



Steel Seismic Design Post-Northridge: Changes in Practice

Thomas A. Sabol, PhD, SE

Principal, Englekirk Institutional

Adjunct Professor, UCLA Department of Civil & Environmental Engineering

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Introduction

- Body of Knowledge
- Analysis Phase
- Design and Documentation Phase
- Construction Phase

Body of Knowledge – Pre-Northridge

- 1992 AISC *Seismic Provisions*
 - 17 members of the AISC Subcommittee (Deierlein, Engelhardt and Saunders remain)
 - 59 pages of provisions (included references and a lot of material now found in other sources)
- SEAOC *Blue Book*
 - Strong Column-Weak Beam (just a suggestion)
- *Uniform Building Code* Chapter 22
 - *Blue Book* minus the “Commentary”

Body of Knowledge – Post-Northridge

- 2010 AISC *Seismic Provisions*
 - 28 members of the AISC Subcommittee
 - 133 pages of provisions (not including references and material found in other sources)
- AISC *Connection Prequalification Standard*
- FEMA/SAC, NIST/NEHRP publications
- SEAOC *Blue Book* ?
- 2012 *International Building Code* Chapter 22
 - Just refers to *Seismic Provisions*

Analysis Phase

- Software Sophistication (?)
 - Improved interface and output
 - Still mostly elastic
 - Centerline-to-centerline models more common than models with rigid offsets (reasonable estimation of panel zone deformation)
 - Nonlinear analysis available via Perform, etc.

Analysis Phase

- “Behavior-Based” Analysis
 - “Hierarchical” design approaches (e.g., EBF, SCWB, brace connections, etc.)
 - Explicit consideration of brace buckling for CBF
- Performance-Based Design for Steel – not so much

Design and Documentation Phase

- Connection Prequalification for Moment Frames (AISC 358)
 - Generic and Proprietary Connections
 - Connection design procedures
 - No weak-axis frames
 - No HSS frames
- Use of deep moment frame columns more common
 - Approximately 2 – 3 psf weight savings but “architectural blowback” due to column depth

Design and Documentation Phase

- Redundancy Factor (ρ)
 - Building code's special interest in moment frames (now via drift)
 - More bays of frames?
- More required information on the drawings
 - Explicit identification of SFRS members and connections
 - Explicit identification of backing bar removal
 - Identification of "protected zones" and "demand critical welds"

Design and Documentation Phase

- Braced Frames
 - Elimination of “all tension” frames
 - Stricter brace member proportion requirements
 - Connection capacity requirements
 - Net section requirements
- New Systems
 - Buckling Restrained Braced Frame
 - Special Plate Shear Walls

Construction Phase

- Higher Expectations
 - Union card vs. WPS
 - Follow the welding procedure specification (WPS)
 - Fabricator/Erector Certification
- Inspection
 - AISC 360 Chapter N and AISC 341 Chapter J
 - Pre-construction meetings
 - Increased reliance on visual inspection
 - Shop fabrication waiver for approved fabricators (?)