PERFORMANCE-BASED SEISMIC ASSESSMENT OF SKEWED BRIDGES

PEER Transportation Systems Research Program

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Objective

Sensitivity analysis of seismic response of skewed bridges

Outline

Developing a bridge matrix of existing recently designed bridges

Developing accurate models in SAP and OpenSees

Selecting representative ground motions

Applying selected ground motions to models and sensitivity analysis of seismic response

Considered EDPs:

- Rotation of superstructure
- Column and abutment displacements
- Fundamental mode shapes and periods

Sensitivity Parameters:

- Skewness of abutments (0, 15, 30, 45 & 60 degrees)
- Geometry of bridges (one, two and three spans)
- Torsional stiffness of bridges (single and Multiple column per bent)
- Span symmetry (symmetrical and unsymmetrical)
- Superstructure elevation (low and high column)

Skewed Bridge Model Matrix

	Column Height	Symetric					Unsymetric				
		00°	15°	30°	45°	60°	00°	15°	30°	45°	60°
2 Span Single Column	Lower										
	Upper										
2 Span Multiple Column	Lower										
	Upper										
3 Span Single Column	Lower										
	Upper										
3 Span Multiple Column	Lower										
	Upper										
Single Span											

2 span- single column
Name: Jack Tone Road On-Ramp
Deck: CIP/PS conc. box girder
Abutment: Non-skewed seat type

2 span- multiple column
Name: La Veta Avenue Overcrossing
Deck: CIP/PS conc. box girder
Abutment: Non-skewed seat type

3 span- multiple column
Name: Jack Tone Road Overhead
Deck: CIP/PS conc. box girder
Abutment: 36 degree-skewed cantilever seat type

Conclusion

Abutment skewness has the largest effect on variation of bridge response and the failure mode of columns and transverse displacement is amplified by increasing abutment skewness.

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