2020 NEHRP PROVISIONS ISSUES CONCRETE, MASONRY & WOOD STRUCTURES

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Concrete: Shear Wall Design

• Issue: Seismic design provisions for concrete shear walls do not necessarily recognize how such walls respond to earthquake excitation.

• Resources: CSA A23.3, NZS 3101, and available literature including substantive test results.

• Could Accomplish: Develop design philosophy and provisions based on the actual anticipated behavior of slender vs. squat and ductile vs. nonductile shear walls.

Contributors: Andrew Taylor, Neil Hawkins, S.K. Ghosh
Concrete: Coupled Shear Walls

- Issue: Superior seismic performance of coupled concrete shear walls is not recognized through appropriate seismic design parameters. Their use is thus not incentivized.

- Resources: Testing and analytical studies available from research organizations and design firms.

- Could Accomplish: Determine appropriate seismic design parameters or plan work needed to establish such parameters.

Figure Credit: Google
Concrete: Structural Slab Reinf. for Combined Gravity and Seismic Loads

• Issue 1: What portion of the slab gravity load reinforcement be used as diaphragm reinforcement?

• Issue 2: Part of diaphragm chord reinforcement, acting as flexural reinforcement, can increase the flexural strength of perimeter beams.

• Resources: Existing design practice, design firm example buildings, NIST Tech Brief 3.

• Could Accomplish: Part 3 white paper; possibly Part 1 provisions.

Figure Credit: NEHRP Tech Brief 3
Concrete: Precast Diaphragm Connector and Joint Reinforcement

- Issue: The new mandatory diaphragm design methodology includes qualification procedures for precast diaphragm connectors. Refinement is needed based on design experience.

- Resources: Designers and precast industry.


*Figure Credit: 2015 NEHRP Provisions*
Concrete: High-Strength Rebar

- Issue: Segments of the design profession would like to use high-strength reinforcement (Grade 75 and higher). However, ductility and strain compatibility are seismic performance concerns. Review of resources recently available is needed to determine path forward.

- Resources: ATC 115 Roadmap, Pankow Foundation reports.

- Could Accomplish: Determine seismic design requirements or plan work needed to establish requirements.
Masonry: Design of Shear Walls With Irregular Openings

- Issue: Rational design approaches for shear walls with varying heights of openings are needed.

- Resources: 2013 TMS 402, Appendix C provides a starting point.

- Could Accomplish: Part 3 white paper on design guidance for consideration by TMS.

Contributors: Phil Samblanet, Richard Bennett, Jason Thompson
Masonry: Seismic Design of Partially Grouted Walls

- Issue 1: Review is needed of in-plane shear capacity of partially grouted walls.
- Issue 2: Review is needed of possible detailing to achieve increased in-plane capacity.
- Resources: TMS 402, NEES research at UCSD, other?
- Could Accomplish: Part 3 white paper on design guidance for consideration by TMS.

Figure Credit: NHERI @ UC San Diego
Masonry: Standard Hooks

- Issue 1: Must all horizontal reinforcing must be hooked, or only reinforcing calculated to provide shear capacity?
- Issue 2: What detailing is required for qualifying standard hooks?
- Resources: TMS 402.
- Could Accomplish: Part 3 white paper providing design guidance for consideration by TMS.

Figure Credit: IRC
Masonry: Joint Reinforcement

• Issue 1: Provisions for use of joint reinforcement for shear capacity are not harmonized between ASD and LRFD methodologies, and requirements for seismic reinforcement being embedded in grout add confusion.

• Issue 2: Recent research appears to indicate that joint reinforcement is more effective than bond beam reinforcement.

• Resources: TMS 402 and available recent research.

• Could Accomplish: Part 3 white paper providing design guidance for consideration by TMS.
Wood: Influence of Finish Materials on Seismic Design

• Issue: Evaluate the need to and methodologies for including effects of finish materials in seismic design. Consider the variation in effect for buildings ranging from one to five stories.

• Resources: ATC-116 analytical studies (in progress).

• Could Accomplish: Develop Part 3 white paper to guide future research and standard development.

Contributors: Phil Line, Kelly Cobeen
Wood (& CFS): Rules for Increased Capacity Shear Wall Systems

• Issue: Develop guidance regarding when new wood or CFS shear wall unit shear capacities can be added based on past justification of seismic design parameters, and when new justification is required.

• Resources: ASCE 7 change proposal from last cycle, similar occurrences in wood in past, FEMA P-795.

• Could Accomplish: Develop Part 3 white paper to guide future standard development, uniformity across materials.
Wood: P-695 Guidance for Proprietary Components

- Issue: Develop guidance for implementation of FEMA P-695 procedures for manufactured proprietary elements, including attributes and numbers of archetypical designs, and how to characterize model, data and design method quality.

- Resources: FEMA P-695, P-795.

- Could Accomplish: Part 3 paper documenting intent and providing guidance to users and peer reviewers.
Wood: Mid-Rise Shear Wall Seismic Design Methodology

• Issue: Mid-rise shear wall building construction is increasing rapidly. Code methods for quantifying seismic demand, including period and displacement demand, are not considered to be representative of mid-rise construction.

• Resources: Recent testing and analytical studies.

• Could Accomplish: Part 3 white paper on demands.
Wood: Hillside Building Seismic Design Methodology

- Issue: Methodologies are needed for seismic design of hillside buildings. The Northridge Earthquake demonstrated that collapse could occur.

- Resources: ATC-110 project analytical studies quantifying force and deformation demands (in progress).

- Could Accomplish: Part 1 or Part 3 provisions, depending on information and timing.
Wood: Mid-Rise CLT Seismic Design Methodology

- Cross-laminated Timber (CLT) large-panel wood construction is starting to make its way into new building construction in the US. Research is currently underway to define seismic design parameters and associated seismic design provisions and detailing.


- Could Accomplish: Part 3 or Part 1 provisions, depending on information available and time frame.
Wood: Heavy Timber Structures

- Issue: Quantification of seismic performance parameters, design methodologies and associated detailing is needed for heavy timber systems such as timber braced frames.

- Could Accomplish: Part 3 white paper on proposed seismic design methods.
Wood: Shear Wall Tie-Down System Criteria

• Issue: Shear wall tie-down systems are currently designed based on capacity considerations only, at typical code design force levels. No consideration is given to the load and deformation behavior to occur under anticipated seismic forces. Criteria need to be developed as required to ensure shear wall performance.

• Resources: Available testing and analytical studies.

• Could Accomplish: Part 1 or Part 3 guidance for tie-down design.