2010 Building Code Update

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Re-tooling your office for changes to the 2010 California Building Regulations that affect light-frame structures

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Introduction

When the rules of practice change, re-tooling efforts can be dramatic for engineers engaged in plan review or production of light-frame structural designs. The repetition and volume that is common in light-frame design requires engineers to develop efficient internal work procedures in order to remain competitive. It is seldom acknowledged that a small organization may have tens to hundreds of thousands of dollars invested into their internal production infrastructure including computer programs, spreadsheets, forms, standards, staff training and other items. As the code develops in complexity and length, challenges occur when seemingly benign code changes create significant impacts to established work flows.

The three-year code publication cycle has grown to represent a monumental task. A quick review of the ICC website divulges the volume and complexity of effort that is behind it. For most practicing engineers, following the code changes that affect design practice is not easy. The current system of identifying changes is inefficient for engineers since it is necessary to compare the old code side-by-side with the new code in order to assess the changes. The CBC uses vertical change bars in the margin to alert the reader of changes, however there are hundreds to go through and many indicate only minor editorial or typographical changes not affecting practice. Thus, it is a substantial task for all engineers, who must ferret out the changes and assess the impact. Although staying abreast of the codes that affect practice is a fundamental requirement, it could be said that codes have grown to a point where a full accounting is well beyond the capability of an individual engineering practitioner.

As an aid for professional engineers engaged in plan review or engaged in the production of light-frame structural designs, this paper analyzes the changes made in the latest code cycle. It is also our intent to identify the new codes that, based upon our experience, promise to alter our industry. As with the similar article we prepared in the last code cycle, our emphasis is on seismic provisions. To further simplify our scope we do not include issues related to essential facilities or structures located in a flood plain. We also opted to shorten descriptions and use common industry labels, opting for easy reading rather than rigorous technical validity. Note that it is easier to refer to "the masonry standard" than repeating TMS 402-08/ACI 530-08/ASCE 5-08.

Another reason for this paper is that California building officials will enforce the 2010 CBC starting January 1, 2011, if not earlier.

Codes and Standards

The code documents referenced in this article are shown in the Table 1 below. **Bold** type indicates new or updated codes or standards.

Table 1 – Code documents

Code/Standard Short Name	Subject
2010 CBC (2009 IBC)	**Building Code**
2010 CRC (2009 IRC)	**Residential Code**
2010 CA Green Building Standards Code	**CalGreen**
ASCE 7-05 (with Supplements 1 and 2)	Design Loads
AF&PA NDS-05	Wood provisions
AF&PA (SDPWS) – 2008	**Wood Shear wall provisions**
AISC 360-05	Steel
AISC 341-05	Steel Seismic Provisions
AISI S200-2007	**Cold Formed Steel-Light Frame**
TMS 402-08	**Masonry**
ACI 318-08	**Concrete**

Those without bold are standards that are unchanged from the previous code cycle: Importantly, ASCE 7 remains the same version as before (i.e. 2005 edition) and thus seismic design procedures are the same, including the same spectral maps with which we are familiar. You may see that ASCE 7 is referenced with Supplements 1 and 2. The significance of these supplements is minor: Supplement 1 is already included in the familiar blue cover book, and Supplement 2 merely revised one of the base shear equations not applicable to light-frame structures. In future code cycles ASCE 7-10 will be used and base shears will be very different (often higher) due to significant changes to the risk-based maps from inclusion of multi-directional ground motions.

Regarding the standards listed in Table 1 that did not change editions, be aware that the Los Angeles Region Uniform Code Program (LARUCP) and the ICC Tri-County Uniform Code committee (TUCC) have prepared 2010 amendments suggesting changes that are made available for adoption in individual jurisdictions. They can be found at www.icclabc.org and www.iccpeninsula.org, respectively. By December 2010 most local jurisdictions have already prepared their code adoption packages and amendments and should be possible to find local changes to the code online.

Two new codes go into effect in California in January: the California Residential Code (CRC) and the new California Green Building Standards Code, known as CALGreen.

2010 California Residential Code (CRC)
The CRC is intended to be a stand-alone code document covering architectural, structural, MEP and energy standards. For designers, the concepts are similar to those used for many years in the conventional construction provisions, yet there are many significant differences. Some differences are:

- The CRC has more detail, design options, and differences in philosophy compared to CBC conventional framing provisions (i.e. Section 2308).
- The CRC provisions are based upon pre-engineered solutions but in many respects are not equivalent to the rigor of current the CBC and ASCE 7-05 standards.
- The CRC further breaks down the seismic design category D into D_0, D_1, and D_2, which have different requirements. For Example "irregular" buildings in D_1, and D_2 require a CBC Lateral Design.
- The CRC expands the portal frame options [CRC R602.10.2 T602.10.4.1].
- CRC provides for corner detailing [CRC R602.10.4.4(1)].
- CRC has lower H:W ratios on shear walls [CRC T602.10.3.1 R602.10.3].
- CRC does not have the same level of safeguards for protecting adjacent property from excavations.

A detailed analysis between the content of the CBC and CRC is beyond the scope of this paper. However, a more basic complexity faces design professionals of residential projects that could be designed by either code. As discussed in the following paragraphs, engineers must contend with the fundamental intent of the Engineering Practice Act and the building codes, not to mention client expectations, all of which can be difficult to align.

As with the conventional construction provisions, the CRC has restrictive geometric and material limitations governing its use. Portions of the structure not meeting the CRC limitations must be designed by a licensed professional. When a structure fits into the CRC limitations, it is clear that a design professional is not mandated. What is less clear is how design professionals should best approach a project that qualifies for the CRC.

The scope of the model code (IRC) is limited to:

> "detached one- and two-family dwellings and townhouses not more than three stories above grade plane in height with a separate means of egress and their accessory structures."

California modified the model code to add CRC Section R301.1.3.2 which states:

> "The building official shall require construction documents to be approved and stamped by a California licensed architect or engineer for all dwellings of woodframe construction more than two stories and basement in height.

Subsequently, the LARUCP also prepared a sample amendment that modified this requirement to state "all dwellings of woodframe construction more than **one** story in height..." Besides the story limitations being reduced from the model code and the lack of mention for CFS light-frame construction, notice that the requirement is for a professional's stamp, and a fully-engineered design per the CBC and ASCE 7 provisions is not explicitly mentioned.

Looking at other states, engineers have often prepared plans based upon the IRC. Engineers will also often not stamp these designs when they are fully compliant with the IRC limitations. However, it is uncertain how such practice may evolve in California when examining the intent of the CBC and CRC together with the intent of the Professional Engineers Act (Business and Professions Code 6700-6799). One basic question is whether a CRC design is considered an exemption to the Act, or if is considered beyond the scope of the Act. For example, consider the situation when an engineer calculates dead loads and the number of required wall lines to conform to the CRC provisions. Does this mathematical calculation fit within the definition of engineering, and will the engineer stamp it? Or, is it outside the Act, and will engineers resist stamping a CRC compliant design to avoid personal liability?

Another basic question concerns how comfortable engineers will become as they gain experience with the CRC and the science behind it. For example, will engineers feel they can rely upon the CRC to protect the public and meet the standard of care? Or, will they conclude that some other duty exists that mandates a CBC based design? In jurisdictions adopting LARUCP amendments, other questions may arise. Indeed, it will be interesting to see what actions are taken by design professionals in the months ahead.

Although it is difficult to predict the effect of the CRC, we expect design engineers will initially opt out of the CRC and continue to use the CBC to design residential structures. In time, some engineers will migrate their design operations to utilize the CRC where possible. The CRC does not guarantee a more conservative design, so construction costs may be less. On the other hand, the CRC can require items such as additional braced wall lines, whereby the CBC could yield creative, cost saving solutions. Thus, it will also be interesting to see how many new residential units built to the CRC.

Finally, it should be mentioned that the CRC is adopted as Part 2.5 of Title 24 and is on par with the CBC which is Part 2. Also, both the CRC and CBC have a section in the first chapter regarding the scope of applicability. CBC section 101.2 (first printing) repeats the CRC scoping language except that the term "California Building Code" was apparently (mistakenly) referenced instead of the CRC. The scoping language is again (correctly) added to CBC 2308.1, although no change bar is shown. This item has not been included in errata to date.

2010 California Green Building Standards Code (CALGreen)

The CALGreen provisions create a number of new sustainability requirements, mostly related to architectural, mechanical, electrical and plumbing provisions. One item of potential structural interest is CALGreen 4.505.2.1 which requires a capillary break under residential slabs-on-ground. One of three listed methods of achieving a capillary break is with "a slab design specified by a licensed design professional." This provision may draw in design engineers who traditionally exclude waterproofing and dampproofing from the scope of their service. Structural engineers should be cautious in assuming that any slab they design will suffice, since the provision is not worded as an exception. However, other methods of achieving equivalent interior moisture control do exist and that can be specified by waterproofing consultants or others. Also, note that CALGreen is unique in that it is not based upon an existing model code.

Structural Changes

The following are changes likely to affect your current practice. The reference code sections are shown with a brief description:

1603.1.6 *Geotechnical information*. The soils bearing pressure needs to be shown on the construction documents. The moving of this requirement from Chapter 18 to Chapter 16 effectively requires the engineer to indicate on the construction documents the assumed bearing pressure where prescriptive methods are used. It is worth noting that SEAOC's Professional Practice Committee has defined the term "construction documents" consistent with the current CBC Section 202 definition, which includes all the written and drawn documents required to obtain a building permit. Thus it is not required that the information be on any particular document, such as the drawings.

1604.8.2 *Walls*. The code section requiring masonry and concrete wall anchorage has been revised such that all walls, regardless of material, shall be "anchored to floors, roofs and other structural elements that provide lateral support" with a "positive direct connection." The designer is referred to ASCE 7 Section 11.7.3 to determine the anchorage force for all walls. This section contains the familiar language for interconnecting portions of the structure for 5 percent of dead load, and this load is incorporated in place of "E" in the load combinations. For masonry and concrete walls the prescriptive 280 plf requirement no longer exists. Similar language is repeated in section 1613.7 which modifies ASCE 7 for compatibility (i.e. to eliminate the 280 plf requirement and to extend the provision to all walls). The intent of the code change was to remove the arbitrary lower bound limit of 280 plf, which was deemed over-conservative in SDC B and C. For buildings assigned to SDC D, E or F, requirements for anchorage of concrete or masonry walls must be designed for 0.80 S_{DS} per ASCE 7 section 12.11.2.1.

1605.3 *Load combinations using allowable stress design*. The Basic and Alternate ASD load combinations have had footnote exception 2 expanded to state that roof live loads of 30 psf or less need not be considered when in combination with seismic loads. This was changed to be consistent with LRFD based load combinations.

Table 1607.1 *Minimum live loads*. The definitions for "deck" and "exterior balcony" were removed from 1602.1 and they no longer have different live loading requirements. The live load for decks and exterior balconies has been revised to be the same uniform live load as the occupancy served. This effectively decreases the live load requirement for many residential balconies down to 40 psf from 100 psf (60 psf in single family and duplexes for balconies not exceeding 100 sf). Secondly,

Table 1607.1 contains footnotes "g" which references 1607.11.2.2, and "l" which references the Building Official for the determination of special purpose roof live loads.

1607.11.2.2 *Special-purpose roofs.* This Section adds a sentence requiring that the 100 psf live load shall not be reduced at roof areas classified as Group A assembly occupancies. The intent of several related of code changes, which affect 1607.9, 1607.9.1.3 and Table 1607.1, was to encourage the formal classification of Group A Occupancies at roof areas open to the public. However, with the changes, the code omitted the paragraph in 2007 CBC 1607.9.1.3 regarding the non-reducibility at any level of live loads equal to or greater than 100 psf in "public assembly occupancies." Since multifamily occupancies frequently have had common areas considered as public assembly occupancies within a Group R use, it appears to now be possible to reduce 100 psf live loads provided they are not formally designated as Group A Occupancy. Also, in structures whose primary occupancy is public assembly with an occupant load greater than 300, the seismic importance factor steps in, since Table 1604.5 was modified to remove the requirement that a structure be "covered" in the Occupancy Category III designation.

1609.1.1 *Determination of wind loads.* SSTD 10 was the previous Standard for Hurricane Resistant Residential Construction based on fastest-mile wind loads rather than the current 3-second gust wind speeds. In section 1609.1.1, the ICC 600 standard is introduced as the new ICC Standard for Residential Construction in High Wind Regions. This standard applies to qualifying structures in Groups R-2 and R-3 in high wind regions (100 to 150 mph) and special wind regions. It uses the new 3-second wind maps, references the AF&PA Wood Frame Construction Manual (WFCM) for wood framing and the AISI S230 Prescriptive Method for One and Two Family Dwellings for cold formed steel (CFS) construction.

1609.6 *Alternate all-heights method.* For light-frame construction not meeting the limitations of Method 1 (Simplified Procedure) the All-heights Method alternate wind design procedure provides wind loads meeting the requirements of ASCE 7 Chapter 6 Method 2 (Analytical Procedure). The Method is a simplification through combining various parameters K_d, G, C_p and GC_{pi} into a single term C_{net}.

1613.6.3 *Automatic sprinkler systems.* This section is the first of a number of new paragraphs added towards the end of Chapter 16. Due to a code change submitted by the American Fire Sprinkler Association, gravity and seismic bracing of sprinkler systems can be designed with NFPA 13 which offers a simplified procedure. As in the past, a California C-16 specialty contractor can design-build the plans without an engineering stamp.

1613.6.7 *Minimum distance for building separation.* For adjacent buildings not structurally connected, the previous code did not specify how to calculate the separation distance to avoid pounding of adjacent structures during an earthquake. Some have considered the requirement as the sum of the calculated maximum displacements of each structure. Conversely, this Section of the CBC re-introduces the familiar verbiage and separation equation from the 97 UBC which uses the root-sum-of-squares of the maximum displacements.

1702 *Definitions.* The definition of Structural Observation has been revised to remove the phrase "at significant construction stages and at the completion of the structural system." Language was added to CBC 1710 stating that "prior to the commencement of observations, the structural observer shall submit to the building official a written statement identifying the frequency and extent of structural observations." Thus, more discretion is given to the design professional regarding the timing of the observations. As with the previous code, the CBC requires a written report at the conclusion of work and only unresolved issues need be identified. Be aware that an LARUCP amendment was prepared that removes this last requirement.

1704.1 *Special inspections - General.* There are many changes regarding special inspections. First of all, Section 1704.1 was modified to specifically state that the engineer of record is not prohibited from performing his or her own special inspections. The new language should clarify and resolve what has been an area of uncertainty and contention in practice. In addition, the specifics of special inspections have been revised for a number of items including cold-formed decks, reinforcing steel, long span trusses, bolts, helical piles, wind resisting systems and more.

In light-frame construction the application of special inspection requirements has often differed between the code language and common practice. In the past, the previous code CBC 1701.1(E)3 exempted all R-3 occupancy structures from special inspection unless specifically required by the building official. In practice, special inspections usually took place in the same manner as with commercial occupancies.

In the 2010 CBC the R-3 exception was removed with reasoning that these structures were generally covered by the CRC, which does not have special inspection requirements. For structures that were not simple enough to qualify for the CRC, the added complexity was deemed sufficient to require special inspections for the usual items prescribed in the CBC. It should be noted that the CRC contains items such as narrow portal shear wall frames, that have no special inspection in the CRC but can require special inspection when using the CBC. The result of this code change is that the 2010 codes effectively shifted away from using occupancy as a basis for requiring special inspections. One downside of this arrangement is that builders may link the engineering and special inspection fees together in their decision to hire licensed professionals.

1706.1 *Special inspections for wind requirements.* Special Inspection is required for shear walls resisting wind forces where 3-second-gust basic wind speed is 120mph or greater in wind Exposure Category "B" (or 110 mph or greater in wind Exposure Categories "C" and "D").

1707.1 *Special inspections for seismic resistance.* The CBC revised provisions for the special inspection of seismic force resisting systems and MEP components in the higher SDC's. Section 1707.1 lists when special inspections for seismic resistance are required and it was modified to create some specific exceptions applicable to light-frame structures. Specifically, 1707.1 indicates that special inspections of these systems are not required when exempted by Section 1704.1 (General), 1705.3 (Statement of Special Inspections, Seismic Resistance), or 1705.3.1 (Statement of Special Inspections, Seismic-force-resisting systems). Accordingly, a typical shear wall with fasteners less than 4 inches on center will not trigger special inspection of the lateral system provided either (1) the S_{DS} does not exceed 0.5g and the structure height does not exceed 35 ft, or (2) the structure is a detached one- or two-family dwelling not exceeding two stories and that does not have a nonparallel system, weak story, torsional or extreme stiffness irregularity. The placement of this exemption in 1707.1 could be prone to some confusion due to the circuitous code sections involved.

1707.6 *Architectural components.* These requirements, previously in Section 1707.7, concern cladding, nonbearing walls and veneer. Per 1707.1 special inspection may be required for these items in SDC D or higher (C or higher for MEP components). The provisions now exempt more items for structures 30 feet or less in height. For example, interior and exterior veneer is now exempt from periodic special inspection on structures 30 feet or less in height.

1709.1 *Contractor responsibility*. This section, previously in 1706, was revised to be less restrictive partially because the "statement of responsibility" was often ignored in practice. Per the revision, the contractor still must submit a written statement acknowledging the special inspection requirements on each wind-resisting or seismic-resisting system or component prescribed. The revision further omits the requirement for detailed information describing "who," and "how" the contractor's internal systems work to meet the inspection objectives. As in the previous code, the statement is not required for projects that do not have a part of the lateral force resisting system included in the basic statement of special inspections.

1801 *Soils and foundations*. This chapter was re-written with mostly editorial changes. One item that is prone to confusion is the minimum slab thickness for a slab-on-ground, in light of a new Table 1808.8.2 that gives concrete cover requirements for reinforcement. In the Table, item 1 "Shallow foundations" refers the reader to ACI 318 Section 7.7 which requires 3 inch clear concrete cover for reinforcement "cast against and permanently exposed to earth." We have seen in the past where some engineers and reviewers cite this 3 inch coverage provision as justification for a minimum slab-on-ground thickness of 5 inches. However, such an interpretation is not consistent with the intent of the code as can be seen in CBC 1910 which specifically states a slab-on-ground minimum thickness of 3.5 inches. For more information on the design of residential slabs on ground refer to ACI 318 section 1.1.4. which references ACI Standard 332-04 – Requirements for Residential Concrete Construction. Alternatively, refer to the PTI method per CBC 1908.1.6. Note that ACI 318 does not govern design of slab-on-ground unless the slab transmits vertical or lateral forces to the soil per Section 1.1.7.

1901.4.11 *Construction documents*. In SDC D, E, or F, the construction documents need to have "a statement if slab on grade is designed as a structural diaphragm." This requirement mirrors a new requirement in Section 21.12.3.4 of ACI 318. The intent appears to help avoid saw cutting of a concrete slab-on-grade used to distribute seismic forces. This provision does not appear to be intended for most residential light-frame construction. For larger projects of light-frame construction we suggest that the interpretation of this provision be verified with the Building Official during the design phase. Uniform enforcement and interpretation regarding this provision may not occur.

1904.2-1904.5 *Durability requirements*. Chapter 4 of ACI 318 was completely re-written and a new provision requires the design professional to assign "Exposure Categories and Classes" and describes various conditions regarding freeze-thaw cycles, sulfates, chlorides as well as requirements for low permeability. Note that Section 1901.4.11 is silent on whether the durability Exposure Categories (determined and assigned by the engineer of record) need to be listed on the construction documents.

1908.1.9 *ACI 318 section D3.3*. The 2010 CBC makes revisions to anchor design, but generally does not exempt designers from the ACI Appendix D equations until the next code cycle. Testing has been pursued for anchorage of wood and CFS light-frame construction that will be a part of the 2012 IBC. Regarding wood sill plates, SEAOC performed significant laboratory testing that was in the future will allow the designer to assume the wood governs for 5/8" diameter or smaller cast-in-place anchor bolts loaded parallel to the grain. With this amendment, designers need only check bolt values using the capacity of NDS Table 11E, for qualifying sill bolt applications near the free edge of the concrete foundation or deck. Note that while ¾" diameter bolts were not tested, the NDS predicts the same ductile failure mode. In the recent Bluebook Article on the topic, SEAOC recommended ¾" diameter anchor bolts also be considered ductile, which yields a practical design solution for anchorage of high capacity double-sided shear walls.

Interestingly, a very similar code amendment was added to the 2010 CBC, but was indicated specifically as a Building Standards Commission (BSC) amendment. Generally BSC's scope of application is limited to state owned buildings as indicated in CBC 1.2.1. (This amendment is found in CBC 1908.1.9.1 and 2305.1.4.)

Outside the BSC amendment, sill plate anchorage design is expected to be similar to the 2007 CBC. As in the past, useful anchor designs may be derived using the assumptions discussed in the SEAOC Bluebook Article on the topic. It is important to note that the 2010 CBC and ACI 318-08 have minor changes affecting sill plate anchorage. For example the non-ductile attachment factor of 2.5 was effectively reduced to 2.0. Post- installed anchors must be qualified for use in cracked concrete thus limiting some options for field fixes of holddown anchorage. Also, anchor bolt reinforcement is permitted per D4.2.1 and D6.2.9 which can restrain the breakout failure and dramatically increase the strength of the connection, which can be especially useful at edge, corner and stemwall locations.

2101.2 *Masonry design methods.* The Masonry Standard has several important changes. Regarding anchor bolts in masonry, the formulas for ASD shear and tension values have been brought into alignment with strength design. Also, the new code includes failure modes related to tensile pullout of bent bars (ASD), shear breakout/pryout (ASD), and shear crushing/pryout (Strength) so that ASD and strength design are finally checking the same failure modes. Besides consistency of results, another benefit of the changes is that some of the ASD bolt solutions are more reasonable than in the past. For more information refer to the Masonry Chronicles article (Winter 2009-10) available online.

2209.2 *Steel decks.* The Steel Deck Institute has two standards that are added for the design of cold formed steel roof and floor decks. These standards can be used in lieu of the AISI Standard applicable to decks.

2210.1 *Cold formed steel light-frame construction.* The AISI North American Standard for Cold-Formed Steel (CFS) Framing standards have been re-named (See Table 2 below). New Standards are shown in **bold**. Steel stud shear walls have minor revisions per AISI S213-07, which is the required standard for light-frame construction per AISI S100's

Table 2 – Renamed CFS standards.

AISI S200-07	General Provisions
AISI S211-07	Wall Stud Design
AISI S212-07:	Header Design
AISI S213-07	Lateral Design
AISI S214-07	Truss Design
AISI S230-07	Prescriptive Method for One and Two-Family Dwellings
AISI S201-07	**Product Data**
***AISI* S210-07**	**Floor and Roof System Design**

mandatory Appendix A. The requirements and shear strength of the cold-formed steel framed shear wall and diaphragm assemblies are similar to those in the 2004 edition of AISI-Lateral, which was adopted by the 2007 CBC. The main difference between the 2007 and 2004 Lateral Design standards is the addition of more robust provisions for diagonal strap braced walls. AISI S213 also has some revisions to available shear strength values of wood or steel sheathing on steel studs. For more information visit the website for AISI (www.steel.org) or the Steel Framing Alliance (www.steelframing.org). Designers should consider that the AISI S213-07 Supplement 1, which narrowly missed adoption in this cycle, requires 43 mil framing to achieve the familiar nominal shear strengths for 0.027 inch steel sheet shear walls. For 33 mil framing, the nominal strengths of these shear wall assemblies are reduced by approximately 30 percent.

2303.4 *Trusses.* Although many change bars occur in this section, the most significant change may be the re-wording of section 2303.4.1.1 to remove the requirement that the building official approve the truss submittal package after receiving it. Specifically, the new code requires truss submittals to be provided to the building official "for approval", whereas the previous code further required the submittal to be provided to the building official "and approved."

As before, it is advisable in many cases to require the truss layout plan be engineered to work as a system and appropriately sealed by the specialty engineer of record. Accordingly engineered design information may be shown on this plan, which may include truss-to-truss hangers, intermediate bracing for slender web or compression members, and any other information related to roof system performance.
2304.9.5 *Fasteners and connectors in contact with preservative-treated and fire-retardant-treated wood.* These requirements were again revisited and re-written. One significant change was that an exception was added which allows uncoated nails to be used in non-exterior locations with SBX/DOT or zinc borate preservative treated wood. Outside this exception, corrosion protection equivalent to ASTM A 653 G185 is required (resultant zinc coating on both sides of steel sheet of 1.85 oz./ft^2) unless addressed by specific manufacturer's recommendations. Be sure to verify your specifications do not reference standard weight zinc coating (G90) unless using the exception noted above. More information is available from www.galvinfo.com or www.strongtie.com. Finally, note that the CRC does not recognize the exemption from galvanized fasteners or connectors that the CBC allows with such borate based preservatives. However, it does exclude ½" or greater diameter anchor bolts from being galvanized per Section R317.3.1

2305 *General design requirements for lateral-force-resisting systems.* A significant change is that the requirement for 3x sill plates was removed. In the previous IBC/CBC the 3x sill requirement was in section 2305.3.11 but it was eliminated when section 2305 was completely edited to remove information deemed to be redundant with the SDPWS wood lateral design standard. The SDPWS purposefully omits the 3x sill requirement and cites testing with 3" x 3" by 0.229" square plate washers which prevented cross-grain bending of the sill plate on medium capacity shear walls. Thus, SDPWS 4.3.6.4.3 requires minimum 3"x3" steel plate washers for all common shear walls, regardless of seismic design category. In the last code, smaller 2 ½"x 2 ½" x ¼" plate washers were required in SDC A-C per the SDPWS and IBC/CBC 2305.3.11. Note that currently an important exception exists in the SDPWS that allows standard cut washers in some shear walls. Standard washers are allowed in non-perforated full-height segmented shear walls that have a maximum 2:1 aspect ratio and do not exceed an ASD seismic demand of 490 plf, provided hold downs are designed without including resisting moment.

While the 3x sill plate requirement may have been removed from current regulations we do not believe the practice will entirely change. First of all, in medium and highly loaded shear walls, a 3x sill may be indirectly required for the anchor bolt design to work. Secondly, many engineers are comfortable with the measure of protection against splitting that a 3x can provide, especially on double sided shear walls with many connectors that may be located in an area of potential decay. It may be noted that the code has been primarily focused on cross-grain bending and the testing did not address splitting potential in double sided, high capacity shear walls.

Finally, note that the square plate washers are required to be ½ inch from the sheathing with adjustment permitted by a slotted hole and stacked standard cut washer. Thus on a double sided 2x6 sill a wider washer is envisioned.

Overall, changes made to the 2008 SDPWS are relatively minor. Revisions include changes to the shear values for wood sheathing applied over gypsum wallboard and the inclusion of the formula behind the perforated shear wall reduction factor table. Regarding Perforated Shear walls, SDPWS Section 4.3.5.3.3 now allows double sided shear walls, effectively doubling the range of its application. Use of the formula, in lieu of the familiar table for the reduction factor, C_o, gives less restrictive reductions for many window and door configurations and it is a good predictor of stiffness.

The shear wall tables are formatted differently between the CBC Table 2306.3 and SDPWS Table 4.3A and some of the data is not included in the CBC table which include allowable shear values for non-Struct I panels of 3/8 inch and 15/32" thickness. However, the values are included in SPDWS.

2308.12.8 *Sill plate anchorage.* These provisions were revised to codify strap anchorage (mud-sill anchor) in addition to anchor bolts for the attachment of sill plates in SDC D and E. In the past they have been a common alternate.

Non-Structural Changes

Other topics from Part I of the 2010 California Building Code:

202 *Definitions.* Provides a new description for secondary members that includes bracing not connected to the columns or not part of the primary structural frame, and floor construction not connected to the columns. For multifamily construction this clarifies the intent of table 601 and 704.3.

419 *Live/Work units.* This section was added to address Live/Work Units, which can be up to 3000 square feet and must be at least 50 percent residential. Live/Work units are assigned Group R-2 Occupancy and thus do not qualify for residential based exemptions tied into R-3 Occupancy, which are commonly found in Volume 1 of the CBC.

504.3 *Roof structures.* Unoccupied roof structures including towers constructed of noncombustible materials can exceed the architectural height limitation. Note that the structural system limitations of ASCE 7 still apply.

704.3 *Protection of the primary structural frame other than columns.* Members of the primary structural frame supporting multiple levels of non-load bearing walls are now required to be individually fire protected. Previously, the individual fire protection requirements for beams and columns were only applicable when a floor and a roof or more than one floor.

704.4.1 *Light-frame construction* is a new section that clarifies king studs and boundary elements in light frame do not need individual fire protection.

Table 720.1(2) *Minimum protection of structural parts based on time periods for* *various noncombustible insulating materials.* New wood and steel stud wall assemblies are listed. Note that some assemblies will have a higher axial capacity, since they do not require footnote 'm' that instructs the designer to assume a minimum slenderness ratio of 33 (often greater than actual) combined with a 22 percent reduction to the basic axial strength, F_c.

903.2.8 *Group R*. This section requires fire sprinklers in all new residential construction including single family homes in California. Section 903.2.18 requires the sprinklers in newly constructed garages and carports. Section 903.3.1.2.1 requires coverage in patios provided there is a roof or floor above.

1203.2 *Attic spaces*. This section has new language that requires blocking to "be arranged so as not to interfere with the movement of air." Roofs must allow ventilation. There is no exception listed for conventionally framed flat roofs with enclosed rafter spaces.

1405.3 *Vapor retarders*. A vapor retarder is required on the interior side of frame walls in certain climate zones designated in the California Energy Code.

1406.6 and 1405.10 require anchored and adhered Masonry veneer to be attached per the Masonry Standard.

1509 specifies that rooftop structures housing mechanical equipment or occurring at the top of ventilation shafts may be exempt from story, building area and height considerations that determine construction type and allowable building height. Penthouses can be up to 1/3 of the area of the supporting roof area and extend another 18 feet above the roof (28 feet if used as an enclosure for tanks or for elevators that go to the roof). It is not clear which roof elevation such structures should be measured from and the provisions do not reference the structural system height limitations of ASCE 7.

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