1. INTRODUCTION

The Caltrans Seismic Design Criteria (SDC) specify the minimum seismic design requirements that are necessary to meet the performance goals established for Ordinary bridges in Memo to Designers (MTD) 20-1.

The SDC is a compilation of new seismic design criteria and existing seismic design criteria previously documented in various locations. The goal is to update all the Offices of Structures Design (OSD) design manuals[1] on a periodic basis to reflect the current state of practice for seismic bridge design. As information is incorporated into the design manuals, the SDC will serve as a forum to document Caltrans' latest changes to the seismic design methodology. Proposed revisions to the SDC will be reviewed by OSD management according to the process outlined in MTD 20-11.

The SDC applies to Ordinary Standard bridges as defined in Section 1.1. Ordinary Nonstandard bridges require project specific criteria to address their non-standard features. Designers should refer to the OSD design manuals for seismic design criteria not explicitly addressed by the SDC.

The following criteria identify the minimum requirements for seismic design. Each bridge presents a unique set of design challenges. The designer must determine the appropriate methods and level of refinement necessary to design and analyze each bridge on a case-by-case basis. The designer must exercise judgment in the application of these criteria. Situations may arise that warrant detailed attention beyond what is provided in the SDC. The designer should refer to other resources to establish the correct course of action. The OSD Senior Seismic Specialists, the OSD Earthquake Committee, and the Earthquake Engineering Office of Structure Design Services and Earthquake Engineering (SDSEE) should be consulted for recommendations.

Deviations to these criteria shall be reviewed and approved by the Section Design Senior or the Senior Seismic Specialist and documented in the project file. Significant departures shall be presented to the Type Selection Panel and/or the Design Branch Chief for approval as outlined in MTD 20-11.

This document is intended for use on bridges designed by and for the California Department of Transportation. It reflects the current state of practice at Caltrans. This document contains references specific and unique to Caltrans and may not be applicable to other parties either institutional or private.

1.1 Definition of an Ordinary Standard Bridge

A structure must meet all of the following requirements to be classified as an Ordinary Standard bridge:

- Span lengths less than 300 feet (90 m)
- Constructed with normal weight concrete girder, and column or pier elements
- Horizontal members either rigidly connected, pin connected, or supported on conventional bearings by the substructure, isolation bearings and dampers are considered nonstandard components.

[1] Caltrans Design Manuals: Bridge Design Specifications, Memo To Designers, Bridge Design Details, Bridge Design Aids, Bridge Design Practice

- Dropped bent caps or integral bent caps terminating inside the exterior girder, C-bents, outrigger bents, and offset columns are nonstandard components.
- Foundations supported on spread footing, pile cap w/piles, or pile shafts
- Soil that is not susceptible to liquefaction, lateral spreading, or scour

1.2 Types of Components Addressed in the SDC

The SDC is focused on concrete bridges. Seismic criteria for structural steel bridges are being developed independently and will be incorporated into the future releases of the SDC. In the interim, inquiries regarding the seismic performance of structural steel components shall be directed to the Structural Steel Technical Specialist and the Structural Steel Committee.

The SDC includes seismic design criteria for Ordinary Standard bridges constructed with the types of components listed in Table 1.

Table 1

Superstructure	Substructure	Foundation	Abutment
Cast-in-place	Reinforced concrete	Footings or pile caps	End diaphragms
-- Reinforced concrete	-- Single column bents	Shafts	Short seat
-- Post-tensioned concrete	-- Multi-column bents	-- Mined	High cantilever
Precast	-- Pier walls	-- CIDH	
-- Reinforced concrete	-- Pile extensions	Piles	
-- Pre-tensioned concrete		-- CISS	
-- Post-tensioned concrete		-- Precast P/S concrete	
		-- Steel pipe	
		-- H Sections	
		-- CIDH	
		-- Proprietary	

1.3 Bridge Systems

A bridge system consists of superstructure and substructure components. The bridge system can be further characterized as an assembly of subsystems. Examples of bridge subsystems include:

- Longitudinal frames separated by expansion joints
- Multi-column or single column transverse bents supported on footings, piles, or shafts
- Abutments

Traditionally, the entire bridge system has been referred to as the global system, whereas an individual bent or column has been referred to as a local system. It is preferable to define these terms as relative and not absolute measures. For example, the analysis of a bridge frame is global relative to the analysis of a column subsystem, but is local relative to the analysis of the entire bridge system.

1.4 Local and Global Behavior

The term "local" when pertaining to the behavior of an individual component or subsystem constitutes its response independent of the effects of adjacent components, subsystems or boundary conditions. The term "global" describes the overall behavior of the component, subsystem or bridge system including the effects of adjacent components, subsystems, or boundary conditions. See Section 2.2.2 for the distinction between local and global displacements.