Permissible

1

- Plastic hinges in inspectable locations or elastic design of columns.
- Abutment resistance not required as part of ERS
- Knock-off backwall permissible

Permissible Upon Approval

2

- Isolation bearings accommodate full displacement
- Abutment not required as part of ERS

Permissible

3

- Plastic hinges in inspectable locations or elastic design of columns
- Abutment not required in ERS, breakaway shear keys permissible

Permissible Upon Approval

4

- Plastic hinges in inspectable locations or elastic design of columns
- Isolation bearings with or without energy dissipaters to limit overall displacements

Permissible Upon Approval

5

- Abutment required to resist the design earthquake elastically
- Longitudinal passive soil pressure shall be less than 0.70 of the value obtained using the procedure given in Article 5.2.3

Permissible Upon Approval

6

- Multiple simply-supported spans with adequate support lengths
- Plastic hinges in inspectable locations or elastic design of columns

Not permissible

Figure 3.3-1a Permissible Earthquake Resisting Systems (ERS).
Figure 3.3-1b Permissible Earthquake Resisting Elements (ERE).
1. Passive abutment resistance required as part of ERS Passive Strength
   Use 100% of strength designated in Article 5.2.3
   **Permissible Upon Approval**

2. Sliding of spread footing abutment allowed to limit force transferred
   Limit movement to adjacent bent displacement capacity
   **Permissible Upon Approval**

3. Ductile End-diaphragms in superstructure (Article 7.4.6)
   **Not permissible**

4. Foundations permitted to rock
   Use rocking criteria according to Appendix A
   **Not permissible**

5. More than the outer line of piles in group systems allowed to plunge or uplift under seismic loadings
   **Not permissible**

6. Wall piers on pile foundations that are not strong enough to force plastic hinging into the wall, and are not designed for the Design Earthquake elastic forces
   **Not permissible**

   Ensure Limited Ductility Response in Piles according to Article 4.7.1

7. Plumb piles that are not capacity-protected (e.g., integral abutment piles or pile-supported seat abutments that are not fused transversely)
   **Not permissible**

   Ensure Limited Ductility Response in Piles according to Article 4.7.1

8. In-ground hinging in shafts or piles
   **Not permissible**

   Ensure Limited Ductility Response in Piles according to Article 4.7.1

9. Batter pile systems in which the geotechnical capacities and/or in-ground hinging define the plastic mechanisms
   **Not permissible**

   Ensure Limited Ductility Response in Piles according to Article 4.7.1

Figure 3.3-2 Permissible Earthquake Resisting Elements that Require Owner’s Approval.
Figure 3.3-3 Earthquake Resisting Elements that are not Recommended for New Bridges.