
Figure 3.7.2-62—Deleted.....	3.7-242
Figure 3.7.2-63—Deleted.....	3.7-243
Figure 3.7.2-64—Deleted.....	3.7-244
Figure 3.7.2-65—Deleted.....	3.7-245
Figure 3.7.2-66—Deleted.....	3.7-246
Figure 3.7.2-67—Elevation View of NAB Stick Model in Y-Z Plane.....	3.7-247

Figure 3.7.2-68—Response Spectra at NI Common Basemat Bottom Node 274 - 5% Damping, X-Direction	3.7-248
Figure 3.7.2-69—Response Spectra at NI Common Basemat Bottom Node 274 - 5% Damping, Y-Direction	3.7-249
Figure 3.7.2-70—Response Spectra at NI Common Basemat Bottom Node 274 - 5% Damping, Z-Direction	3.7-250
Figure 3.7.2-71—Soil Model Surface Response Spectra at Centers of Footprint of EPGB - 5% Damping, X-Direction	3.7-251
Figure 3.7.2-72—Soil Model Surface Response Spectra at Centers of Footprint of EPGB - 5% Damping, Y-Direction	3.7-252
Figure 3.7.2-73—Soil Model Surface Response Spectra at Centers of Footprint of EPGB - 5% Damping, Z-Direction	3.7-253
Figure 3.7.2-74—Spectrum Envelope of Reactor Building Internal Structure - Elev. +16 ft, 10-3/4 in (+5.15m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction.....	3.7-254
Figure 3.7.2-75—Spectrum Envelope of Reactor Building Internal Structure - Elev. +16 ft, 10-3/4 in (+5.15m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction.....	3.7-255
Figure 3.7.2-76—Spectrum Envelope of Reactor Building Internal Structure - Elev. +16 ft, 10-3/4 in (+5.15m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction.....	3.7-256
Figure 3.7.2-77—Spectrum Envelope of Reactor Building Internal Structure - Elev. +63 ft, 11-3/4 in (+19.50m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction.....	3.7-257
Figure 3.7.2-78—Spectrum Envelope of Reactor Building Internal Structure - Elev. +63 ft, 11-3/4 in (+19.50m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction.....	3.7-258
Figure 3.7.2-79—Spectrum Envelope of Reactor Building Internal Structure - Elev. +63 ft, 11-3/4 in (+19.50m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction.....	3.7-259
Figure 3.7.2-80—Spectrum Envelope of Safeguard Building 1 - Elev. +26 ft, 7 in (+8.10m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction.....	3.7-260
Figure 3.7.2-81—Spectrum Envelope of Safeguard Building 1 - Elev. +26 ft, 7 in (+8.10m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction.....	3.7-261
Figure 3.7.2-82—Spectrum Envelope of Safeguard Building 1 - Elev. +26 ft, 7 in (+8.10m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction	3.7-262

Figure 3.7.2-83—Spectrum Envelope of Safeguard Building 1 - Elev. +68 ft, 11 in (+21.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction.....	3.7-263
Figure 3.7.2-84—Spectrum Envelope of Safeguard Building 1 - Elev. +68 ft, 11 in (+21.00m) 2%, 3%, 4%, 5%, 7% and 10% Damping, Y-Direction.....	3.7-264
Figure 3.7.2-85—Spectrum Envelope of Safeguard Building 1 - Elev. +68 ft, 11 in (+21.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction	3.7-265
Figure 3.7.2-86—Spectrum Envelope of Safeguard Building 2&3 - Elev. +26 ft, 7 in (+8.10m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction.....	3.7-266
Figure 3.7.2-87—Spectrum Envelope of Safeguard Building 2&3 - Elev. +26 ft, 7 in (+8.10m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction.....	3.7-267
Figure 3.7.2-88—Spectrum Envelope of Safeguard Building 2&3 - Elev. +26 ft, 7 in (+8.10m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction	3.7-268
Figure 3.7.2-89—Spectrum Envelope of Safeguard Building 2&3 - Elev. +53 ft, 6 in (+16.30m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction.....	3.7-269
Figure 3.7.2-90—Spectrum Envelope of Safeguard Building 2&3 - Elev. +53 ft, 6 in (+16.30m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction.....	3.7-270
Figure 3.7.2-91—Spectrum Envelope of Safeguard Building 2&3 - Elev. +53 ft, 6 in (+16.30m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction	3.7-271
Figure 3.7.2-92—Spectrum Envelope of Safeguard Building 4 - Elev. +68 ft, 11 in (+21.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction.....	3.7-272
Figure 3.7.2-93—Spectrum Envelope of Safeguard Building 4 - Elev. +68 ft, 11 in (+21.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction.....	3.7-273
Figure 3.7.2-94—Spectrum Envelope of Safeguard Building 4 - Elev. +68 ft, 11 in (+21.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction	3.7-274
Figure 3.7.2-95—Spectrum Envelope of Containment Building - Elev. +123 ft, 4-1/4 in (+37.60m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction.....	3.7-275

Figure 3.7.2-96—Spectrum Envelope of Containment Building - Elev. +123 ft, 4-1/4 in (+37.60m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction.....	3.7-276
Figure 3.7.2-97—Spectrum Envelope of Containment Building - Elev. +123 ft, 4-1/4 in (+37.60m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction.....	3.7-277
Figure 3.7.2-98—Spectrum Envelope of Containment Building - Elev. +190 ft, 3-1/2 in (+58.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction.....	3.7-278
Figure 3.7.2-99—Spectrum Envelope of Containment Building - Elev. +190 ft, 3-1/2 in (+58.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction.....	3.7-279
Figure 3.7.2-100—Spectrum Envelope of Containment Building - Elev. +190 ft, 3-1/2 in (+58.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction.....	3.7-280
Figure 3.7.2-101—Spectrum Envelope of EPGB at the Center of Basemat - 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction.....	3.7-281
Figure 3.7.2-102—Spectrum Envelope of EPGB at the Center of Basemat - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction	3.7-282
Figure 3.7.2-103—Spectrum Envelope of EPGB at the Center of Basemat - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction.....	3.7-283
Figure 3.7.2-104—Spectrum Envelope of ESWB at Elev +63 ft, 0 in at Node 12733 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction	3.7-284
Figure 3.7.2-105—Spectrum Envelope of ESWB at Elev +63 ft, 0 in at Node 12733 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction	3.7-285
Figure 3.7.2-106—Spectrum Envelope of ESWB at Elev +63 ft, 0 in at Node 12733 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction	3.7-286
Figure 3.7.2-107—Spectrum Envelope of ESWB at Elev +14 ft, 0 in at Node 10385 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction	3.7-287
Figure 3.7.2-108—Spectrum Envelope of ESWB at Elev +14 ft, 0 in at Node 10385 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction	3.7-288
Figure 3.7.2-109—Spectrum Envelope of ESWB at Elev +14 ft, 0 in at Node 10385 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction	3.7-289

Figure 3.7.2-110—Spectrum Envelope of Fuel Building at Elev. +12 ft, 1-2/3 in (3.7 m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction	3.7-290
Figure 3.7.2-111—Spectrum Envelope of Fuel Building at Elev. +12 ft, 1-2/3 in (3.7 m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction	3.7-291
Figure 3.7.2-112—Spectrum Envelope of Fuel Building at Elev. +12 ft, 1-2/3 in (3.7 m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction	3.7-292
Figure 3.7.2-113—Dynamic 3D Finite Element Model of Nuclear Island, Isometric View.....	3.7-293
Figure 3.7.2-114—Dynamic 3D Finite Element Model of Nuclear Island, Elevation View	3.7-294
Figure 3.7.2-115—Dynamic 3D Finite Element Model of Fuel Building (FB).....	3.7-295
Figure 3.7.2-116—Dynamic 3D Finite Element Model of Safeguard Building 1 (SB1)	3.7-296
Figure 3.7.2-117—Dynamic 3D Finite Element Model of Safeguard Building 2/3 (SB2/3)	3.7-297
Figure 3.7.2-118—Dynamic 3D Finite Element Model of Safeguard Building 4 (SB4)	3.7-298
Figure 3.7.2-119—Dynamic 3D Finite Element Model of Reactor Containment Building (RCB)	3.7-299
Figure 3.7.2-120—Dynamic 3D Finite Element Model of Reactor Building Internal Structures (RBIS).....	3.7-300
Figure 3.7.2-121—SSI Analysis Model – Excavated Soil Solid Elements, Nuclear Island Foundation	3.7-301
Figure 3.7.2-122—SSI Analysis Model – Nuclear Island Beam Elements.....	3.7-302
Figure 3.7.2-123—SSI Analysis Model – Nuclear Island Shell Elements	3.7-303
Figure 3.7.2-124—SSI Analysis Model – Adjacent Structures Foundation Rigid Beam Elements	3.7-304
Figure 3.7.2-125—Deleted.....	3.7-305
Figure 3.7.2-126—SSI Analysis Model – Nuclear Auxiliary Building Foundation and Sidewall Rigid Beams	3.7-306
Figure 3.7.2-127—Deleted.....	3.7-307
Figure 3.7.2-128—SSI Analysis Model – Nuclear Auxiliary Building Stick Model	3.7-308
Figure 3.7.2-129—SSI Analysis Model – Nuclear Auxiliary Building Foundation Excavated Soil	3.7-309

Figure 3.7.2-130—Nuclear Island and Nuclear Auxiliary Building Interface Nodes.....	3.7-310
Figure 3.7.2-131—Deleted.....	3.7-311
Figure 3.7.2-132—Nuclear Island Foundation Layout Showing Basemat, Sidewalls, and Shear Key	3.7-312
Figure 3.7.2-133—Deleted.....	3.7-313
Figure 3.7.2-134—Deleted.....	3.7-314
Figure 3.7.2-135—Deleted.....	3.7-315
Figure 3.7.2-136—Deleted.....	3.7-316
Figure 3.7.2-137—Location of Response Output Nodes – NI Common Basemat.....	3.7-317
Figure 3.7.2-138—Location of Response Output Nodes – Reactor Building Internal Structure – Elev. +16 ft, 10-3/4 in (+5.15 m).....	3.7-318
Figure 3.7.2-139—Location of Response Output Nodes – Reactor Building Internal Structure – Elev. +63 ft, 11-3/4 in (+19.50 m).....	3.7-319
Figure 3.7.2-140—Location of Response Output Nodes – Safeguard Building 1 – Elev. +26 ft, 3 in (+8.10 m).....	3.7-320
Figure 3.7.2-141—Location of Response Output Nodes – Safeguard Building 1 – Elev. +68 ft, 10-3/4 in (+21.00 m).....	3.7-321
Figure 3.7.2-142—Location of Response Output Nodes – Safeguard Building 2 and 3 – Elev. +26 ft, 7 in (+8.10 m).....	3.7-322
Figure 3.7.2-143—Location of Response Output Nodes – Safeguard Building 2 & 3 – Elev. +50 ft, 6-1/4 in (+15.40 m).....	3.7-323
Figure 3.7.2-144—Location of Response Output Nodes – Safeguard Building 4 – Elev. +68 ft, 10-3/4 in (+21.00 m).....	3.7-324
Figure 3.7.2-145—Deleted.....	3.7-325
Figure 3.7.2-146—Deleted.....	3.7-326
Figure 3.7.2-147—Location of Response Output Nodes, Fuel Building at Elev. +12 ft, 1-2/3 in (3.7 m).....	3.7-327
Figure 3.7.2-148—Spectrum Envelope of EPGB at Elev. +51 ft, 6 in - 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction.....	3.7-328
Figure 3.7.2-149—Spectrum Envelope of EPGB at Elev. +51 ft, 6 in - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction.....	3.7-329
Figure 3.7.2-150—Spectrum Envelope of EPGB at Elev. +51 ft, 6 in - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction	3.7-330
Figure 3.7.2-151—Solid Element Basemat.....	3.7-331
Figure 3.7.2-152—Foundation Basemat Model with Solid Element Basemat	3.7-332

Figure 3.8-1—Reactor Building Plan at Elevation -50 Feet	3.8-176
Figure 3.8-2—Reactor Building Plan at Elevation -20 Feet	3.8-177
Figure 3.8-3—Reactor Building Plan at Elevation -8 Feet	3.8-178
Figure 3.8-4—Reactor Building Plan at Elevation +5 Feet	3.8-179
Figure 3.8-5—Reactor Building Plan at Elevation +17 feet	3.8-180
Figure 3.8-6—Reactor Building Plan at Elevation +29 feet	3.8-181
Figure 3.8-7—Reactor Building Plan at Elevation +45 feet	3.8-182
Figure 3.8-8—Reactor Building Plan at Elevation +64 feet	3.8-183
Figure 3.8-9—Reactor Building Plan at Elevation +79 feet	3.8-184
Figure 3.8-10—Reactor Building Plan at Elevation +94 feet	3.8-185
Figure 3.8-11—Reactor Building Section A-A.....	3.8-186
Figure 3.8-12—Reactor Building Section B-B.....	3.8-187
Figure 3.8-13—Reactor Building Section C-C	3.8-188
Figure 3.8-14—Finite Element Model of Reactor Containment Building	3.8-189
Figure 3.8-15—Finite Element Model of Reactor Containment Building Dome Concrete	3.8-190
Figure 3.8-16—Finite Element Model of Reactor Containment Building Basemat Concrete	3.8-191
Figure 3.8-17—Finite Element Model of Reactor Containment Building Interface with Concrete Interior Structures	3.8-192
Figure 3.8-18—Finite Element Model of Reactor Containment Building Tendon Layout in Cylindrical Wall.....	3.8-193
Figure 3.8-19—Finite Element Model of Reactor Containment Building Tendon Layout in Dome.....	3.8-194
Figure 3.8-20—Accident Temperature versus Time (Reactor Containment Building)	3.8-195
Figure 3.8-21—Accident Pressure versus Time (Reactor Containment Building)	3.8-196
Figure 3.8-22—Temperature Gradient Through Cylinder Wall	3.8-197
Figure 3.8-23—Temperature Gradient Through Dome.....	3.8-198
Figure 3.8-24—Temperature Gradient Through Basemat.....	3.8-199
Figure 3.8-25—Equipment Hatch General Assembly	3.8-200
Figure 3.8-26—Personnel Airlock, Emergency Airlock General Overview	3.8-201
Figure 3.8-27—Containment Penetration for Feedwater Pipe.....	3.8-202

Figure 3.8-28—Containment Penetrations for High Energy Pipes	3.8-203
Figure 3.8-29—Containment Standard Piping Penetrations – Single Pipe.....	3.8-204
Figure 3.8-30—Containment Standard Piping Penetrations – Multiple Pipes	3.8-205
Figure 3.8-31—Fuel Transfer Tube Penetration (Conceptual View).....	3.8-206
Figure 3.8-32—Reactor Building Internal Structures ANSYS Model	3.8-207
Figure 3.8-33—Reactor Building Internal Structures ANSYS Model – Section through Center of Building Looking West	3.8-208
Figure 3.8-34—Reactor Building Internal Structures ANSYS Model – Section through Reactor Cavity and Refueling Canal.....	3.8-209
Figure 3.8-35—Reactor Building Internal Structures ANSYS Model – Section through Center of Building Looking North.....	3.8-210
Figure 3.8-36—Reactor Building Internal Structures ANSYS Model – Section through Center of Building Looking Northwest	3.8-211
Figure 3.8-37—Reactor Building Internal Structures ANSYS Model – View of IRWST and Internal Structures Basemat	3.8-212
Figure 3.8-38—Fuel Building Plan Elevation -31 Feet.....	3.8-213
Figure 3.8-39—Fuel Building Plan Elevation -20 Feet.....	3.8-214
Figure 3.8-40—Fuel Building Plan Elevation -11 Feet.....	3.8-215
Figure 3.8-41—Fuel Building Plan Elevation 0 Feet.....	3.8-216
Figure 3.8-42—Fuel Building Plan Elevation +12 Feet.....	3.8-217
Figure 3.8-43—Fuel Building Plan Elevation +24 Feet.....	3.8-218
Figure 3.8-44—Fuel Building Plan Elevation +36 Feet.....	3.8-219
Figure 3.8-45—Fuel Building Plan Elevation +49 Feet.....	3.8-220
Figure 3.8-46—Fuel Building Plan Elevation +64 Feet.....	3.8-221
Figure 3.8-47—Fuel Building Plan Elevation +79 Feet.....	3.8-222
Figure 3.8-48—Fuel Building Plan Elevation +90 Feet.....	3.8-223
Figure 3.8-49—Fuel Building Plan Elevation +112 Feet.....	3.8-224
Figure 3.8-50—Fuel Building Plan Section A-A.....	3.8-225
Figure 3.8-51—Fuel Building Plan Section B-B	3.8-226
Figure 3.8-52—Fuel Building Plan Section C-C.....	3.8-227
Figure 3.8-53—Safeguard Building 1 Plan Elevation -31 Feet	3.8-228
Figure 3.8-54—Safeguard Building 1 Plan Elevation -16 Feet	3.8-229
Figure 3.8-55—Safeguard Building 1 Plan Elevation 0 Feet	3.8-230
Figure 3.8-56—Safeguard Building 1 Plan Elevation +15 Feet	3.8-231

Figure 3.8-57—Safeguard Building 1 Plan Elevation +27 Feet	3.8-232
Figure 3.8-58—Safeguard Building 1 Plan Elevation +39 Feet	3.8-233
Figure 3.8-59—Safeguard Building 1 Plan Elevation +55 Feet	3.8-234
Figure 3.8-60—Safeguard Building 1 Plan Elevation +69 Feet	3.8-235
Figure 3.8-61—Safeguard Building 1 Plan Elevation +81 Feet	3.8-236
Figure 3.8-62—Safeguard Building 1 Plan Elevation +96 Feet	3.8-237
Figure 3.8-63—Safeguard Building 1 Section A-A.....	3.8-238
Figure 3.8-64—Safeguard Buildings 2 and 3 Plan Elevation -31 Feet	3.8-239
Figure 3.8-65—Safeguard Buildings 2 and 3 Plan Elevation -16 Feet	3.8-240
Figure 3.8-66—Safeguard Buildings 2 and 3 Plan Elevation 0 Feet.....	3.8-241
Figure 3.8-67—Safeguard Buildings 2 and 3 Plan Elevation +15 Feet	3.8-242
Figure 3.8-68—Safeguard Buildings 2 and 3 Plan Elevation +27 Feet	3.8-243
Figure 3.8-69—Safeguard Buildings 2 and 3 Plan Elevation +39 Feet	3.8-244
Figure 3.8-70—Safeguard Buildings 2 and 3 Plan Elevation +53 Feet	3.8-245
Figure 3.8-71—Safeguard Buildings 2 and 3 Plan Elevation +69 Feet	3.8-246
Figure 3.8-72—Safeguard Buildings 2 and 3 Plan Elevation +79 Feet	3.8-247
Figure 3.8-73—Safeguard Buildings 2 and 3 Plan Elevation +94 Feet	3.8-248
Figure 3.8-74—Safeguard Buildings 2 and 3 Section B-B.....	3.8-249
Figure 3.8-75—Safeguard Building 4 Plan Elevation -31 Feet	3.8-250
Figure 3.8-76—Safeguard Building 4 Plan Elevation -16 Feet	3.8-251
Figure 3.8-77—Safeguard Building 4 Plan Elevation 0 Feet	3.8-252
Figure 3.8-78—Safeguard Building 4 Plan Elevation +15 Feet	3.8-253
Figure 3.8-79—Safeguard Building 4 Plan Elevation +26 Feet	3.8-254
Figure 3.8-80—Safeguard Building 4 Plan Elevation +39 Feet	3.8-255
Figure 3.8-81—Safeguard Building 4 Plan Elevation +55 Feet	3.8-256
Figure 3.8-82—Safeguard Building 4 Plan Elevation +69 Feet	3.8-257
Figure 3.8-83—Safeguard Building 4 Plan Elevation +81 Feet	3.8-258
Figure 3.8-84—Safeguard Building 4 Plan Elevation +96 Feet	3.8-259
Figure 3.8-85—Safeguard Building 4 Section A-A.....	3.8-260
Figure 3.8-86—ANSYS Finite Element Model of Nuclear Island Common Basemat Structure - Outside View	3.8-261

Figure 3.8-87—ANSYS Finite Element Model of Nuclear Island Common Basemat Structure - Section Through Fuel Building and Safeguard Building 2/3 Island	3.8-262
Figure 3.8-88—ANSYS Finite Element Model of Nuclear Island Common Basemat Structure - Section Through Safeguard Buildings 4 and 1	3.8-263
Figure 3.8-89—Emergency Power Generating Buildings Plan Elevation 0'-0"	3.8-264
Figure 3.8-90—Emergency Power Generating Buildings Plan Elevation 33'-4"	3.8-265
Figure 3.8-91—Emergency Power Generating Buildings Plan Elevation 51'-6"	3.8-266
Figure 3.8-92—Emergency Power Generating Buildings Plan Elevation 68'-0"	3.8-267
Figure 3.8-93—Emergency Power Generating Buildings Section A-A	3.8-268
Figure 3.8-94—Emergency Power Generating Buildings Section B-B	3.8-269
Figure 3.8-95—Essential Service Water Building Plan Elevation 0'-0"	3.8-270
Figure 3.8-96—Essential Service Water Building Plan Elevation 14'-0"	3.8-271
Figure 3.8-97—Essential Service Water Building Plan Elevation 47'-0"	3.8-272
Figure 3.8-98—Essential Service Water Building Plan Elevation 63'-0"	3.8-273
Figure 3.8-99—Essential Service Water Building Plan Elevation 80'-0"	3.8-274
Figure 3.8-100—Essential Service Water Building Roof Plan Elevation 96'-0"	3.8-275
Figure 3.8-101—Essential Service Water Building Section A-A	3.8-276
Figure 3.8-102—Essential Service Water Building Section B-B	3.8-277
Figure 3.8-103—Nuclear Island Common Basemat Structure Foundation Basemat ANSYS Model	3.8-278
Figure 3.8-104—Emergency Power Generating Building Foundation Basemat Model	3.8-279
Figure 3.8-105—Essential Service Water Building Foundation Basemat Model	3.8-280
Figure 3.8-106—Elastic Displacement for Soil Case 1u	3.8-281
Figure 3.8-107—Elastic Displacement for Soil Case 2u	3.8-282
Figure 3.8-108—Elastic Displacement for Soil Case 1n2u	3.8-283
Figure 3.8-109—Elastic Displacement for Soil Case 3u	3.8-284
Figure 3.8-110—Elastic Displacement for Soil Case 4u	3.8-285

Figure 3.8-111—Elastic Displacement for Soil Case 5a	3.8-286
Figure 3.8-112—Elastic Displacement for Soil Case 5u	3.8-287
Figure 3.8-113—Elastic Displacement for Soil Case 2sn4u	3.8-288
Figure 3.8-114—Elastic Displacement for Soil Case 2n3u	3.8-289
Figure 3.8-115—Elastic Displacement for Soil Case 3r3u.....	3.8-290
Figure 3.8-116—Deleted.....	3.8-291
Figure 3.8-117—Deleted.....	3.8-291
Figure 3.8-118—Jurisdictional Boundaries for the Design of Concrete Structures of the U.S. EPR Common Basemat Structure	3.8-292
Figure 3.8-119—Containment Dedicated Spare Penetration	3.8-293
Figure 3.8-120—Containment Penetration for Main Steam Pipe.....	3.8-294
Figure 3.8-121—Low Voltage Electrical Penetration Sleeve	3.8-295
Figure 3.8-122—Medium Voltage Electrical Penetration Sleeve	3.8-296
Figure 3.8-123—Construction Opening	3.8-297
Figure 3.8-124—Relative Differential Settlement Step 1, NI Basemat	3.8-298
Figure 3.8-125—Relative Differential Settlement Step 2, Walls up to Elevation -16 feet	3.8-299
Figure 3.8-126—Relative Differential Settlement Step 3, Floor Slabs at Elevation -16 feet	3.8-300
Figure 3.8-127—Relative Differential Settlement Step 4, Walls up to Grade Elevation	3.8-301
Figure 3.8-128—Relative Differential Settlement Step 5, Floor Slabs at Grade Elevation	3.8-302
Figure 3.8-129—Relative Differential Settlement Step 6, Walls up to Elevation 55 feet	3.8-303
Figure 3.8-130—Relative Differential Settlement Step 7, Floor Slabs at Elevation 55 feet	3.8-304
Figure 3.8-131—Relative Differential Settlement Step 8, Walls up to Elevation 96 feet	3.8-305
Figure 3.8-132—Relative Differential Settlement Step 9, Floor Slabs at Elevation 96 feet	3.8-306
Figure 3.8-133—Relative Differential Settlement Step 10, Walls up to Elevation 144 feet	3.8-307
Figure 3.8-134—Relative Differential Settlement Step 11, Full NI Common Basemat Structure	3.8-308
Figure 3.8-135—Total Differential Settlement, EPGB.....	3.8-309

Figure 3.8-136—Total Differential Settlement, ESWB	3.8-310
Figure 3.8-137—Reactor Containment Building Door Locations at Elevation -8 feet	3.8-311
Figure 3.8-138—Reactor Containment Building Door Locations at Elevation +5 feet	3.8-312
Figure 3.8-139—Reactor Containment Building Door Locations at Elevation +17 feet	3.8-313
Figure 3.8-140—Reactor Containment Building Door Locations at Elevation +29 feet	3.8-314
Figure 3.8-141—Reactor Containment Building Door Locations at Elevation +45 feet	3.8-315
Figure 3.8-142—Reactor Containment Building Door Locations at Elevation +64 feet	3.8-316
Figure 3.8-143—Reactor Containment Building Door Locations at Elevation +79 feet	3.8-317
Figure 3.8-144—Reactor Containment Building Door Locations at Elevation +94 feet	3.8-318
Figure 3.8-145—Foundation Modulus for High Frequency Soil Cases.....	3.8-319
Figure 3.9.4-1—Control Rod Drive Mechanism Assembly	3.9-71
Figure 3.9.5-1—Reactor Pressure Vessel General Arrangement.....	3.9-84
Figure 3.9.5-2—Lower Reactor Internals.....	3.9-85
Figure 3.9.5-3—Reactor Pressure Vessel Heavy Reflector.....	3.9-86
Figure 3.9.5-4—Reactor Pressure Vessel Upper Internals.....	3.9-87
Figure 3.9.5-5—Section A-A Flow Distribution Device	3.9-88
Figure 3.9.5-6—Section B-B Upper Support Plate	3.9-89
Figure 3.9.5-7—Section C-C Upper Core Plate.....	3.9-90
Figure 3.11-1—Harsh and Mild Zones in Safeguard Buildings.....	3.11-165
Figure 3A-1—Demonstration of Modified ISRS for Frequency Determination Approach to Equivalent Static Load Method: High Frequency Peak Has Highest Spectral Acceleration	3A-17
Figure 3A-2—Demonstration of Modified ISRS for Frequency Determination Approach to Equivalent Static Load Method: Low Frequency Peak Has Highest Spectral Acceleration	3A-18
Figure 3A-3—Demonstration of Modified ISRS for Response Spectrum Method: High Frequency Peak Has Highest Spectral Acceleration	3A-19
Figure 3A-4—Demonstration of Modified ISRS for Response Spectrum Method: Low Frequency Peak Has Highest Spectral Acceleration.....	3A-20

Figure 3B-1—Dimensional Arrangement Reference Plant Building Location	3B-2
Figure 3B-2—Reactor Building Dimensional Plan at Elevation -15 m (-50 ft).....	3B-3
Figure 3B-3—Reactor Building Dimensional Plan at Elevation -6.15 m (-20 ft).....	3B-4
Figure 3B-4—Reactor Building Dimensional Plan at Elevation -2.3 m (-8 ft).....	3B-5
Figure 3B-5—Reactor Building Dimensional Plan at Elevation +1.5 m (+5 ft).....	3B-6
Figure 3B-6—Reactor Building Dimensional Plan at Elevation +5.15 m (+17 ft).....	3B-7
Figure 3B-7—Reactor Building Dimensional Plan at Elevation +8.7 m (+29 ft).....	3B-8
Figure 3B-8—Reactor Building Dimensional Plan at Elevation +13.8 m (+45 ft).....	3B-9
Figure 3B-9—Reactor Building Dimensional Plan at Elevation +19.5 m (+64 ft)....	3B-10
Figure 3B-10—Reactor Building Dimensional Plan at Elevation +24.1 m (+79 ft)...3B-11	
Figure 3B-11—Reactor Building Dimensional Plan at Elevation +28.5 m (+94 ft)...3B-12	
Figure 3B-12—Reactor Building Dimensional Section A-A	3B-13
Figure 3B-13—Reactor Building Dimensional Section B-B	3B-14
Figure 3B-14—Reactor Building Dimensional Section C-C	3B-15
Figure 3B-15—Fuel Building Dimensional Plan Elevation -9.6 m (-31 ft)	3B-16
Figure 3B-16—Fuel Building Dimensional Plan Elevation -6.2 m (-20 ft)	3B-17
Figure 3B-17—Fuel Building Dimensional Plan Elevation -3.4 m (-11 ft)	3B-18
Figure 3B-18—Fuel Building Dimensional Plan Elevation 0 m (0 ft).....	3B-19
Figure 3B-19—Fuel Building Dimensional Plan Elevation +3.7 m (+12 ft)	3B-20
Figure 3B-20—Fuel Building Dimensional Plan Elevation +7.4 m (+24 ft)	3B-21
Figure 3B-21—Fuel Building Dimensional Plan Elevation +11.1 m (+36 ft)	3B-22
Figure 3B-22—Fuel Building Dimensional Plan Elevation +14.8 m (+49 ft)	3B-23
Figure 3B-23—Fuel Building Dimensional Plan Elevation +19.5 m (+64 ft)	3B-24
Figure 3B-24—Fuel Building Dimensional Plan Elevation +24.2 m (+79 ft)	3B-25
Figure 3B-25—Fuel Building Dimensional Plan Elevation +27.4 m (+90 ft)	3B-26
Figure 3B-26—Fuel Building Dimensional Plan Elevation +34 m (+112 ft)	3B-27
Figure 3B-27—Fuel Building Dimensional Section A-A	3B-28
Figure 3B-28—Fuel Building Dimensional Section B-B	3B-29
Figure 3B-29—Fuel Building Dimensional Section C-C.....	3B-30
Figure 3B-30—Safeguard Building 1 Dimensional Plan Elevation -9.6 m (-31 ft)....3B-31	
Figure 3B-31—Safeguard Building 1 Dimensional Plan Elevation -5.0 m (-16 ft)....3B-32	
Figure 3B-32—Safeguard Building 1 Dimensional Plan Elevation 0 m (0 ft).....3B-33	

Figure 3B-33—Safeguard Building 1 Dimensional Plan Elevation +4.7 m (+15 ft)	3B-34
Figure 3B-34—Safeguard Building 1 Dimensional Plan Elevation +8.1 m (+27 ft)	3B-35
Figure 3B-35—Safeguard Building 1 Dimensional Plan Elevation +12 m (+39 ft)	3B-36
Figure 3B-36—Safeguard Building 1 Dimensional Plan Elevation +16.8 m (+55 ft)	3B-37
Figure 3B-37—Safeguard Building 1 Dimensional Plan Elevation +21 m (+69 ft)	3B-38
Figure 3B-38—Safeguard Building 1 Dimensional Plan Elevation +24.7 m (+81 ft)	3B-39
Figure 3B-39—Safeguard Building 1 Dimensional Plan Elevation +29.3 m (+96 ft)	3B-40
Figure 3B-40—Safeguard Building 1 Dimensional Section A-A	3B-41
Figure 3B-41—Safeguard Buildings 2 and 3 Dimensional Plan Elevation -9.6 m (-31 ft)	3B-42
Figure 3B-42—Safeguard Buildings 2 and 3 Dimensional Plan Elevation -5 m (-16 ft)	3B-43
Figure 3B-43—Safeguard Buildings 2 and 3 Dimensional Plan Elevation 0 m (0 ft).....	3B-44
Figure 3B-44—Safeguard Buildings 2 and 3 Dimensional Plan Elevation +4.7 m (+15 ft)	3B-45
Figure 3B-45—Safeguard Buildings 2 and 3 Dimensional Plan Elevation +8.1 m (+27 ft)	3B-46
Figure 3B-46—Safeguard Buildings 2 and 3 Dimensional Plan Elevation +12 m (+39 ft)	3B-47
Figure 3B-47—Safeguard Buildings 2 and 3 Dimensional Plan Elevation +16.3 m (+53 ft)	3B-48
Figure 3B-48—Safeguard Buildings 2 and 3 Dimensional Plan Elevation +21 m (+69 ft)	3B-49
Figure 3B-49—Safeguard Buildings 2 and 3 Dimensional Plan Elevation +24 m (+79 ft)	3B-50
Figure 3B-50—Safeguard Buildings 2 and 3 Dimensional Plan Elevation +28.8 m (+94 ft)	3B-51
Figure 3B-51—Safeguard Buildings 2 and 3 Dimensional Section B-B.....	3B-52
Figure 3B-52—Safeguard Building 4 Dimensional Plan Elevation -9.6 m (-31 ft)....	3B-53

Figure 3B-53—Safeguard Building 4 Dimensional Plan Elevation -5 m (-16 ft).....	3B-54
Figure 3B-54—Safeguard Building 4 Dimensional Plan Elevation 0 m (0 ft)	3B-55
Figure 3B-55—Safeguard Building 4 Dimensional Plan Elevation +4.7 m (+15 ft)	3B-56
Figure 3B-56—Safeguard Building 4 Dimensional Plan Elevation +8.1 m (+27 ft)	3B-57
Figure 3B-57—Safeguard Building 4 Dimensional Plan Elevation +12 m (+39 ft)	3B-58
Figure 3B-58—Safeguard Building 4 Dimensional Plan Elevation +16.8 m (+55 ft)	3B-59
Figure 3B-59—Safeguard Building 4 Dimensional Plan Elevation +21 m (+69 ft)	3B-60
Figure 3B-60—Safeguard Building 4 Dimensional Plan Elevation +24.7 m (+81 ft)	3B-61
Figure 3B-61—Safeguard Building 4 Dimensional Plan Elevation +29.3 m (+96 ft)	3B-62
Figure 3B-62—Safeguard Building 4 Dimensional Section A-A	3B-63
Figure 3B-63—Emergency Power Generating Buildings Dimensional Plan Elevation 0 m (0 ft).....	3B-64
Figure 3B-64—Emergency Power Generating Buildings Dimensional Plan Elevation +10.16 m (+33 ft).....	3B-65
Figure 3B-65—Emergency Power Generating Buildings Dimensional Plan Elevation +15.7 m (+52 ft).....	3B-66
Figure 3B-66—Emergency Power Generating Buildings Dimensional Plan Elevation +20.72 m (+68 ft).....	3B-67
Figure 3B-67—Emergency Power Generating Buildings Dimensional Section A-A	3B-68
Figure 3B-68—Emergency Power Generating Buildings Dimensional Section B-B	3B-69
Figure 3B-69—Essential Service Water Building Dimensional Plan Elevation 0 m (0 ft).....	3B-70
Figure 3B-70—Essential Service Water Building Dimensional Plan Elevation +4.27 m (+14 ft).....	3B-71
Figure 3B-71—Essential Service Water Building Dimensional Plan Elevation +14.33 m (+47 ft).....	3B-72
Figure 3B-72—Essential Service Water Building Dimensional Plan Elevation +19.2 m (+63 ft).....	3B-73

Figure 3B-73—Essential Service Water Building Dimensional Plan Elevation +24.38 m (+80 ft).....	3B-74
Figure 3B-74—Essential Service Water Building Roof Dimensional Plan Elevation +29.26 m (+96 ft).....	3B-75
Figure 3B-75—Essential Service Water Building Dimensional Section A-A.....	3B-76
Figure 3B-76—Essential Service Water Building Dimensional Section B-B.....	3B-77
Figure 3C-1—RCS Primary Side Hydraulic Model	3C-31
Figure 3C-2—SG Secondary Side Hydraulic Model	3C-32
Figure 3C-3—RPV Isolated Hydraulic Model.....	3C-33
Figure 3C-4—ACP Hydraulic Model	3C-34
Figure 3C-5—RCS Four-Loop Structural Model	3C-35
Figure 3C-6—SG Detailed Structural Model.....	3C-38
Figure 3C-7—RCP Detailed Structural Model	3C-39
Figure 3C-8—RPV Isolated Structural Model	3C-40
Figure 3C-9—Rayleigh Damping Curve	3C-41
Figure 3D-1—Typical Combined LOCA/SLB Inside Containment Temperature Service Conditions Envelope	3D-34
Figure 3D-2—Typical Combined LOCA/SLB Inside Containment Pressure Service Conditions Envelope	3D-35
Figure 3D-3—Outside Containment Temperature Service Conditions Envelope (Feedwater Valve Compartment).....	3D-36
Figure 3D-4—Outside Containment Pressure Service Conditions Envelope (Feedwater Valve Compartment).....	3D-37
Figure 3D-5—Outside Containment Temperature Service Conditions Envelope (Main Steam Valve Compartment).....	3D-38
Figure 3D-6—Outside Containment Pressure Service Conditions Envelope (Main Steam Valve Compartment).....	3D-39
Figure 3D.D-1—Sample Arrhenius Plot for Material Activation Energy Based on 30% Retention of Elongation	3D-93
Figure 3E.1-1—ANSYS Analysis Results for Nuclear Island Elements.....	3E-96
Figure 3E.1-2—Gusset Section of RCB.....	3E-97
Figure 3E.1-3—Cross-Section of Gusset	3E-98
Figure 3E.1-4—180° FEM Gusset Segment of Containment Foundation	3E-99
Figure 3E.1-5—Gusset Section - Typical Reinforcement	3E-100
Figure 3E.1-6—Plan View of Equipment Hatch Area	3E-101

Figure 3E.1-7—FEM of Equipment Hatch Area - Outer View	3E-102
Figure 3E.1-8—FEM of Equipment Hatch Area - Inner View.....	3E-103
Figure 3E.1-9—Cross-Section of Equipment Hatch Area.....	3E-104
Figure 3E.1-10—Elevation View of Equipment Hatch Area Showing Cuts.....	3E-105
Figure 3E.1-11—Sections 1-1 and 2-2 of the Equipment Hatch Area	3E-106
Figure 3E.1-12—Reinforcement Pattern for Section 1-1 of the Equipment Hatch Area	3E-107
Figure 3E.1-13—Reinforcement Pattern for Section 2-2 of the Equipment Hatch Area	3E-108
Figure 3E.1-14—Reinforcement Pattern for Section 3-3 of the Equipment Hatch Area	3E-109
Figure 3E.1-15—Elevation View of the Entire RCB	3E-110
Figure 3E.1-16—Section Cut Through Entire RCB.....	3E-111
Figure 3E.1-17—Elevation View of Critical Section	3E-112
Figure 3E.1-18—Section View Cut Through Critical Section.....	3E-113
Figure 3E.1-19—Plan View Cut Through Critical Section.....	3E-114
Figure 3E.1-20—Elevation View of Buttress 3.....	3E-115
Figure 3E.1-21—Plan View Cut Through Typical Narrow Buttress	3E-116
Figure 3E.1-22—Plan View Cut Through Typical Wide Buttress	3E-117
Figure 3E.1-23—Containment Wall Reinforcement (Typical Section)	3E-118
Figure 3E.1-24—Containment Buttress Reinforcement (Typical Narrow Section).....	3E-119
Figure 3E.1-25—Containment Buttress Reinforcement (Typical Wide Section).....	3E-120
Figure 3E.1-26—Floor Slab Plan View at Elevation 4'-11 1/16"	3E-121
Figure 3E.1-27—Typical Cavity Walls Plan View	3E-122
Figure 3E.1-28—Isolated View of FEM For Floor Slab and SG/RCP Wing Wall.....	3E-123
Figure 3E.1-29—Isolated View of FEM For Floor Slab and SG/RCP Separation Wall.....	3E-124
Figure 3E.1-30—Area of Detail for Floor Slab at Elevation 4'-11 1/16" with Thickness 6'-6 3/4"	3E-125
Figure 3E.1-31—Reinforcement of Floor Slab at Elevation 4'-11 1/16", Section 1-1	3E-126

Figure 3E.1-32—Area of Detail for Floor Slab at Elevation 4'-11 1/16" with Thickness 3'-3 3/8"	3E-127
Figure 3E.1-33—Reinforcement of Floor Slab Section 3-3	3E-128
Figure 3E.1-34—Reinforcement of Floor Slab Section 2-2	3E-129
Figure 3E.1-35—Area of Detail for SG/RCP Wing Wall Bottom	3E-130
Figure 3E.1-36—SG/RCP Wing Wall Bottom Reinforcement	3E-131
Figure 3E.1-37—Area of Detail for SG/RCP Wing Wall Top	3E-132
Figure 3E.1-38—SG/RCP Wing Wall Top Reinforcement	3E-133
Figure 3E.1-39—Area of Detail for SG Separation Wall Bottom	3E-134
Figure 3E.1-40—SG Separation Wall Bottom Reinforcement	3E-135
Figure 3E.1-41—Area of Detail for SG Separation Wall Top	3E-136
Figure 3E.1-42—SG Separation Wall Top Reinforcement	3E-137
Figure 3E.1-43—Location of PZR Cubical	3E-138
Figure 3E.1-44—PZR Isometric View Showing Support Locations	3E-139
Figure 3E.1-45—Plan View of FEM for Floor Slab of PZR Cubical	3E-140
Figure 3E.1-46—Elevation View of FEM for Wall Section of PZR Cubical	3E-141
Figure 3E.1-47—PZR Floor Slab Section - Reinforcement at Support	3E-142
Figure 3E.1-48—PZR Wall Section - Typical Reinforcement	3E-143
Figure 3E.1-49—RB Operating Floor - Elevation 63'-11 11/16" Showing Section Locations	3E-144
Figure 3E.1-50—Plan View of RB Operating Floor Showing Rooms	3E-145
Figure 3E.1-51—RB Operating Floor Reinforcement - Section 1-1	3E-146
Figure 3E.1-52—RB Operating Floor Reinforcement - Section 2-2	3E-147
Figure 3E.1-53—RB Operating Floor Reinforcement - Section 3-3 and 4-4	3E-148
Figure 3E.1-54—RB Operating Floor Reinforcement - Section 5-5	3E-149
Figure 3E.1-55—RB Operating Floor Reinforcement - Section 6-6	3E-150
Figure 3E.1-56—RB Operating Floor Reinforcement - Section 7-7	3E-151
Figure 3E.1-57—RB Operating Floor Reinforcement - Section 8-8	3E-152
Figure 3E.1-58—RSB Wall Vertical Design Boundaries	3E-153
Figure 3E.1-59—FB Roof and RSB Wall Design Boundaries	3E-154
Figure 3E.1-60—SB 2&3 Roof and RSB Wall Design Boundaries	3E-155
Figure 3E.1-61—Isometric FEM of FB Roof to RSB Wall Connection	3E-156
Figure 3E.1-62—Isometric FEM of SB 2 and 3 Roof to RSB Wall Connection	3E-157

Figure 3E.1-63—RSB Wall to Roof Connection - Typical Reinforcement	3E-158
Figure 3E.1-64—Location of SB1 South and West Walls Below Grade	3E-159
Figure 3E.1-65—Location of SB4 North and East Walls Below Grade.....	3E-160
Figure 3E.1-66—SB1 Wall A13001 Isometric View	3E-161
Figure 3E.1-67—SB1 Wall A13003 Isometric View	3E-162
Figure 3E.1-68—SB4 Wall A33008 Isometric View	3E-163
Figure 3E.1-69—SB4 Wall A33003 Isometric View	3E-164
Figure 3E.1-70—Cross Section of Walls A13001, A13003, A33008, and A33003 Showing Reinforcement	3E-165
Figure 3E.1-71—Isometric FEM of NI Foundation Basemat.....	3E-166
Figure 3E.1-72—Elevation View of RB Internal Structure Base Slab	3E-167
Figure 3E.1-73—Reinforcement Pattern for NI Foundation Base Mat (Except Below RCB)	3E-168
Figure 3E.1-74—Reinforcement Pattern for RB Internal Structures Base Slab - Elevation -25'-7" to -20'-2"	3E-169
Figure 3E.1-75—Reinforcement Pattern for RB Internal Structures Base Slab - Elevation -25'-7" to -7'-6 1/2"	3E-170
Figure 3E.1-76—Reinforcement Pattern for NI Foundation Base Mat below RCB	3E-171
Figure 3E.2-1—Finite Element Planar Reference Frame Systems	3E-187
Figure 3E.2-2—EPGB Basemat Foundation – FEM.....	3E-188
Figure 3E.2-3—Reinforcement Sketch for EPGB Basemat Foundation.....	3E-189
Figure 3E.2-4—EPGB Wall at Column Line 11 - GT STRUDL FEM	3E-190
Figure 3E.2-5—EPGB Sign Convention for Horizontal and Vertical Cuts at Column Line 11	3E-191
Figure 3E.2-6—Nomenclature for Section Cuts through EPGB Wall at Column Line 11	3E-192
Figure 3E.2-7—FEM of Highly Stressed Areas of EPGB Wall at Column Line 11	3E-193
Figure 3E.2-8—Reinforcement Sketch for EPGB Wall at Column Line 11.....	3E-194
Figure 3E.2-9—EPGB Slab at Elevation 51'-6"	3E-195
Figure 3E.2-10—Elevation View of EPGB Critical Section at Elevation 51'-6"	3E-196
Figure 3E.2-11—FEM View of EPGB Elevation 51'-6"	3E-197
Figure 3E.2-12—Design Sketch of EPGB Elevation 51'-6"	3E-198
Figure 3E.3-1—Finite Element Planar Reference Frame Systems	3E-214

Figure 3E.3-2—ESWB Basemat Foundation - FEM	3E-215
Figure 3E.3-3—Reinforcement Sketch for ESWB Basemat Foundation	3E-216
Figure 3E.3-4—ESWB Wall at Column Line 4 - FEM	3E-217
Figure 3E.3-5—Sign Convention for ESWB Horizontal and Vertical Cuts at Column Line 4	3E-218
Figure 3E.3-6—Vertical and Horizontal Section Cuts for ESWB Wall at Column Line 4	3E-219
Figure 3E.3-7—Reinforcement Configuration for ESWB Wall at Column Line 4	3E-220
Figure 3E.3-8—ESWB Fan Deck Slab at Elevation 63'-0" - FEM.....	3E-221
Figure 3E.3-9—Reinforcement Sketch for ESWB Fan Deck Slab at Elevation 63'-0"	3E-222
Figure 3E.3-10—Orientation of Positive Axis.....	3E-223

[Next File](#)