LRFD Bridge Seismic Design Flowchart (does not include Major Bridges) **

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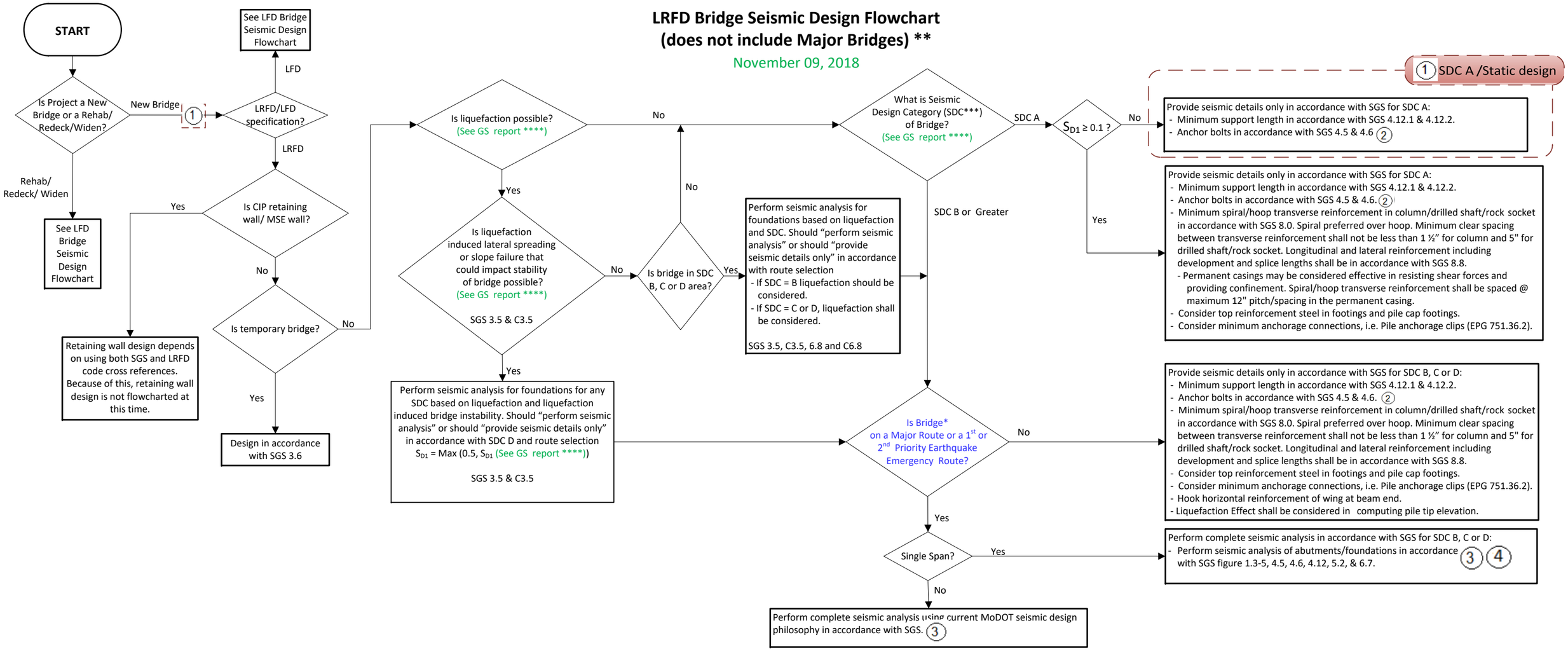

Seismic Design Category/Seismic Zone by Code		
Value of design spectral acceleration coefficient at 1.0 second period, $S_{D1} = F_V \cdot S1$ SGS 3.4.1-3	[1]AASHTO Guide Specifications for LRFD Seismic Bridge Design (SGS) SGS 3.5 **Seismic Design Category (SDC)**	[2]AASHTO LRFD Bridge Design Specifications (LRFD) LRFD 3.10.6 **Seismic Zones**
$S_{D1} < 0.15$	A	1
$0.15 \leq S_{D1} < 0.30$	B	2
$0.30 \leq S_{D1} < 0.50$	C	3
$0.50 \leq S_{D1}$	D	4

[1]SGS is required for seismic design. LRFD is shown because SGS refers to LRFD for support, and understanding the equivalency of category and zone may be important.

[2]LRFD inequalities are different. Use SGS as shown.

New Bridge Analysis and Design Procedure (Based on AASHTO Guide Specifications For LRFD Seismic Bridge Design)

Notes:

1. All static design shall include SDC A detailing requirements per SGS.
2. If $A_s < 0.05$, the horizontal design connection force in the restrained directions =0.15 x the vertical reaction due to the tributary permanent load. If $A_s \geq 0.05$, the horizontal design connection force in the restrained directions = Max(A_s, 0.25) x the vertical reaction due to the tributary permanent load.
3. If member size needs to be increased to meet SDC B, C or D then re-check SDC A/Static design requirements.
4. In accordance with SGS 4.5, performing a seismic analysis may be discretionary. For single span bridges, there has been favorable response to seismic loads in past earthquakes. Differences in response could be expected based on length, weight and stiffness of span and would be expected between an integral and nonintegral bridge. For example, a long integral single span bridge should require a seismic analysis while a short stiff span may not (but shall meet applicable seismic detailing requirements). A nonintegral bridge of any span length shall require a seismic analysis so that connections and foundations are properly designed between the bridge span and the abutments to resist a horizontal seismic force where the developed seismic lateral force is carried into the foundation.

* **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.**

** **See State Bridge Engineer for Major Bridges.**

*** **AASHTO Guide Specifications for LRFD Seismic Bridge Design (SGS) uses Seismic Design Categories ("SDC") and AASHTO LRFD Bridge Design Specifications (LRFD) uses "Seismic Zone". They are categorically equivalent for purpose of detailing when SGS refers to LRFD.**

**** **Geotechnical Section (GS) is responsible for the determination of SDC, S_{D1} and the liquefaction potential including liquefaction induced lateral spreading or slope failure.**