Appendix F: Response Plots of Model 1c: Effect of Vertical Component Ground Motions

Complete analysis of the baseline model—Model 1c—at both two-component and three-component conditions have been conducted in order to evaluate the effect of vertical component ground motions. As complimentary information to Section 7.7, more figures are presented in this appendix, which includes:

- Base shear versus roof displacement relationships under BSE-1E and BSE-2E hazard-level ground motions
- Roof displacement histories under BSE-1E and BSE-2E hazard-level ground motions
- Roof displacement orbits under BSE-1E and BSE-2E hazard-level ground motions
Figure F.1  Base shear versus roof displacement relationships under BSE-1E level ground motion number 1 with and without vertical component motions (Model 1c).

Figure F.2  Base shear versus roof displacement relationships under BSE-1E level ground motion number 2 with and without vertical component motions (Model 1c).
Figure F.3  Base shear versus roof displacement relationships under BSE-1E level ground motion number 3 with and without vertical component motions (Model 1c).

Figure F.4  Base shear versus roof displacement relationships under BSE-1E level ground motion number 4 with and without vertical component motions (Model 1c).
Figure F.5  Base shear versus roof displacement relationships under BSE-1E level ground motion number 5 with and without vertical component motions (Model 1c).

Figure F.6  Base shear versus roof displacement relationships under BSE-1E level ground motion number 6 with and without vertical component motions (Model 1c).
Figure F.7  Base shear versus roof displacement relationships under BSE-1E level ground motion number 7 with and without vertical component motions (Model 1c).

Figure F.8  Base shear versus roof displacement relationships under BSE-1E level ground motion number 8 with and without vertical component motions (Model 1c).
Figure F.9  Base shear versus roof displacement relationships under BSE-1E level ground motion number 9 with and without vertical component motions (Model 1c).

Figure F.10  Base shear versus roof displacement relationships under BSE-1E level ground motion number 10 with and without vertical component motions (Model 1c).
Figure F.11  Base shear versus roof displacement relationships under BSE-1E level ground motion number 11 with and without vertical component motions (Model 1c).

Figure F.12  Base shear versus roof displacement relationships under BSE-1E level ground motion number 12 with and without vertical component motions (Model 1c).
Figure F.13  Base shear versus roof displacement relationships under BSE-1E level ground motion number 13 with and without vertical component motions (Model 1c).

Figure F.14  Base shear versus roof displacement relationships under BSE-1E level ground motion number 14 with and without vertical component motions (Model 1c).
Figure F.15  Base shear versus roof displacement relationships under BSE-1E level ground motion number 15 with and without vertical component motions (Model 1c).

Figure F.16  Base shear versus roof displacement relationships under BSE-1E level ground motion number 16 with and without vertical component motions (Model 1c).
Figure F.17 Base shear versus roof displacement relationships under BSE-1E level ground motion number 17 with and without vertical component motions (Model 1c).

Figure F.18 Base shear versus roof displacement relationships under BSE-1E level ground motion number 18 with and without vertical component motions (Model 1c).
Figure F.19  Base shear versus roof displacement relationships under BSE-1E level ground motion number 19 with and without vertical component motions (Model 1c).

Figure F.20  Base shear versus roof displacement relationships under BSE-1E level ground motion number 20 with and without vertical component motions (Model 1c).
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Figure F.23  Roof displacement histories under BSE-1E level ground motion number 3 with and without vertical component motions (Model 1c).

Figure F.24  Roof displacement histories under BSE-1E level ground motion number 4 with and without vertical component motions (Model 1c.)
Figure F.25  Roof displacement histories under BSE-1E level ground motion number 5 with and without vertical component motions (Model 1c).

Figure F.26  Roof displacement histories under BSE-1E level ground motion number 6 with and without vertical component motions (Model 1c).
Figure F.27 Roof displacement histories under BSE-1E level ground motion number 7 with and without vertical component motions (Model 1c).

Figure F.28 Roof displacement histories under BSE-1E level ground motion number 8 with and without vertical component motions (Model 1c).
Figure F.29  Roof displacement histories under BSE-1E level ground motion number 9 with and without vertical component motions (Model 1c).

Figure F.30  Roof displacement histories under BSE-1E level ground motion number 10 with and without vertical component motions (Model 1c).
Figure F.31  Roof displacement histories under BSE-1E level ground motion number 11 with and without vertical component motions (Model 1c).

Figure F.32  Roof displacement histories under BSE-1E level ground motion number 12 with and without vertical component motions (Model 1c).
Figure F.33  Roof displacement histories under BSE-1E level ground motion number 13 with and without vertical component motions (Model 1c).

Figure F.34  Roof displacement histories under BSE-1E level ground motion number 14 with and without vertical component motions (Model 1c).
Figure F.35    Roof displacement histories under BSE-1E level ground motion number 15 with and without vertical component motions (Model 1c).

Figure F.36    Roof displacement histories under BSE-1E level ground motion number 16 with and without vertical component motions (Model 1c).
Figure F.37  Roof displacement histories under BSE-1E level ground motion number 17 with and without vertical component motions (Model 1c).

Figure F.38  Roof displacement histories under BSE-1E level ground motion number 18 with and without vertical component motions (Model 1c).
Figure F.39  Roof displacement histories under BSE-1E level ground motion number 19 with and without vertical component motions (Model 1c).

Figure F.40  Roof displacement histories under BSE-1E level ground motion number 20 with and without vertical component motions (Model 1c).
Figure F.41  Roof displacement orbits under BSE-1E level ground motion number 1 with and without vertical component motions (Model 1c).

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Figure F.43  Roof displacement orbits under BSE-1E level ground motion number 3 with and without vertical component motions (Model 1c).

Figure F.44  Roof displacement orbits under BSE-1E level ground motion number 4 with and without vertical component motions (Model 1c).
Figure F.45  Roof displacement orbits under BSE-1E level ground motion number 5 with and without vertical component motions (Model 1c).

Figure F.46  Roof displacement orbits under BSE-1E level ground motion number 6 with and without vertical component motions (Model 1c).
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Figure F.48  Roof displacement orbits under BSE-1E level ground motion number 8 with and without vertical component motions (Model 1c).
Figure F.49  Roof displacement orbits under BSE-1E level ground motion number 9 with and without vertical component motions (Model 1c).

Figure F.50  Roof displacement orbits under BSE-1E level ground motion number 10 with and without vertical component motions (Model 1c).
Figure F.51  Roof displacement orbits under BSE-1E level ground motion number 11 with and without vertical component motions (Model 1c).

Figure F.52  Roof displacement orbits under BSE-1E level ground motion number 12 with and without vertical component motions (Model 1c).
Figure F.53  Roof displacement orbits under BSE-1E level ground motion number 13 with and without vertical component motions (Model 1c).

Figure F.54  Roof displacement orbits under BSE-1E level ground motion number 14 with and without vertical component motions (Model 1c).
Figure F.55  Roof displacement orbits under BSE-1E level ground motion number 15 with and without vertical component motions (Model 1c).

Figure F.56  Roof displacement orbits under BSE-1E level ground motion number 16 with and without vertical component motions (Model 1c).
Figure F.57  Roof displacement orbits under BSE-1E level ground motion number 17 with and without vertical component motions (Model 1c).

Figure F.58  Roof displacement orbits under BSE-1E level ground motion number 18 with and without vertical component motions (Model 1c).
Figure F.59  Roof displacement orbits under BSE-1E level ground motion number 19 with and without vertical component motions (Model 1c).

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Figure F.62  Base shear versus roof displacement relationships under BSE-2E level ground motion number 2 with and without vertical component motions (Model 1c).
Figure F.63  Base shear versus roof displacement relationships under BSE-2E level ground motion number 3 with and without vertical component motions (Model 1c).

Figure F.64  Base shear versus roof displacement relationships under BSE-2E level ground motion number 4 with and without vertical component motions (Model 1c).
Figure F.65  Base shear versus roof displacement relationships under BSE-2E level ground motion number 5 with and without vertical component motions (Model 1c).

Figure F.66  Base shear versus roof displacement relationships under BSE-2E level ground motion number 6 with and without vertical component motions (Model 1c).
Figure F.67 Base shear versus roof displacement relationships under BSE-2E level ground motion number 7 with and without vertical component motions (Model 1c).

Figure F.68 Base shear versus roof displacement relationships under BSE-2E level ground motion number 8 with and without vertical component motions (Model 1c).
Figure F.69  Base shear versus roof displacement relationships under BSE-2E level ground motion number 9 with and without vertical component motions (Model 1c).

Figure F.70  Base shear versus roof displacement relationships under BSE-2E level ground motion number 10 with and without vertical component motions (Model 1c).
Figure F.71  Base shear versus roof displacement relationships under BSE-2E level ground motion number 11 with and without vertical component motions (Model 1c).

Figure F.72  Base shear versus roof displacement relationships under BSE-2E level ground motion number 12 with and without vertical component motions (Model 1c).
Figure F.73  Base shear versus roof displacement relationships under BSE-2E level ground motion number 13 with and without vertical component motions (Model 1c).

Figure F.74  Base shear versus roof displacement relationships under BSE-2E level ground motion number 14 with and without vertical component motions (Model 1c).
Figure F.75  Base shear versus roof displacement relationships under BSE-2E level ground motion number 15 with and without vertical component motions (Model 1c).

Figure F.76  Base shear versus roof displacement relationships under BSE-2E level ground motion number 16 with and without vertical component motions (Model 1c).
Figure F.77  Base shear versus roof displacement relationships under BSE-2E level ground motion number 15 with and without vertical component motions (Model 1c).

Figure F.78  Base shear versus roof displacement relationships under BSE-2E level ground motion number 16 with and without vertical component motions (Model 1c)
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Figure F.80  Base shear versus roof displacement relationships under BSE-2E level ground motion number 18 with and without vertical component motions (Model 1c).
Figure F.81  Base shear versus roof displacement relationships under BSE-2E level ground motion number 19 with and without vertical component motions (Model 1c).

Figure F.82  Base shear versus roof displacement relationships under BSE-2E level ground motion number 20 with and without vertical component motions (Model 1c).
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Figure F.84 Roof displacement histories under BSE-2E level ground motion number 2 with and without vertical component motions (Model 1c).
Figure F.85  Roof displacement histories under BSE-2E level ground motion number 3 with and without vertical component motions (Model 1c).

Figure F.86  Roof displacement histories under BSE-2E level ground motion number 4 with and without vertical component motions (Model 1c).
Figure F.87  Roof displacement histories under BSE-2E level ground motion number 5 with and without vertical component motions (Model 1c).

Figure F.88  Roof displacement histories under BSE-2E level ground motion number 6 with and without vertical component motions (Model 1c).
Figure F.89  Roof displacement histories under BSE-2E level ground motion number 7 with and without vertical component motions (Model 1c).

Figure F.90  Roof displacement histories under BSE-2E level ground motion number 8 with and without vertical component motions (Model 1c).
Figure F.91  Roof displacement histories under BSE-2E level ground motion number 9 with and without vertical component motions (Model 1c).

Figure F.92  Roof displacement histories under BSE-2E level ground motion number 10 with and without vertical component motions (Model 1c).
Figure F.93 Roof displacement histories under BSE-2E level ground motion number 11 with and without vertical component motions (Model 1c).

Figure F.94 Roof displacement histories under BSE-2E level ground motion number 12 with and without vertical component motions (Model 1c).
Figure F.95  Roof displacement histories under BSE-2E level ground motion number 13 with and without vertical component motions (Model 1c).

Figure F.96  Roof displacement histories under BSE-2E level ground motion number 14 with and without vertical component motions (Model 1c).
Figure F.97  Roof displacement histories under BSE-2E level ground motion number 15 with and without vertical component motions (Model 1c).

Figure F.98  Roof displacement histories under BSE-2E level ground motion number 16 with and without vertical component motions (Model 1c).
Figure F.99  Roof displacement histories under BSE-2E level ground motion number 17 with and without vertical component motions (Model 1c).

Figure F.100  Roof displacement histories under BSE-2E level ground motion number 18 with and without vertical component motions (Model 1c).
Figure F.101  Roof displacement histories under BSE-2E level ground motion number 19 with and without vertical component motions (Model 1c).

Figure F.102  Roof displacement histories under BSE-2E level ground motion number 20 with and without vertical component motions (Model 1c).
Figure F.103  Roof displacement orbits under BSE-2E level ground motion number 1 with and without vertical component motions (Model 1c).

Figure F.104  Roof displacement orbits under BSE-2E level ground motion number 2 with and without vertical component motions (Model 1c).
Figure F.105  Roof displacement orbits under BSE-2E level ground motion number 3 with and without vertical component motions (Model 1c).

Figure F.106  Roof displacement orbits under BSE-2E level ground motion number 4 with and without vertical component motions (Model 1c).
Figure F.107  Roof displacement orbits under BSE-2E level ground motion number 5 with and without vertical component motions (Model 1c).

Figure F.108  Roof displacement orbits under BSE-2E level ground motion number 6 with and without vertical component motions (Model 1c).
Figure F.109  Roof displacement orbits under BSE-2E level ground motion number 7 with and without vertical component motions (Model 1c).

Figure F.110  Roof displacement orbits under BSE-2E level ground motion number 8 with and without vertical component motions (Model 1c).
Figure F.111  Roof displacement orbits under BSE-2E level ground motion number 9 with and without vertical component motions (Model 1c).

Figure F.112  Roof displacement orbits under BSE-2E level ground motion number 10 with and without vertical component motions (Model 1c).
Figure F.113  Roof displacement orbits under BSE-2E level ground motion number 11 with and without vertical component motions (Model 1c).

Figure F.114  Roof displacement orbits under BSE-2E level ground motion number 12 with and without vertical component motions (Model 1c).
Figure F.115  Roof displacement orbits under BSE-2E level ground motion number 13 with and without vertical component motions (Model 1c).

Figure F.116  Roof displacement orbits under BSE-2E level ground motion number 14 with and without vertical component motions (Model 1c).
Figure F.117  Roof displacement orbits under BSE-2E level ground motion number 15 with and without vertical component motions (Model 1c).

Figure F.118  Roof displacement orbits under BSE-2E level ground motion number 16 with and without vertical component motions (Model 1c).
Figure F.119  Roof displacement orbits under BSE-2E level ground motion number 17 with and without vertical component motions (Model 1c).

Figure F.120  Roof displacement orbits under BSE-2E level ground motion number 18 with and without vertical component motions (Model 1c).
Figure F.121  Roof displacement orbits under BSE-2E level ground motion number 19 with and without vertical component motions (Model 1c).

Figure F.122  Roof displacement orbits under BSE-2E level ground motion number 20 with and without vertical component motions (Model 1c).