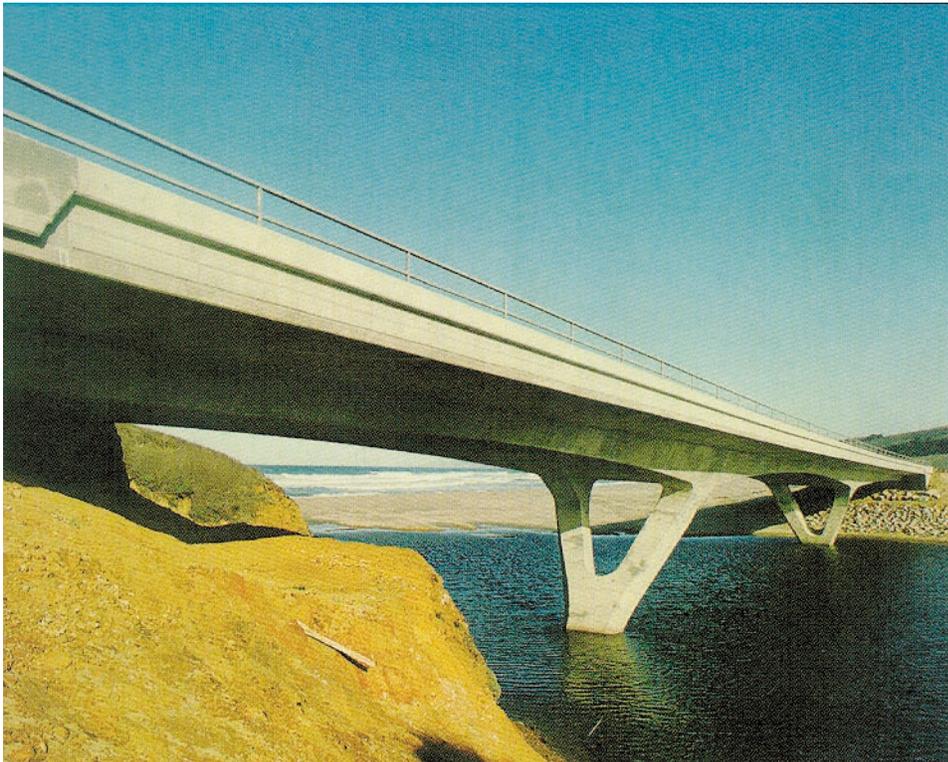


Improved Seismic Design Criteria for California Bridges: Resource Document



ATC Applied Technology Council

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Applied Technology Council

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Cover Illustration:

New Pescadero Creek Bridge

Photo by Bob Colin, California Department of Transportation

ATC-32-1

Improved Seismic Design Criteria for California Bridges: Resource Document

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Preface

In May 1991 the California Department of Transportation (Caltrans) awarded the Applied Technology Council (ATC) a contract to conduct a critical review of the 1986 Caltrans *Bridge Design Specifications* (together with subsequent seismic-design-related revisions made available to ATC throughout the ATC-32 project's duration) and to recommend improvements where needed. The recommendations developed under the ATC-32 project were published in 1996 in the ATC-32 report, *Improved Seismic Design Criteria for California Bridges: Provisional Recommendations*, which was formatted in 2 columns to provide recommended changes to Caltrans' design provisions (left column) and companion commentary (right column). The report was prepared with the assistance of six technical subcontractors and a publications consultant, with guidance and overview provided by an advisory 13-member Project Engineering Panel (PEP). Topics included seismic loading, seismic effects (analysis), concrete design, foundation design, steel design, and bearing design.

During final preparation of the ATC-32 report, the PEP and Project Manager recognized that a significant amount of potentially valuable work carried out by the subcontractors could not be included in the recommendations for revision to the 1986 Caltrans *Specifications*. Reasons for this decision included the following.

- The material was related to an area of active research, in which there was not a clear consensus among experts in the field.
- There were insufficient resources to allow the PEP to evaluate the material and to decide whether to recommend relevant changes to the 1986 *Specifications*.
- The material was important for the practice of seismic design, but was inappropriate for either design specifications or commentary.

As a result, ATC created this companion resource document (the ATC-32-1 report) to provide a more complete documentation of the ATC-32 project. The ATC-32-1 report contains chapters on specific topics generally developed by the subcontractors responsible for that topic, including the results from trial designs and design parameter studies by project personnel.

ATC gratefully acknowledges the Project Manager, Richard V. Nutt, and the subcontractors who prepared this report, noting that much of their effort was carried out after the completion of the ATC-32 project when project funding was no longer available.

The detailed technical work required for the development of the recommendations was performed primarily by four specialty subcontractors. J.P. Singh and staff at Klienfelder/Geospectra, were responsible for developing new ARS spectra and other recommendations related to seismic loading. Po Lam and staff at Earth Mechanics, working with Geoff Martin of the University of Southern California, were responsible for the development of the foundation design guidelines. Nigel Priestley of the University of California (UC) San Diego and Jack Moehle of UC Berkeley developed the recommendations related to response analysis and reinforced concrete design. They were assisted by Gregg Fenves of UC Berkeley who was particularly helpful in the development of analysis guidelines. John Kulicki and staff at Modjeski and Masters developed new design criteria for steel structures and conventional bridge bearings.

Trial designs using the draft recommendations to the 1986 Caltrans *Specifications* were performed by two bridge design consultants. John Quincy directed the efforts of Quincy Engineering, and Kosal Krishnan directed those of Kercheval Engineers. Nonlinear dynamic analysis studies to evaluate near-fault effects were performed by Dynamic Isolation Systems under the direction of Ronald Mayes. An independent external review of the recommendations for structural steel was conducted by Ahmad Itani of the University of Nevada at Reno.

Technical editing and formatting of this report were performed, respectively, by A. Gerald Brady and Michelle Schwartzbach of ATC.

ATC also gratefully acknowledges the advisory PEP, whose members included Ian G. Buckle (Chair), Robert Cassano, Allen Ely, Nicholas Forell (ATC Board representative), James H. Gates (Caltrans representative), I.M. Idriss, Roy A. Imbson, James O. Jirsa, James R. Libby, Joseph P. Nicoletti, Joseph Penzien, Maurice S. Power, and James E. Roberts (Caltrans representative). (The affiliations of these individuals are provided in the list of project participants).

In addition, ATC is pleased to acknowledge other Caltrans personnel involved in the project. Mohsen Sul-

tan was the Contract Manager and coordinated the technical participation of other Caltrans engineers. Dan Kirkland and Tim Leahy served as Contract Administrators and, along with their staff, provided ATC invaluable assistance in complying with Caltrans requirements. Finally, ATC wishes to thank the many Caltrans engineers who have shown an interest in this project by com-

menting on the draft recommendations, attending PEP meetings, and participating in other discussions.

Christopher Rojahn
ATC Executive Director

Contents

Preface	iii
List of Figures	xi
List of Tables	xxi
1 Introduction	1
1.1 Purpose and Contents	1
1.2 Report Organization	1
2 Design Concepts and Design Approach	3
2.1 Performance Criteria	3
2.2 Design Philosophy	5
2.2.1 1986 Caltrans <i>Specifications</i>	5
2.2.2 ATC-32 <i>Recommendations</i>	6
2.3 Design Strategies	6
3 Seismic Loading	9
3.1 Review of Caltrans Practice	9
3.2 Proposed ARS Spectra	11
3.2.1 <i>A</i> : Peak Rock Acceleration	11
3.2.2 <i>R</i> : Rock Spectra	11
3.2.3 <i>S</i> : Site Modification Factors	12
3.3 Design Time-Histories	17
3.4 Ground Motion Issues	30
3.4.1 Characterization of Ground Motion for Severity and Damage Potential	30
3.4.2 Near-Fault Effects	30
3.4.3 Basin Effects	31
3.4.4 Blind Thrust Faults	32
3.4.5 Vertical Motion	32
3.4.6 Relative Displacements	32
3.5 Performance-Based Approach	32
3.6 Site-Specific Response Studies	35
4 Dynamic Analysis	37
4.1 Analysis Selection Guidelines	37
4.1.1 Purpose of the Analysis	37
4.1.2 Performance Objective	37
4.1.3 Importance of Structure	38
4.1.4 Regularity of the Structure and Uniformity of the Soil Conditions	38
4.1.5 Varying Soil Properties and Profiles	39
4.1.6 Availability and Usefulness of Analysis Tools	39

4.1.7 Recommendations	40
4.2 Bridge Dynamic Response and Analysis.	40
4.2.1 General Considerations	40
4.2.2 Linear Dynamic Analysis	41
4.3 P- Δ Considerations	53
4.3.1 Introduction	53
4.3.2 Definition of Static P- Δ Effects	53
4.3.3 Dynamic Response of Simple Structures	54
4.3.4 Behavior of Steel and Reinforced Concrete Structures	58
4.3.5 Summary	62
5 Foundation Design.	65
5.1 Introduction	65
5.2 Abutments	65
5.2.1 Review of Caltrans Practice.	65
5.2.2 Selection of Abutment Types	66
5.2.3 Abutment Stiffness	66
5.2.4 Abutment Soil Capacity.	70
5.2.5 Allowable Displacements	72
5.2.6 Abutment Damping Issues.	76
5.2.7 Abutment Embankment Response Issues	77
5.2.8 Stability of Abutments, and Earth Pressure, for Structural Design	78
5.3 Pile Footings	80
5.3.1 Review of Caltrans Practice.	80
5.3.2 Foundation Stiffness	80
5.3.3 Moment Capacity of Pile Group	81
5.3.4 Lateral Stiffness and Capacity	82
5.3.5 Structural Pile Design	83
5.4 Column and Pile Shafts	86
5.4.1 Point of Effective Fixity	86
5.4.2 Minimum Shaft Length for Stability Considerations	87
5.5 Slope Stability Analysis.	88
5.5.1 Landslide Classification.	88
5.5.2 Geology	88
5.5.3 Earthquake-Induced Landslides.	92
5.5.4 Review of Slope Stability Analysis Approaches.	92
5.6 Analysis and Design of Retaining Walls.	108
5.6.1 Types of Retaining Walls	108
5.6.2 Earth Pressure Theories and Retaining Wall Design.	111
5.7 Force-Based Versus Displacement-Based Foundation Design Criteria	131
5.8 Conclusions	133
6 Ductile Component Design	135
6.1 Introduction	135
6.2 Seismic Design Forces, Z	135
6.2.1 Introduction	135
6.2.2 Current Z Factors	135
6.2.3 Recommended Z Factors for the Safety Evaluation Earthquake	139
6.2.4 Recommendations for the Functional Evaluation Earthquake	141
6.3 Plastic Hinge Locations.	141
6.4 Load Combinations	141

6.5	Flexural Strength Computation for Plastic Hinges	142
6.5.1	Current Caltrans Practice	142
6.5.2	Discussion of Caltrans Practice	143
6.5.3	Flexural Strength Estimates for Noncircular Sections	146
6.5.4	Recommended Design Approach for Flexural Strength Computation for Plastic Hinges	146
6.6	Reinforcement Limits	147
6.6.1	Introduction	147
6.7	Ductility Design and Assessment	150
6.7.1	Introduction—Current Caltrans Practice	150
6.7.2	Discussion of Current Practice	150
6.7.3	Confinement for Specified Plastic Rotations	151
6.7.4	Confinement for Standard Ductility Levels	152
6.7.5	Confinement for Buckling Restraint	155
6.7.6	Plastic End Region	157
6.7.7	Design Recommendations	157
7	Capacity-Protected Design	159
7.1	Introduction	159
7.2	Capacity Design Factors ϕ_o	159
7.2.1	Introduction—Caltrans Practice	159
7.2.2	Discussion of Overstrength Requirements	159
7.2.3	Recommended Provisions for Capacity Design Actions	160
7.3	Shear Strength	161
7.3.1	Basic Concepts	161
7.3.2	Shear Strength of Beams	164
7.3.3	Shear Strength Criteria for Columns (Alternative 1)	165
7.3.4	Shear Strength Criteria for Columns (Alternative 2)	166
7.3.5	Recommended Shear Strength Criteria for Columns	168
7.3.6	Shear Strength of Walls	168
7.4	Joint Strength	170
7.4.1	Principal Stress Levels	170
7.4.2	Joint Reinforcement Levels	171
8	Reinforcing Details	175
8.1	Introduction	175
8.2	Caltrans Practice	175
8.2.1	Development of Bars in Tension (1986 Caltrans <i>Specifications</i> , Section 8.25)	175
8.2.2	Splices (1986 Caltrans <i>Specifications</i> , Section 8.32)	175
8.3	Discussion of Current Practice	176
8.3.1	Basic Development Length	176
8.3.2	Modification Factors	176
8.3.3	Bundled Bars	177
8.3.4	Splicing	177
8.4	General Considerations	177
8.4.1	Anchorage	178
8.4.2	Lap Splices	180
8.4.3	Flexural Bond	182
8.5	Recommendations	183
8.5.1	Anchorage of Column Reinforcement	183
8.5.2	Lap Splices	183
8.5.3	Flexural Bond Limitation	183

9 Steel Bridges	185
9.1 Introduction	185
9.2 Reexamination of the Basic Philosophy of Permitting Inelastic Response.	185
9.3 Materials	186
9.4 Bolted Joints	186
9.5 Steel Components: Wide Flange or Other I-Beam Sections	186
9.5.1 Column Design Requirements.	186
9.5.2 Moment-Resisting Frames.	187
9.5.3 Concentrically Braced Frame (CBF) Requirements	190
9.6 Box Sections with Stiffened Plates	191
9.6.1 General.	191
9.6.2 Unstiffened Box Knee Joints.	191
9.6.3 Stiffened Box Columns	192
Appendix A. Caltrans ARS Spectra for Rock	201
A.1 Introduction	201
A.2 Spectral Comparisons	201
A.3 Conclusions	203
Appendix B. Digitized Design Spectra.	253
Appendix C. Proposed New Probabilistic ARS Procedure.	265
Appendix D. Seismic Response of Simple Reinforced Concrete Bridges Designed Using Various Criteria	279
D.1 Introduction and Overview	279
D.2 Conventional Design Criteria	279
D.3 Recent Design Criteria Developed by the ATC-32 <i>Recommendations</i>	281
D.4 Description of Study	281
D.5 Modeling Column Strength and Stiffness	282
D.6 Stiffness Assumptions, Design, and Spectral Response	284
D.7 Ground Motions and Scaling Parameters	286
D.8 The SPEC Computer Program	287
D.9 Treatment of Inelastic Response Results	287
D.10 Inelastic Response of Bents Designed Using Conventional Criteria.	289
D.11 Inelastic Response of Bents Designed Using Recent Criteria	289
D.12 Hybrid Design Criteria and Inelastic Response.	293
D.13 Conclusions	293
Appendix E. Column Design Studies	297
E.1 Introduction	297
E.2 Parameter Studies.	297
E.3 Moment of Inertia Sensitivity Studies	300
E.4 Sensitivity to Column Dimensions and Transverse Steel	302
E.5 Effectiveness in Satisfying Performance Criteria	305
E.6 Implications for Design Specifications	306
E.7 Final ATC-32 <i>Recommendations</i> Column Studies	309
Appendix F. Trial Designs Using ATC-32 <i>Recommendations</i> — Kercheval Engineers.	313
F.1 Introduction	313
F.2 Bridge Description.	313

F.3	Seismic Analysis and Design Procedure	314
F.4	Results of the Trial Designs	315
F.5	Cost Estimate and Conclusion	321
Appendix G.	Trial Designs Using ATC-32 <i>Recommendations</i> — Quincy Engineers	327
G.1	Introduction	327
G.2	Selected Bridges	327
G.3	Methodology	327
G.4	Results of Analysis	331
G.5	Component Design Comparison	332
G.6	Construction Cost Comparison	332
G.7	Comments on Specifications	332
G.8	Section 4 - Foundations	338
G.9	Section 8 - Reinforced Concrete	339
	References and Additional Bibliography	341
	Project Participants	353
	ATC Projects and Report Information	355