Bridge Seismic Retrofit Flowchart (does not include Major Bridges) * **START** March 2024 New or Replacement Bridge** s Project a New or Replacement Bridge See Bridge Seismic Planning Flowchart or a Rehab/Redeck/Superstructure Replacement/Widen? Bridge Seismic Design Flowchart Yes Rehab/Redeck/ Superstructure Replacement/ Widen What is Seismic SDC/SPC B or Redeck/Widen Is Project a Rehab/Redeck/ Is Superstructure and Substr. Will Bridge Yes No Does It Have Timber Category (SDC or SPC) Superstructure Replacement/ Cond. Ratings 6 or Better Substructure be Trestle Piles? of Bridge? Widen? (SI&A Item Nos. 59 & 60)? Widened? Superstructure Replacement Superstructure replacement requires a good No SDC/SPC A substructure and it is the core team's decision Yes Rehab 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 No Do not include Yes Where practical, make end bents Are there any Exp. Jts. in substructure. For example, based on SDC and seismic retrofit in integral and make the slab the slab? route, retrofit of the substructure could include this project. continuous over the joints. practicable seismic detailing only or a complete seismic analysis may be required to determine sufficient seismic capacity. Economic analysis should be considered as part of the decision to

Seismic Design Category/Seismic Hazard Level		
Value of design spectral acceleration coefficient at 1.0 second period, S _{D1}	¹ AASHTO Guide Specifications for LRFD Seismic Bridge Design (SGS) SGS Table 3.5-1	² Seismic Retrofit Manual for Highway Structures
SGS 3.4.1 and 3.5	Seismic Design Category (SDC)	Hazard Level
S _{D1} < 0.10	A1	I
$0.10 \le S_{D1} < 0.15$	A2 ³	l ³
0.15 ≤ S _{D1} < 0.30	В	II
0.30 ≤ S _{D1} < 0.50	С	III
0.50 ≤ S _{D1}	D	IV

re-use and retrofit, or re-build. Where

eliminate expansion joints.

practicable, make end bents integral and

- * See State Bridge Engineer for Major Bridges.
- ** For new retaining walls follow new or replacement bridge procedure.
- *** Use acceleration coefficient value and SPC, or acceleration coefficient A_S, S_{D1} and SDC information from existing plan details if available otherwise use Preliminary Seismic Map.

For MoDOT Earthquake Emergency Routes and Major Routes, See Preliminary Seismic Map.

Consider Replacing Tall Bearings.

Consider Restrainers at Expansion Devices in SDC/SPC B, C and D Bridges.

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).

¹SGS and seismic retrofit manual for highway structures shown to understand the equivalency category and hazard level.

²Seismic retrofit manual for highway structures S_{D1} ranges are slightly different. Use SGS as shown.

³Structural members shall be detailed in accordance with SDC B (SGS 8.2) if bridge carry a 1st or 2nd priority earthquake emergency route.