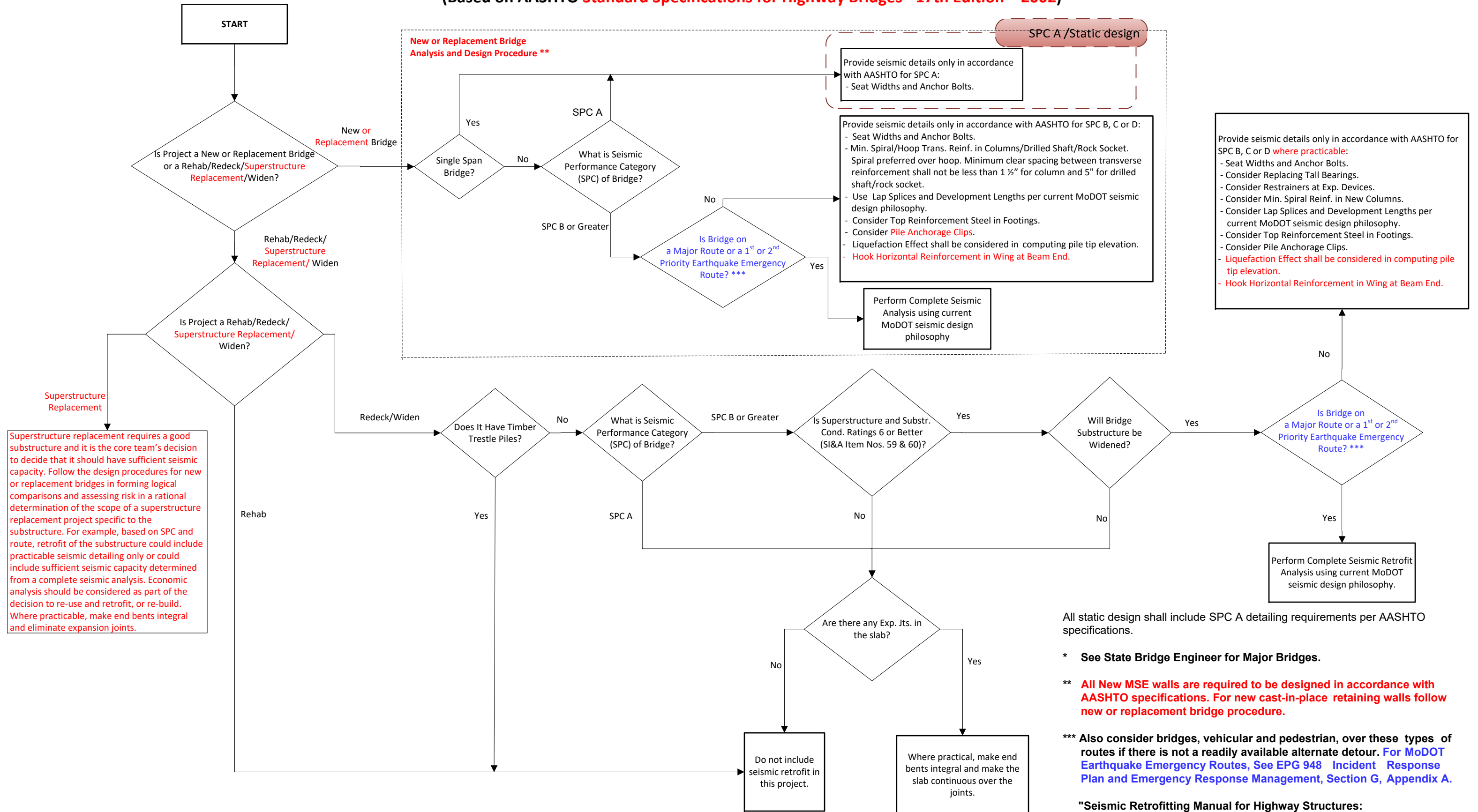


# LFD Bridge Seismic Design Flowchart (does not include Major Bridges) \*

November 09, 2018

(Based on AASHTO Standard Specifications for Highway Bridges - 17th Edition – 2002)



SPC A /Static design

Provide seismic details only in accordance with AASHTO for SPC A:  
- Seat Widths and Anchor Bolts.

Provide seismic details only in accordance with AASHTO for SPC B, C or D:  
- Seat Widths and Anchor Bolts.  
- Min. Spiral/Hoop Trans. Reinf. in Columns/Drilled Shaft/Rock Socket. Spiral preferred over hoop. Minimum clear spacing between transverse reinforcement shall not be less than 1 1/2" for column and 5" for drilled shaft/rock socket.  
- Use Lap Splices and Development Lengths per current MoDOT seismic design philosophy.  
- Consider Top Reinforcement Steel in Footings.  
- Consider Pile Anchorage Clips.  
- Liquefaction Effect shall be considered in computing pile tip elevation.  
- Hook Horizontal Reinforcement in Wing at Beam End.

Provide seismic details only in accordance with AASHTO for SPC B, C or D where practicable:  
- Seat Widths and Anchor Bolts.  
- Consider Restrainers at Exp. Devices.  
- Consider Min. Spiral Reinf. in New Columns.  
- Consider Lap Splices and Development Lengths per current MoDOT seismic design philosophy.  
- Consider Top Reinforcement Steel in Footings.  
- Consider Pile Anchorage Clips.  
- Liquefaction Effect shall be considered in computing pile tip elevation.  
- Hook Horizontal Reinforcement in Wing at Beam End.

Superstructure replacement requires a good substructure and it is the core team's decision to decide that it should have sufficient seismic capacity. Follow the design procedures for new or replacement bridges in forming logical comparisons and assessing risk in a rational determination of the scope of a superstructure replacement project specific to the substructure. For example, based on SPC and route, retrofit of the substructure could include practicable seismic detailing only or could include sufficient seismic capacity determined from a complete seismic analysis. Economic analysis should be considered as part of the decision to re-use and retrofit, or re-build. Where practicable, make end bents integral and eliminate expansion joints.

All static design shall include SPC A detailing requirements per AASHTO specifications.

\* See State Bridge Engineer for Major Bridges.

\*\* All New MSE walls are required to be designed in accordance with AASHTO specifications. For new cast-in-place retaining walls follow new or replacement bridge procedure.

\*\*\* Also consider bridges, vehicular and pedestrian, over these types of routes if there is not a readily available alternate detour. For MoDOT Earthquake Emergency Routes, See EPG 948 Incident Response Plan and Emergency Response Management, Section G, Appendix A.

"Seismic Retrofitting Manual for Highway Structures: Part 1 – Bridges, FHWA-HRT-06-032, January 2006 and Part 2 – Retaining Structures, Slopes, Tunnels, Culverts and Roadways, FHWA-HRT-05-067, August 2004 uses Seismic Hazard Level ("SHL") terminology (Not used in flowchart).