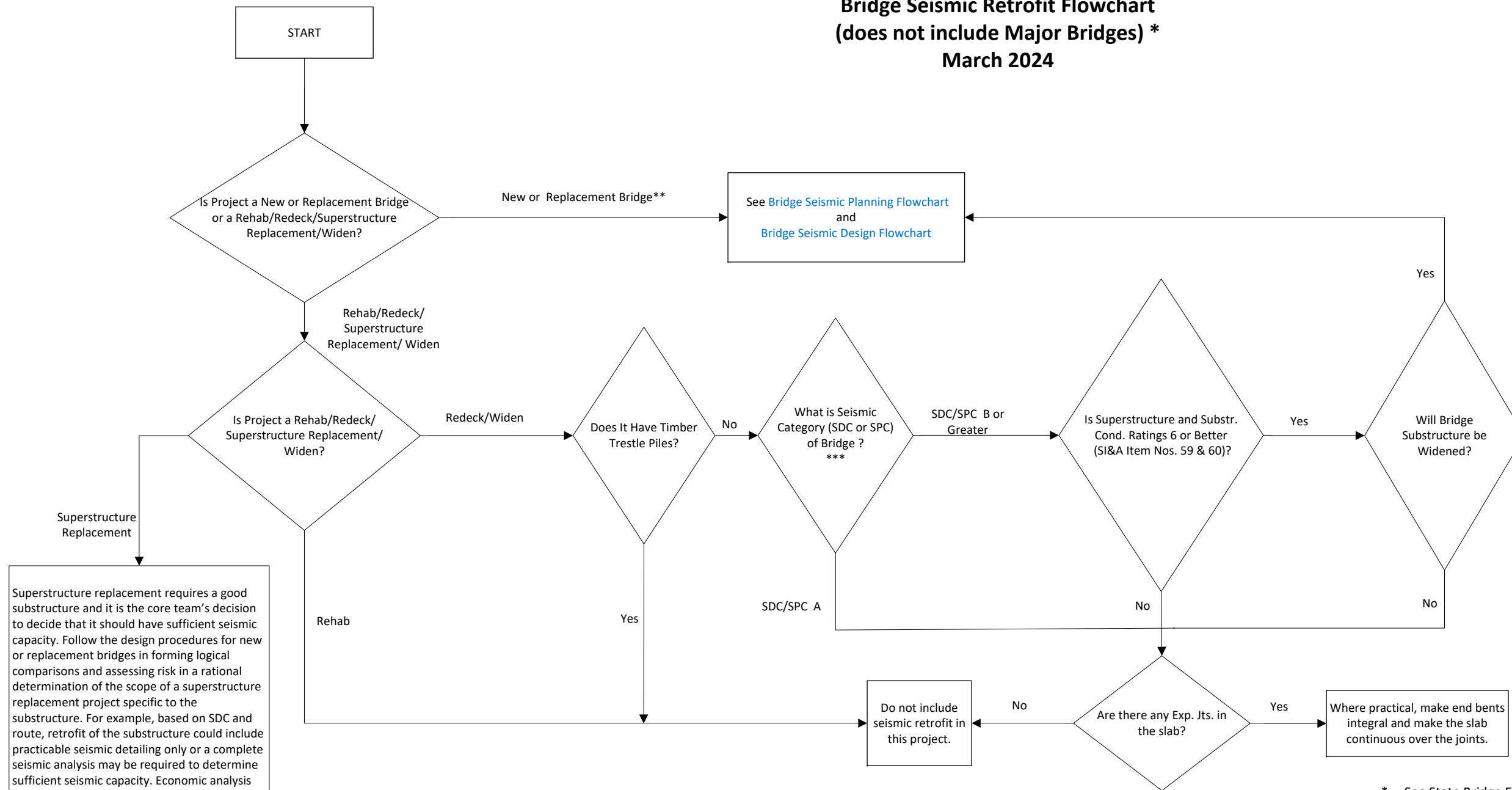


Bridge Seismic Retrofit Flowchart (does not include Major Bridges) * March 2024



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 SDC and route, retrofit of the substructure could include 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 re-use and retrofit, or re-build. Where practicable, make end bents integral and eliminate expansion joints.

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

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.

* 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).