APPENDIX B

Detail Results of Three-Story Study Frames

B.1 Ductility at beam-to-knee brace connections

The ductility of beam rotation at beam-to-knee brace connections of the three stories KBMF with conventional were computed at the nodes numbers in shown in Figure B.1.

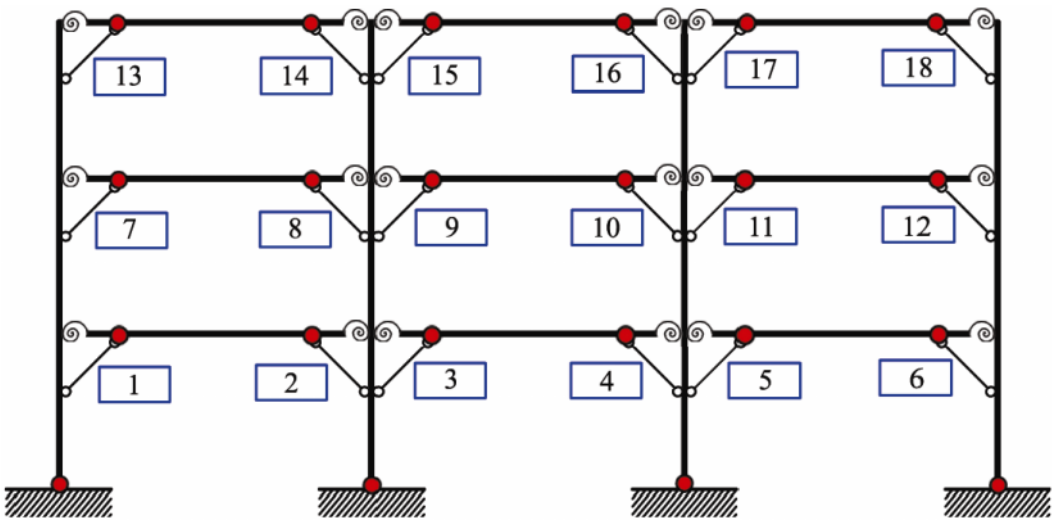

Figure B.1 Node numbers at beam-to-knee brace connections of three stories KBMF with conventional brace

The ductility of beam rotation at beam-to-knee brace connections form nonlinear dynamic analysis of three stories KBMF with conventional brace under Design Basis Earthquake (DBE) ground motions and Maximum Considered Earthquake (MCE) ground motions are shown in Table B.1 and Table B.2, respectively.

The result consists of the two selected ground motions. LA 10 and LA 16 ground motion represent the median and maximum of the DBE ground motions, respectively. These values were obtained by dividing the beam rotation (θ) at maximum inter-story drifts of both ground motion mentioned above by the yielding rotation of each beam story (θ_y).

Table B.1 Ductility factor of beam rotation at beam-to-knee brace connections of KBMF with conventional brace under DBE ground motions

Node Number	Design Basis Earthquake (DBE)	
	LA10 Ground Motion	LA16 Ground Motion
1	2.140	2.865
2	1.950	2.076
3	1.788	2.631
4	1.817	2.199
5	1.754	2.730
6	2.090	2.438
7	0.989	1.229
8	1.130	0.945
9	0.949	1.117
10	1.138	0.940
11	0.946	1.106
12	1.236	0.957
13	0.925	0.871
14	0.878	0.862
15	0.885	0.828
16	0.881	0.863
17	0.879	0.830
18	0.897	0.869

Table B.2 Ductility factor of beam rotation at beam-to-knee brace connections of KBMF with conventional brace under MCE ground motions

Node Number	Maximum Considered Earthquake (MCE)	
	LA10 Ground Motion	LA16 Ground Motion
1	2.731	5.347
2	3.004	2.996
3	2.482	5.132
4	2.910	3.147
5	2.853	5.228
6	3.114	3.343
7	1.007	3.010
8	1.733	1.025
9	0.964	2.703
10	1.775	1.006
11	0.963	2.640
12	1.880	1.011
13	0.964	1.747
14	0.985	0.898
15	0.921	1.679
16	1.010	0.908
17	0.916	1.663
18	1.098	0.909

The ductility of beam rotation at beam-to-knee brace connections of the three stories KBMF with BRB were computed at the nodes numbers in shown in Figure B.2.

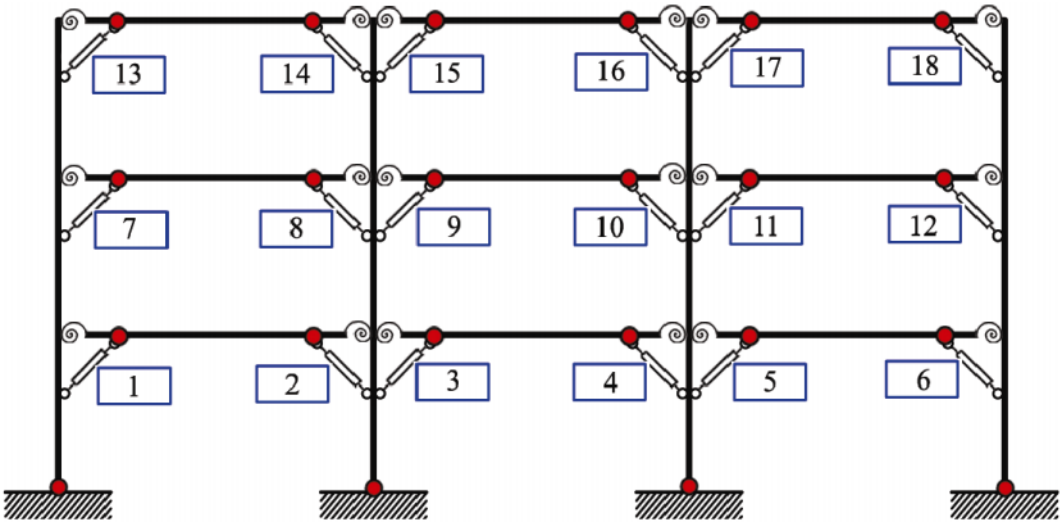

Figure B.2 Node numbers at beam-to-knee brace connections of three stories KBMF with conventional brace

The ductility of beam rotation at beam-to-knee brace connections form nonlinear dynamic analysis of three stories KBMF with BRB under Design Basis Earthquake (DBE) ground motions and Maximum Considered Earthquake (MCE) ground motions are shown in Table B.3 and Table B.4, respectively.

The result consists of the two selected ground motions. LA 10 and LA 16 ground motion represent the median and maximum of the DBE ground motions, respectively. These values were obtained by dividing the beam rotation (θ) at maximum inter-story drifts of both ground motion mentioned above by the yielding rotation of each beam story (θ_y).

Table B.3 Ductility factor of beam rotation at beam-to-knee brace connections of KBMF with BRB under DBE ground motions

Node Number	Design Basis Earthquake (DBE)	
	LA10 Ground Motion	LA16 Ground Motion
1	2.171	2.988
2	1.993	2.630
3	1.815	2.720
4	1.866	2.667
5	1.792	2.861
6	2.127	3.052
7	1.223	1.306
8	1.187	1.161
9	1.143	1.158
10	1.180	1.120
11	1.169	1.144
12	1.314	1.741
13	0.941	0.940
14	0.940	0.943
15	0.901	0.893
16	0.926	0.938
17	0.914	0.899
18	0.919	0.950

Table B.4 Ductility factor of beam rotation at beam-to-knee brace connections of KBMF with BRB under MCE ground motions

Node Number	Maximum Considered Earthquake (MCE)	
	LA10 Ground Motion	LA16 Ground Motion
1	3.555	5.892
2	3.380	5.056
3	3.131	5.598
4	3.212	5.131
5	3.070	5.754
6	3.468	5.570
7	1.772	3.167
8	1.882	2.704
9	1.680	3.066
10	1.868	2.698
11	1.704	3.046
12	1.994	2.753
13	1.046	1.598
14	1.079	1.341
15	1.047	1.473
16	1.083	1.330
17	1.018	1.512
18	1.200	1.434

B.2 Knee braces ductility of KBMFs

The ductility values of the knee braces of the three stories KBMF with conventional brace and KBMF with BRB from nonlinear dynamic analyses were computed at the members shown in Figure B.3 and Figure B.4, respectively.

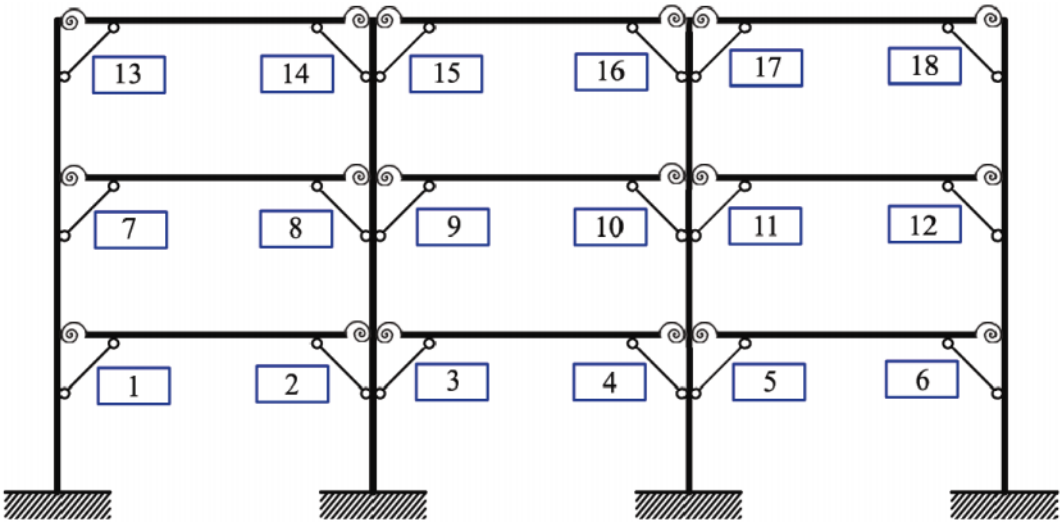

Figure B.3 Knee braces number of three stories KBMF with conventional brace

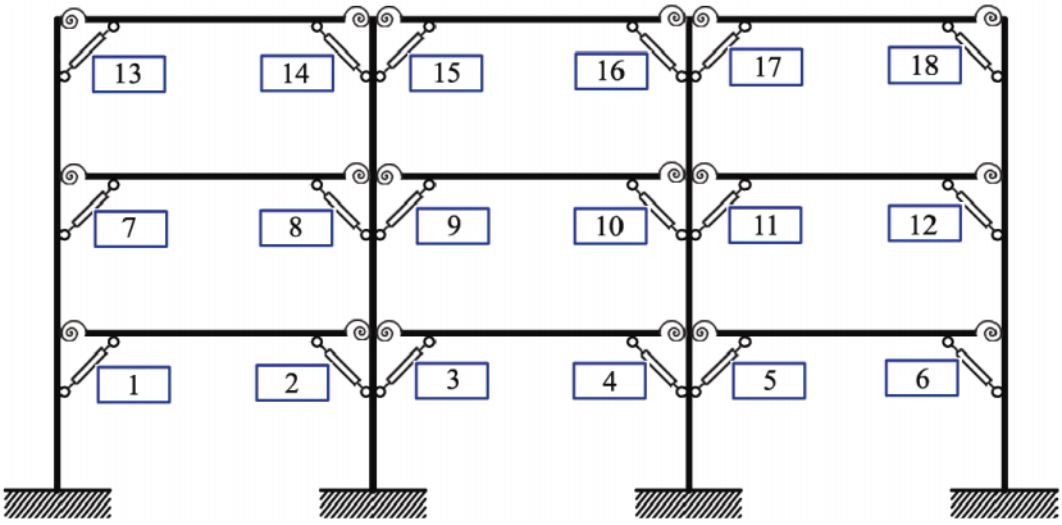

Figure B.4 Knee braces number of three stories KBMF with BRB

The knee brace axial deformation ratios from nonlinear dynamic analysis of both three stories KBMFs are shown in Tables B.5 to B.8. The knee braces axial deformation values for each ground motion was obtained by the maximum value for each ground motions.

Table B.5 Axial deformation ratios of KBMF with conventional brace under DBE ground motions

Member No.	Design Basis Earthquake (DBE)	
	LA10 Ground Motion	LA16 Ground Motion
1	0.885	0.807
2	0.849	2.075
3	0.872	0.799
4	0.859	2.475
5	0.899	0.802
6	0.853	2.196
7	2.056	0.796
8	1.116	2.145
9	1.962	0.783
10	1.034	2.066
11	2.004	0.770
12	1.280	2.141
13	1.131	0.723
14	1.512	1.086
15	1.168	0.719
16	1.355	1.012
17	1.339	0.738
18	1.367	1.028

Table B.6 Axial deformation ratios of KBMF with conventional brace under MCE ground motions

Member No.	Maximum Considered Earthquake (MCE)	
	LA10 Ground Motion	LA16 Ground Motion
1	3.249	0.869
2	1.961	5.662
3	2.511	0.964
4	1.869	6.426
5	2.655	1.144
6	2.343	5.628
7	3.793	1.160
8	2.302	6.006
9	3.572	1.581
10	2.216	5.844
11	3.620	1.534
12	2.410	6.003
13	2.490	0.787
14	1.890	4.440
15	2.364	0.838
16	1.760	4.389
17	2.455	0.836
18	1.797	4.588

Table B.7 Axial deformation ratios of KBMF with BRB under DBE and ground motions

Member No.	Design Basis Earthquake (DBE)	
	LA10 Ground Motion	LA16 Ground Motion
1	0.899	0.851
2	0.897	0.840
3	0.894	0.978
4	0.901	0.0839
5	0.888	0.976
6	0.899	0.989
7	1.045	0.837
8	0.953	1.171
9	1.144	0.788
10	0.943	1.158
11	1.156	0.794
12	0.950	1.075
13	0.958	0.823
14	0.943	0.820
15	0.996	0.998
16	0.967	0.841
17	0.975	0.986
18	0.964	0.996

Table B.8 Axial deformation ratios of KBMF with BRB under MCE and ground motions

Member No.	Maximum Considered Earthquake (MCE)	
	LA10 Ground Motion	LA16 Ground Motion
1	1.034	0.957
2	0.990	2.245
3	0.978	0.911
4	0.995	2.226
5	0.978	0.927
6	1.020	2.375
7	1.541	1.137
8	1.029	2.261
9	1.991	0.988
10	1.028	2.243
11	1.615	0.978
12	1.027	2.219
13	1.478	0.898
14	1.435	1.744
15	1.201	0.863
16	1.513	1.742
17	1.125	0.901
18	1.185	1.695